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GRAVITY IN THE SUDBURY BASIN
AND VICINITY

BY

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Gravity in the Sudbury Basin and Vicinity

A. H. MILLER AND M. J. S. INNES

ABSTRACT

The results of some 500 measurements of gravity over an area of about 2,000 square miles in the Sudbury district are presented. Although a more complete network of stations is desirable, the principal trends and major features of the gravity field are believed to have been established.

It has been shown that most of these features are largely controlled by surface densities of the rock formations. The anomalies, for instance, are quite variable over the Killarney granites and gneisses and were found to be directly related to density changes within these masses.

A gravity high that persists along the southern boundary of the basin is the most prominent feature of the anomaly pattern and is largely due to the noritic phase of the irruptive and to the Stobie formation. The steep gradient over the Mississagi quartzites is interpreted as reflecting a thinning of this formation to the north.

Evaluation of the gravity data over the basin suggests that the structure of the Sudbury irruptive and overlying Whitewater sediments is similar to one deduced by Collins and Kindle from geological considerations. The measurements deny the existence of large underground channels near the centre of the basin, but provide some support to the theory that the rise of the magma was controlled by faulting along the south side of the basin.

INTRODUCTION

The shape of the Sudbury Nickel irruptive has long been the subject of considerable debate and enquiry, because some of the world's richest nickel-copper ore deposits are located near its margins and are believed to be genetically related to it. The irruptive outcrops as an oval ring (see Figure 1) approximately 37 miles long and 17 miles across. Norite, the basic phase of the irruptive, forms the outer part of the ring while micropegmatite, the granitic phase, forms the inner portion; a comparatively narrow transition zone lies between the two. The outcrop of the intrusive varies in width from about 1 mile on the north to a maximum of 3.6 miles to the south. Diamond drilling and mining operations¹ have shown that the lower contact of the norite dips toward the centre of the structure at angles* varying from 30 to 50 degrees.

Overlying the irruptive and wholly within its ring is a conformable series of sedimentary rocks and volcanic tuffs known as the Whitewater series. Its formations outcrop concentrically with the irruptive and are disposed in a broad synclinal structure with gentle dips prevailing throughout the central parts. In a general way the series is considered to be conformable with the underlying irruptive.

From these facts it has been inferred, and accepted by most geologists, that the nickel irruptive is a thick basin-shaped sheet or sill† that lies between the contact of the Whitewater series and the older rocks below. Not so certain, however, is the configuration of the intrusive at depth, and in 1947 Dr. H. J. Fraser of Falconbridge Mines, Limited,

¹ Knight, C. W., Report of Royal Ontario Nickel Commission, Ontario Dept. Mines, 1917.

* In some places the norite contact with the underlying formations is nearly vertical or dips outward, but such instances are believed due to faulting. See: Cooke H.C., "Structural Geology of Canadian Ore Deposits", *Bull. Can. Inst. Min. Met.*, 1948.

† It is still open to question whether the irruptive was folded into a syncline, along with the Whitewater series, or was intruded after the syncline had formed.

See: Cooke, H. C., "Structural Geology of Canadian Ore Deposits", *Bull. Can. Inst. Min. Met.*, p. 588, 1948.

Yates, A. B., "Structural Geology of Canadian Ore Deposits", *Bull. Can. Inst. Min. Met.*, p. 601, 1948.

