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Gravity Measurements in Quebec
(South of Latitude 52° N.)

BY

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Page 111, first line of Abstract, *for* "west longitude 64° W.," *read* "west of longitude 64° W.,"

Page 111, third line of Introduction, *for* "of longitude 62° W.," *read* "of longitude 64° W.,"

Page 141, 23rd line of Table, second to last column, delete plus sign.

GRAVITY MEASUREMENTS IN QUEBEC

(South of Latitude 52°N.)

By L. G. D. Thompson and G. D. Garland

ABSTRACT

The results of gravity measurements in Quebec, south of latitude 52°N. and west longitude 64°W., which have been adjusted to the common datum of the primary base network established in Canada in 1952, are presented in this report. While the data include measurements taken during the period 1945 to 1954, observations made on an air survey in 1951 cover the greater part of the area under consideration. The gravity information is presented in the form of tables of principal facts and a preliminary Bouguer anomaly map. Descriptions of primary bases in Quebec are also included.

The general anomaly pattern is discussed and an interpretation is presented. It is believed that the major anomaly trends over the Canadian Shield are caused by systematic differences in density of the Precambrian rocks. There appear to be no gravitational features along the northern boundary of the Grenville sub-province which could be related to the presence of the presumed Huron-Mistassini thrust fault. Large anorthosite bodies in the area are characterized by negative gravity anomalies, which together with the determinations of density show that these rocks are less dense than the surrounding granitic rocks. The positive anomalies in the Eastern Townships and Gaspé are believed to be associated with a belt of ultrabasic rock at moderate depth which surfaces in the Richmond-Thetford and Gaspé districts.

INTRODUCTION

The results for over 1700 gravity meter observations made by the Dominion Observatory from 1945 to 1954 in the province of Quebec, south of latitude 52°N. and west of longitude 62°W., are presented in this report together with an interpretation of the Bouguer anomalies in the area. The main basis of this report is a regional air survey carried out in 1951 throughout the unsettled areas of Quebec north from the Ottawa and the St. Lawrence Rivers as far as 52°N. Observations by road and rail have been included to eliminate gaps in the regional coverage and to provide more information in areas of important structures.

All of the observations have been adjusted to the common datum of the primary gravity base network established in 1952 (Innes and Thompson, 1953). The results are presented in the form of tables of principal facts and a preliminary gravity anomaly map. Descriptions of some additional gravimeter bases have been included for future reference.

In the interpretation of the gravity anomalies, particular attention is given to the significance of:

(1) the anomalies along the northern boundary of the Grenville sub-province;
(2) the local anomalies associated with the large anorthosite bodies in the area;
(3) the anomalies along the Shield boundary;
(4) the positive anomalies in the Eastern Townships and Gaspé region.

THE GRAVITY OBSERVATIONS

History of the Observations and their Adjustment

Several different gravity meters have been used for gravity measurements in this area since 1945. The extent to which each instrument has been employed and the area in

which each year's observations have been made, is given in the following brief account. The manner in which the observations have been adjusted to the base network is outlined so that an estimate of the reliability of each season's observations may be formed.

1945: Observer: **A. H. Miller,**
Instrument: **Humble Gravimeter,**
No. of Stations: **137.**

Measurements with the Humble* instrument in this year constitute some of the earliest gravity meter observations made in Canada by the Dominion Observatory. While this instrument provided a great number of useful observations, it was, by modern standards, somewhat unreliable due to a high and irregular drift rate. By adjusting the Humble observations directly to the new primary bases, much of the error has been eliminated and the following traverses have been included in this report.

(*a*) A loop around the Gaspé peninsula.

This traverse was corrected to the 1952 base value at Rivère du Loup.

(*b*) Traverses north of the St. Lawrence river in the vicinity of Mont Laurier and Lake St. John.

These observations were adjusted to the 1952 bases in each area.

1946: Observer: **A. H. Miller,**
Instrument: **Atlas Gravimeter No. C-24,**
No. of Stations: **47.**

The Atlas gravimeter was used extensively by the Dominion Observatory between 1946 and 1952 for gravity work in Canada. Comparisons with more recent observations have shown that its scale constant, as supplied by the manufacturer, was adequately determined and the observations required very little adjustment to the base network. The following observations were made in Quebec in 1946.

(*a*) A traverse from Chapeau to Ottawa along the north shore of the Ottawa River.

These observations have been corrected to the base values at Pembroke and Ottawa.

(*b*) Traverses in the Eastern Townships, south of the St. Lawrence River.

These observations have been adjusted to the adopted base value at Montreal.

1947: Observer: **A. H. Miller,**
Instrument: **Atlas Gravimeter No. C-24,**
No. of Stations: **87.**

Two traverses were made in this year in Quebec.

(*a*) From Timiskaming to Noranda.

These stations have been adjusted to the primary bases at North Bay, Ontario and Rouyn, Quebec.

(*b*) From Quebec city to the New Brunswick border.

These have been adjusted relative to the bases at Quebec and Rivière du Loup.

1948: Observer: **A. H. Miller,**
Instrument: **Atlas Gravimeter No. C-24,**
No. of Stations: **66.**

*This instrument belonged to the Humble Oil and Refining Company of Houston, Texas, and was placed at the disposal of the Dominion Observatory through the courtesy of the American Geophysical Union.

Observations in this year were restricted to the Joliette-St. Michel des Saints region and have been adjusted to the network values at Joliette and Berthierville.

1948: Observer: **M. J. S. Innes,**
Instrument: **North American Gravity Meter No. 85,**
No. of Stations: **78.**

Observations were made at stations along the Canadian National railway between Quebec city, La Tuque, Noranda, and Cochrane, Ontario and have been adjusted to the 1952 base values on the route. Transportation was by means of gasoline rail speeder and regular passenger coach. High drift rates caused by uncushioned jolts of the speeder rendered the results unacceptable between Quebec city and La Tuque. However, satisfactory results were obtained from La Tuque to Cochrane.

1950: Observer: **G. D. Garland,**
Instrument: **North American Gravity Meter No. 85,**
No. of Stations: **13.**

Most of the observations made in this year north of Quebec city and in the Eastern Townships were repeated in 1952 and 1954 and the more recent values have been used. However, observations along one short traverse between Quebec city and St. Simeon are included in this work.

1951: Observer: **R. Bedford,**
Instrument: **North American Gravity Meter No. 85,**
No. of Stations: **426.**

Observations were made by road in the Noranda-Senneterre region as part of a detailed survey covering the important mining regions in Ontario and Quebec extending from Timmins through Kirkland Lake to Noranda and Val d'Or. The stations were established at 1- to 2-mile intervals to give a more detailed gravity picture. The results of this survey have been adjusted to the 1952 base value at Rouyn, Quebec and at other appropriate bases in Ontario. As it is intended to publish this survey of the mining regions separately, the principal facts are not included in this report.

A feature of this survey was the establishment of a network of stations from Rouyn to Senneterre which was adjusted to minimize the observation errors. Taschereau and Senneterre, two bases used on the air survey of the same year, were included in this network.

1951: Observer: **L. G. D. Thompson,**
Instrument: **Worden Gravity Meter No. 44,**
No. of Stations: **314.**

In 1951 air transportation was employed to establish gravity stations on the shores of lakes at about 25-mile intervals in areas inaccessible by car or rail. Nine base stations in Quebec (*see* Figure 1) were used in this survey: Taschereau, Senneterre, St. Felicien, La Tuque (Lac-à-Beauce), Waswanipi, Nemiscau, Chibougamau (Cache Lake), Oskelaneo, and O'Connell Lodge.

The adopted values for these bases and thus for all observations are relative to the 1952 base network. Taschereau and Senneterre are relative to the adopted value at Rouyn (1951 station network by Bedford). O'Connell Lodge was evaluated in 1951 by Bedford on a traverse from Senneterre to Maniwaki, the latter station being well evaluated

by many direct connections to Ottawa (Saxov, 1956). Chibougamau (Cache Lake), St. Felicien, and La Tuque (Lac-à-Beauce) were established in 1952 as part of the primary base network. Nemiscau was established by air as a primary base in 1952 at the same time as Moosonee. Waswanipi and Oskelaneo were evaluated by a single air traverse from Nemiscau to Senneterre using both North American No. 85 and Worden No. 44 gravity meters.

1951-52: Observers: **L. G. D. Thompson, J. A. Robinson, R. Bedford,**
Instruments: **Worden Gravity Meter No. 44, North American Gravity Meter No. 85, Atlas Gravimeter No. C-24,**
No. of Stations: **about 125.**

During 1951 and 1952 many stations were established north of the Ottawa river in the vicinity of Lachute and south of the Ottawa river west of Vaudreuil. These observations provided data for the gravity maps included in the report on southern Ontario (Thompson and Miller, in press). The principal facts for these stations are not repeated here but the results have been considered in the preparation of the enclosed anomaly map.

1952: Observers: **R. Bedford, M. J. S. Innes, J. A. Robinson,**
Instrument: **North American Gravity Meter No. 85,**
No. of Stations: **40.**

The network of primary bases was established at this time.

1952: Observer: **R. Bedford,**
Instrument: **North American Gravity Meter No. 85,**
No. of Stations: **53.**

These observations were made during the establishment of the primary base network and include—

(*a*) A traverse from La Tuque to St. Roche de Mekanic along the St. Maurice river.

(*b*) A traverse from Chicoutimi to Stoneham along highway 54.

(*c*) A traverse along the Chibougamau road from St. Felicien to Chibougamau townsite.

1953: Observer: **G. D. Garland,**
Instrument: **North American Gravity Meter No. 85,**
No. of Stations: **17.**

A short traverse was made in 1953 to provide more information in the vicinity of St. Urbain. The observations were reduced relative to the base at Quebec city.

1954: Observer: **R. J. Uffen,**
Instrument: **North American Gravity Meter No. 85,**
No. of Stations: **265.**

These observations provided further control, especially south of the St. Lawrence river, and filled several gaps in the regional coverage. They include:

(*a*) A traverse of the Mont Laurier-Senneterre highway from Maniwaki to Senneterre and several roads near Buckingham.

(*b*) A traverse from St. Simeon to Baie Comeau along the north shore of the St. Lawrence river.

(*c*) A regional survey of the Eastern Townships from Huntington northward to the centre of the Gaspé peninsula.

All of this work was connected to existing bases in the 1952 network.

The Principal Facts

The principal facts for the 1952 bases and the observations prepared for this report are listed in Appendix A. They are grouped according to years and the area surveyed, starting with the 1945 results and progressing to those of 1954.

The observed gravity values have been computed to the tenth milligal.

The elevations of stations were obtained from the best information available. Most of the stations in the southern part of the region are located at railway stations, bench marks of the Geodetic Survey, or permanent marks of the Topographical Survey, for which elevations by first and second order levelling are available. In a few cases the elevations were determined by altimeter.

In the northern area covered by the air survey in 1951, elevations were determined with altimeters relative to certain known elevations. Two Wallace and Tiernan altimeters, reading to one foot, were carried in the aircraft and read before take-off and after landing at each lake. A recording microbarograph was set up at the base camp to record daily pressure variations. Since 1951, the Quebec Streams Commission has made available the results of levelling of several river systems which include the elevations of many lakes occupied on the gravity survey. Using these and every other available height control, the unknown elevations were computed by standard methods of altimetry.

The station positions were scaled from the largest scale maps available; usually 1 mile to the inch in the southern portion of the region and 8 miles to the inch in the north. Theoretical gravity at sea level was obtained from the International formula as tabulated by Swick (1942). The Bouguer anomaly was computed using a factor based on a rock density of 2.67 grams per cubic centimetre.

The Gravity Anomaly Map

A preliminary Bouguer anomaly map of the area has been prepared (*see* inside back cover), which is adequate for purposes of interpretation. While the generalized geology has been added to aid in the interpretation, for purposes of clarity only the gravity contours have been included on this relatively small scale map; the station locations and anomaly values are given in the tables. The extent of the gravity measurements in the area is indicated by the accompaning sketch map (Figure 1). Shown on this map are individual stations established during the air survey at about 25-mile intervals and traverses completed by road and rail with stations from 2 to 10 miles apart. In view of the station distribution, the contour interval has been selected as 10 milligals.

The Descriptions of Sites of Gravimeter Bases

The descriptions of several of the bases of the 1952 network in Quebec have already been published (Innes and Thompson 1953). However, the descriptions of all primary bases established in 1952 including Rupert House and the 1951 air survey bases of

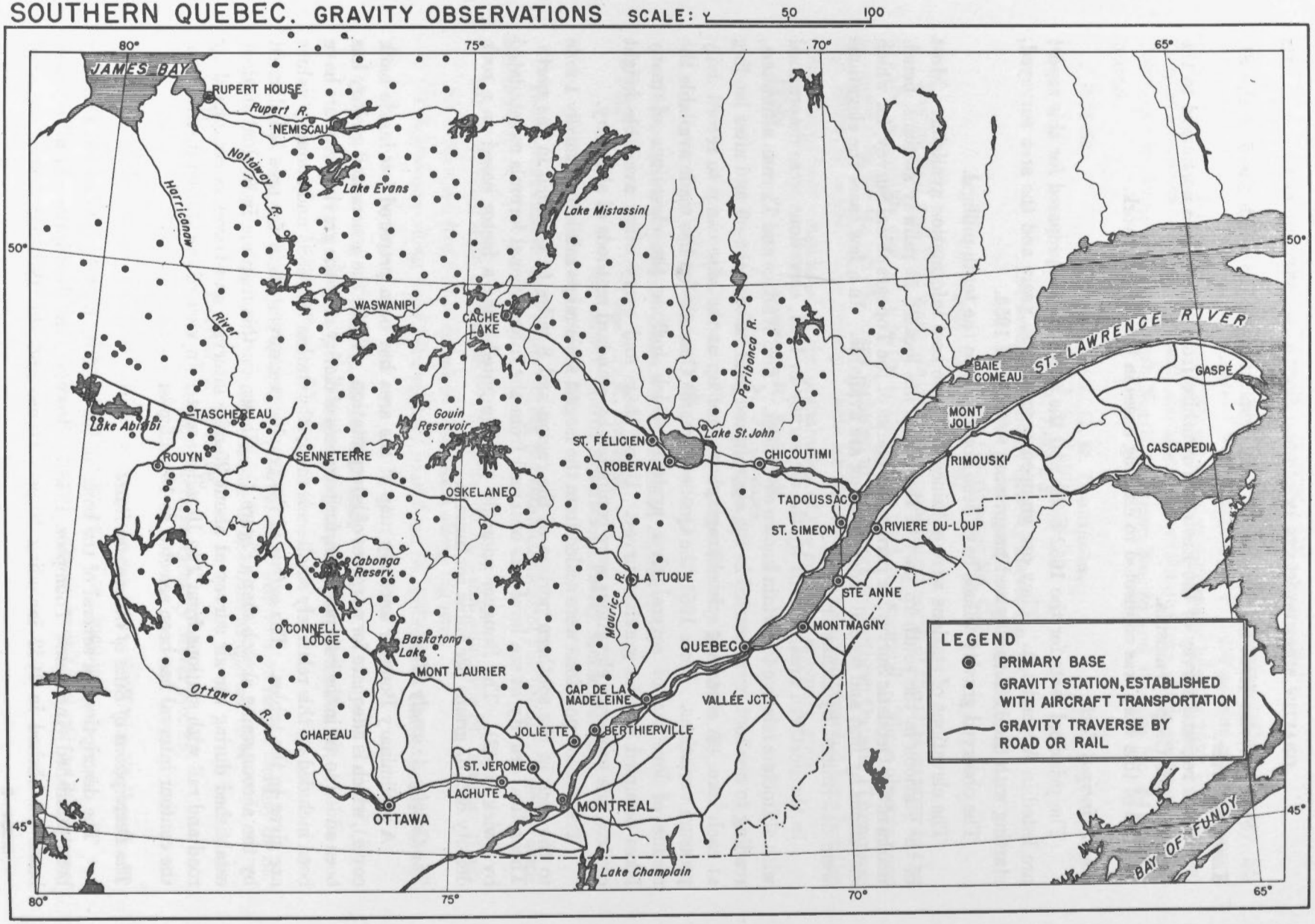

FIGURE 1.—Map of the area showing distribution of road and rail traverses and stations established by air transportation

Nemiscau, Cache Lake (Chibougamau), St. Felicien and Lac-à-Beauce (La Tuque) are presented in Appendix B of this report. Since there are only a few primary bases in the northern region which can be used for control on future surveys, it has been considered desirable to include the descriptions of the other base stations used on the air survey even though they are not primary bases.

Each diagram is oriented so that approximate north is at the top of the drawing. While the distances shown on the diagrams are exact, it should be noted that the scale, the configuration of structures and terrain are diagrammatic and intended for identification purposes only.

INTERPRETATION OF THE ANOMALIES

Extent and General Character of the Area

The area under study embraces portions of three recognized geological regions: the Canadian Shield, the St. Lawrence Lowlands and the northern Appalachians. Within the Shield the observations extend over a major portion of the Grenville sub-province and a portion of the Temiskaming sub-province to the north. In the interpretation of the gravity anomalies, attention is paid to the nature of the structures inferred within each region, and to the boundaries between regions.

While the elevation of the land surface ranges from sea level to over 4,000 feet, the greater part of the area has a mean elevation of slightly less than 1,500 feet above sea level. The highest recorded elevation is 4,160 feet, for Mt. Jacques Cartier, in the Shickshock Mountains of the Gaspé peninsula. Other regions where the elevation exceeds 3,000 feet include the Laurentian Mountains, extending along the southerly portion of the Canadian Shield, and rather limited areas of the Sutton Mountains in the Eastern Townships. Within the Shield, the general trend is a decrease in height from the Laurentian Mountains toward the north, as evidenced by the elevation of 1,401 feet at Parent, and 1,220 feet for Lake Mistassini.

Examination of the anomaly map indicates the range of Bouguer anomaly encountered. Positive values are found only within a relatively narrow strip extending, with interruptions, from the tip of Gaspé peninsula to the International Boundary near Lake Memphremagog. The highest values, as observed near Richmond, are about 45 milligals. Within the Shield itself, the Bouguer anomaly ranges between minus 10 and minus 85 milligals, the greatest negative being observed at Waswanipi in the northwesterly portion of the area. Isostatic corrections have not been computed but they are available for a few pendulum stations distributed over the area up to about latitude 49°.

Canadian Shield

The General Anomaly Pattern

Most of the area considered in this paper lies within the Canadian Shield. Since the the greater part of the gravity observations over the undeveloped regions were established on lakes at intervals of about 20 miles, it is obvious that only the major structural trends may be studied.

Very generally, the pattern of anomalies from south to north is a pronounced negative in the area immediately north of Montreal, an east-west positive trend extending from the

Ontario border to the St. Lawrence River near the mouth of the Saguenay River, a second major negative area north of this, and finally a second positive region at the northwestern limit of the area. A profile extending northwesterly from Montreal, as shown in Figure 2, crosses these chief trends.

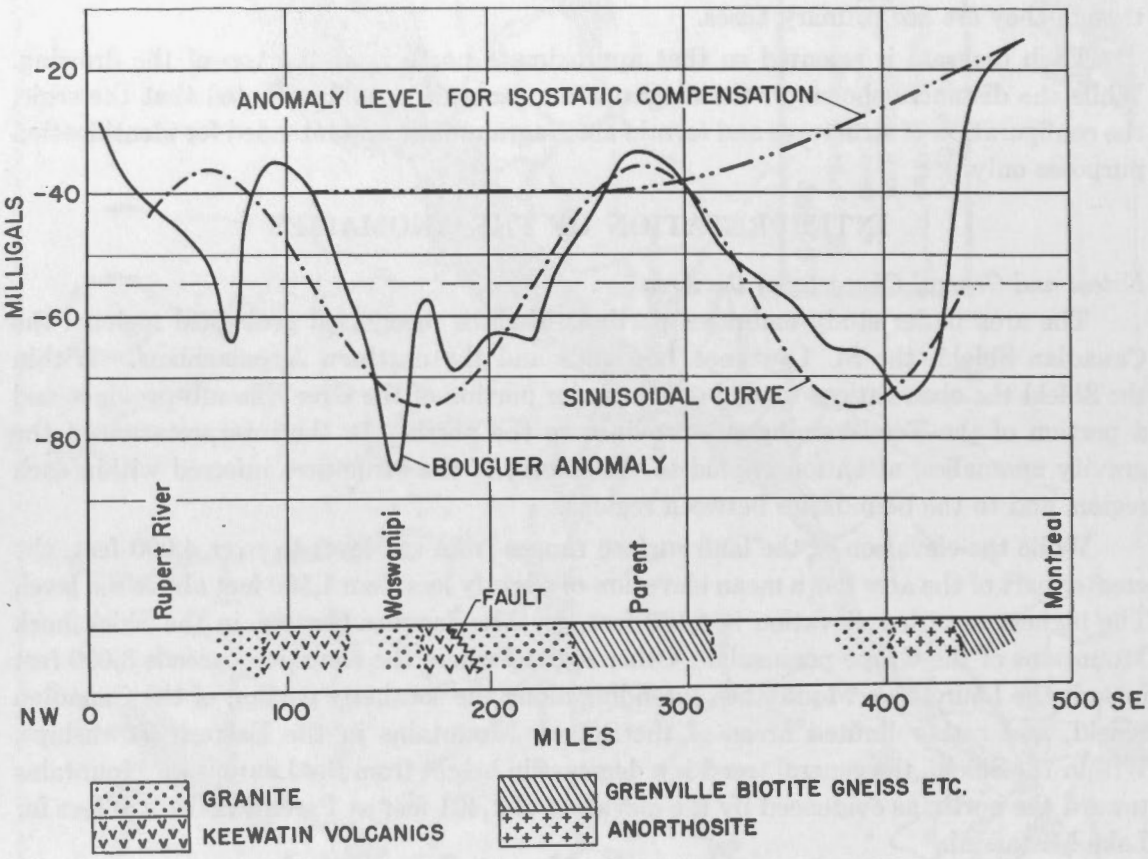

FIGURE 2.—Bouguer anomaly profile, Montreal-Waswanipi-Rupert River

In the Temiskaming sub-province of the Shield, north of the limit of the Grenville sub-province, differences between rock types are sufficiently clear cut for a correlation with the anomalies to be found without difficulty. Wherever detailed geological maps are available for comparison, as in the vicinity of Val d'Or or farther north at Broadback River (Shaw 1940), it is found that relatively high Bouguer anomalies occur over the dense Keewatin volcanics, while much more negative values extend over granitic rocks. Within the Grenville region, however, the problem is more difficult partly because much of the area is not mapped in detail, and also because of the gneissic, foliated character of the rocks which makes the boundaries between rock types often indistinct and makes the representative sampling for density determinations very difficult. Following early gravity surveys over extensive Precambrian areas, the existence of considerable variations in anomaly level over broad regions mapped simply as "gneiss" or "granite" appeared to imply a hidden cause for the effects. Consequently, the broadest trends of this type were ascribed to warpings of the crustal layers, rather than to density variations in the surface rocks (Garland 1950). However, more detailed studies of specific areas (Oldham 1954) have shown that there are in fact systematic differences between the densities of various types of the gneissic rocks, and that major distortions of the anomaly field may be produced by

these density variations. In the Parry Sound region of Ontario, Oldham showed that within an area about 20 miles in diameter, the dominant rock type was biotite and hornblende gneiss with a mean density of 2.85 gms/cc., and that this area was surrounded by more granitic gneisses of mean density 2.69 gms/cc. If this difference in density extends in depth for some thousands of feet, it could explain the observed variations in Bouguer anomaly.

It remains to demonstrate the degree of correlation between the major anomaly trends and the rock types for the Grenville region in Quebec. Along the extreme southern edge of the exposed Shield, from the vicinity of Ottawa to the lower St. Lawrence, the anomaly is relatively high, that is, above minus 30 milligals. This area includes the Grenville type area of Logan (1847), and the Buckingham and other areas studied in detail by Wilson (1920, 1924, 1925). The dominant rock types in these areas appear to be metamorphosed sediments, such as crystalline limestone and sillimanite-garnet gneisses. It is true that these are intruded in many areas by granite, but on the whole the denser, metamorphic types predominate. The region includes also numerous basic intrusives, termed the Buckingham series by Wilson, and the local effect of these on the gravity map may be seen in the type area, north of the town of Buckingham. The densities of the intrusive rocks are found to be over 2.85 gms/cc., and of the surrounding gneiss, 2.83 gms/cc.