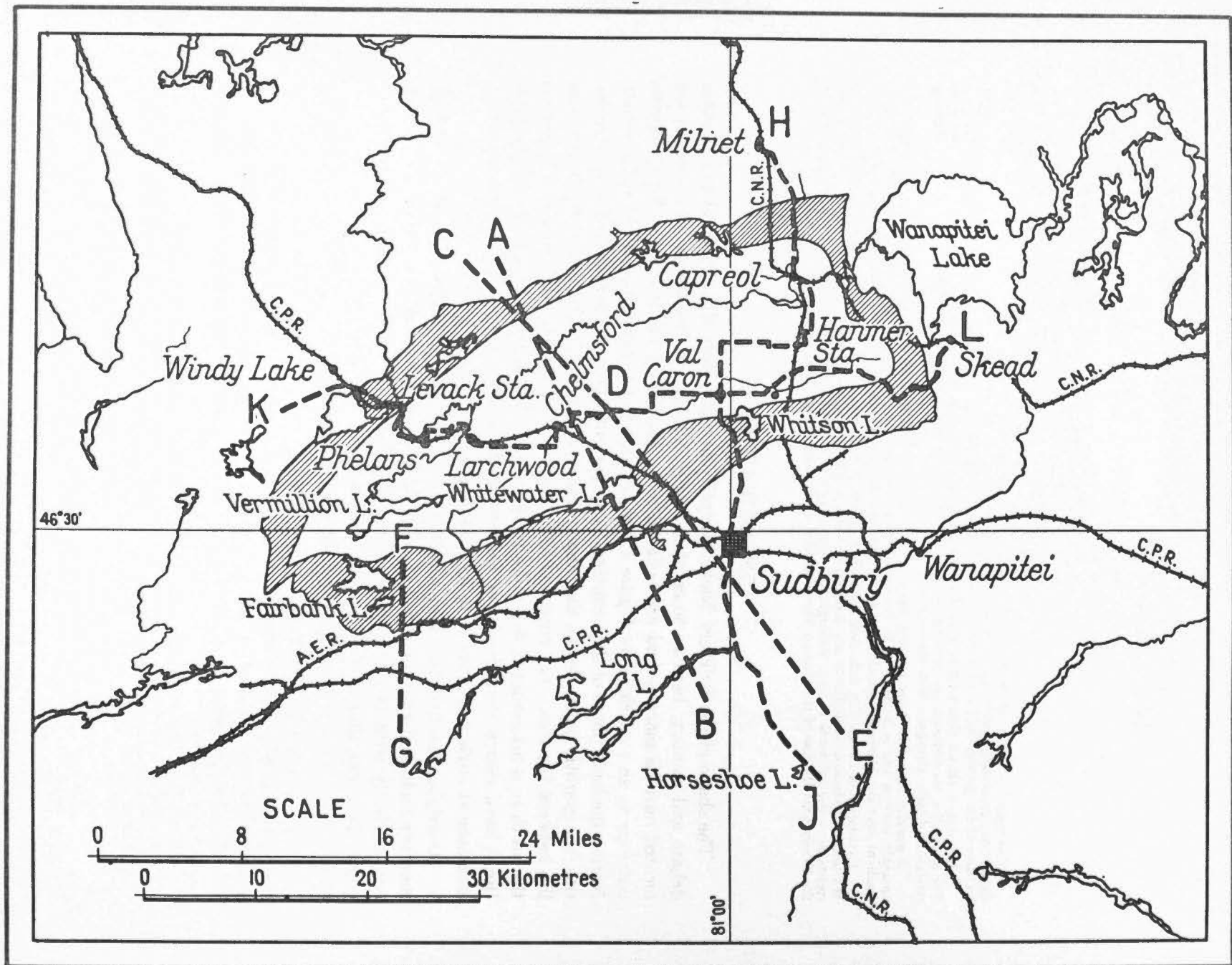


FIGURE 1. Location Map.

suggested to the newly established committee on Research in the Geological Sciences† that geophysical surveys, gravimetric and seismic, might profitably be employed to throw some light on the problem.

In agreement with this proposal the Dominion Observatory made some 340 gravity measurements in the area during the summer of 1948. Since then, in connection with other gravimeter programs, other observations were taken to increase the total number of stations to about 500. The stations are distributed over an area of about 2,000 square miles. The greatest density of stations is in the vicinity of the basin; here automobile transport was used and measurements were taken at $\frac{1}{2}$ -mile intervals along most of the passable roads. About 20 gravimeter stations were established in the outlying regions using aircraft transportation. Through the courtesy of the superintendents of the Canadian Pacific and Canadian National railways, measurements were taken at sites along all railway lines radiating from Sudbury. Transportation was by train and "way" freights which stopped for three to five minutes at various railway stations along the way. Complete coverage of the area so far has not been possible and a much denser network is required to outline with certainty the smaller features of the gravitational field. Nevertheless, the existing distribution provides a general knowledge of the major trends and will serve as a basis for more detailed study in the future.

In the following section the results of the gravity measurements are presented and the more pronounced anomalies examined in relation to the larger geological formations. The gravity anomalies for certain hypothetical geological sections of the basin are given and compared with the observed anomalies.

COMPUTATION OF THE GRAVITY ANOMALIES

The principal facts for the gravity stations are tabulated in the Appendix. Although both Bouguer and Free Air anomalies are listed, only the former have been used in the geological interpretation which follows. The Free Air anomalies have been included for their use in geoidal and isostatic investigations. The Bouguer anomalies shown on the accompanying maps and profiles are based upon an adopted value* of $980.684 \text{ cm. per sec}^2$ for gravity at the Sudbury pendulum station and for the gravimeter station just outside the building (the Technical High School). In the Table of Principal Facts, however, the observed values of gravity and the anomalies have been adjusted to agree with recent gravimeter comparisons‡ which give $980.6860 \text{ cm. per sec}^2$ for Sudbury. Accordingly the anomalies in the Table are all 2 milligals greater than those shown on the gravity maps, but such systematic differences will have no bearing on the geological interpretation of the results.