There is in addition an intense local anomaly, reaching values of plus 20 milligals over a breadth of 10 or 12 miles, in the vicinity of Huntingdon, southwest of Montreal. The Precambrian rocks in this vicinity, north of the International Boundary, are everywhere concealed by Cambrian and Ordovician strata of thickness between 500 and 1,700 feet (Dresser and Denis, 1944, p.255). However, the positive anomaly is on strike with a belt of gabbro known in the Malone district of New York (Buddington 1939), and it would appear that what is observed is the effect of the northeasterly extremity of this belt.

The boundary between this southerly area of higher anomaly and the more negative area to the north follows a smooth arc from near Mont Laurier to the St. Maurice River, then runs northerly for some miles. The contour map and the profile in Figure 2 demonstrate the sharpness with which the anomaly decreases. Included in the negative area north of this rapid decrease is the mass of the Morin anorthosite, which is discussed in more detail later, and the associated acid intrusives, such as syenite, described by Osborne (1938). Furthermore, Osborne (1936) has shown that in the vicinity of Shawinigan Falls, where the anomaly contours run almost north-south, there is a transition in rock types from granitic gneiss on the west to basic gneisses and amphibolite on the east. Much of the area which underlies this broad negative belt is unmapped in detail, but it seems reasonable to presume that the dominant rock type is granitic gneiss or acidic intrusions.

Proceeding northward, we observe the next major feature of the map to be a belt of relatively high anomaly, with a remarkable east-west trend from near the boundary of the Grenville sub-province, through Parent, to a broader high area north of Quebec city. Near its western end, this belt includes the Cawatose area mapped in detail by Wahl and Osborne (1950), in which the dominant rock is described as a biotite paragneiss. Analyses given by these authors show that this rock consists principally of plagioclase, quartz, and biotite, with an average volume content of 25 per cent of the latter mineral. Such a rock

would have a theoretical mineral density of 2.77 gms./cc. By contrast, a "pink granite gneiss" found in minor amounts in the same area is given as being composed of plagioclase, microcline, quartz and an average of 5 per cent of biotite. The theoretical mineral density of this rock would be 2.63 gms./cc.

In the area north of Monet, on the Canadian National railway line west of Parent, the rock types along the belt of higher gravity are also known in some detail. The mapping of Faesaler (1936) indicates a gradation from biotite paragneiss, in the vicinity of the railroad, to granitic rocks near the northern limit of his map-area, which lies about 50 miles to the north. As shown in Figure 2, this gradation corresponds to the decrease in anomaly from minus 30 to minus 70 milligals.

The negative belt north of this gradient extends in an east-west direction across the north of Lake St. John, from at least as far west as the boundary of the Grenville, to the eastern limit of the area covered by the gravity observations. It includes the large anorthosite mass north and east of Lake St. John, the Roberval granite described by Dresser (1916), and large areas of granitic rocks mapped by the Quebec Department of Mines (Map No. 961, 1952). Apart from the anorthosite, the rocks appear to be dominantly granitic. They are bordered on the north, in part, by basic volcanics of Keewatin type, as in the Surprise Lake area (Deland 1953), where the anomaly increases sharply toward the north.

There would appear, therefore, to be a fairly definite relationship between the rock types as exposed at the surface and the major features of the anomaly field. In general, the more positive trends are associated with either basic volcanics, as in the Temiskaming provinces, or with the dense gneisses of the Grenville, while negative anomalies are associated with granitic rocks. From a quantitative point of view, little more can be done than to estimate the probable depth extent of the density differences, as the spacing of stations and the gradational nature of many of the boundaries prohibit a more detailed analysis.

The profile of Figure 2, which crosses the main trends perpendicularly and is representative of the anomaly variations, shows differences in anomaly level of about 40 milligals between the high and low areas. If we take the density difference between the granitic and denser rock types to be 0.15 gms./cc. (corresponding to 2.70 gms./cc. for granite gneiss, and 2.85 gms./cc. for biotite paragneiss and similar types) the depth extent required to produce this anomaly variation is 21,000 feet (6.4 kilometres). In other words, the characteristic rock types of the different regions may persist in depth through a significant proportion of the crust. Hodgson (1953) has deduced from a study of seismic waves from rock bursts that the crust beneath northern Ontario is single-layered, with a mean thickness of 35.4 kilometres.

The questions which now arise are the magnitude of the stresses developed in the crust due to these variations in anomaly, which persist over widths of several tens of miles, and the degree of isostatic compensation of the region as a whole. To illustrate an approach to these problems, two additional curves have been drawn on Figure 2. The first of these illustrates the level of Bouguer anomaly which would correspond to zero isostatic anomaly, on the Airy hypothesis for a depth of compensation of 40 kilometres. This curve has been obtained from the isostatic corrections given by Miller and Hughson (1936) for pendulum stations in Quebec and Ontario, and although it is reasonably well defined between Montreal

and Parent, its character to the northwest is uncertain. The correction is rather slowly varying over the area of interest, and the curve indicates that in the vicinity of Parent and Oskelaneo a Bouguer anomaly of about minus 40 milligals would correspond to zero Airy anomaly. The second curve added to the figure is a sinusoidal variation, of wave-length 220 miles and amplitude 20 milligals, centred about a level of minus 56 milligals. It is rather remarkable how the sinusoidal curve approximates the main features of the observed anomaly profile over the central portion of the region. This is a convenient circumstance, for a harmonic, two-dimensional variation in gravity may be directly interpreted in terms of a corresponding harmonic surface distribution of mass, and for the latter case Jeffreys (1952, p. 188) has given the distribution of stress-difference required to support the loading.

It is well known that an anomaly variation of the form $\Delta g = C \sin mx$ where C is the amplitude, $m = 2\pi f$, and x is the distance in miles, may be produced by a surface distribution σ at a depth h, where

$$\sigma = \frac{C}{2\pi G} . e^{mh} . \sin mx, \text{ G being the gravitational constant.}$$

In the present case using the sinusoidal approximation, $\Delta g = 0.020 \sin 0.0285x$ in cm./sec.^{2}.

The corresponding surface distribution at a depth of 2 miles (roughly one-half the inferred depth extent of the structures) is

$$\sigma = \frac{0.020}{2\pi \times 6.67 \times 10^{-8}} . e^{2 \times 0.0285} . \sin 0.0285x$$

$$\text{or} \qquad \sigma = 5.1 \times 10^4 \sin 0.0285x \qquad \text{in gms./cm.}^2$$

Jeffreys points out that on an elastic theory for the crust, a surface loading of the form

$$\sigma = b \sin mx$$

gives rise to a stress difference which acquires a maximum value of

$$\frac{2gb}{e} \text{ at a depth } h = \frac{1}{m} .$$

With the above expression for σ, the corresponding maximum stress difference is 3.7×10^7 dynes/cm^2, at a depth of 37 miles below the surface. This is not large compared to the usually accepted figure for the strength of about 1.0×10^9 dynes/cm^2 for the crust itself (Jeffreys 1952, p. 196), but it is significant that the maximum value occurs some 15 miles beneath the base of the crust. The existence of such stresses, presumably since Precambrian time, would therefore be evidence of considerable strength in the sub-crustal rocks. However, the value obtained for this particular area is not in itself critical, for Jeffreys has shown that a strength up to 3.3×10^8 dynes/cm^2 to a depth of 600 kilometres is required to support even broader departures of the gravitational field from normal values.

The sinusoidal mass distribution investigated above is of course merely a convenient approximation. The form of the observed profile, however, does suggest the approximately equal areal extent of rock types of the high and low density types. The mean density of the upper 6 or 7 kilometres of the crust within this region of the Shield must therefore be in the neighbourhood of 2.78 gms/cc., rather than 2.67 gms./cc. usually quoted. Furthermore, since there is no reason to assume a decrease in density with depth, this may well represent the mean density of the entire upper portion of the crust under the area. The

implication would be that beneath the depth of 6 or 7 kilometres, the material is, overall, rather homogeneous as to density, and that above this depth a separation into well marked belts of less dense granitic types, and denser, more basic rocks, has taken place. It is perhaps worth pointing out that the persistence of the negative trends over widths of several tens of miles is rather strong evidence against the formation of the lighter rock types by differentiation in place from a denser magma. For in this case, the still denser "basic pole" resulting from the differentiation process would be in the form of a broad sheet, whose excess attraction at points removed from the edges would nearly compensate for the mass deficiency in the overlying layer. The question is discussed in more detail when the anorthosite bodies are considered.

Returning to the curves of Figure 2, it is seen that in the vicinity of Parent the mean of the observed profile (approximately the axis of the sine curve at minus 56 milligals) is depressed some 16 milligals beneath the curve representing zero isostatic anomaly. In other words, the area as a whole appears to be over-compensated by an amount corresponding to an anomaly of 16 milligals, with the effects of density variations superimposed on this condition. Such an over-compensation could result from an excess crustal thickness of about 1 kilometre under the area in question which may well be a legacy from Precambrian mountain building.

The conclusion, therefore, is that the peculiar pattern of anomalies over this portion of the Shield, in which the intense negative effects are most prominent, is a result of the superposition of the contributions of major density differences upon an overall depressed Bouguer anomaly field. The granitic rocks give large negative effects because they are consistently less dense than the crust as a whole, the belts of granite being separated by regions of rocks denser than average. Crustal warping, if such a condition exists, is probably of such broad extent that it affects the major portion of the area to almost the same extent, and is not specifically related to the bodies of granite. The evidence being accumulated on anomalies over granites in many parts of the world (Bott 1953, Marshall and Narain 1954) supports the suggestion that granites are lighter than the crust as a whole, but it is admitted that the contributions of crustal deformation may be very different in different circumstances, as suggested by Marshall and Narain.

The Northern Boundary of the Grenville Sub-Province

The nature of the boundary between the Grenville and Temiskaming sub-provinces has been a subject of much discussion (Quirke and Collins, 1930; Gill 1948). Characteristically, the well-known rock types of the Temiskaming sub-province, that is, early Precambrian volcanic, sedimentary and intrusive rocks with a general east-west trend, are either cut off at the boundary, or pass through a narrow transition zone into Grenville gneisses with a northeasterly trending foliation. Norman (1936) described the relations in the Chibougamau region, where the Grenville rocks appear to be thrust over the older formations from the southeast, and suggested the presence of a continuous fault-zone extending from Lake Huron to beyond Lake Mistassini. Later writers have amplified this suggestion (Cooke, 1947; Wilson, 1948).

If the boundary does represent a major fault zone, evidence of this might be expected in the gravity anomalies, even with the rather open distribution of stations available.

In fact, the evidence is rather negative. There is a pronounced gravity gradient over the line of the presumed fault only in the region of Lake Chibougamau, where a band of Keewatin type lavas is known to end against the gneisses. There is no gravitational evidence of ultrabasic rocks being brought to the surface as there is along the Appalachian frontal thrusts discussed later.

It is perhaps significant that many of the major anomaly trends over the Grenville region are east-west, not northeast as is the foliation often observed in the rocks. Furthermore, the positive and negative trends are in line, approximately, with similar trends on the opposite side of the Grenville-Temiskaming boundary. For example, the prominent area of relatively high anomaly passing through Parent is in line with the major volcanic belt passing through Senneterre in the Temiskaming sub-province. To the north of this, the pronounced negative trend extends over both the "granites" of the Temiskaming and "granite gneiss" of the Grenville. It is possible, therefore, that in the Grenville sub-province the high and low density rock types were distributed along similar lines to those of the Temiskaming, and the northeast trend so often reported was subsequently impressed on this system by regional metamorphism.

It is obviously unsafe to draw further conclusions from the gravity observations alone, especially in view of the distribution of stations. The above discussion is not intended to suggest that a major fault separating the Grenville and Temiskaming regions does not exist. There is simply no direct evidence from the gravity anomalies for it, and there is evidence against any widespread emplacement of ultrabasic rocks along the boundary. Finally, the continuity of certain features of the anomaly map across the boundary suggest a certain original similarity in structural relationships between the denser gneisses of the Grenville and the volcanic and associated sedimentary rocks of the Temiskaming.

The Anorthosites

The area under study includes three well-known bodies of anorthosite: the Morin mass (Adams 1897) north of Montreal, a portion of the mass north and east of Lake St. John (Denis 1934; Ross 1949), and the smaller St. Urbain body (Mawdsley 1927), north of Baie St. Paul. Of the larger masses, only the Morin mass lies completely within the area of the gravity survey, but it is evident that both larger bodies lie within belts of highly negative Bouguer anomaly. Furthermore, the observations over the Morin body (Figure 3) show that a local, still more intense, negative anomaly occurs over the anorthosite. In other words, the anorthosite mass represents a body of even lower density than the surrounding rock types, which themselves are of the lighter Grenville types. It can only be concluded that the main mass, extending to depth, consists almost entirely of plagioclase or rock of comparable density, and that concentrations of ferromagnesian minerals are of infrequent occurrence through the volume of rock as a whole.

The question of the typical density of anorthosite is therefore of some importance and several measurements have been made on samples taken from the Morin body, as shown in Figure 4. Measurements of the density of the surrounding rocks are not shown on the map, but the mean of the densities of thirty-six samples of Grenville crystalline limestone, Trembling Mountain gneiss, and members of the Morin series other than anorthosite, is

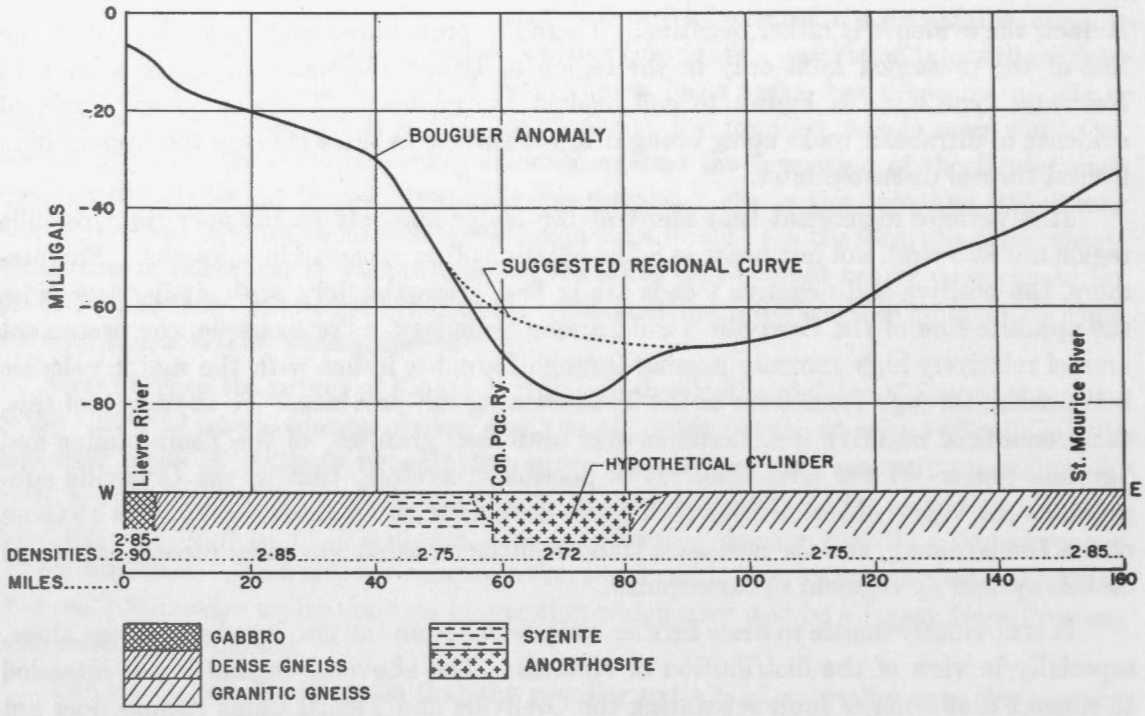

FIGURE 3.—Bouguer anomaly profile, St. Maurice River-Lièvre River

2.75 gms/cc. The range in density of rocks within the limits of the main body is from 2.65 gms/cc. for a coarsely-crystalline sample consisting almost entirely of plagioclase, to 3.08 gms/cc. for a sample high in ferromagnesium minerals. However, there is a suggestion from the diagram that the distribution of types is not random, but that the denser phase is most abundant in an area toward the south centre of the mass. If the distribution of types of density significantly greater than 2.70 gms. per cc. is as suggested by the broken line on the diagram, then a weighted mean density of the body as a whole (near the surface) would be about 2.72 gms./cc. In other words, the density contrast with the surrounding rocks may be of the order of 0.03 gms/cc., in which case a rock mass in the form of an approximately vertical cylinder would have to extend about 8 miles in depth to explain the observed negative anomaly. These relationships are indicated in Figure 3.

It is significant that the anorthosite appears to be of lower density than the surrounding rocks, and that the body must extend to such depth. Many of the theories for the origin of anorthosite assume that plagioclase crystals accumulated during the differentiation of an intermediate or basic parent magma (Bowen 1917, Grout 1928, Balk 1931). The evidence of the gravity anomalies would rule against the presence of a basic layer beneath the anorthosite, as suggested by Bowen, or against the presence of masses of gabbro throughout the body, as in Balk's view. It would be virtually impossible, for example to interpret the local negative anomaly over the Morin body by a differentiated sill of any reasonable thickness. Whatever thickness of the light phase was assumed, the basic layer beneath would have to be taken proportionately thicker, depending on the assumed composition of the parent magma. If this body has originated through differentiation, the denser material must have been removed laterally, beyond the limits of the negative anomaly.

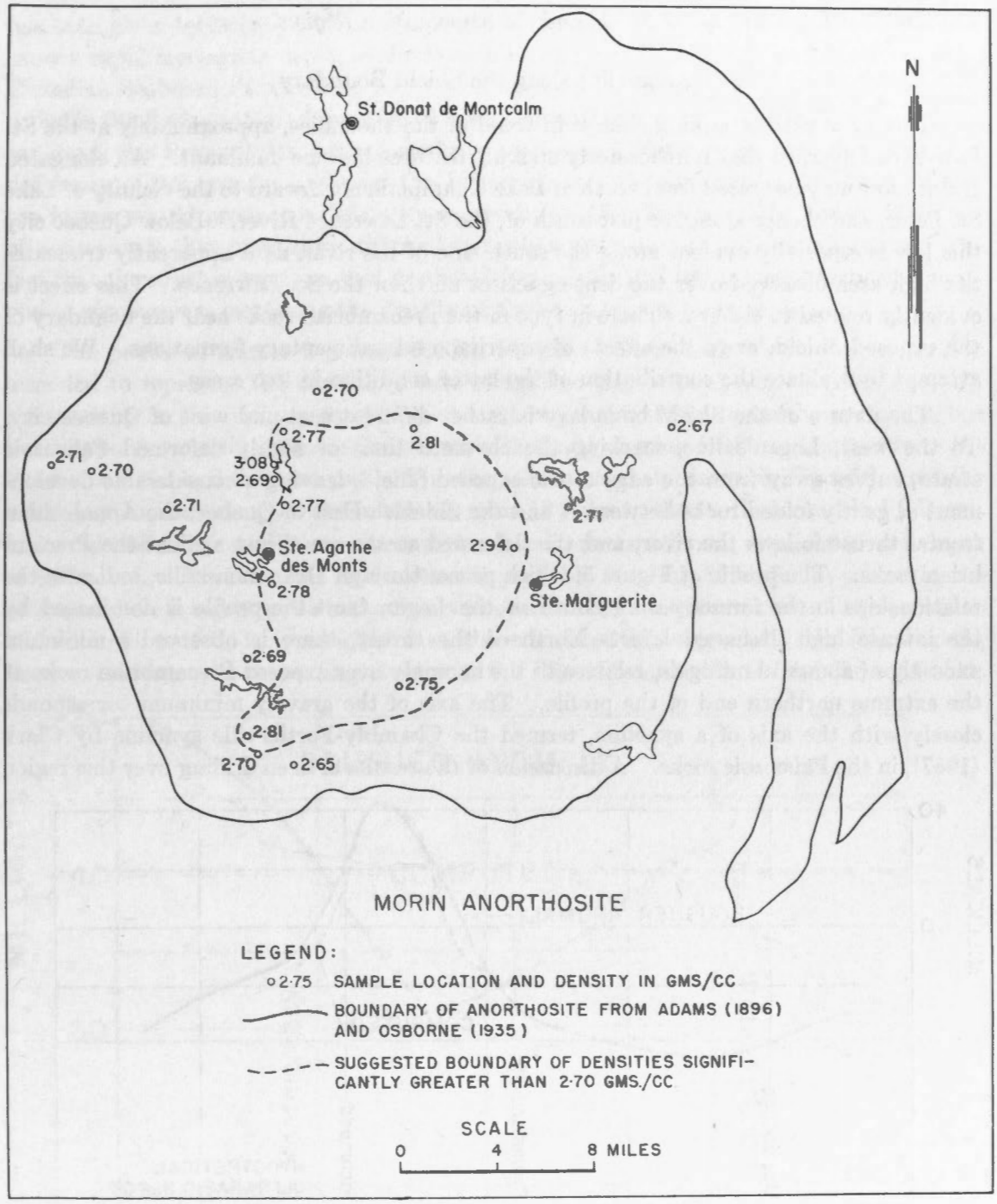

FIGURE 4.—Distribution of densities in Morin anorthosite

There may be further significance in the fact that the large bodies of anorthosite occur in the two general belts of the lower density, granitic rock types of the Grenville. In other words, there may have been conditions existing along these lines which were favourable to the formation, or emplacement, of both granite and anorthosite. The St. Urbain body, whose mean diameter is about 12 miles, occurs in an area of the denser type of gneisses, and may have had a somewhat different origin than the larger masses. It does, however, produce a local decrease of the Bouguer anomaly.

The Southern Boundary of the Shield and the Appalachian Region

Anomalies along the Shield Boundary

There is a rather striking change in trend of the anomalies, approximately at the St. Lawrence River, so that northeasterly striking features become dominant. An elongated gravity low may be traced from north of Lake Champlain northward to the vicinity of Lake St. Peter, and thence along, or just south of, the St. Lawrence River. Below Quebec city this low is especially evident along the south side of the river, as it apparently truncates the high area observed over the dense gneisses north of the St. Lawrence. This effect is evidently related to either a change in type of the Precambrian rocks near the boundary of the exposed Shield, or to the effects of superimposed sedimentary formations. We shall attempt to evaluate the contribution of the latter condition in two areas.