The anomalies are based upon the International Formula of 1930 for normal gravity, γ_0 , at sea level.

$$\gamma_0 = 978.049 (1 + 0.0052884 \sin^2 \phi - 0.0000059 \sin^2 2\phi)$$

where ϕ is the latitude. The Bouguer correction for the height of the station is given by $(0.09406 - 0.0128 \sigma) \text{ H.mgls.}$,

† *Bull. Can. Inst. Min. Met.*, 1946.

* Miller, A. H., *Publications of the Dominion Observatory*, Vol. XI, No. 4, p. 96. 1936.

‡ Innes, M. J. S., and Thompson, L. G. D., *Publications of the Dominion Observatory*, Vol. XVI, No. 8, 1953.

where σ is the mean density of the rock in gms per cm^3 and H is the height of the station in feet above mean sea level. Consistent with other regional investigations a constant average value of 2.67 gms per c.c. has been assumed for the rock density for the entire area. It is shown in the next section that there is considerable variation in density among the rock types present and that the mean density may be closer to 2.74 gms per c.c. If so, the resulting error in the Bouguer anomalies would be about 0.8 milligals. The greater part of such an error, however, is systematic, as the heights of stations vary from about 600 to 1,300 feet with a mean height of 850 feet.

The accuracy of the anomalies also depends upon the accuracy of the gravity measurements and how well the position and heights of stations have been determined. Repeated measurements have shown that the observed gravity values are reliable to one-tenth of a milligal. The elevations were obtained whenever possible from bench marks and railway elevations. For most of the stations, however, aneroid altimeters were employed. Repeated observations have indicated that errors in elevation are not likely to exceed 8 feet, which is equivalent to an error of about 0.5 milligals. The position of the gravity stations were, for the most part, scaled from maps with scales of one mile and two miles to an inch, and errors from this source are estimated to be less than 0.1 milligal. Apart from possible systematic errors mentioned above it is believed that the maximum error from all sources does not exceed 0.7 milligals.

The map enclosed at end of paper shows the gravity stations and Bouguer anomalies in units of 1×10^{-4} C.G.S., or tenths of milligals. Contours are drawn at intervals of 25 of these units, or 2.5 milligals, where the gravity stations are more dense, otherwise a contour interval of 10 milligals has been chosen.

DENSITY OF ROCK FORMATIONS

To interpret the variations of the Bouguer anomaly the densities of the underlying rock formations must be known with fair accuracy. During the course of the gravity measurements 160 rock samples were gathered from outcrops near the sites of the gravity stations. Their densities, which were later measured in the laboratory, are summarized in Table 1.

Although much care was taken to obtain a representative selection of unweathered samples from each formation, there is considerable variation among the densities within each group. The standard deviation of the mean value for each formation is included in the table and provides a measure of the uncertainty in applying these measurements of density. The sedimentary formations provide the most consistent sets with deviations ranging from 0.03 to 0.06 gms/ cm^3 . Although not altogether unexpected, the volcanic rocks, basic intrusives and the Killarney granites and gneisses show quite large variations in density, with deviations ranging from 0.07 to 0.12 gms/ cm^3 . The large variations in the density of the granites (from 2.54 to 3.15 gms per c.c.) from this district have previously been reported by Garland*.

Examination of the table shows that the mean densities of the formations fall roughly into three density ranges. The lowest density group, 2.60 to 2.70 gms per c.c., consists of the Chelmsford and Onwatin formations of the Whitewater series, the Cobalt and

* Garland, G. D., *Publications of the Dominion Observatory*, Vol. XVI, No. 1, p. 48.

Bruce sediments with the exception of the McKim formation and some of the sediments of the Stobie group. Included also in this group of low density rocks are specimens of the early Precambrian granites (Birch Lake and Levack granite) which lie to the north and northwest of the basin.

TABLE 1
SUMMARY OF DENSITY MEASUREMENTS

Formation	Mean Density	Standard Deviation of Mean	Number of Determinations
	gm/cm ³	gm/cm ³	
Quartz Diorite.....	2.83	—	1
Granite and Granite Gneiss (Killarney, Creighton).....	2.74	0.12	42
Norite Irruptive (a) Micropegmatite.....	2.72	0.04	7
(b) Transition zone.....	2.92	0.03	3
(c) Norite.....	2.87	0.09	10
Whitewater Series (a) Chelmsford formation.....	2.65	0.05	5
(b) Onwatin formation.....	2.61	0.03	5
(c) Onaping formation.....	2.74	0.08	11
Nipissing Diabase.....	2.84	0.09	9
Cobalt Series (a) Lorraine Quartzite.....	2.83	—	1
(b) Gowganda formation.....	2.68	0.06	5
Bruce Series (a) Serpent Quartzite.....	2.62	—	1
(b) Espanola formation.....	2.65	—	1
(c) Mississagi Quartzite.....	2.62	0.04	17
(d) McKim formation.....	2.74	0.03	6
(e) Copper Cliff Rhyolite.....	2.61	0.07	4
Granite and Granite Gneiss (Levack, Birch Lake).....	2.66	0.04	10
Stobie Group (a) Greywacke and Quartzite.....	2.68	0.06	3
(b) Basic lavas.....	2.90	0.11	17

The next density range, 2.70 to 2.80 gms. per c.c. includes the Onaping and McKim formations, the micropegmatite member of the Sudbury irruptive and the granitic rocks (Creighton granite, Killarney granite and gneisses) found to the southeast of the basin. The highest density range, 2.8 gms. per c.c. and greater, includes the norite and transition zone rocks of the Nickel irruptive, the Nipissing diabase and the basic lavas of the Stobie group lying along the south side of the basin.