The nature of the Shield boundary is rather different east and west of Quebec city. To the west, Logan's line, marking the northern limit of highly deformed Palæozoic strata, curves away from the edge of the exposed Shield, leaving a considerable development of gently folded rocks between it and the Shield. East of Quebec, the Appalachian frontal thrust follows the river, and the deformed strata are thrust against the Precambrian rocks. The profile of Figure 5, which passes through Drummondville, indicates the relationships in the former case. South of the Logan fault the profile is dominated by the intense high discussed later. North of the thrust, there is observed a minimum anomaly of about 10 milligals, relative to the anomaly over exposed Precambrian rocks at the extreme northern end of the profile. The axis of the gravity minimum corresponds closely with the axis of a syncline, termed the Chambly-Fortierville syncline by Clark (1947), in the Palæozoic rocks. A discussion of the results of deep drilling over this region

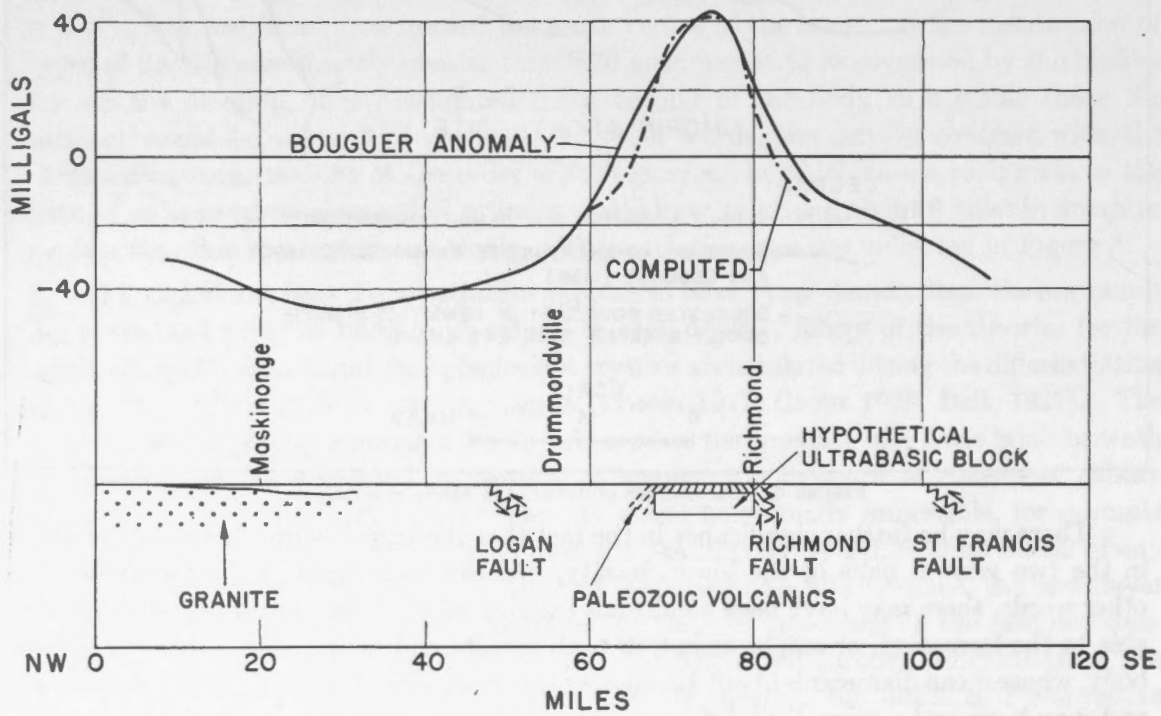

FIGURE 5.—Observed and computed Bouguer anomaly profiles, Richmond-Drummondville-Maskinonge

has been given by Belyea (1952). In particular, two wells drilled south of Trois Rivières show a rapid increase in depth to the Precambrian toward the axis of the syncline. The Canadian Seaboard St. Gregoire No. 1 well, approximately on the axis of the structure, ended in the Beekmantown formation of lower Ordovician age at a depth of 5,040 feet below sea level; the Precambrian surface could be well over 1,000 feet deeper. For a density deficiency of 0.2 gms./cc. between the Palæozoic and Precambrian rocks, 6,000 feet of the former would produce a deficiency in gravity of 15 milligals. The known thickness of sediments is thus more than sufficient to explain the observed gravity minimum. The fact that the effect is less than that predicted is probably due to the well-known phenomenon of compaction, increasing the density of the sedimentary rocks at depth.

The profile of Figure 6 crosses the St. Lawrence River near Montmorency, and is intended to represent the conditions east of Quebec city. As shown by Alcock (1947), the structure in this vicinity consists of at least two major thrusts from the southeast, but for simplicity we may examine the effects of a single dipping fault contact between the Palæozoic rocks and the basement. The decrease in anomaly shown in Figure 6, from the vicinity of Montmorency to the minimum some 12 miles to the south, is practically linear, and would be satisfactorily consistent with a frontal thrust dipping at about 5° to a depth of 6,700 feet. However, this explanation is probably too simplified, for as shown in the diagram, there is a greater decrease observed over the Precambrian rocks as the edge of the Palæozoic formations is approached than the calculated effect predicts. In other words, there is evidence of a decreasing density in the Precambrian rocks toward the southeast,

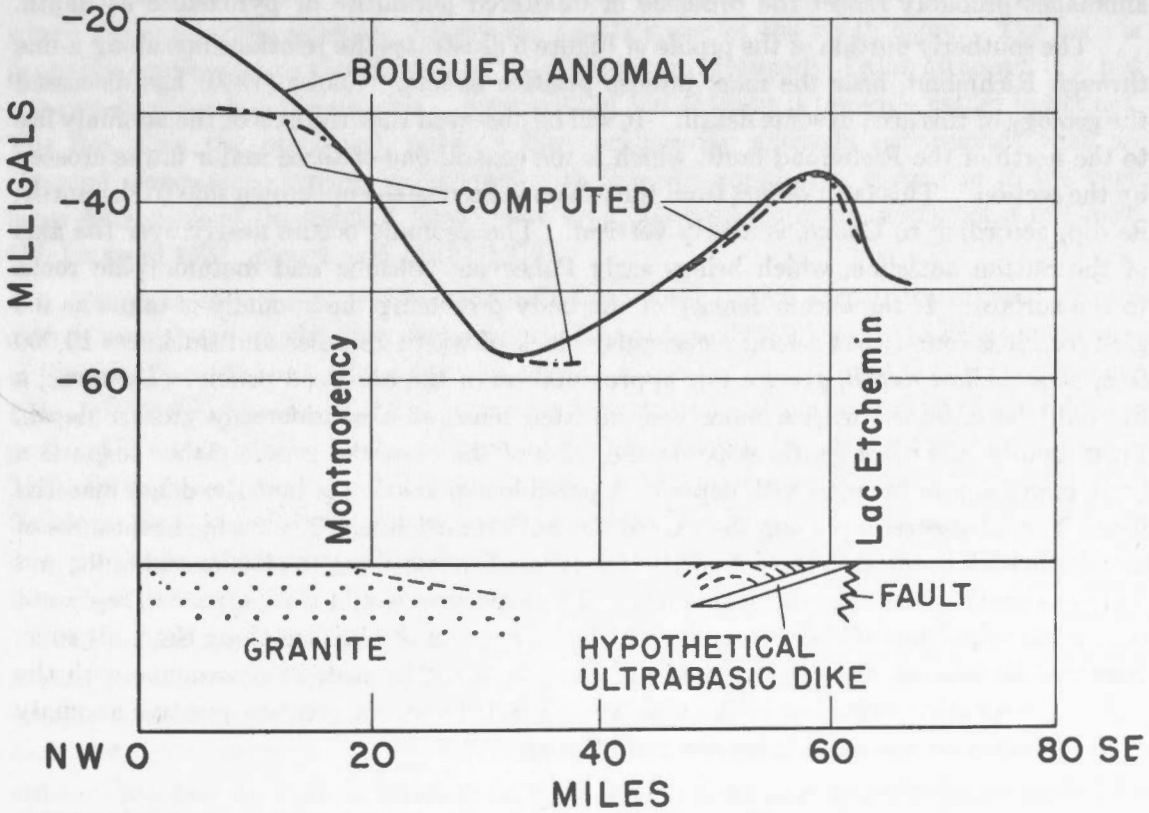

FIGURE 6.—Observed and computed Bouguer anomaly profiles, Lac Etchemin-Montmorency

and this is very probably influencing the form of the profile. Nevertheless, the striking parallelism of the axis of the gravity low to Logan's line along the St. Lawrence River below Quebec suggests that at least a major part of the gravity deficiency is due to the Palæozoic formations thrust against the Shield. The low is thrown into prominence as a narrow strip between the Shield and the area of high gravity which lies about 30 miles southeast of the St. Lawrence, discussed in the following section.

The Positive Anomalies of the Eastern Townships and Gaspé

The pronounced positive anomalies of southern Quebec lie along an axis which lies south of the northern limit of the Appalachian region and extends from the International Boundary to the end of Gaspé peninsula. However, the positive trend is interrupted in the region of St. Pamphile, east of Quebec city, and two detached high areas are therefore seen on the map. The more southerly of these is most intense in the district between Waterloo, Richmond and Thetford Mines, and would appear to be related to the well-known ultrabasic rocks in this vicinity.*

The ultrabasic rocks of southern Quebec have been well described in the literature (Dresser 1913, Cooke 1937). As many of the exposures are serpentinized, the general area has been referred to as the Serpentine Belt. However, the mineral serpentine has a density of only about 2.5 gms./cc., and large bodies of this material in Palæozoic rocks would not produce the striking positive anomalies. There must therefore be a limit to the depth below the present surface to which serpentinization has taken place. The gravity anomalies probably reflect the presence of unaltered peridotite or pyroxenite at depth.

The southerly portion of the profile of Figure 5 illustrates the relationships along a line through Richmond, near the most intense positive effects. Cooke (1950) has discussed the geology of this area in some detail. It will be observed that the axis of the anomaly lies to the north of the Richmond fault, which is the central one of three major faults crossed by the section. This fault differs from the others in having the upthrown side to the north; its dip, according to Cooke, is nearly vertical. The anomaly occurs nearly over the axis of the Sutton anticline, which brings early Palæozoic volcanic and metamorphic rocks to the surface. If the excess density of the body producing the anomaly is taken as 0.5 gms./cc., it is found that a long rectangular block of width 13 miles and thickness 10,000 feet, at a shallow depth, gives a fair approximation of the observed profile. However, a fit could be obtained with a more concentrated mass at a considerably greater depth. Furthermore, the more gentle slope on the sides of the observed profile rather suggests a body increasing in breadth with depth. A possible explanation is that the dense material forms a core squeezed up along the axis of the Sutton anticline. The surface exposures of ultrabasic rock in the area are actually in the form of sheets along the Richmond fault, and lie to the south of the axis of the anomaly. The exposures would thus appear to represent only a minor portion of the main mass which has reached the surface along the fault zone. North of Richmond, the positive axis curves sharply to the east, in accordance with the exposed Serpentine Belt, and in the vicinity of Black Lake, the greatest positive anomaly is coincident with the surface exposure of ultrabasic rocks.

*The specific relationships in the area between the Richelieu and Chaudière Rivers are the subject of a detailed investigation by Professor M. M. Fitzpatrick of Queens' University and will be discussed here only to complete the regional picture.

Northeast of Thetford Mines, the exposures are much less frequent, and the extent of the Serpentine Belt, as determined by surface mapping, is somewhat uncertain. The continuity of the belt has been largely established by the aeromagnetic maps of the Geological Survey of Canada which indicate a distinct positive trend extending toward St. Pamphile. The gravity observations confirm the suggestion of a continuous structure, and in addition throw more light on the depth extent and form of the anomalous body.

Examination of the gravity map shows that the positive trend decreases rather uniformly from the Chaudière River until it practically disappears southwest of St. Pamphile, The profile of Figure 6 indicates the nature of the anomaly in the vicinity of Lac Etchemin. with the major geological features as mapped by Tolman (1936). Small bodies of serpentine are found in the vicinity of the fault shown, which brings the older Caldwell group on the north in contact with Beauceville strata on the south. The peak of the gravity anomaly is observed near the trace of this fault, but the asymmetry of the curve strongly suggests a body dipping to the north beneath the Sutton anticlinal axis a few miles to the northwest. For comparison, the computed profile of a dyke-like structure dipping to the north at 15° is shown. The presence of a northwesterly dipping body may seem strange in a region where the major thrusts are from the southeast, but the asymmetry of the positive anomaly is quite marked, as far as the effect can be traced. It would appear to suggest that the location of the ultrabasic rocks is controlled at depth by the Sutton anticline, and at the surface by the fault which forms the southerly boundary of the older rocks.

The positive area in Gaspé is most intense near the easterly end of the peninsula, where the axis of the anomaly follows the gentle curve of the north shore. The high is probably continuous to the vicinity of Val Brillant on Matapedia Lake, although it is not completely defined in the interior. Southeast of Val Brillant it becomes rather indistinct. The fact that the prominent positive Bouguer gravity anomaly corresponds with an elevated topographic region, in contrast with isostatic conditions, gives rise to the very large deflections of the vertical which have been observed along the north coast of Gaspé (McDiarmid 1931, Alcock and Miller 1932).

Along the line of the positive anomaly lie several known serpentine masses. From east to west there are the Mount Serpentine body (Jones 1935), about 15 miles northwest of Gaspé village; Mount Albert (Alcock 1926); two bodies near Mount South (McGerrigle 1954), about 16 miles south of Ste. Anne des Monts: and a small body west of Lake Matapedia (Aubert de la Rue 1941). These bodies are believed by McGerrigle to be of post-Midddle Silurian, pre-Middle Devonian age. They may possibly be related to thrust faulting along the northerly side of Gaspé peninsula (McGerrigle 1953), faulting which has brought the pre-Ordovician Shickshock group in contact with Lower Ordovician sedimentary rocks on the north.

The most complete profile across the gravity anomaly is that obtained south of Matane, as shown in Figure 7. In this vicinity the peak of the curve is quite narrow and sharply defined, suggesting a source at no great depth. The curve displays also a marked asymmetry, decreasing much more rapidly on the north side. For comparison, the computed effect is shown for a dyke-like sheet of material with excess density 0.5 gms./cc., thickness 1.5 miles, and dip 30° toward the south. The calculated curve fits the observa-

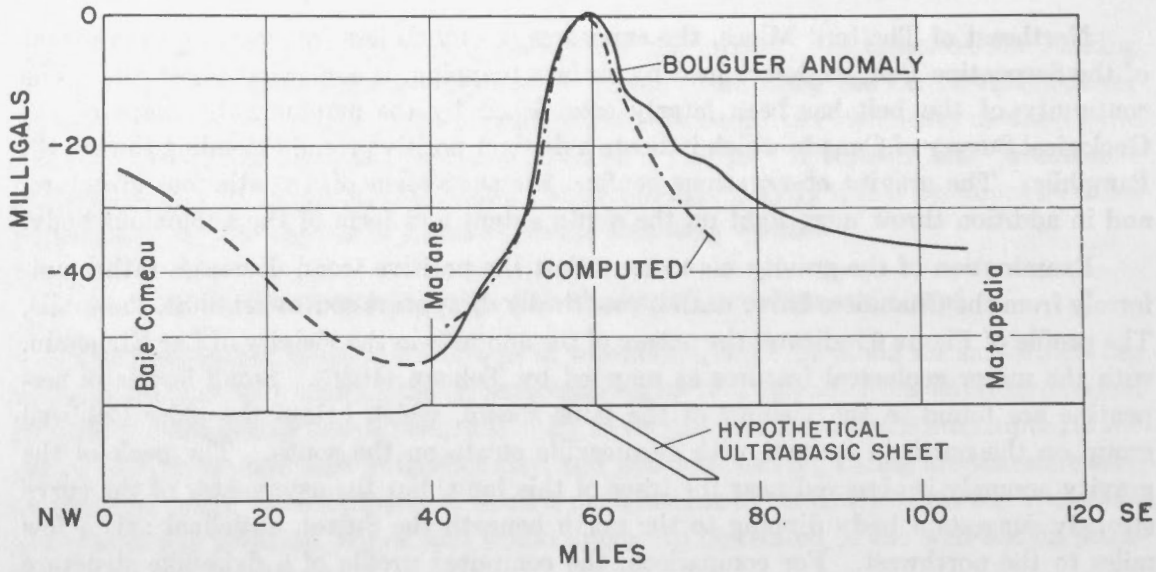

FIGURE 7.—Observed and computed Bouguer anomaly profiles, Matapedia-Matane-Baie Comeau

tions fairly well, except toward the southerly end of the profile. One might be tempted to assume a body with flatter dip to improve the fit, but the "shoulders" on the observed profile suggest the presence of subsidiary bodies on the south, and it is probably unwise to push the interpretation further. In any case, southerly dip, and depth extent to about 10 miles, are indicated. The surface rocks along the line of the profile consist almost entirely of steeply dipping shales, sandstones, quartzite and conglomerate of Lower Ordovician (Sillery) age (Aubert de la Rue 1941). There would be nothing in the lithology to suggest the rapid increase in anomaly from Matane southward. However, the axis of maximum anomaly is in direct line with the small exposure of serpentinized peridotite 12 miles southwest of Lake Matapedia.

If the interpretation offered above is correct, and if the structure is continuous between the actual lines of stations, the ultrabasic material underlying Gaspé peninsula would be in the form of a southerly dipping sheet, curved so that its surface trace parallels the north shore (and other structures), and thinning toward the west.

There appears to be no doubt that near surface concentrations of dense material are missing in the vicinity of St. Pamphile, so that there is in fact a gap of at least 30 miles between the Gaspé and Eastern Township belts. It is not obvious from the overall structure why the amounts of ultrabasic rock which have been brought to moderate depths should decrease with distance from both the Richmond-Thetford and Gaspé areas, and finally disappear in this region.

General Conclusions

The interpretation of the Bouguer anomalies has led to certain broad conclusions regarding structures in the Precambrian Shield and northern Appalachian regions. It may be useful to summarize these in this place.

(1) The chief anomaly trends over the Precambrian Shield are believed to be caused by systematic differences in density extending well into the crust. The extreme densities encountered are about 2.70 or less for granitic types, and 2.85 gms./cc. for dense paragneiss or basic volcanic rocks, depending on the particular province of the Shield. As the volumes

of each general type have been shown to be roughly equal, it is suggested that the mean density of the upper portion of the crust under the area in question is closer to 2.78 gms./cc. than the 2.67 or 2.70 gms./cc. often quoted. Granite batholiths thus represent emplacements in the crust of material less dense than the crust as a whole.

(2) The negative anomalies are especially prominent because the mean anomaly level in the central part of the Shield area studied, appears to be about 16 milligals less than that consistent with zero isostatic anomaly. It is suggested that this may represent the effect of an incomplete adjustment following the erosion of Precambrian mountains.

(3) No outstanding gravitational effects are observed over the line of the presumed Huron-Mistassini or Grenville front thrust. The strike of certain major anomalies in the Grenville sub-province is east-west, and approximately in line with similar effects observed over the Temiskaming province northwest of this line.

(4) The major anorthosite bodies covered by the observations are shown to be even less dense than the granitic rocks into which they appear to be intruded. It is felt that no process of differentiation in place from an intermediate or basic magma would be consistent with these observations.

(5) Belts of positive anomaly in southeastern Quebec are taken to indicate the presence, at moderate depths, of ultrabasic rocks whose scattered surface exposures form the well-known Serpentine Belt. The trend is shown to be nearly continuous from the international border to the end of Gaspé peninsula, but there is a definite gap, roughly south of the mouth of the Saguenay River. In the Eastern Townships, the form of the profiles studied suggest that the bulk of the dense material may occupy the core of the Sutton anticline, although the material which has reached the surface has followed a fault bounding the anticlinal structure on the south. In the Gaspé area, a southerly dipping sheet is suggested, which may owe its location to thrust faults, including the prominent one bounding the Shickshock Mountains on the north. Assuming the adopted density contrast is valid at depth, a vertical depth extent of about 10 miles is suggested for the sheet.

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APPENDIX A

The Principal Facts

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse—1945 South of St. Lawrence River around Gaspé Peninsula HUMBLE

Station		Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ′	° ′				
	Lac au Saumon	67 20.6	48 25.0	502	980.8862	−.0038	−.0209
	Sayabec	40.7	33.3	580	.8969	.0019	−.0179
	Bic	68 42.0	22.3	79	.8875	−.0382	−.0409
	St. Fabien	52.1	17.4	447	.8582	−.0256	−.0408
	Metis Beach	67 59.3	40.4	80	.9050	−.0477	−.0504
	Baie des Sables	52.2	43.9	35	.9124	−.0497	−.0509
	St. Ulrich	41.7	47.4	28	.9168	−.0512	−.0521
	Matane	31.6	50.9	25	.0205	−.0530	−.0539
	Ste. Félicité	20.3	53.8	53	.9244	−.0508	−.0526
	Grosses Roches	10.4	56.0	80	.9279	−.0481	−.0508
	Les Méchins	66 58.8	59.6	78	.9363	−.0452	−.0478
	Capucins	50.9	49 02.2	15	.9446	−.0467	−.0472
	Cap Chat	41.3	05.4	70	.9499	−.0410	−.0434
	Ste. Anne des Monts	29.1	07.1	17	.9654	−.0330	−.0336
		20.0	10.3	90	.9753	−.0210	−.0241
	Ste. Marthe	10.6	11.9	25	.9979	−.0069	−.0078
	Ruisseau Arbour	65 57.0	13.5	40	981.0050	−.0007	−.0021
	Rivière à Claude	53.8	12.8	25	.0033	−.0028	−.0037
	Mont Louis	44.3	13.5	15	.0097	.0016	.0011
		29.5	14.9	870	980.9658	.0360	.0064
		16.3	13.5	700	.9777	.0340	.0102
		03.8	13.1	263	981.0115	.0273	.0184
		64 46.3	08.6	455	980.9972	.0378	.0223
		33.2	04.2	370	.9964	.0355	.0229
	Fox River	23.5	48 59.2	50	981.0073	.0238	.0221
	Griffin Cove	18.4	55.3	60	980.9983	.0215	−.0195
	Cap des Rosiers	12.6	51.5	40	.9900	.0171	.0158
	Cap des Rosiers	12.6	51.2	45	.9894	.0173	.0153
	Gaspé	29.1	49.1	71	.9880	.0215	.0191
	Douglastown	23.1	45.5	11	.9840	.0172	.0169
	St. Georges	14.7	39.5	168	.9613	.0183	.0126
	Percé	13.3	31.2	76	.9537	.0144	.0119
	Percé Sta.	18.9	27.8	101	.9381	.0062	.0028
	Grande Rivière	29.7	23.5	56	.9329	.0033	.0014
	Chandler	40.5	20.2	2	.9334	.0036	.0035
	Newport	45.0	15.7	37	.9251	.0053	.0040
	Gascons	52.0	11.8	117	.9059	−.0005	−.0045
	Black Cape	65 49.3	07.9	78	.9004	−.0039	−.0065
	Port Daniel	64 59.3	10.5	9	.9070	−.0077	−.0080
	St. Godefroy	65 07.4	05.1	77	.8914	−.0088	−.0114
	Paspébiac	15.3	01.9	186	.8790	−.0061	−.0124
	Bonaventure	28.2	03.0	62	.8927	−.0058	−.0079
	Caplan	40.8	06.2	87	.8967	−.0042	−.0072
	Maria	66 00.3	10.5	28	.8967	−.0162	−.0171
	Carleton	08.0	07.0	48	.8989	−.0069	−.0085
	Nouvelle	18.6	08.0	49	.8926	−.0146	−.0163
	Escuminac	28.5	07.4	22	.8828	−.0260	−.0268
	Oak Bay	37.3	03.3	55	.8705	−.0290	−.0309
	St. Jean	73 15.1	45 18.0	105	.6260	−.0205	−.0241
	Chambly Canton	16.1	26.4	76	.6421	−.0199	−.0224
	Rougemont	03.9	26.3	167	.6362	−.0171	−.0228
	Abbotsford	72 53.6	26.1	207	.6303	−.0189	−.0260

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse—1945 South of St. Lawrence River — HUMBLE

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies: Free Air	Gravity Anomalies: Bouguer
		° ′	° ′				
	Eastray	72 20.6	45 18.4	911	980.5988	.0275	−.0035
	Coaticook	71 48.3	08.0	957	.5337	−.0177	−.0503
	Ayer's Cliff	72 02.3	10.2	559	.5722	−.0199	−.0390
	Caughnawaga	73 40.7	24.9	88	.6431	−.0155	−.0185
	Pointe Claire	49.5	25.6	81	.6458	−.0145	−.0172

Road Traverse 1945—North of St. Lawrence River
In vicinity of Lake St. John and Mont Laurier — HUMBLE

		70 03.0	47 56.5	753	980.8270	.0032	−.0224
	Lake Deschênes	04.3	57.3	758	.8260	.0016	−.0242
		01.8	48 05.1	432	.8548	−.0120	−.0267
	Petit Saguenay R.	04.5	12.8	55	.8801	−.0336	−.0355
	Rivière St. Jean	16.4	12.7	328	.8587	−.0292	−.0404
	Rivière Eternité	23.8	15.2	625	.8467	−.0170	−.0383
	St. Félix d'Otis	37.5	16.6	764	.8330	−.0197	−.0458
	Port Alfred	52.8	20.1	28	.8700	−.0573	−.0582
	Chicoutimi	71 03.8	25.8	21	.8689	−.0675	−.0682
	Chicoutimi (pend)	03.8	25.7	75	.8648	−.0663	−.0689
	Jonquière	15.2	24.7	487	.8446	−.0463	−.0629
	(Samson)	24.3	26.0	580	.8455	−.0386	−.0584
	Labarre	35.6	27.2	537	.8446	−.0454	−.0637
	St. Joseph d'Alma	39.4	33.0	302	.8650	−.0557	−.0660
	Metabetchouan	52.3	25.7	359	.8561	−.0483	−.0606
	Chambord	72 03.0	26.0	551	.8435	−.0434	−.0621
	Roberval	13.1	30.9	350	.8587	−.0544	−.0663
	St. Prime	19.5	35.7	351	.8635	−.0567	−.0686
	Normandin	30.3	49.6	419	.8710	−.0635	−.0778
	St. Félicien	26.9	39.0	368	.8659	−.0576	−.0701
	Dolbeau	13.6	52.6	414	.8761	−.0634	−.0775
	Péribonca	02.9	45.9	348	.8698	−.0659	−.0777
	Honfleur	71 50.9	44.7	371	.8742	−.0575	−.0701
	St. Henri de Taillon	49.4	39.7	401	.8678	−.0536	−.0672
	St. Coeur de Marie	42.0	38.0	391	.8673	−.0525	−.0658
	Park Gate	40.6	15.7	1245	.7918	−.0144	−.0568
	Sawine River	34.6	07.8	1390	.7811	.0003	−.0470
	Le Gîte	32.1	05.6	1800	.7531	.0142	−.0471
		24.5	47 57.8	1740	.7400	.0072	−.0521
		17.1	45.4	2530	.6892	.0493	−.0369
		14.5	37.6	2630	.6773	.0585	−.0311
	Le Relais	14.2	31.3	2720	.6701	.0691	−.0235
		11.4	24.3	2655	.6730	.0764	−.0140
		13.4	14.1	2360	.6723	.0633	−.0171
	S. Park Gate	15.7	09.7	1870	.6934	.0449	−.0188
	Stoneham	21.5	46 59.0	550	.7536	−.0030	−.0217
	Charlesbourg	16.1	52.1	375	.7449	−.0178	−.0306
	St. Augustin	28.0	45.4	212	.7434	−.0246	−.0318
	Neuville	35.1	42.6	226	.7386	−.0238	−.0315
	Donnacona	43.9	40.3	31	.7482	−.0291	−.0301
	Grondines	72 02.5	37.7	121	.7436	−.0213	−.0254

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse—1945 North of St. Lawrence River

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	La Pérade	72 12.5	46 34.6	39	980.7424	−.0256	−.0270
	Champlain	21.6	27.3	43	.7237	−.0330	−.0344
	Cap de la Madeleine	30.0	22.4	55	.7145	−.0336	−.0355
	Pointe du Lac	41.3	17.7	62	.6996	−.0409	−.0430
	Yamachiche	50.0	17.2	30	.6996	−.0431	−.0441
	Maskinongé	73 01.2	13.5	48	.6965	−.0390	−.0406
	St. Lin	45.4	51.2	210	.6692	−.0174	−.0246
	New Glasgow	52.5	50.2	242	.6672	−.0149	−.0232
	Ste. Thérèse	50.3	38.5	143	.6499	−.0239	−.0288
	Shawbridge	74 05.7	52.3	595	.6463	−.0058	−.0261
	Val Morin	10.3	00.6	1018	.6024	−.0224	−.0571
	Ste. Agathe	17.0	03.1	1207	.5860	−.0248	−.0659
	Nantel	24.1	06.3	1264	.5794	−.0308	−.0739
	Modes Creek	43.7	10.7	705	.6389	−.0305	−.0545
	Labelle	44.0	17.0	749	.6401	−.0346	−.0602
	l'Annonciation	52.5	25.0	816	.6418	−.0386	−.0664
	Nominingue	75 01.7	23.6	835	.6472	−.0294	−.0578
	(Lac Jaquay)	08.9	29.9	1050	.6402	−.0256	−.0614
	"	08.9	30.0	1078	.6405	−.0229	−.0596
	Val Barette	21.3	30.5	792	.6608	−.0302	−.0572
	Mont Laurier	29.4	33.4	731	.6701	−.0310	−.0559
	Ferme Neuve	27.0	42.0	719	.6872	−.0280	−.0525
	Mont St. Michel	20.1	47.0	907	.6792	−.0258	−.0567
	St. Anne du Lac	19.6	52.8	873	.6990	−.0179	−.0476
	Lac Gatineau	43.0	33.6	850	.6831	−.0071	−.0361
	St. Famille d'Aumond	54.0	27.6	644	.6904	−.0102	−.0322
	Messines	76 01.3	14.5	571	.6814	−.0063	−.0257
	Gracefield	03.3	05.6	508	.6719	−.0084	−.0257
	Kazabazua	03.4	45 57.1	601	.6589	.0001	−.0203
	Venosta	01.4	52.1	549	.6526	−.0036	−.0223
	Farrelton	75 54.9	44.9	346	.6498	−.0146	−.0263
	Wakefield	55.8	38.4	330	.6349	−.0213	−.0325
	Kirk's Ferry	48.9	32.6	340	.6219	−.0241	−.0361
	Ironsides	44.8	28.4	186	.6325	−.0221	−.0284
	E. Templeton	36.4	29.7	160	.6468	−.0123	−.0177
	Thurso	14.7	35.9	186	.6521	−.0138	−.0201
	Plaisance	06.8	36.5	184	.6399	−.0271	−.0334

Road Traverse 1946 Chapeau to Ottawa along North Shore of Ottawa River — Atlas

	Chapeau	77 04.5	45 55.0	359	980.6476	−.0307	−.0430
	Waltham	76 54.5	54.6	368	.6557	−.0212	−.0337
	Davidson	45.9	52.2	365	.6374	−.0162	−.0286
	Fort Coulonge	44.3	50.4	367	.6561	−.0146	−.0271
	Vinton	36.9	47.0	368	.6521	−.0134	−.0259
	Campbells Bay	36.2	44.0	363	.6527	−.0088	−.0211
	Shawville	29.5	36.3	571	.6290	−.0013	−.0207
	Wyman	18.1	31.8	398	.6257	−.0141	−.0276
	Quyon	14.4	31.3	279	.6276	−.0227	−.0322
	Breckenridge	75 57.3	28.9	219	.6280	−.0243	−.0318

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse 1946 South of St. Lawrence River in Eastern Townships — Atlas

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	St. Bruno	73 20.8	45 30.8	74	980.6564	−.0123	−.0149
	St. Basil	17.3	31.7	58	.6584	−.0132	−.0152
	Ste. Madeleine	05.7	35.6	111	.6481	−.0245	−.0282
	Ste. Rosalie	72 54.2	38.4	112	.6524	−.0243	−.0281
	Ste. Rosalie (Stn.)	54.6	38.3	112	.6516	−.0249	−.0287
	St. Eugene	41.9	48.3	270	.6596	−.0171	−.0263
	St. Eugene (Stn.)	39.2	46.7	272	.6659	−.0082	−.0175
	St. Germain	33.3	50.3	264	.6652	−.0151	−.0241
	Drummondville	29.5	52.8	290	.6615	−.0200	−.0299
	St. Cyril	25.4	55.8	285	.6599	−.0266	−.0363
	N.D. du Bon Conseil	20.6	46 00.1	271	.6627	−.0316	−.0408
	St. Léonard Jct.	22.3	06.4	243	.6707	−.0357	−.0440
	Nicolet	36.3	13.5	67	.6923	−.0414	−.0437
	Nicolet	36.3	13.5	69	.6924	−.0411	−.0435
	La Baie	42.9	08.0	82	.6812	−.0428	−.0456
	Pierreville	48.8	04.1	77	.6760	−.0426	−.0452
	Yamaska	54.8	00.1	54	.6747	−.0400	−.0419
	Sorel	73 06.9	02.4	44	.6824	−.0368	−.0383
	St. Ours	09.1	45 53.3	49	.6708	−.0342	−.0359
	St. Denis de Richelieu	09.7	47.1	50	.6642	−.0314	−.0331
	St. Charles R. Richelieu	11.3	41.4	41	.6590	−.0288	−.0302
	St. Mathias	16.1	28.4	45	.6470	−.0209	−.0224
	Lawrenceville	72 20.4	25.4	704	.6369	.0355	.0115
	Racine	15.1	30.3	894	.6365	.0456	.0151
	Kinsey Falls	04.4	51.5	391	.7070	.0369	.0236
	Warwick	71 59.3	56.6	480	.7018	.0325	.0161
	St. Albert	72 05.4	46 00.1	380	.6835	−.0006	−.0135
	St. Clothilde	14.2	45 59.4	305	.6723	−.0178	−.0282
	Princeville	71 52.5	46 10.2	528	.6768	−.0085	−.0265
	N.D. de Lourdes	49.3	19.6	388	.6848	−.0278	−.0410
	Warden	72 30.3	45 22.8	670	.6449	.0442	.0214
	Adamsville	46.9	16.1	376	.6035	−.0147	−.0275
	Cowansville	45.0	12.4	345	.6000	−.0155	−.0273
	Farnham	58.5	16.9	193	.6121	−.0245	−.0311
	Ste. Brigide d'Iberville	73 03.9	19.3	157	.6193	−.0243	−.0297
	Richelieu	16.0	26.8	85	.6410	−.0207	−.0236
	Beaconsfield	50.9	26.1	108	.6445	−.0140	−.0177

Road Traverse 1947 between Timiskaming and Rouyn — Atlas

	Timiskaming (Ry. Stn.)	79 05.7	46 43.1	742	980.6882	−.0265	−.0517
	Timiskaming (pend)	06.0	43.0	834	.6816	−.0243	−.0527
	Dozois	08.6	50.3	772	.7013	−.0214	−.0477
	Laniel	16.2	47 02.6	880	.7118	−.0191	−.0491
	Fabre	22.0	12.0	737	.7468	−.0117	−.0368
	Baie d'Africain	23.7	14.4	595	.7595	−.0159	−.0362
	Ville Marie	26.5	19.8	640	.7646	−.0147	−.0365
	Ville Marie	26.1	19.8	660	.7642	−.0132	−.0357
	Ville Marie	26.7	19.9	630	.7650	−.0154	−.0369
	(Fabre)	21.9	06.6	827	.7210	−.0209	−.0491

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse 1947 — Atlas

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	(Fabre)	79 22.1	47 07.1	776	980.7252	−.0223	−.0487
	(Fabre)	22.5	08.4	810	.7258	−.0204	−.0480
	(Fabre)	22.6	09.1	813	.7259	−.0211	−.0488
	Lavallée River	22.2	10.8	725	.7387	−.0191	−.0438
	(Baie d'Africain)	24.2	15.6	745	.7495	−.0136	−.0390
	Miron	25.2	17.6	690	.7572	−.0141	−.0268
	Lorrainville	20.1	21.2	767	.7688	−.0007	−.0268
	(Ville Marie)	26.2	22.1	715	.7670	−.0086	−.0330
	(Guigues)	26.9	24.5	743	.7604	−.0163	−.0416
	(Guigues)	26.2	26.1	708	.7664	−.0159	−.0400
	Guigues	26.2	27.8	744	.7778	−.0037	−.0291
	(Guigues)	26.0	31.9	648	.7878	−.0089	−.0310
	(N.D. du Nord)	26.3	35.2	710	.7730	−.0228	−.0470
	N.D. du Nord	29.2	35.4	602	.7854	−.0209	−.0414
	Guérin	15.8	39.9	975	.7560	−.0220	−.0552
	(Guérin)	15.8	45.7	1065	.7517	−.0265	−.0628
	(Guérin)	15.7	48.6	949	.7680	−.0254	−.0578
	Rivière Solitaire	14.3	54.8	886	.7810	−.0277	−.0578
		14.9	48 01.9	910	.7878	−.0293	−.0603
		15.7	04.7	931	.7935	−.0258	−.0575
		16.0	08.0	904	.8033	−.0234	−.0542
	Arntfield	15.3	12.1	935	.8166	−.0134	−.0452
	Rouyn	01.9	14.4	962	.8275	−.0033	−.0361
	Noranda	01.3	14.9	980	.8276	−.0023	−.0357
	(Evain)	07.2	14.5	946	.8170	−.0155	−.0477
	Lake Fortune	18.0	11.4	937	.8150	−.0137	−.0456
	Kag Lake	28.5	09.2	1106	.7950	−.0145	−.0521

Road Traverse 1947 South of St. L. River between Quebec City and New Brunswick Border — Atlas

	Beaumont	71 00.7	46 49.6	176	980.7355	−.0421	−.0481
	St. Michel	70 54.7	52.5	32	.7486	−.0470	−.0481
	St. Valier	49.3	53.5	91	.7451	−.0464	−.0495
	Berthier en bas	43.9	55.6	32	.7501	−.0501	−.0512
	Cap St. Ignace	27.7	47 02.2	44	.7538	−.0552	−.0567
	L'Islet	22.4	07.5	31	.7678	−.0504	−.0514
	St. Jean Port Joli	16.4	12.7	49	.7761	−.0482	−.0499
	St. Roch des Aulnaies	11.1	18.5	17	.7904	−.0456	−.0462
	St. Pacôme (Stn.)	69 58.4	24.6	52	.7913	−.0505	−.0523
	St. Philippe de Néri	53.2	27.8	144	.7907	−.0473	−.0522
	St. Pascal	48.3	31.6	182	.7926	−.0475	−.0537
	Ste. Hélène	44.2	35.4	317	.7916	−.0415	−.0523
	St. André (Stn.)	41.4	37.9	347	.7942	−.0399	−.0517
	(St. André)	44.0	40.3	23	.8233	−.0448	−.0456
	N.D. du Portage	37.1	45.8	34	.8318	−.0435	−.0447
	St. Alexandre	38.1	41.1	369	.7989	−.0379	−.0505
	(Provincial Forest)	32.5	36.4	768	.7649	−.0273	−.0534
	Pelletier	25.8	32.8	1260	.7357	−.0048	−.0477
	St. Éleuthère	17.7	29.4	947	.7609	−.0039	−.0362
	(St. Éleuthère)	17.2	30.0	706	.7749	−.0135	−.0375

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse 1947 South of St. Lawrence River

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	Estcourt	69 13.5	47 27.5	711	980.7704	−.0138	−.0380
	Sully	10.0	27.4	709	.7689	−.0153	−.0395
	Rivière-Bleue	02.7	26.1	667	.7665	−.0198	−.0425
	Glendyne	68 55.4	23.7	672	.7620	−.0202	−.0431
	Les Étroits	54.2	23.1	673	.7615	−.0197	−.0426
	Boundary Stn.	43.6	22.3	684	.7615	−.0175	−.0408
	Interprovincial Bdy.	29.2	29.3	490	.7861	−.0216	−.0383
	Ste. Rose du Dégelé	39.0	33.0	530	.7866	−.0228	−.0409
	N.D. du Lac	48.0	36.7	604	.7856	−.0225	−.0431
	Cabano	53.0	40.9	563	.7936	−.0246	−.0438
	St. Louis du Ha Ha	59.2	40.0	984	.7719	−.0053	−.0389
	Rivière du Loup	69 31.7	49.6	412	.8141	−.0313	−.0454
	Rivière du Loup	31.7	49.6	301	.8217	−.0342	−.0444
	St. Nicholas	71 23.6	46 42.0	223	.7305	−.0313	−.0389
	St. Antoine	34.0	39.7	162	.7314	−.0327	−.0382
	Ste. Croix	43.8	37.3	218	.7251	−.0301	−.0375
	Lotbinière	56.0	36.9	86	.7404	−.0266	−.0295
	Deschaillons	72 06.1	33.2	151	.7307	−.0247	−.0298
	Ste. Sophie	06.5	25.6	232	.7004	−.0359	−.0439
	Gentilly	16.5	24.0	58	.7167	−.0335	−.0355
	Ste. Angèle de Laval	30.7	19.6	32	.7107	−.0354	−.0365
	Nicolet	36.3	13.5	67	.6923	−.0414	−.0437
	N.D. du Bon Conseil	20.6	00.1	274	.6627	−.0313	−.0407
	St. Albert	05.4	00.1	380	.6835	−.0006	−.0135
	Bon Conseil Stn.	23.4	45 57.6	306	.6584	−.0288	−.0392
	Ste. Rosalie	54.1	38.6	112	.6523	−.0247	−.0285
	St. Mathias	73 16.1	28.4	45	.6470	−.0209	−.0224
	Richelieu	16.0	26.8	85	.6408	−.0209	−.0238
	Dorval	44.4	26.9	83	.6461	.0256	−.0188

Road Traverse—1948 in vicinity of Joliette and St. Michel des Saints

ATLAS

	Marelan	74 33.0	45 38.2	256	980.6471	−.0157	−.0244
		16.0	38.0	255	.6455	−.0171	−.0258
	St. Hermas	11.5	36.2	159	.6485	−.0204	−.0259
		06.4	36.9	139	.6476	−.0242	−.0290
		73 59.7	34.9	130	.6488	−.0209	−.0253
	(St. Eustache)	52.8	33.9	92	.6471	−.0246	−.0278
	Rosemere	47.8	38.0	89	.6504	−.0278	−.0309
	St. Maurice	45.5	40.0	89	.6534	−.0278	−.0309
	Terrebonne	37.3	41.8	59	.6599	−.0268	−.0289
	(Charlemagne)	28.3	43.0	42	.6605	−.0296	−.0311
		25.4	45.7	38	.6662	−.0283	−.0296
	St. Norbert Stn.	16.9	46 08.8	170	.6887	−.0282	−.0340
	St. Norbert	19.0	10.2	256	.6838	−.0271	−.0358
		19.9	14.2	667	.6570	−.0213	−.0440
		20.8	15.9	683	.6539	−.0255	−.0487
	St. Gabriel	22.9	17.5	603	.6575	−.0318	−.0523
	St. Damien	28.9	20.0	613	.6527	−.0393	−.0602
		32.5	19.7	742	.6404	−.0391	−.0644
		36.5	19.4	716	.6380	−.0434	−.0678

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse 1948 — Atlas

Station No.	Station Name	Longitude ° ′	Latitude ° ′	Elevation Feet	Observed Gravity	Gravity Anomalies Free Air	Gravity Anomalies Bouguer
		° ′	° ′				
	Ste. Émélie de l'Énergie	73 38.6	46 19.3	744	980.6363	−.0424	−.0678
		40.3	21.3	890	.6301	−.0379	−.0682
	La Barrière	43.0	25.3	1033	.6282	−.0323	−.0675
		43.3	28.2	1316	.6166	−.0216	−.0664
	La Glacière	44.3	29.8	1492	.6134	−.0108	−.0616
		47.0	32.1	1577	.6099	−.0097	−.0634
	St. Michel des Saints	55.0	40.7	1201	.6453	−.0225	−.0634
	(St. Michel des Saints)	55.6	41.1	1214	.6474	−.0198	−.0612
	(St. Michel des Saints)	56.1	41.3	1280	.6436	−.0177	−.0613
	(St. Michel des Saints)	57.0	42.0	1338	.6420	−.0149	−.0605
	(St. Michel des Saints)	57.9	42.5	1377	.6409	−.0131	−.0600
	(St. Michel des Saints)	54.9	41.5	1199	.6465	−.0227	−.0636
	(St. Michel des Saints)	54.3	39.3	1216	.6445	−.0198	−.0612
		51.4	36.3	1313	.6327	−.0180	−.0627
	St. Zénon	49.1	33.6	1571	.6154	−.0070	−.0605
		33.7	17.4	677	.6437	−.0384	−.0615
	St. Jean de Matha	32.1	13.8	759	.6412	−.0278	−.0537
	St. Félix de Valois	25.5	10.3	412	.6678	−.0285	−.0426
		25.2	05.0	199	.6847	−.0238	−.0306
	Joliette	26.0	01.3	193	.6908	−.0126	−.0192
	St. Thomas de Joliette	21.3	00.5	99	.6905	−.0206	−.0240
		18.7	02.7	93	.6901	−.0248	−.0280
		15.0	05.4	75	.6908	−.0299	−.0325
	Berthier	12.7	05.3	34	.6915	−.0329	−.0341
		11.0	03.6	32	.6873	−.0348	−.0359
		11.2	00.5	34	.6838	−.0334	−.0346
	Lanoraie	13.2	45 57.5	45	.6811	−.0306	−.0321
	Lavaltrie	16.7	53.1	70	.6777	−.0250	−.0274
	(L'Assomption)	24.9	50.3	54	.6764	−.0236	−.0255
	Vaucluse	25.7	53.4	71	.6818	−.0212	−.0236
		26.1	57.7	113	.6886	−.0170	−.0208
		26.8	59.1	138	.6890	−.0163	−.0210
	Rawdon	42.9	46 02.7	572	.6469	−.0230	−.0425
	Mount Loyal	48.2	01.8	706	.6259	−.0301	−.0541
	St. Théodore	53.6	04.3	799	.6152	−.0357	−.0630
		59.0	08.0	1124	.5933	−.0327	−.0710
	Notre Dame de la Merci	74 03.4	13.4	1252	.5943	−.0277	−.0704
		08.7	16.0	1327	.5923	−.0266	−.0718
	St. Donat	13.2	19.1	1350	.5934	−.0280	−.0740
		14.4	14.0	1442	.5857	−.0194	−.0685
		15.9	08.0	1236	.5786	−.0368	−.0789
	Ste. Agathe	17.0	03.1	1207	.5861	−.0247	−.0658
	St. Alexis	73 36.9	56.0	219	.6766	−.0164	−.0239
	St. Esprit	39.9	54.1	204	.6752	−.0164	−.0234
	Papineau	74 00.0	44.8	228	.6575	−.0178	−.0256
	Pointe au Chêne	45.0	38.7	187	.6710	−.0010	−.0054
	Buckingham Jct.	75 25.2	32.8	190	.6574	−.0034	−.0099

PRINCIPAL FACTS FOR GRAVITY STATIONS

Rail Traverse 1948 from La Tuque to Cochrane Ont. N.A.85

Station No.	Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	La Tuque	72 47.0	47 26.3	545	980.7750	−.0230	−.0416
	Stirling	51.4	34.2	596	.7836	−.0214	−.0417
	Cressman	56.5	38.4	601	.7800	−.0309	−.0513
	Rapide Blanc	73 03.0	40.6	879	.7739	−.0141	−.0441
	Lac Darey	09.5	38.9	1032	.7594	−.0117	−.0469
	Duplessis	12.6	42.2	972	.7639	−.0178	−.0509
	Windigo	19.8	46.0	929	.7738	−.0176	−.0493
	Ferguson	25.1	48.7	999	.7730	−.0159	−.0500
	Vandry	33.2	51.4	1030	.7763	−.0137	−.0488
	Weymont	45.3	54.3	1152	.7760	−.0068	−.0461
	Cann	52.9	54.3	1187	.7786	−.0010	−.0414
	Hibbard	74 02.9	52.6	1462	.7596	.0084	−.0414
	Casey	11.0	53.6	1374	.7669	.0059	−.0409
	McCarthy	21.3	52.1	1432	.7616	.0083	−.0405
	Wykes	31.3	53.2	1466	.7632	.0115	−.0384
	Parent	37.0	55.4	1400	.7720	.0108	−.0369
	Timbrell	45.8	58.4	1410	.7795	.0147	−.0333
	Strachan	53.4	48 03.0	1454	.7846	.0171	−.0325
	Greening	59.5	07.0	1424	.7927	.0163	−.0322
	Froissart	75 10.8	06.8	1347	.7971	.0138	−.0321
	Oskelaneo	12.3	06.6	1362	.7950	.0134	−.0330
	Clova	21.8	06.7	1389	.7930	.0138	−.0335
	Coquar	29.2	07.3	1478	.7904	+.0187	−.0316
	Monet	38.8	10.1	1456	.7978	.0199	−.0297
	Bourmont	50.0	12.1	1449	.7992	.0176	−.0318
	Langlade	58.7	13.8	1422	.8004	.0138	−.0347
	Dix	76 06.0	15.3	1385	.8001	.0077	−.0395
	Bolger	18.8	15.1	1315	.7977	−.0010	−.0458
	Forsythe	26.0	14.1	1301	.7891	−.0094	−.0537
	Doucet	34.7	13.5	1220	.7818	−.0234	−.0650
	Press	44.1	14.5	1201	.7817	−.0268	−.0677
	Signal	50.1	17.8	1165	.7943	−.0225	−.0622
	Forget	57.0	19.6	1136	.7999	−.0223	−.0610
	Regiskan	77 04.8	19.8	1099	.8035	−.0225	−.0600
	Phipps	06.8	20.2	1100	.8085	−.0180	−.0555
	Senneterre	14.6	23.6	1027	.8216	−.0169	−.0519
	Belcourt	21.1	24.2	1023	.8326	−.0072	−.0420
	Uniacke	30.8	25.3	1058	.8294	−.0087	−.0447
	Barraute	38.2	26.4	1024	.8297	−.0133	−.0482
	Natagan	41.4	27.3	1074	.8285	−.0111	−.0477
	Fisher	48.2	29.3	1122	.8352	−.0029	−.0411
	Landrienne	57.1	33.3	1051	.8416	−.0091	−.0449
	Amos	78 07.1	34.3	991	.8486	−.0093	−.0430
	La Ferme	11.9	34.6	1049	.8412	−.0116	−.0474
	Villemontel	21.7	37.7	1047	.8528	−.0049	−.0406
	Launay	32.1	38.8	1055	.8344	−.0242	−.0601
	Taschereau	41.6	40.0	1015	.8337	−.0304	−.0650
	Authier	51.4	43.7	1005	.8582	−.0124	−.0466
	Makamik	79 00.5	45.5	933	.8611	−.0189	−.0507
	Colombourg	08.0	46.8	931	.8559	−.0262	−.0579
	La Sarre	12.2	48.0	880	.8561	−.0326	−.0626
	Dupuy	21.7	49.8	943	.8640	−.0215	−.0536

PRINCIPAL FACTS FOR GRAVITY STATIONS

Rail Traverse 1948 from La Tuque to Cochrane, Ont. N.A.85

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	La Reine	79 30.3	48 52.0	908	980.8533	−.0388	−.0697
	Goodwin	41.4	54.3	943	.8582	−.0340	−.0661
	Eades	52.4	56.4	905	.8799	−.0191	−.0499
	Mace	56.3	56.7	880	.8790	−.0227	−.0527
	Low Bush	80 08.2	55.4	886	.8801	−.0192	−.0493
	Kirke	14.5	55.6	938	.8756	−.0191	−.0510
	Bingle	23.9	56.9	969	.8713	−.0144	−.0554
	Stimson	37.4	58.7	984	.8809	−.0140	−.0476
	Norembega	43.5	59.4	981	.8845	−.0117	−.0451
	Brower	50.1	49 00.8	873	.8903	−.0182	−.0479
	Abitibi	53.5	01.6	892	.8929	−.0150	−.0454
	Cochrane (pend)	81 00.7	03.7	915	.8874	−.0215	−.0526
	Tiblemont	77 18.8	48 18.6	1041	.8214	−.0083	−.0437
	Ballast Pit (M.17)	25.9	11.5	1051	.8097	−.0084	−.0442
	Pascalis	29.1	08.9	1091	.8103	−.0002	−.0373
	Colombière	35.4	05.7	—	.8014	−.	
	Val d'Or	46.4	06.6	1010	.8116	−.0031	−.0375
	Du Buisson	53.9	05.9	985	.8063	−.0097	−.0432
	Malartic	78 07.5	08.3	1042	.8025	−.0117	−.0472
	Heva	13.3	10.8	1064	.8025	−.0133	−.0496
	Cadillac	22.8	13.3	1023	.8032	−.0203	−.0551
	Montanier	30.0	12.8	1097	.7995	−.0162	−.0536
	Bousquet	36.0	12.9	994	.8066	−.0190	−.0529
	Joannes	42.5	13.5	1051	.8013	−.0198	−.0556
	McWatters	54.7	12.9	1001	.8155	−.0094	−.0435
	Noranda-Rouyn (CNR Stn.)	79 01.7	14.8	978	.8267	−.0032	−.0365

Road Traverse 1950 from Quebec City to St. Siméon NA85

	Quebec	71 13.2	46 48.2	334	980.7289	−.0318	−.0432
	Dufournel	04.7	55.2	25	.7672	−.0331	−.0339
	Chateau Richer	01.0	58.3	18	.7688	−.0368	−.0374
	Ste Anne de Beaupré	70 55.4	47 01.5	18	.7682	−.0422	−.0428
	St. Joachim	50.8	03.3	25	.7728	−.0397	−.0405
	St. Tite des Caps	46.4	08.5	1041	.7285	−.0038	−.0336
		41.2	15.2	1980	.6913	.0449	−.0225
		36.7	21.7	1215	.7526	.0445	−.0169
	Les Éboulements	19.0	28.8	905	.7622	−.0057	−.0365
	Ruisseau Jureux	12.6	32.3	18	.8216	−.0349	−.0355
	Cap à l'Aigle	07.4	38.4	258	.8267	−.0164	−.0252
	Rivière au Saumon	58.2	45.2	841	.8054	.0069	−.0217
	St. Siméon	52.7	50.7	41	.8584	−.0236	−.0250

PRINCIPAL FACTS FOR GRAVITY STATIONS

Air Trip—1951 WORDEN No. 44.

Station No.	Station Name	Longitude ° ′	Latitude ° ′	Elevation Feet	Observed Gravity	Gravity Anomalies Free Air	Gravity Anomalies Bouguer
	South Porcupine (Air Base)	81 11.8	48 28.6	920	980.8342	−.0219	−.0532
	Deception Lake	18.1	49 01.6	898	.8982	−.0091	−.0397
		13.3	23.0	747	.9427	−.0107	−.0362
	McInnes (Air Base)	21.2	32.3	717	.9690	−.0011	−.0255
		80 28.5	50.2	925	.9903	.0132	−.0183
		81 41.0	40.3	741	.9885	.0088	−.0164
	Nonigose Lake	55.3	48.9	692	981.0081	.0110	−.0126
	Smoky Falls	82 09.8	50 03.1	564	.0382	.0080	−.0112
	Guilfoyle Lake	22.4	49 45.3	705	980.9869	−.0036	−.0276
		09.7	35.2	698	.9900	.0139	−.0099
		81 49.9	21.8	732	.9531	.0001	−.0249
	Tahquatagama Lake	22.5	50.5	807	981.0056	.0169	−.0106
		80 59.3	47.7	851	980.9970	.0166	−.0123
	Harris Lake	48.3	35.3	831	.9690	.0052	−.0231
		38.1	55.6	859	981.0056	.0143	−.0150
	Stringer Lake	52.2	50 11.6	746	.0332	.0076	−.0178
	Agaskagou Lake	24.0	13.9	839	.0221	.0018	−.0268
		79 58.1	11.8	876	.0063	−.0074	−.0372
		34.4	16.7	836	.0091	−.0157	−.0441
		12.8	08.8	816	980.9778	−.0371	−.0649
		17.8	49 53.1	799	.9892	−.0040	−.0313
		41.8	59.3	858	.9919	−.0050	−.0342
		80 00.0	54.6	873	.9695	−.0190	−.0487
		19.4	37.5	1004	.9450	−.0058	−.0400
	Chabbie Lake	79 44.8	34.6	938	.9375	−.0152	−.0471
	Bateman Lake	80 03.5	23.7	986	.9105	−.0215	−.0550
	Little Abitibi Lake	31.8	24.8	863	.9338	−.0114	−.0408
		55.0	27.1	862	.9472	−.0015	−.0309
	Lillabella Lake	81 01.4	06.5	818	.8997	−.0225	−.0503
	Cochrane Court House	02.0	03.6	—	—	—	—
		80 41.7	13.2	906	.9162	−.0077	−.0385
		04.1	11.3	1031	.8881	−.0212	−.0563
	Joe Lake	79 32.0	05.2	1001	.8741	−.0289	−.0630
	Turgeon Lake	02.5	01.5	960	.8763	−.0251	−.0578
		00.8	10.8	1073	.8744	−.0302	−.0667
	Mistawak Lake	78 40.3	25.2	882	.9108	−.0342	−.0643
		79 06.8	35.8	857	.9476	−.0145	−.0437
		78 54.0	47.0	832	.9587	−.0224	−.0508
	Taschereau (Air Base)	40.9	48 40.0	1005	.8338	−.0313	−.0655
		17.0	49 52.0	801	.9738	−.0177	−.0449
	Mattagami Lake	77 47.0	53.9	818	.9540	−.0387	−.0665
		56.0	37.7	821	.9428	−.0255	−.0534
	Harricanaw River	78 17.8	27.3	882	.9292	−.0179	−.0480
		25.0	14.6	938	.8965	−.0265	−.0584
		41.1	03.1	996	.8779	−.0224	−.0563
	Chicobi Lake	30.1	48 51.5	978	.8638	−.0209	−.0542
	Obalski Lake	77 57.4	46.5	958	.8687	−.0105	−.0431
	Fiedmont Lake	40.9	20.5	992	.7975	−.0397	−.0735
	Guequen Lake	12.3	08.0	1047	.7969	−.0056	−.0413
	Senneterre (Air Base)	13.6	23.4	1008	.8222	−.0178	−.0521
	Sabourin Lake	42.6	47 56.2	1082	.7754	−.0169	−.0538
	Mourier Lake	78 10.0	59.5	995	.7829	−.0225	−.0564

PRINCIPAL FACTS FOR GRAVITY STATIONS

Air Trip—1951 WORDEN No. 44.

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	Clerion Lake	78 40.9	47 49.8	898	980.7708	−.0292	−.0598
	Beaumesnil Lake	79 03.8	46.4	884	.7710	−.0253	−.0554
	Lac des Quinze	03.9	29.2	862	.7556	−.0169	−.0463
	Guay Lake	01.2	11.9	895	.7219	−.0217	−.0521
	Lac aux Sables	78 42.1	22.5	1026	.7562	.0091	−.0258
	L. Simard	35.8	35.7	868	.7610	−.0208	−.0503
	Bay Lake	18.0	25.3	1084	.7297	−.0161	−.0531
	L. Decelles (Reservoir)	03.0	41.1	1027	.7561	−.0188	−.0538
	Gaotanaga Lake	77 35.8	38.2	1052	.7560	−.0121	−.0480
	L. Denain	76 59.0	54.0	1238	.7699	−.0045	−.0466
	L. Tavernier	59.5	48 11.3	1098	.8086	−.0048	−.0422
	Waswanipi Lake	39.6	49 28.7	877	.9162	−.0335	−.0634
	L. Baptiste	59.2	32.2	1139	.8976	−.0327	−.0715
	Bell River	77 15.7	23.5	899	.9003	−.0395	−.0702
	Taibi Lake	34.0	26.9	901	.9019	−.0429	−.0735
		44.1	48 53.8	1085	.8398	−.0383	−.0753
	L. Despinassy	18.1	46.7	992	.8687	−.0076	−.0414
	Martin Lake	76 48.5	26.7	1383	.7890	−.0206	−.0677
	L. Faillon	44.5	19.0	1164	.7891	−.0297	−.0693
	L. Valmy	13.6	26.2	1272	.8127	.0083	.0350
	L. Megiscane	75 52.0	36.1	1273	.8230	−.0111	−.0544
	L. St. Cyr	38.7	48.9	1279	.8312	−.0214	−.0650
	L. Lacroix	22.0	49 01.4	1264	.8605	−.0121	−.0552
		39.6	12.9	1292	.8454	−.0417	−.0857
		55.8	04.6	1273	.8518	−.0248	−.0681
	Wilson Lake	76 28.0	07.9	1213	.8657	−.0214	−.0626
	Wetethagami Lake	14.0	48 55.8	1205	.8422	−.0277	−.0690
	L. Cuvillier	33.6	53.9	1233	.8405	−.0238	−.0658
	L. Charette	22.3	38.6	1242	.8227	−.0180	−.0603
		46.1	39.5	1284	.8160	−.0140	−.0658
	L. Parent	77 04.4	36.0	994	.8385	−.0217	−.0555
	L. Parent	76 56.9	45.4	994	.8481	−.0260	−.0599
	L. Quevillon	77 00.9	49 05.9	828	.8927	−.0276	−.0558
	Wedding Lake	76 43.5	17.9	995	.9108	−.0117	−.0456
	Pustkitamika Lake	18.2	24.3	954	.9087	−.0272	−.0597
	L. au Goeland	45.5	43.7	862	.9311	−.0423	−.0717
	L. Bouchier	77 48.3	50 08.0	803	.9702	−.0448	−.0721
		78 11.8	10.2	813	.9787	−.0386	−.0663
	Soscumica Lake	77 30.2	17.4	802	.9926	−.0364	−.0637
	Mattagami Lake	28.2	02.2	818	.9577	−.0470	−.0748
	Waswanipi Post (Air Base)	76 30.0	49 39.3	882	.9095	−.0554	−.0855
	Lady Beatrix Lake	77 03.0	50 02.5	891	.9635	−.0350	−.0653
	Olga Lake	10.0	49 49.9	841	.9596	−.0250	−.0536
	Bachelor Lake	76 07.4	31.0	977	.9224	−.0213	−.0581
		75 52.6	47.1	1010	.9522	−.0123	−.0467
	Caupichigau Lake	36.1	50 04.3	1114	.9607	−.0195	−.0575
	L. Manson	51.3	14.2	1076	.9873	−.0112	−.0478
	Kaminskanun Lake.	76 01.6	28.5	1112	981.0048	−.0114	−.0493
		13.0	41.7	879	.0443	−.0133	−.0433
	Kenonisca Lake	33.0	34.6	864	.0266	−.0220	−.0515
	Opatawaga Lake	41.2	22.0	891	980.9975	−.0299	−.0602
		18.5	15.2	982	.9850	−.0238	−.0573

PRINCIPAL FACTS FOR GRAVITY STATIONS

Air Trip—1951 WORDEN No. 44.

Station		Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ′	° ′				
	Yapuwichi Lake	76 17.6	50 02.2	939	980.9621	−.0315	−.0635
	Maicasagi Lake	41.0	49 55.3	862	.9582	−.0324	−.0618
	Lady Beatrix Lake	52.5	50 12.2	891	981.0144	.0015	−.0288
	Crow Bay	41.9	51.2	800	.0611	−.0181	−.0453
		47.3	51 05.7	758	.0838	−.0206	−.0464
	Lake Evans	77 03.9	50 57.9	800	.0630	−.0260	−.0532
	Chabinoche Lake.	04.7	29.6	913	.0041	−.0325	−.0352
	Lac Maurice	56.2	27.1	807	.0160	−.0269	−.0544
	L. Lucie	78 24.5	24.2	789	.0102	−.0301	−.0570
		18.6	35.7	758	.0326	−.0276	−.0534
		10.0	49.7	651	.0624	−.0285	−.0506
	L. Pirie	77 44.1	51.3	833	.0519	−.0242	−.0526
	L. du Tust	20.6	51 01.6	807	.0726	−.0212	−.0487
	L. Colomb	38.3	03.8	757	.0865	−.0152	−.0410
		07.2	12.0	739	.0955	−.0200	−.0452
	Nemiscau (Air Base)	76 54.0	19.4	766	.1026	−.0213	−.0473
	L. Dana	77 17.3	50 45.9	800	.0340	−.0373	−.0645
	L. Randal	19.8	51 21.3	783	.1079	−.0172	−.0438
		34.5	33.0	619	.1409	−.0167	−.0378
		50.8	43.4	539	.1699	−.0105	−.0289
		46.9	59.7	551	.1884	−.0147	−.0334
	Mirabelli Lake	22.6	51.6	611	.1610	−.0246	−.0454
		02.5	58.9	730	.1584	−.0267	−.0516
		76 47.8	44.8	652	.1382	−.0336	−.0558
		77 12.0	35.2	688	.1270	−.0274	−.0508
	Lacs Jolliet	76 49.3	33.7	706	.1170	−.0335	−.0575
		28.8	30.1	761	.1136	−.0264	−.0523
	L. Champion	13.7	41.6	742	.1213	−.0373	−.0626
		75 53.4	54.1	993	.1260	−.0273	−.0611
		24.4	54.2	936	.1365	−.0224	−.0542
	L. Le Vilin	74 58.0	42.1	1007	.1120	−.0225	−.0568
	L. Lemare	75 25.0	43.0	934	.1210	−.0216	−.0535
		48.4	28.6	764	.1084	−.0291	−.0552
		76 08.8	21.3	831	.1004	−.0201	−.0484
	L. Poncet	02.5	06.1	872	.0827	−.0136	−.0433
		29.9	07.0	874	.0833	−.0121	−.0419
	Mishagomish Lake	12.1	50 51.7	921	.0564	−.0121	−.0434
		75 50.0	35.5	1109	.0240	−.0029	−.0407
	Waposite Lake	18.6	14.7	1178	980.9800	−.0096	−.0497
	L. Lamarck	18.2	49 55.4	1103	.9587	−.0094	−.0469
	Opemisca Lake	74 48.2	54.2	1176	.9508	−.0086	−.0486
	L. Cache (Chibougamau Air Base)	25.4	49.8	1245	.9440	−.0024	−.0448
		49.8	50 01.1	1180	.9616	−.0077	−.0479
		75 07.5	04.5	1160	.9740	−.0022	−.0417
	Opataca Lake	74 55.4	23.7	1180	.9882	−.0145	−.0547
	Assinica Lake	75 15.9	32.0	1178	981.0097	−.0055	−.0456
		29.8	40.5	1046	.0334	−.0072	−.0424
	Thin Man Lake	36.0	53.0	1064	.0553	−.0016	−.0379
	L. Lecordier	37.5	51 07.7	988	.0764	−.0094	−.0430
	L. Villon	14.9	06.3	1010	.0652	−.0164	−.0508
	L. Montmort	74 50.7	09.0	1074	.0655	−.0141	−.0507

PRINCIPAL FACTS FOR GRAVITY STATIONS

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Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
		75 09.2	50 54.2	1096	981.0526	−.0031	−.0404
		74 47.5	45.9	1223	.0338	.0023	−.0393
		33.0	29.8	1243	980.9932	−.0127	−.0550
	L. Lemieux	32.3	18.9	1245	.9808	−.0087	−.0511
	L. Chevrillon	27.2	01.1	1205	.9593	−.0077	−.0487
	Waconichi Lake	04.0	06.9	1267	.9640	−.0057	−.0489
	Mistassini Lake	01.0	32.7	1220	981.0016	−.0107	−.0523
	Mistassini Post	73 52.8	24.6	1230	980.9835	−.0156	−.0578
		74 13.0	56.1	1229	981.0266	−.0194	−.0613
		73 46.6	51 08.9	1211	.0527	−.0138	−.0550
	Mistassini Lake	05.0	21.9	1220	.0569	−.0278	−.0694
	Mistassini Lake	72 59.2	16.6	1220	.0510	−.0260	−.0676
	Albanel Lake	50.7	11.0	1265	.0356	−.0289	−.0720
	Albanel Lake	73 13.3	50 57.0	1265	.0290	−.0149	−.0580
	Mistassini Lake	29.2	51 02.8	1220	.0411	−.0155	−.0571
		54.4	50 51.4	1235	.0287	−.0098	−.0519
	Mistassini Lake	43.0	50.1	1220	.0293	−.0086	−.0502
	Albanel Lake	30.8	45.1	1265	.0204	−.0060	−.0491
	St. Félicien (AirBase)	72 26.5	48 39.0	350	980.8673	−.0599	−.0698
	File-axe Lake	73 34.8	50 18.9	1480	.9551	−.0123	−.0627
	L. Laganiere	39.6	05.1	1332	.9350	−.0259	−.0713
		52.0	49 55.1	1481	.9178	−.0143	−.0647
		25.4	54.6	1333	.9329	−.0123	−.0577
		10.7	50 11.2	1273	.9558	−.0197	−.0630
		72 56.5	28.4	1543	.9564	−.0192	−.0717
		36.0	19.7	1427	.9504	−.0232	−.0718
	Swan Lake	53.3	49 53.1	1356	.9246	−.0163	−.0624
		73 19.4	46.4	1354	.9158	−.0156	−.0618
		50.2	37.7	1378	.8917	−.0242	−.0711
	L. Presqu'île	74 50.1	44.1	1165	.9372	−.0082	−.0479
	Dickson Lake	75 12.5	38.7	1134	.9082	−.0321	−.0708
		32.1	35.1	1018	.9174	−.0285	−.0632
		50.0	22.3	1122	.8854	−.0317	−.0699
		18.8	27.5	1190	.9018	−.0243	−.0621
	L. Hébert	15.4	16.2	1278	.8626	−.0308	−.0743
		74 38.0	13.1	1445	.8365	−.0365	−.0857
	Surprise Lake	55.6	21.3	1223	.8813	−.0249	−.0665
	Iréné Lake	46.2	32.2	1195	.9205	−.0045	−.0452
		02.7	31.9	1303	.8890	−.0253	−.0697
		73 42.5	27.6	1240	.8885	−.0254	−.0676
		25.6	30.8	1382	.8994	−.0059	−.0530
		03.5	23.4	1141	.8802	−.0368	−.0756
	Petit L. Chigoubiche	32.9	12.7	1167	.8635	−.0350	−.0748
		45.9	01.1	1332	.8318	−.0340	−.0794
	Potrincourt Lake	74 07.4	10.8	1280	.8606	−.0245	−.0681
	Rohault Lake	20.8	25.0	1283	.8892	−.0168	−.0605
	Obatogamau Lake	27.4	38.6	1218	.9100	−.0223	−.0638
	L. Magouche	72 15.5	48 58.7	642	.8693	−.0578	−.0797
	L. Damville	73 05.3	49 08.4	925	.8642	−.0507	−.0822
		72 34.9	20.4	782	.8968	−.0495	−.0761
	L. Clair	08.8	32.0	674	.9151	−.0586	−.0816
		10.3	48.0	1433	.9076	−.0184	−.0672

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Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	L. Goéland	71 40.5	49 46.7	1290	980.9133	−.0243	−.0728
	L. Margane	08.0	55.4	1309	.9487	−.0000	−.0446
	L. à Paul	70 45.2	50.9	1335	.9499	.9104	−.0351
	Shipshaw Lake	51.4	34.9	1289	.9127	−.0075	−.0514
	Etienniche Lake	71 21.3	30.0	1040	.9112	−.0251	−.0605
		27.0	15.3	870	.8813	−.0491	−.0787
	Connelly Lake	58.0	20.3	670	.9038	−.0529	−.0757
	L. de l'Ouest	56.1	06.4	673	.8942	−.0415	−.0644
		72 14.1	09.1	628	.8945	−.0494	−.0708
	L. Bernabé	71 38.0	48 54.1	683	.8630	−.0534	−.0766
	L. Vermont	09.0	56.0	1009	.8517	−.0369	−.0713
		70 56.5	49 12.2	1766	.8453	.0038	−.0563
	Lac à la Croix Camp	41.0	21.2	1676	.8667	.0033	−.0537
	Pipmuacan Lake	25.3	30.9	1225	.9023	−.0179	−.0596
	Itamamo Lake	28.2	09.9	1565	.8603	.0037	−.0496
	L. Beauséjour	44.9	48 57.9	2137	.7958	.0105	−.0623
	L. Poulin-de-Courval	27.9	52.9	2207	.8005	.0105	−.0579
		20.6	56.0	1848	.8159	.0062	−.0567
		35.3	38.0	2169	.7711	.0185	−.0554
	L. Brébeuf	36.0	11.9	758	.8257	−.0206	−.0464
		71 14.5	12.0	1139	.7894	−.0212	−.0600
	L. à la Carpe	51.7	12.6	1156	.7914	−.0185	−.0578
	L. à la Croix	72 51.9	36.9	1420	.7982	−.0232	−.0716
		73 18.0	18.4	1567	.7675	−.0124	−.0658
	L. de la Fourche	07.0	05.6	1130	.7842	−.0177	−.0562
		01.0	47 52.4	909	.7850	−.0179	−.0489
	L. Chaumonot	72 48.1	58.8	992	.7897	−.0150	−.0488
	L. Panache	33.5	48 16.9	1171	.7960	−.0190	−.0589
		27.0	47 53.9	1170	.7831	.0026	−.0373
	L. Édouard	21.6	36.3	1163	.7760	.0211	−.0185
	L. des Isles	22.5	13.6	1016	.7661	.0315	−.0032
	L. à Beauce (Air Base)	45.9	19.0	689	.7650	−.0085	−.0320
	Mekinac Lake	41.8	03.7	515	.7538	−.0132	−.0307
	Brown Lake	73 10.9	46 55.9	1133	.6861	−.0110	−.0496
	Shawinigan Lake	07.5	40.1	1046	.6693	−.0122	−.0478
	Gd. L. des Isles	30.6	42.8	1275	.6431	−.0210	−.0644
	L. Toro (Resevoir)	46.7	48.4	1175	.6612	−.0207	−.0607
	L. Cypres	74 12.9	31.6	1367	.6177	−.0209	−.0675
	L. Jamet	30.8	33.9	1480	.6093	−.0221	−.0725
	L. Mattawin	16.8	49.2	1621	.6309	−.0102	−.0654
	Clear Lake	73 50.1	47 03.7	1297	.6849	−.0085	−.0527
	L. à la Chienne	31.0	01.8	1347	.6801	−.0057	−.0516
	L. Geoffrion	17.1	14.7	1344	.7087	.0032	−.0426
	L. aux Rats	09.1	29.1	785	.7578	−.0219	−.0486
	Oscar Lake	29.5	32.7	1385	.7240	−.0046	−.0518
	L. Dupuis	46.7	22.9	1219	.7140	−.0155	−.0571
	L. Troyes	74 11.7	11.3	1487	.6809	−.0060	−.0567
	Mazanaskwa Lake	31.6	07.4	1457	.6754	−.0085	−.0581
	L. Maison de Pierre	42.0	46 52.9	1415	.6555	−.0106	−.0588
	Sprouk Lake	46.0	47 13.9	1307	.6955	−.0123	−.0568
	Nemikachi Lake	31.2	24.5	1396	.6994	−.0159	−.0634
	Kempt Lake	11.7	23.2	1371	.7011	−.0145	−.0612

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Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	Manuan Lake	74 05.6	47 33.8	1338	980.7290	−.0056	−.0512
	L. Albert	73 31.7	45.8	1162	.7602	−.0090	−.0486
		13.2	44.3	909	.7683	−.0225	−.0535
	L. du Droit	35.5	48 06.4	1666	.7587	−.0060	−.0507
	Ellwood Lake	74 08.9	04.6	1560	.7732	−.0132	−.0399
	L. Lorette	31.1	03.7	1533	.7790	.0179	−.0343
	L. Dugré	48.7	09.8	1569	.7884	.0216	−.0318
	Chapman Lake	40.4	20.4	1235	.7940	−.0201	−.0622
	Great Beaver Lake	20.3	11.2	1403	.7898	.0053	−.0425
		73 53.6	17.7	1277	.7985	−.0077	−.0512
		22.5	27.3	1795	.7636	−.0082	−.0693
		25.0	40.2	1692	.7788	−.0220	−.0796
	L. Lobruère	42.2	29.9	1635	.7793	−.0114	−.0671
		59.2	41.7	1373	.8052	−.0278	−.0745
	Oskelaneo (Air Base)	75 12.0	06.5	1336	.7948	.0090	−.0345
	L. Déziel	74 24.3	34.4	1318	.8025	−.0247	−.0696
	B. de l'Est	75 03.1	21.3	1318	.8027	−.0049	−.0498
	L. Medora	34.3	12.7	1404	.8016	.0149	−.0330
	Pascagama Lake	39.6	30.3	1277	.8206	−.0044	−.0479
	B. Mattawa	22.2	22.9	1318	.8127	.0027	−.0422
		07.0	38.6	1318	.8229	−.0106	−.0555
	Pascagama R.	23.8	46.4	1299	.8279	−.0190	−.0633
		74 51.8	49 01.4	1524	.8287	−.0195	−.0714
		29.3	04.3	1343	.8516	−.0179	−.0636
		16.3	00.5	1364	.8366	−.0253	−.0718
	B. Verreau	33.7	48 48.5	1318	.8239	−.0244	−.0693
	L. Marmette	49.0	38.8	1318	.8064	−.0274	−.0723
	L. Dix-Milles	48.5	47 51.1	1406	.7670	.0127	−.0351
	L. Dandurand	29.6	48.5	1403	.7587	.0081	−.0397
	Wagwabika Lake	38.2	36.3	1498	.7246	.0012	−.0498
	Mitchinamekus Lake	75 04.3	18.6	1272	.7091	−.0090	−.0523
	Long Lake	18.0	05.0	861	.7199	−.0164	−.0457
		43.1	00.6	755	.7146	−.0251	−.0508
	Nutakim Lake	36.3	20.5	1313	.7116	−.0055	−.0502
		16.7	27.3	1213	.7294	−.0073	−.0486
	L. Bolduc	21.0	46.7	1402	.7509	.0029	−.0449
		41.3	48 04.0	1438	.7876	.0171	−.0319
	L. Capitachouane	58.4	03.0	1406	.7926	.0205	−.0273
	L. Durand	76 11.1	16.1	1325	.8031	.0038	−.0413
		28.2	47 59.5	1319	.7953	.0204	−.0246
	L. Bouchette	33.5	39.0	1182	.7679	.0108	−.0295
		25.4	24.2	1202	.7279	−.0051	−.0461
	O'Sullivan Lake	01.4	36.0	1308	.7301	−.0107	−.0552
	Eskwahani Lake	75 41.1	48.6	1338	.7539	−.0029	−.0485
	McLennan Lake	46.6	26.1	1380	.7184	−.0008	−.0478
	Poigan Lake	76 18.9	12.0	1079	.7123	−.0140	−.0508
		32.5	02.2	1199	.6873	−.0130	−.0539
	L. Andov	46.2	23.3	1198	.7277	−.0044	−.0452
	Gull Lake	48.6	33.7	1140	.7483	−.0049	−.0437
		77 20.9	37.8	1067	.7606	−.0055	−.0419
		33.9	28.1	1066	.7489	−.0028	−.0391
	Kokomis Lake	58.5	21.3	1100	.7337	−.0046	−.0421

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Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	L. Babinet	78 15.4	47 14.9	1180	980.7174	−.0038	−.0440
	Saseginaga Lake	36.6	07.5	1038	.7156	−.0079	−.0432
	Cataboningue Lake	48.9	02.1	891	.7142	−.0150	−.0453
	Kipawa Lake	79 10.9	46 59.6	884	.7093	−.0168	−.0469
		78 46.3	49.3	884	.6899	−.0208	−.0509
	L. Sairs	26.5	50.5	892	.6893	−.0224	−.0528
	Watson Lake	15.0	47 01.2	992	.7001	−.0182	−.0520
	L. Tremblay	77 57.5	08.7	1011	.7121	−.0157	−.0502
	L. des Baies	40.8	16.6	1069	.7228	−.0095	−.0466
	L. Nollet	16.0	16.4	1123	.7214	−.0074	−.0456
		02.6	20.2	1139	.7250	−.0080	−.0468
	L. Nizard	76 53.8	07.5	1198	.6930	−.0154	−.0562
	L. Brulé	77 14.1	46 57.0	1168	.6834	−.0120	−.0518
	Busted Lake	35.1	47 02.8	1181	.6966	−.0063	−.0465
	L. Dumoine	53.6	46 54.7	1030	.6875	−.0175	−.0526
	L. Pin-Blanc	78 09.3	43.1	1093	.6690	−.0126	−.0498
	L. Bleu	23.0	35.2	1063	.6589	−.0137	−.0499
	Nemewin Lake	43.0	27.3	817	.6546	−.0293	−.0571
		10.5	25.2	1112	.6396	−.0133	−.0512
	Russell Lake	77 54.6	37.7	1108	.6645	−.0076	−.0453
	Les Lacs Aumand	32.2	32.5	1185	.6516	−.0054	−.0458
	Bruce Lake	17.8	43.8	1166	.6625	−.0133	−.0530
	Gale Lake	76 50.9	45.1	1184	.6692	−.0068	−.0472
	L. Savary	25.5	43.6	789	.6899	−.0211	−.0480
	Brodtkorb Lake	38.5	31.0	1062	.6659	−.0005	−.0368
	Bryson Lake	77 01.1	29.1	883	.6637	−.0166	−.0467
	St. Patrick Lake	22.4	22.3	886	.6546	−.0153	−.0454
	L. du Princeau	41.1	18.2	690	.6603	−.0218	−.0453
	L. aux Vers	08.1	08.8	860	.6441	−.0079	−.0378
	Usborne Lake	76 40.3	12.7	821	.6629	.0013	−.0266
	L. Mer-Bleue	13.9	14.5	708	.6739	−.0010	−.0251
	L. Bras-Coupé	11.5	33.8	759	.6882	−.0109	−.0368
		05.3	59.3	1094	.6914	−.0145	−.0518
	Ottawa Laurentian Air Service	75 40.7	45 27.4	190	.6353	−.0174	−.0239
	Madawaska Lake	78 24.0	17.7	1401	.5294	−.0052	−.0425
	O'Connell Lodge (Air Base)	76 32.0	47 02.4	1201	.6873	−.0131	−.0540

Primary Bases 1952 Network in Quebec N.A. 85.

	St. Anne de Bellevue	73 56.6	45 24.5	110	980.6463	−.0091	−.0133
	Dorval Airport	45.5	27.3	97	.6454	−.0159	−.0192
	Montreal	34.0	30.0	151	.6499	−.0104	−.0155
	Pointe aux Trembles	29.5	38.4	42	.6581	−.0250	−.0265
	St. Sulpice	21.2	49.6	35	.6786	−.0221	−.0233
	Berthierville	10.7	46 05.0	29	.6880	−.0365	−.0375
	Trois Rivières	72 32.3	20.6	49	.7110	−.0350	−.0367
	Cap de la Madeleine	30.0	22.4	55	.7145	−.0336	−.0355
	Ste. Anne de la Pérade	12.2	34.6	38	.7428	−.0223	−.0266
	Portneuf	71 53.0	41.7	19	.7530	−.0275	−.0282

PRINCIPAL FACTS FOR GRAVITY STATIONS

Primary Bases 1952 Network in Quebec — N.A. 85.

Station No.	Station Name	Longitude ° ′	Latitude ° ′	Elevation Feet	Observed Gravity	Gravity Anomalies Free Air	Gravity Anomalies Bouguer
	Quebec	71 13.2	46 48.2	340	980.7289	−.0312	−.0428
	Lévis	11.0	48.8	17	.7486	−.0428	−.0434
	Montmagny	70 33.1	58.8	51	.7487	−.0545	−.0562
	Ste. Anne de la Pocatière	01.4	47 22.1	154	.7818	−.0467	−.0520
	Notre Dame du Portage	69 37.1	45.8	34	.8318	−.0435	−.0447
	Rivière du Loup	31.7	49.6	290	.8232	−.0337	−.0436
	St. Siméon	53.0	50.7	25	.8584	−.0241	−.0250
	Tadoussac	42.7	48 08.2	10	.8816	−.0296	−.0299
	Petit Saguenay	70 04.2	12.9	58	.8804	−.0332	−.0352
	Grande Baie	51.0	19.1	18	.8713	−.0554	−.5060
	Chicoutimi	71 03.8	25.7	75	.8648	−.0663	−.0689
	Grand Mère	72 41.2	46 36.9	426	.7191	−.0159	−.0304
	St. Tite	33.9	43.4	457	.7316	−.0103	−.0259
	St. Roch de Mékinac	46.3	48.9	478	.7257	−.0224	−.0387
	Rivière aux Rats	53.6	47 12.6	393	.7585	−.0332	−.0466
	Lac à Beauce	46.0	19.3	689	.7650	−.0085	−.0320
	La Tuque	47.0	26.3	545	.7750	−.0230	−.0416
	Lachute	74 20.0	45 39.4	226	.6470	−.0204	−.0281
	St. Jérome	00.2	46.8	310	.6609	−.0097	−.0203
	St. Jacques	73 34.3	56.9	196	.6797	−.0169	−.0235
	Joliette	26.2	46 01.3	186	.6906	−.0135	−.0198
	Stoneham	71 23.5	57.6	511	.7518	−.0063	−.0237
	St. Joseph d'Alma	39.4	48 33.0	302	.8650	−.0557	−.0660
	Roberval	72 12.6	30.7	346	.8587	−.0545	−.0662
	St. Félicien	26.4	39.0	367	.8658	−.0579	−.0704
	Arntfield	79 15.3	12.1	935	.8166	−.0134	−.0452
	Rouyn	01.9	14.4	962	.8275	−.0033	−.0361
	Cache Lake	74 25.6	49 49.6	1245	.9440	−.0024	−.0448
	Rupert House	78 45.1	51 29.2	18	981.1763	−.0326	−.0332
	Nemiscau	76 54.0	19.4	766	.1026	−.0213	−.0473

Road Traverse 1952 La Tuque to St. Roch de Mékinac — N.A. 85.

		72 46.4	47 29.1	505	980.7823	−.0237	−.0409
		43.5	33.3	513	.7858	−.0257	−.0432
		43.9	37.4	526	.7899	−.0265	−.0444
		46.7	27.7	509	.7792	−.0243	−.0417
		47.2	24.4	551	.7747	−.0199	−.0386
		47.0	22.2	531	.7773	−.0162	−.0342
		47.8	20.7	437	.7743	−.0255	−.0404
		50.1	18.1	431	.7742	−.0223	−.0369
		51.6	16.5	445	.7698	−.0229	−.0381
		50.7	14.7	412	.7692	−.0239	−.0380
		53.0	10.4	405	.7585	−.0288	−.0426
		54.4	07.2	431	.7534	−.0267	−.0413
		55.6	05.2	421	.7520	−.0260	−.0403
		55.6	02.9	403	.7472	−.0291	−.0428
		55.7	00.5	450	.7416	−.0267	−.0420
		54.3	46 55.7	390	.7403	−.0264	−.0397
		54.6	52.2	423	.7326	−.0257	−.0401
		48.5	51.6	360	.7383	−.0250	−.0373

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse 1952 Chibougamau Rd. N.A. 85.

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies Free Air	Gravity Anomalies Bouguer
		° ′	° ′				
		73 12.7	48 56.5	1070	980.9375	−.0461	−.0825
		22.7	49 02.9	1208	.8432	−.0369	−.0780
		41.7	12.5	1267	.8563	−.0382	−.0757
		33.2	07.6	1219	.8478	−.0382	−.0798

Road Traverse 1952 Chicoutimi to Stoneham N.A. 85.

		71 04.3	48 23.6	438	980.8410	−.0529	−.0678
		06.0	22.1	507	.8370	−.0481	−.0654
		07.9	19.1	487	.8402	−.0424	−.0590
		10.0	17.5	785	.8164	−.0358	−.0625
		13.8	16.3	928	.8048	−.0321	−.0637
		15.9	12.8	1169	.7881	−.0208	−.0607
		14.2	08.3	1407	.7741	−.0058	−.0537
		15.0	05.9	1571	.7622	−.0014	−.0521
		15.1	05.2	1635	.7558	.0020	−.0537
		13.5	01.8	2231	.7194	.0267	−.0492
		14.2	47 59.2	2275	.7122	.0276	−.0499
		14.1	56.9	2479	.7032	.0413	−.0432
		15.2	55.9	2443	.7040	.0402	−.0430
		15.7	52.9	2516	.6950	.0426	−.0431
		15.1	49.1	2499	.6906	.0422	−.0430
		13.2	46.4	2529	.6889	.0474	−.0388
		12.7	43.4	2519	.6894	.0514	−.0344
		13.1	41.0	2457	.6888	.0486	−.0351
		14.2	38.0	2605	.6757	.0539	−.0348
		14.0	34.0	2578	.6731	.0548	−.0330
		14.0	31.1	2554	.6795	.0632	−.0238
		13.9	27.8	2566	.6800	.0699	−.0175
		11.4	24.2	2516	.6749	.0655	−.0202
		13.2	16.1	2309	.6742	.0574	−.0213
		13.3	13.9	2303	.6748	.0607	−.0177
		14.7	10.7	1929	.6910	.0465	−.0192
		14.9	10.2	1929	.6893	.0465	−.0201
		19.3	08.0	1396	.7212	.0307	−.0168
		20.6	06.2	1105	.7371	.0219	−.0157
		21.0	03.4	888	.7389	.0075	−.0227
		21.9	46 59.0	571	.7525	−.0021	−.0215

Road Traverse 1953 St. Urbain area N.A. 85

	Baie St Paul	70 30.5	47 26.5	45	980.8181	−.0273	−.0286
		31.7	27.0	68	.8210	−.0229	−.0252
		31.4	29.6	107	.8224	−.0217	−.0254
		30.9	31.6	134	.8137	−.0306	−.0352
		32.4	33.5	210	.8093	−.0310	−.0382
		34.8	37.8	1040	.7702	.0015	−.0339
		37.1	39.9	1109	.7659	.0005	−.0373
		38.1	40.8	1934	.7226	.0335	−.0324

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse 1953 St. Urbain area N. A. 85

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies Free Air	Gravity Anomalies Bouguer
		° ′	° ′				
		70 39.3	47 42.5	2472	980.7073	.0662	−.0180
		41.7	42.2	2592	.6977	.0684	−.0199
		43.3	43.6	2470	.7056	.0627	−.0214
		43.0	45.3	2456	.7080	.0612	−.0224
		44.3	46.8	2566	.7038	.0652	−.0222
		32.7	36.4	977	.7704	−.0021	−.0354
		32.7	34.7	288	.8069	−.0279	−.0377
		31.3	32.6	170	.8102	−.0325	−.0383
		31.8	28.9	175	.8188	−.0179	−.0239

Road Traverse 1954—Base stations Maniwaki to Senneterre and detail from Senneterre to Ottawa N.A. 85

	Dom. Obs. Front Steps	75 42.9	45 23.6	274.3	980.6220	−.0171	−.0265
	Maniwaki Stn.	58.6	46 22.4	569	.6907	−.0090	−.0285
	Maniwaki P.O.	58.6	22.6	561	.6907	−.0101	−.0292
	B.M. TS 49	43.0	33.6	850	.6859	−.0043	−.0333
	B.M. 717-G	76 04.3	43.8	754	.6969	−.0177	−.0434
	B.M. 727-G	24.9	53.6	1116	.6796	−.0156	−.0536
	B.M. 732-G	31.8	47 00.9	1244	.6812	−.0130	−.0554
	B.M. 753-G	37.7	08.9	1206	.6956	−.0142	−.0552
	O'Connell Lodge (1951)	32.2	02.3	1208	.6861	−.0136	−.0547
	B.M. 760-G	51.4	18.0	1174	.7166	−.0098	−.0498
	B.M. 771-G	77 08.9	34.2	1194	.7542	.0054	−.0353
	B.M. 781-G	20.8	48.7	1080	.7651	−.0162	−.0530
	B.M. 788-G	22.9	48 04.4	1045	.7999	−.0082	−.0438
	Senneterre CNR	14.7	23.5	1026	.8213	−.0172	−.0521
	Senneterre Air Base	13.6	23.4	1008	.8225	−.0175	−.0518
		15.3	22.8	1032	.8235	−.0133	−.0485
		18.5	18.5	1035	.8209	−.0092	−.0445
		20.2	13.7	1046	.8069	−.0150	−.0506
		22.0	08.8	1078	.8050	−.0076	−.0433
		22.3	02.4	1061	.7975	−.0061	−.0423
		21.4	47 56.5	1111	.7741	−.0160	−.0539
	Lowther	21.3	52.0	1107	.7662	−.0175	−.0552
		18.5	46.0	1152	.7554	−.0150	−.0543
		16.5	41.9	1168	.7572	−.0056	−.0454
		16.0	38.0	1141	.7604	.0009	−.0379
		13.1	37.2	1265	.7526	.0060	−.0371
		06.0	27.8	1187	.7419	.0020	−.0384
		01.9	26.0	1183	.7353	−.0022	−.0425
		76 57.9	21.3	1211	.7220	−.0059	−.0470
		46.0	14.0	1239	.7017	−.0126	−.0548
		41.1	12.3	1243	.6988	−.0126	−.0549
		27.3	46 57.6	1265	.6755	−.0117	−.0548
		51.2	47 20.5	1180	.7192	−.0104	−.0506
		48.8	27.1	1196	.7258	−.0122	−.0529
		43.8	29.9	1186	.7467	.0036	−.0368
		38.7	34.7	1171	.7585	.0067	−.0331

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse 1952 Chicoutimi to Stoneham N.A. 85.

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies Free Air	Gravity Anomalies Bouguer
		° ′	° ′				
		76 34.3	47 35.9	1180	980.7624	.0097	−.0305
		20.1	46 51.2	977	.6873	−.0174	−.0507
		16.7	49.3	864	.6915	−.0209	−.0504
		09.8	46.9	1019	.6825	−.0118	−.0347
		08.0	48.5	819	.6956	−.0199	−.0478
		08.5	51.6	779	.7001	−.0238	−.0504
		07.0	55.1	782	.7044	−.0245	−.0512
		01.1	47 01.8	855	.7044	−.0277	−.0568
		75 56.9	09.0	1062	.6996	−.0239	−.0600
		53.0	16.9	1023	.7062	−.0328	−.0676
		76 04.0	17.0	1222	.7161	−.0043	−.0459
		08.0	22.5	1188	.7208	−.0111	−.0515
		00.0	28.3	1218	.7174	−.0203	−.0618
		75 50.5	26.2	1229	.7176	−.0159	−.0578
		76 00.8	46 41.6	758	.6976	−.0133	−.0391
		75 56.4	38.2	680	.7027	−.0104	−.0336
		50.5	35.4	889	.6842	−.0051	−.0354
		30.0	33.2	755	.6705	−.0281	−.0538
		37.9	33.6	847	.6792	−.0113	−.0402
		33.2	33.7	768	.6757	−.0224	−.0485
		29.5	33.5	731	.6701	−.0311	−.0560
		30.2	28.4	921	.6597	−.0160	−.0473
	Lac des Iles	31.7	24.3	745	.6718	−.0143	−.0397
	Wabasee	32.2	20.1	668	.6722	−.0149	−.0376
		38.1	17.1	502	.6736	−.0245	−.0416
		40.3	13.2	695	.6731	−.0010	−.0247
		39.5	09.3	665	.6716	.0005	−.0221
	N.D. de Laus	37.4	05.3	636	.6741	.0063	−.0153
		34.9	02.4	672	.6701	.0100	−.0129
		33.3	45 58.4	666	.6677	.0131	−.0095
		37.0	53.3	626	.6592	.0085	−.0129
		36.5	49.3	644	.6482	.0053	−.0167
		35.0	45.9	518	.6488	.0021	−.0155
		30.2	41.8	473	.6469	−.0009	−.0171
	Buckingham	25.1	35.3	429	.6482	.0061	−.0086
		26.5	38.7	581	.6463	.0133	−.0064
		25.6	33.0	163	.6597	−.0040	−.0095

Road Traverse Base Stations St. Siméon to Baie Comeau and local Observations N.A. 85. Uffen 1954

Tadoussac (Dock)	69 42.7	48 08.3	25	980.8754	−.0343	−.0352
	42.1	10.6	49	.8583	−.0109	−.0277
Grandes-Bergeronnes	32.1	14.7	103	.8834	−.0286	−.0321
	27.2	17.3	102	.8848	−.0312	−.0347
St. Paul du Nord	13.8	34.9	37	.9180	−.0304	−.0317
	21.7	23.0	72	.8949	−.0325	−.0350
	18.8	26.1	122	.8977	−.0296	−.0338
	17.0	29.0	21	.9192	−.0220	−.0227
	05.1	41.3		.9088		

PRINCIPAL FACTS FOR GRAVITY STATIONS

Road Traverse Base Stations St. Siméon to Baie Comeau and local Observations N. A. 85 Uffen 1954

Station No.	Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	Forestville (Church)	69 03.6	48 44.8	286	980.9098	−.0300	−.0397
		08.5	34.1	13	.9266	−.0230	−.0234
		07.4	35.3	24	.9205	−.0297	−.0306
	Portneuf (Church)	05.9	37.1	38	.9182	−.0334	−.0347
		06.0	43.3	174	.9176	−.0305	−.0365
		68 41.8	55.3	226	.9486	−.0316	−.0323
		69 03.5	47.8	123	.9259	−.0337	−.0379
		00.0	49.0	163	.9274	−.0302	−.0357
		68 53.6	49.9	33	.9368	−.0355	−.0344
		47.1	53.7	170	.9364	−.0275	−.0333
		41.0	55.9		.9479		
	Chute aux Outardes (Church)	23.6	49 07.4	170	.9625	−.0219	−.0277
		38.7	00.8	120	.9523	−.0270	−.0311
		36.5	03.0	16	.9644	−.0280	−.0285
		25.4	05.0	17	.9681	−.0272	−.0278
	Baie Comeau (Airport)	14.3	13.0	165	.9720	−.0213	−.0269
	Baie Comeau (DOCK)	09.0	13.2	13	.9820	−.0259	−.0263
		20.9	10.8	200	.9678	−.0189	−.0257
		16.5	11.8	65	.9791	−.0218	−.0240
		12.1	13.0	150	.9762	−.0185	−.0236
	Looping to Rimouski and Observations in Gaspé				Uffen 1954	N.A. 85	
	Rimouski (Church)	68 31.5	48 26.5	19	980.8955	−.0421	−.0428
	Mont Joli (Stn.)	11.3	35.3	261	.8899	−.0381	−.0469
	St. Angele de Merci	05.5	32.1	266	.8904	−.0384	−.0413
	St. Gabriel (Church)	09.2	26.0	1082	.8297	−.0072	−.0441
		13.9	22.8	674	.8500	−.0205	−.0435
		23.1	18.7	751	.8420	−.0151	−.0406
	St. Blandine (Church)	27.3	21.8	534	.8597	−.0225	−.0407
	Road Traverse—1954 North Shore of Ottawa River West of Montreal and in Eastern Townships					N.A. 85	
	Lachute	74 20.0	45 39.4	226	980.6470	−.0204	−.0281
	Brownsburg	24.3	40.5	362	.6357	−.0206	−.0329
		26.0	42.8	570	.6291	−.0111	−.0305
	Pine Hill	29.2	44.3	778	.6241	.0013	−.0252
		33.3	45.7	929*	.6240	.0133	−.0184
		34.4	46.8	935	.6281	.0162	−.0156
	Lost River	33.0	49.7	799	.6369	.0080	−.0193
	Lakeview	34.1	52.8	740	.6359	−.0033	−.0285
		34.2	55.8	624	.6385	−.0161	−.0374
	Arundel	36.9	57.9	625	.6333	−.0244	−.0457
		37.0	46 00.5	797	.6244	−.0210	−.0482
	St. Jovite Stn.	35.3	07.8	701	.6335	−.0320	−.0556
		36.4	05.4	674	.6321	−.0323	−.0553
	Brébeuf	40.0	04.3	649	.6404	−.0247	−.0468
		42.9	03.3	745	.6367	−.0178	−.0432

PRINCIPAL FACTS FOR GRAVITY STATIONS

Uffen 1954 *Altimeter

Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	St. Rémi D'Amherst	74 45.7	46 00.5	686	980.6428	−.0131	−.0364
		47.2	45 59.3	721	.6434	−.0074	−.0319
		52.9	59.5	732	.6418	−.0082	−.0332
		54.7	56.2	739	.6395	−.0049	−.0301
	Namur	55.8	53.7	710	.6439	.0005	−.0237
		55.8	51.5	718	.6412	.0018	−.0226
	Notre Dame de la Paix	58.0	48.5	616	.6413	−.0031	−.0240
		58.4	44.5	526	.6428	−.0040	−.0219
		57.3	42.2	525	.6390	−.0045	−.0224
	Montebello	56.7	39.0	161	.6543	−.0187	−.0241
	St. Hubert	73 25.3	30.2	83	.6533	−.0137	−.0165
	St. Lambert	30.5	29.9	71	.6522	−.0155	−.0179
		29.7	28.2	56	.6511	−.0154	−.0173
	La Prairie	29.7	25.2	52	.6454	−.0170	−.0188
		32.2	24.1	58	.6426	−.0175	−.0195
		36.3	24.4	66	.6431	−.0168	−.0190
		40.7	24.9	87	.6437	−.0149	−.0179
		43.0	21.5	114	.6433	−.0077	−.0116
		47.1	21.3	102	.6452	−.0066	−.0101
	Maple Grove	50.3	19.2	91	.6488	−.0008	−.0039
	Beauharnois	52.8	18.9	81	.6491	−.0011	−.0038
		55.8	19.0	86	.6457	−.0041	−.0070
	St. Timothé	74 02.4	17.5	131	.6466	.0032	−.0012
	Valleyfield	07.9	15.4	145	.6473	.0082	.0035
		07.1	13.1	155	.6463	.0118	.0065
	Ste Barbe	11.9	09.8	167	.6468	.0184	.0127
	Port Lewis	16.9	10.2	164	.6436	.0143	.0087
	St. Amicet	21.8	08.5	166	.6384	.0119	.0063
		22.1	05.2	173	.6351	.0142	.0083
		27.3	02.1	173	.6314	.0152	.0093
	Dundee P.O.	30.6	00.0	155	.6284	.0136	.0083
	Dundee Centre	26.2	01.8	188	.6313	.0169	.0105
		24.1	00.5	195	.6335	.0217	.0151
		18.9	02.3	180	.6417	.0258	.0197
		14.3	03.8	185	.6455	.0278	.0214
	Huntingdon	10.9	05.2	165	.6482	.0265	.0209
		05.8	07.4	154	.6507	.0247	.0194
		73 59.9	07.9	144	.6518	.0241	.0192
		74 06.1	02.6	191	.6468	.0315	.0250
		00.3	02.3	311	.6349	.0314	.0208
		73 56.8	01.6	507	.6165	.0324	.0151
		50.3	02.4	484	.6115	.0240	.0075
		45.6	02.7	293	.6185	.0127	.0027
		41.2	02.8	240	.6161	.0051	−.0031
	Hemmingford	35.3	02.8	269	.6140	.0057	−.0035
		34.8	04.8	242	.6165	.0027	−.0056
		37.6	06.0	206	.6188	−.0002	−.0072
	Holton Stn.	39.6	08.2	195	.6227	−.0007	−.0073
		40.6	10.4	180	.6265	−.0016	−.0077
		35.3	12.3	205	.6236	−.0050	−.0120
		34.0	14.5	225	.6261	−.0039	−.0116
	St. Rémi	36.7	15.4	199	.6301	−.0029	−.0097

PRINCIPAL FACTS FOR GRAVITY STATIONS

Uffen 1954

Station		Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ′	° ′				
	St. Rémi	73 39.0	45 16.3	163	980.6363	−.0023	−.0078
		40.9	18.0	191	.6382	−.0002	−.0067
		42.7	14.2	142	.6400	.0027	−.0022
		48.1	14.5	130	.6484	.0094	.0050
		44.7	18.6	150	.6416	−.0016	−.0067
		48.2	17.2	127	.6505	.0072	.0029
	Vendome	53.7	15.7	130	.6497	.0089	.0045
		56.7	14.1	134	.6491	.0111	.0065
		59.9	12.9	138	.6460	.0102	.0005
		74 03.9	11.1	173	.6501	.0203	.0144
		73 55.8	09.0	133	.6519	.0215	.0170
	Howick CNR	51.2	11.5	132	.6512	.0169	.0124
	Aubrey	47.2	08.6	136	.6397	.0102	.0054
		45.0	06.0	166	.6303	.0066	.0010
		31.0	02.7	195	.6180	.0029	−.0037
	Portneuf	71 53.0	46 41.7	19	.7531	−.0274	−.0281
	Ste Anne de la Pérade	72 12.2	34.6	38	.7429	−.0222	−.0265
	St. Tite	33.9	43.4	457	.7316	−.0103	−.0259
	Grandmere	41.2	36.9	426	.7191	−.0159	−.0304
	Cap de la Madeleine	30.0	22.4	55	.7146	−.0335	−.0354
	Berthierville	73 10.7	05.0	29	.6881	−.0364	−.0374
	St. Sulpice	21.2	45 49.6	35	.6786	−.0221	−.0233
	Pointe aux Trembles	29.5	38.4	42	.6581	−.0250	−.0265
	Dorval	45.5	27.3	97	.6453	−.0160	−.0193
	Ste Anne de Bellevue	56.6	24.5	110	.6462	−.0092	−.0134
	St. Jérome	00.2	46.8	310	.6609	−.0097	−.0203
	St. Jacques	34.3	56.9	196	.6798	−.0168	−.0234
	Joliette	26.2	01.3	186	.6907	−.0134	−.0197
		26.0	04.1	193	.6112	−.0116	−.0127
	Lacolle	22.4	05.0	157	.6095	−.0126	−.0180
		19.3	05.9	130	.6088	−.0172	−.0116
		16.5	08.5	104	.6111	−.0212	−.0248
		16.1	11.7	107	.6155	−.0214	−.0251
		15.2	14.3	116	.6198	−.0202	−.0241
	St. Jean CPR	15.3	18.6	118	.6264	−.0198	−.0238
		34.0	30.0	151	.6499	−.0104	−.0155
		28.8	22.8	80	.6402	−.0160	−.0187
	St. Phillippe	28.6	21.2	116	.6366	−.0138	−.0177
		26.6	18.6	134	.6338	−.0109	−.0155
	St. Jacques le Mineur	25.0	16.8	180	.6283	−.0094	−.0155
		26.4	14.4	172	.6257	−.0091	−.0150
		27.9	11.2	191	.6165	−.0117	−.0182
		28.0	08.2	175	.6124	−.0128	−.0188
		21.8	08.9	183	.6112	−.0143	−.0205
		24.2	11.4	183	.6161	−.0132	−.0194
		22.6	14.8	156	.6221	−.0148	−.0201
		20.0	15.8	150	.6249	−.0142	−.0192
		19.6	18.2	159	.6275	−.0142	−.0197
	Cowansville	72 44.9	12.1	381	.6002	−.0116	−.0245
	Granby	43.8	24.0	387	.6244	.0053	−.0187
	Waterloo	31.0	20.5	701	.6350	.0407	.0169
	Magog	10.5	16.3	690	.5934	.0044	−.0191

PRINCIPAL FACTS FOR GRAVITY STATIONS

Uffen 1954

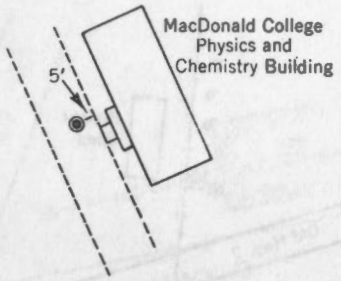
Station No.	Station Name	Longitude	Latitude	Elevation Feet	Observed Gravity	Gravity Anomalies	
						Free Air	Bouguer
		° ′	° ′				
	Sherbrooke	71 53.2	45 23.8	485	980.6131	−.0065	−.0230
	Richmond	72 08.6	39.5	393	.6908	.0394	.0260
	Marbleton	71 35.0	37.4	844	.6042	−.0020	−.0308
	Megantic	70 52.9	34.5	1310	.5535	−.0046	−.0492
	Disraeli	71 21.0	54.1	833	.6401	.0077	−.0207
	Black Lake	21.4	46 02.5	939	.6931	.0580	.0260
	Plessisville	46.2	13.0	504	.6813	−.0105	−.0277
	Thetford Mines	18.3	05.1	1029	.6599	.0294	−.0057
	Tring Junction	70 59.6	16.2	1068	.6443	.0008	−.0056
	Beauceville	45.7	12.3	633	.6488	−.0298	−.0513
	St. Georges	40.0	07.2	621	.6414	−.0307	−.0518
	Lac Etchemin	30.6	23.3	1260	.6366	.0004	−.0425
	St. Malachie	47.3	32.3	768	.6792	−.0171	−.0432
	St. Henri	71 04.0	41.5	290	.7104	−.0443	−.543
	Uffen 1954 (Isle D'Orléans)						
	Quebec City	71 13.2	46 48.2	340	980.7289	−.0312	−.0428
	St. Pierre D'Orléans	04.4	53.4	293	.7440	−.0283	−.0383
		01.3	55.7	319	.7450	−.0284	−.0393
		70 57.8	58.4	212	.7530	−.0345	−.0417
		49.5	47 00.6	228	.7555	−.0338	−.0415
		52.4	56.1	192	.7489	−.0370	−.0436
		52.4	53.7	35	.7543	−.0428	−.0450
		71 02.1	51.8	342	.7385	−.0362	−.0445
		08.0	51.1	124	.7480	−.0368	−.0411
	Uffen 1954						
	Trois Rivières	72 32.3	46 20.6	49	980.7111	−.0349	−.0366
	St. Pierre les Bequets	12.5	30.3	100	.7228	−.0230	−.0364
	Manseau	00.3	22.2	309	.6909	−.0330	−.0436
	Victoriaville	71 57.5	03.5	435	.6898	.0058	−.0090
	Danville	72 01.0	45 47.5	450	.6920	.0339	.0187
	Drummondville	29.3	52.9	290	.6617	−.0200	−.0299
	Ste. Hélène de Bagot	43.9	43.8	241	.6650	−.0076	−.0158
	St. Hyacinthe	56.8	37.7	110	.6482	−.0276	−.0313
	St. Hilaire	73 11.9	33.4	85	.6554	−.0162	−.0191
	Beloeil	12.9	32.9	48	.6568	−.0176	−.0192

APPENDIX B

Descriptions of Sites of Gravimeter Bases

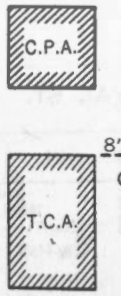
QUEBEC
HIGHWAY No. 2

STE. ANNE DE BELLEVUE, QUE.



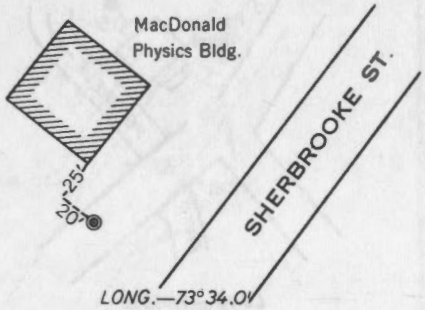
LONG.—73°56.6'
LAT.—45°24.5'
ELEV.—110 ft.
g.—980.6463

DORVAL AIRPORT, QUE.



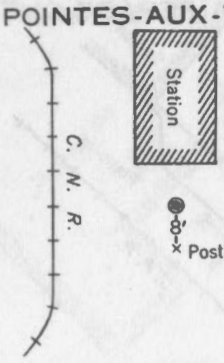
LONG.—73°45.5'
LAT.—45°27.3'
ELEV.—97 ft.
g.—980.6454

MONTREAL, QUE.



LONG.—73°34.0'
LAT.—45°30.0'
ELEV.—151 ft.
g.—980.6499

POINTES-AUX-TREMBLES, QUE.

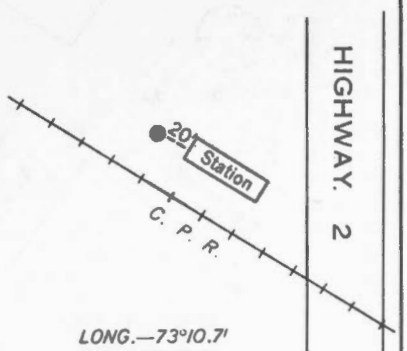


LONG.—73°29.5'
LAT.—45°38.4'
ELEV.—42 ft.
g.—980.6581

ST. SULPICE, QUE.

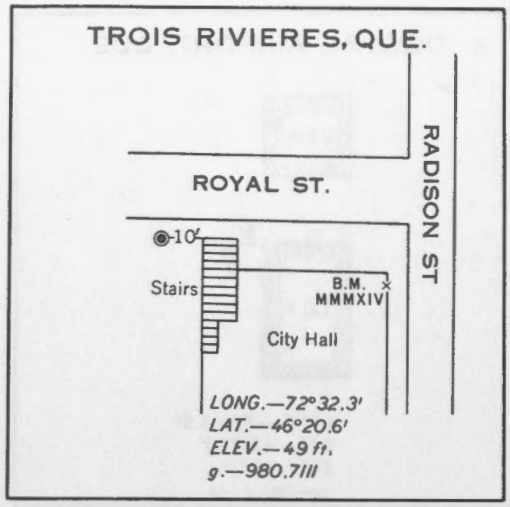
LONG.—73°21.2'
LAT.—45°49.6'
ELEV.—35 ft.
g.—980.6786

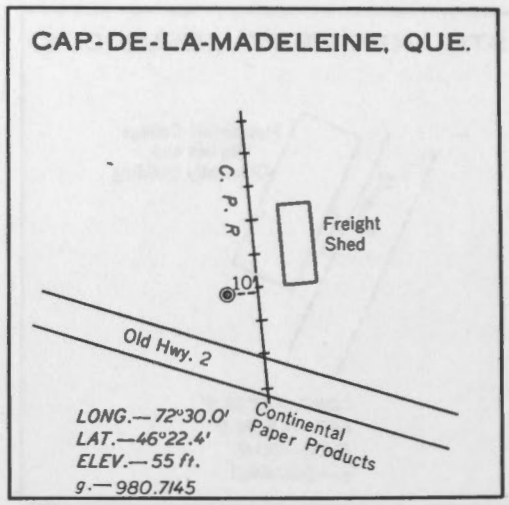
BERTHIERVILLE, QUE.

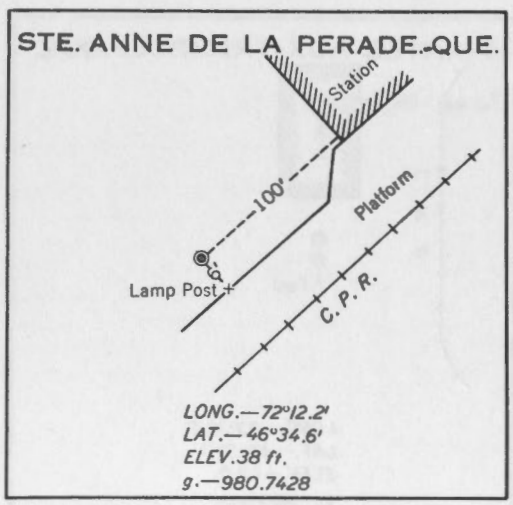


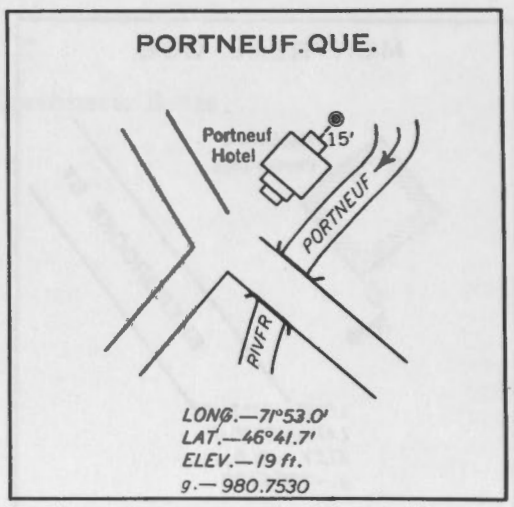
LONG.—73°10.7'
LAT.—46°05.0'
ELEV.—29 ft.
g.—980.6880

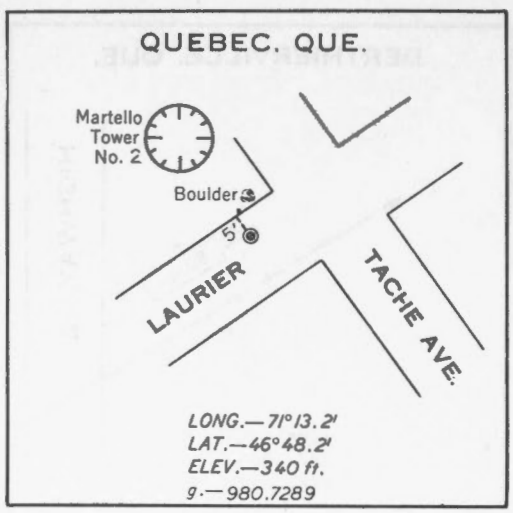
HIGHWAY No. 2 (CONT'D)

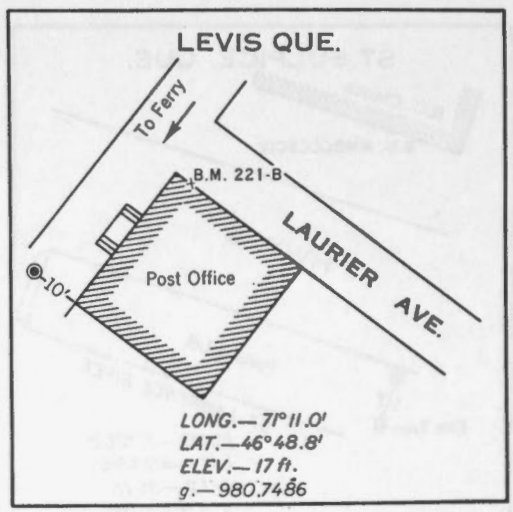




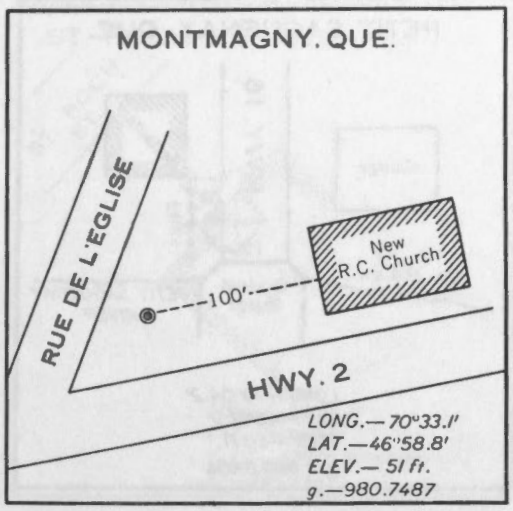


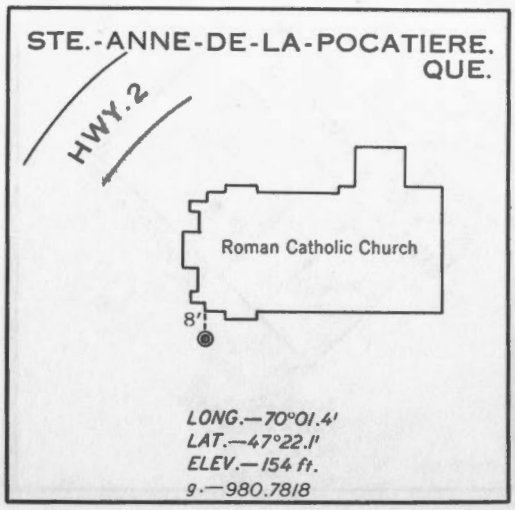


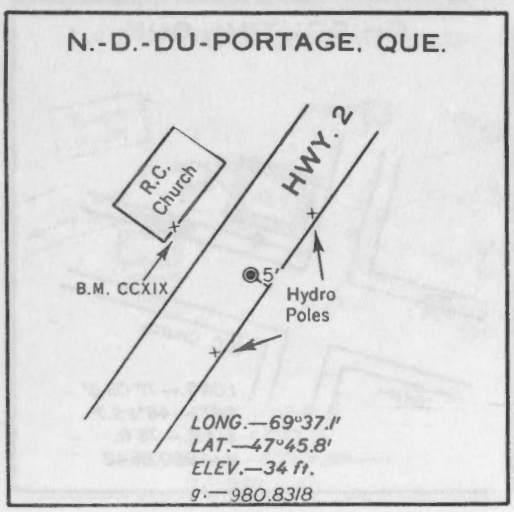


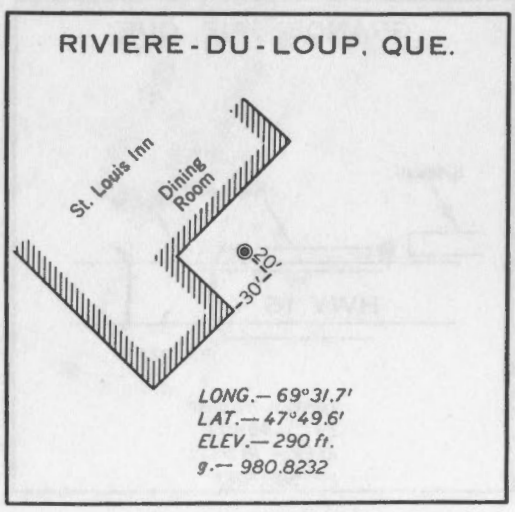


HIGHWAY No. 2 (CONT'D)

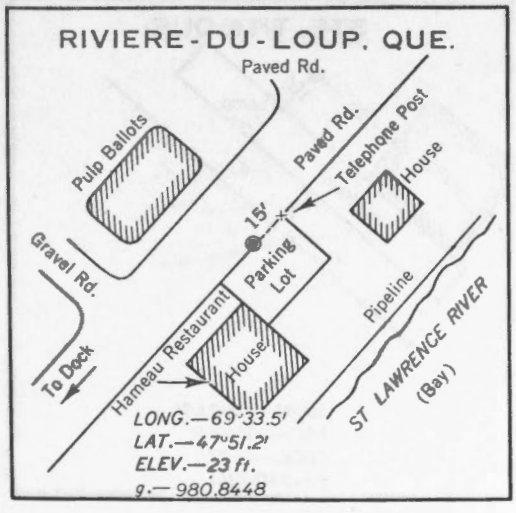


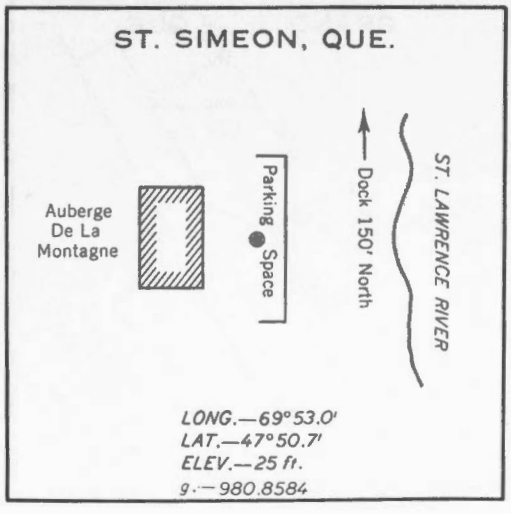






HIGHWAY No.15

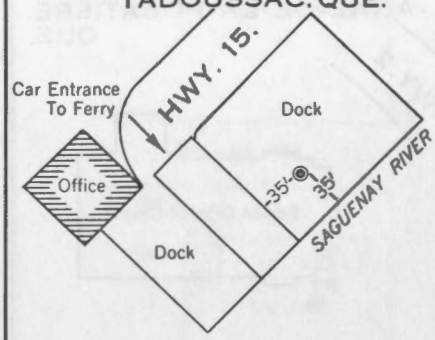




HIGHWAY No.15 (CONT'D)

HIGHWAY No. 15

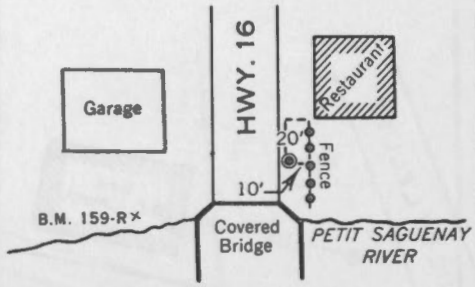
TADOUSSAC, QUE.



LONG.—69° 42.7'
LAT.—48° 08.2'
ELEV.—10 ft.
g.—980.8816

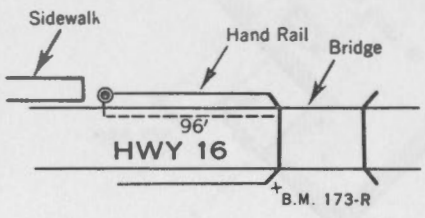
HIGHWAY No. 16

PETIT SAGUENAY, QUE.



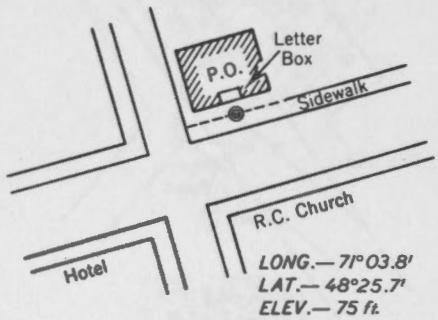
LONG.—70° 04.2'
LAT.—48° 12.9'
ELEV.—58 ft.
g.—980.8804

GRANDE BAIE, QUE.



LONG.—70° 51.0'
LAT.—48° 19.1'
ELEV.—18 ft.
g.—980.8713

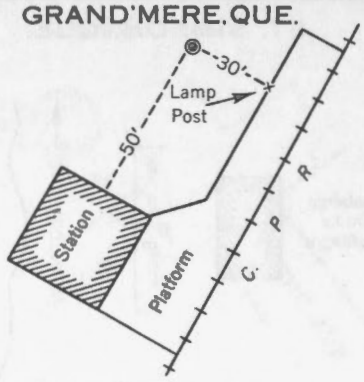
CHICOUTIMI, QUE.



LONG.—71° 03.8'
LAT.—48° 25.7'
ELEV.—75 ft.
g.—980.8648

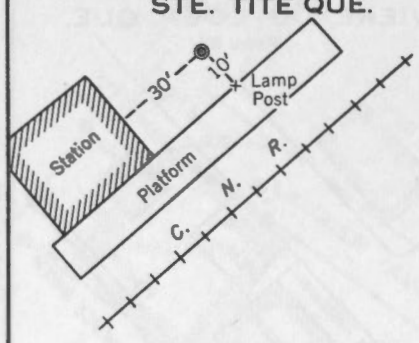
HIGHWAY No. 19

GRAND'MERE, QUE.



LONG.—72° 41.2'
LAT.—46° 36.9'
ELEV.—426 ft
g.—980.7191

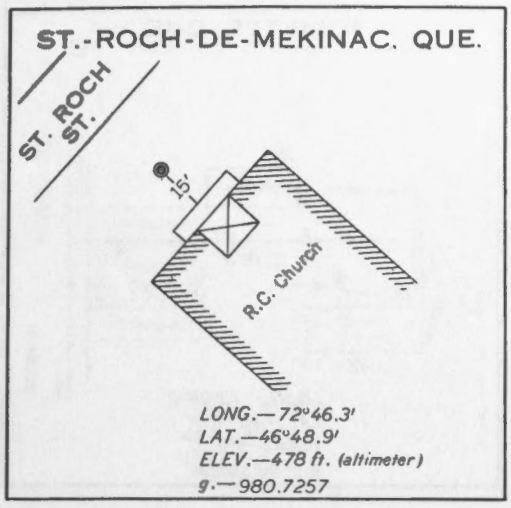
STE. TITE QUE.



LONG.—72° 33.9'
LAT.—46° 43.4'
ELEV.—457 ft.
g.—980.7316

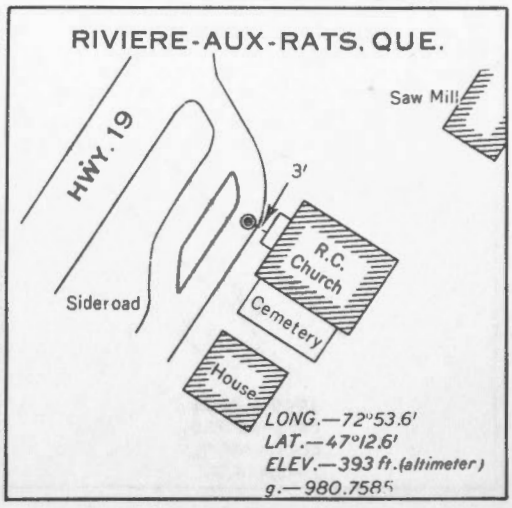
HIGHWAY No.19 (CONT'D)

ST.-ROCH-DE-MEKINAC. QUE.



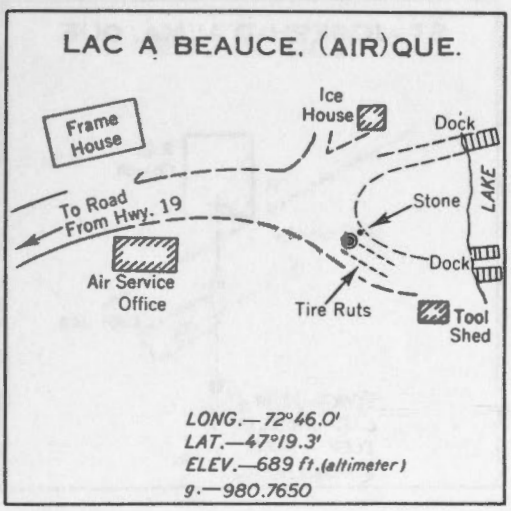
LONG.—72°46.3'
LAT.—46°48.9'
ELEV.—478 ft. (altimeter)
g.—980.7257

RIVIERE-AUX-RATS, QUE.



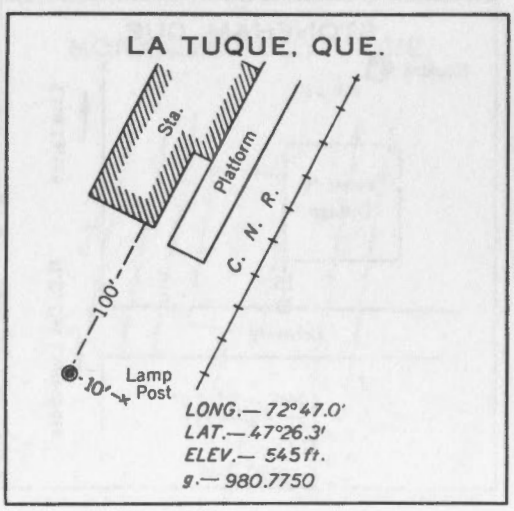
LONG.—72°53.6'
LAT.—47°12.6'
ELEV.—393 ft. (altimeter)
g.—980.7585

LAC A BEAUCE, (AIR) QUE.



LONG.—72°46.0'
LAT.—47°19.3'
ELEV.—689 ft. (altimeter)
g.—980.7650

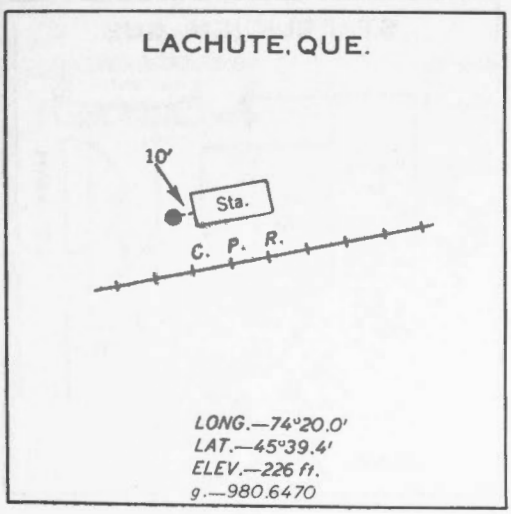
LA TUQUE, QUE.



LONG.—72°47.0'
LAT.—47°26.3'
ELEV.—545 ft.
g.—980.7750

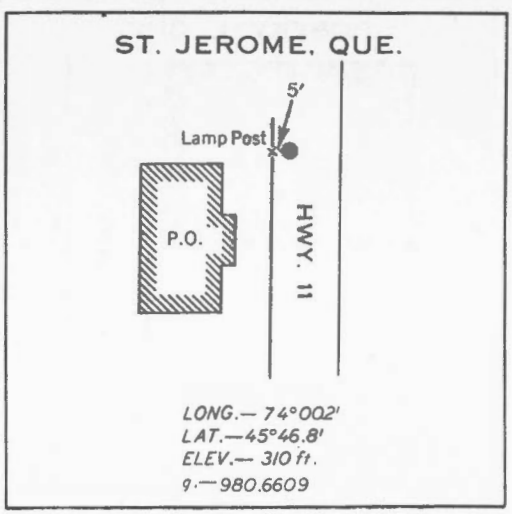
HIGHWAY 41

LACHUTE, QUE.



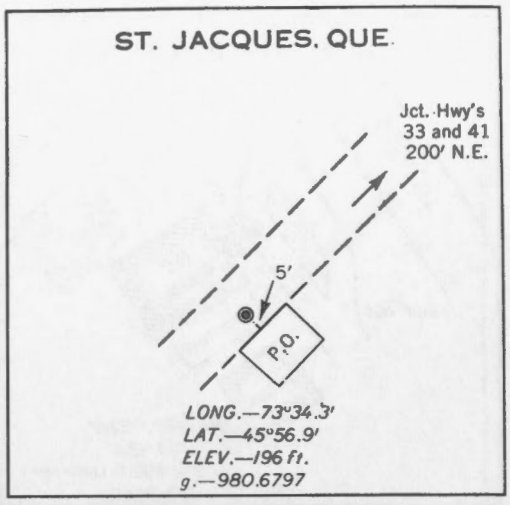
LONG.—74°20.0'
LAT.—45°39.4'
ELEV.—226 ft.
g.—980.6470

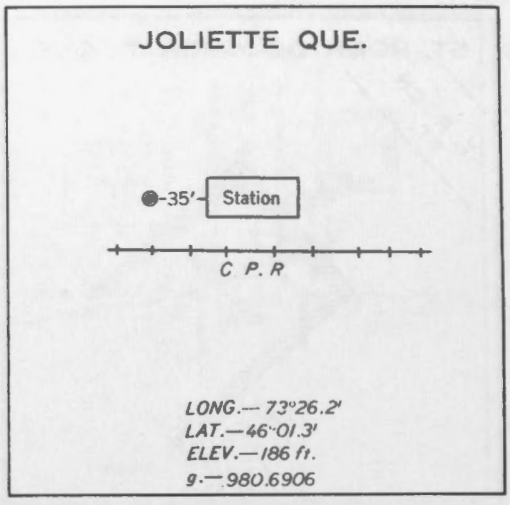
ST. JEROME, QUE.



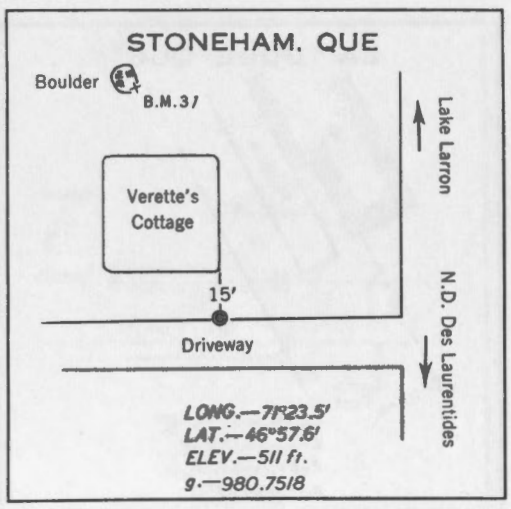
LONG.—74°00.2'
LAT.—45°46.8'
ELEV.—310 ft.
g.—980.6609

HIGHWAY No. 41 (CONT'D)

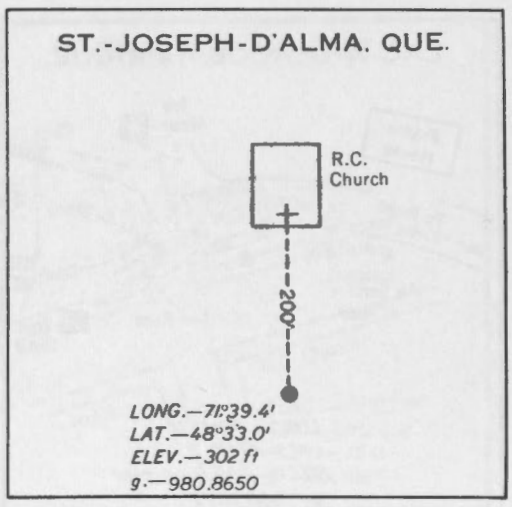


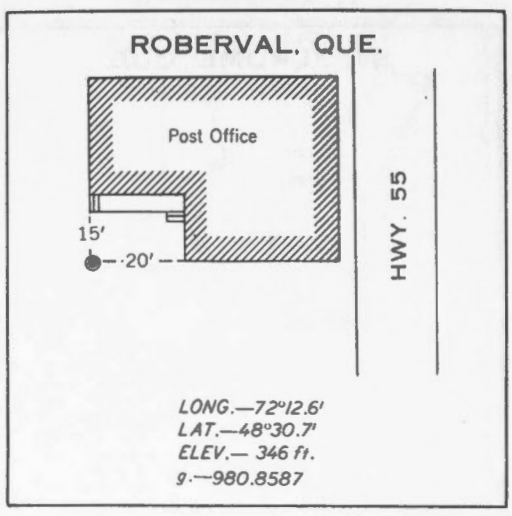


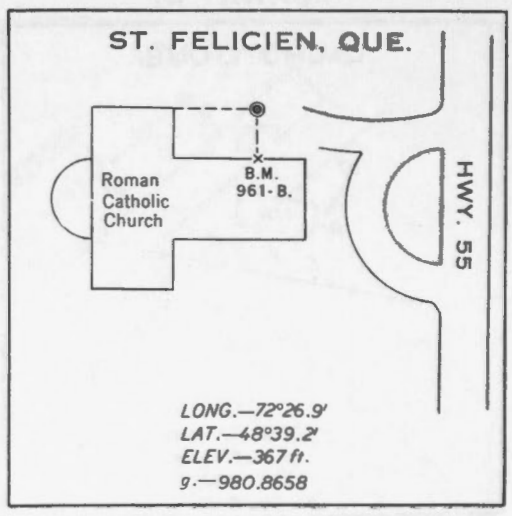
HIGHWAY No. 54



HIGHWAY No. 55

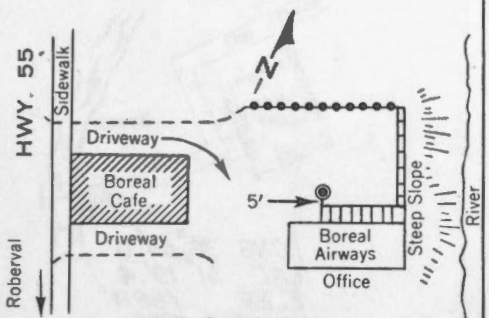






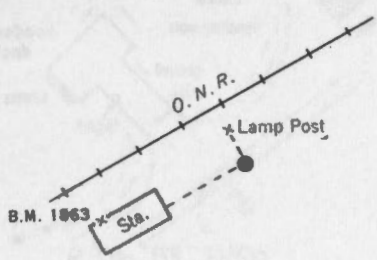
HIGHWAY No.55(CONT'D)

ST. FELICIEN (AIR), QUE.



LONG.—72°26.5'
LAT.—48°39.0'
ELEV.—350 ft.
g.—980.8673

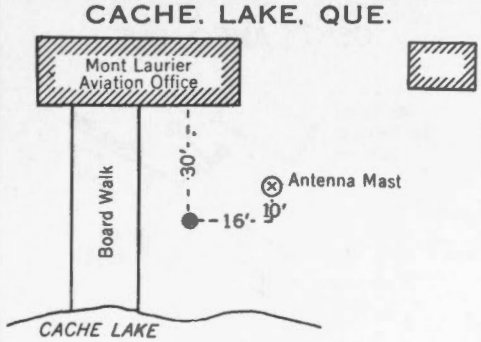
ROUYN, QUE.



LONG.—79°01.9'
LAT.—48°14.3'
ELEV.—961 ft.
g.—980.8275

CHIBOUGAMAU ROAD

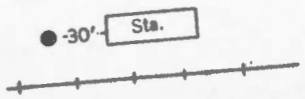
CACHE, LAKE, QUE.



LONG.—74°25.6'
LAT.—49°49.6'
ELEV.—1245 ft. (altimeter)
g.—980.9440

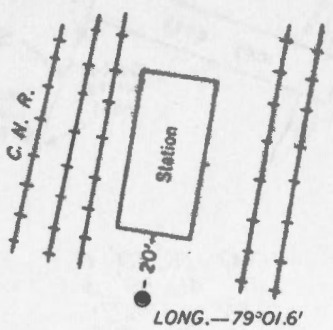
HIGHWAY No.59

ARNTFIELD, QUE.



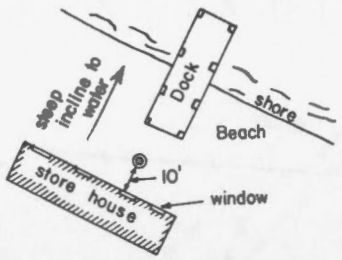
LONG.—79°15.3'
LAT.—48°11.9'
ELEV.—935 ft.
g.—980.8166

NORANDA-ROUYN, QUE.



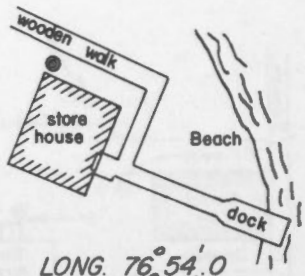
LONG.—79°01.6'
LAT.—48°14.8'
ELEV.—978 ft.
g.—980.8267

RUPERT HOUSE, QUE.



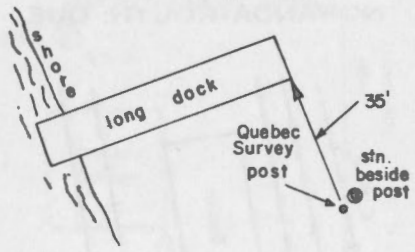
LONG. 78° 45'.1
LAT. 51° 29'.2
ELEV. 18 ft.
g = 981·1763

NEMISCAU, QUE.



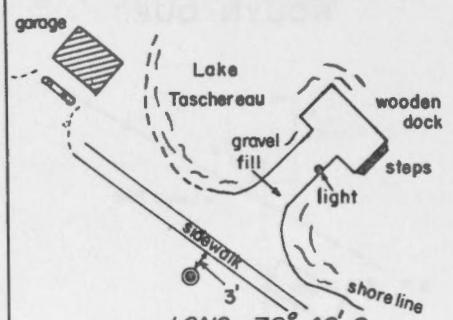
LONG. 76° 54'.0
LAT. 51° 19'.4
ELEV. 766 ft
g = 981·1026

WASWANIPI, QUE.



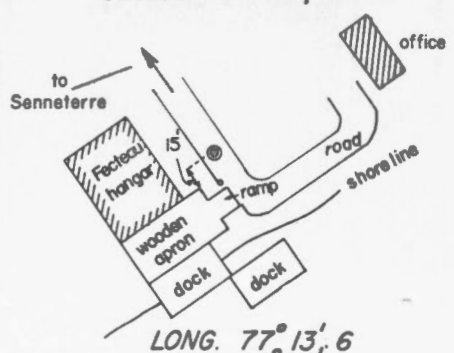
LONG. 76° 30' 0
LAT. 49° 39'.3
ELEV. 882 ft.
g = 980·9095

TASCHEREAU, QUE.



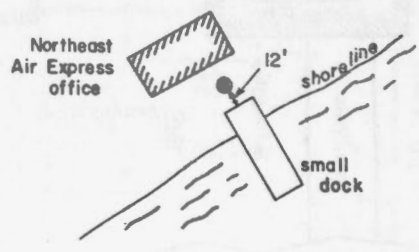
LONG. 78° 40'.9
LAT. 48° 40'.0
ELEV. 1005 ft.
g = 980·8338

SENNETERRE, QUE.

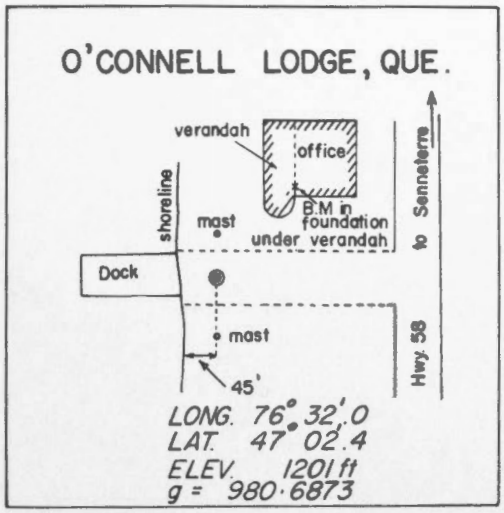


LONG. 77° 13'.6
LAT. 48° 23'.4
ELEV. 1008 ft.
g = 980·8222

OSKELANEO, QUE.



LONG. 75° 12'.0
LAT. 48° 06'.5
ELEV. 1336 ft.
g = 980·7948


O'CONNELL LODGE, QUE.
verandah
office
B.M in foundation under verandah
shoreline
mast
Dock
mast
45'
to Senneterre
Hwy 58
LONG. 76° 32'.0
LAT. 47° 02.4
ELEV. 1201 ft
g = 980·6873

GRAVITY ANOMALY MAP
OF QUEBEC (SOUTH OF 52°)

JAMES BAY
LAKE EVANS
LAKE MISTASSINI
PLETIPI LAKE
MANICOUAGAN LAKE
MANOUANE LAKE
PIPMUACAN LAKE
BAIE COMEAU
ST. FELICIEN
LAKE ST JOHN
GOUIN RESERVOIR
CABONGA RESERVOIR
KEMPT LAKE
LAKE ABITIBI
LAKE NIPISSING
NORTH BAY
OTTAWA
MONTREAL
QUEBEC
LAKE ST PETER
ST LAWRENCE RIVER

LEGEND

- PALAEOZOIC SEDIMENTS
- PROTEROZOIC SEDIMENTS AND VOLCANICS
- ARCHAEAN TYPE VOLCANIC AND SEDIMENTARY ROCKS
- ARCHAEAN GRANITIC ROCKS AND GRANITIZED SEDIMENTS INCLUDING GRENVILLE TYPE SEDIMENTS AND MINOR VOLCANICS
- PRECAMBRIAN BASIC INTRUSIVES INCLUDING ANORTHOSITE INTRUDING GRENVILLE ROCKS
- -200 CONTOUR OF EQUAL BOUGUER ANOMALY CONTOUR INTERVAL 10 MILLIGALS
- FAULT

SCALE

MILES 16 8 0 16 32 48 64 MILES