A graphical representation of the data in Table 1 is given in Figure 2. The mean density of each formation is plotted along with the corresponding mean Bouguer anomaly, and clearly shows that the anomalies are largely due to the rocks which outcrop.

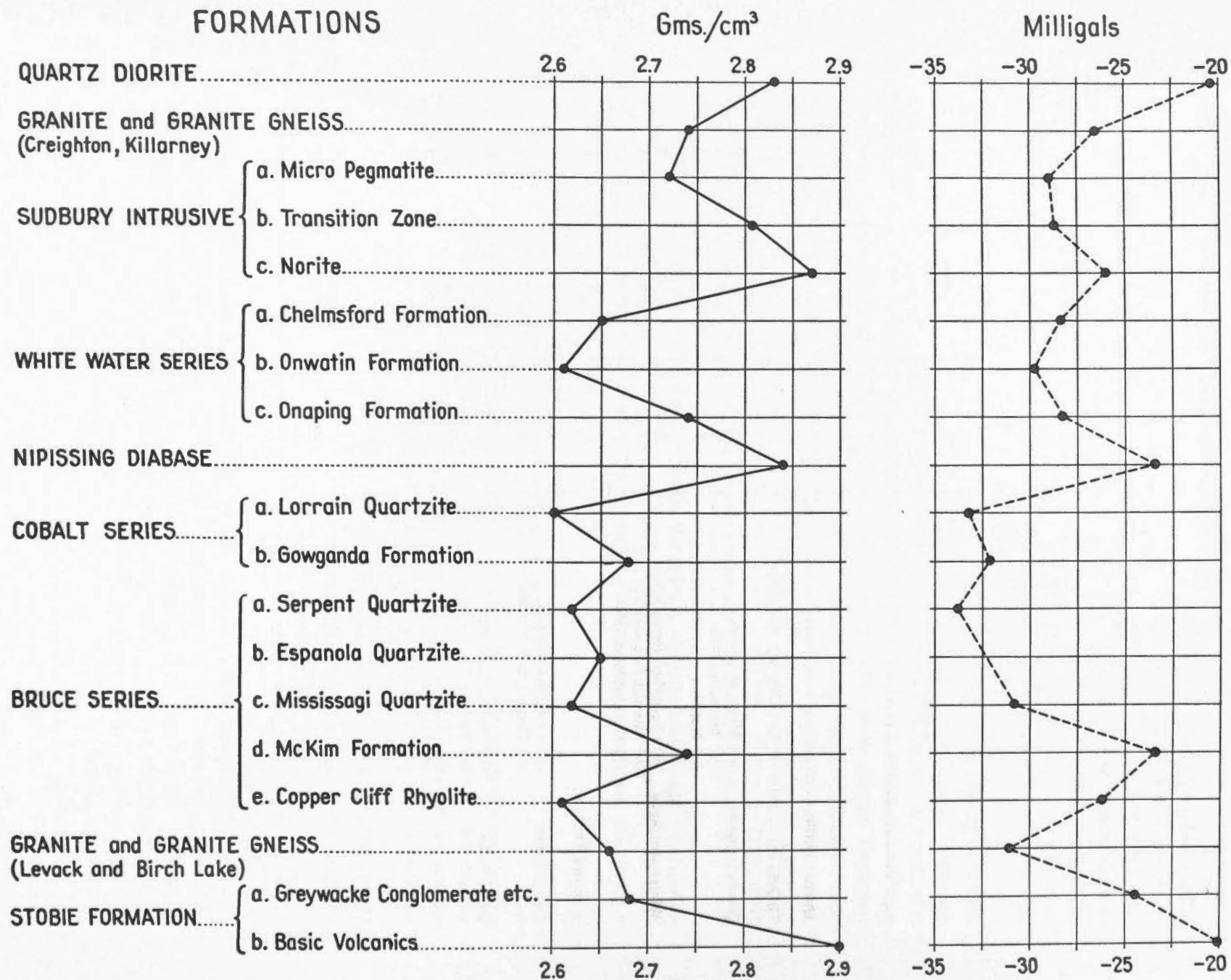
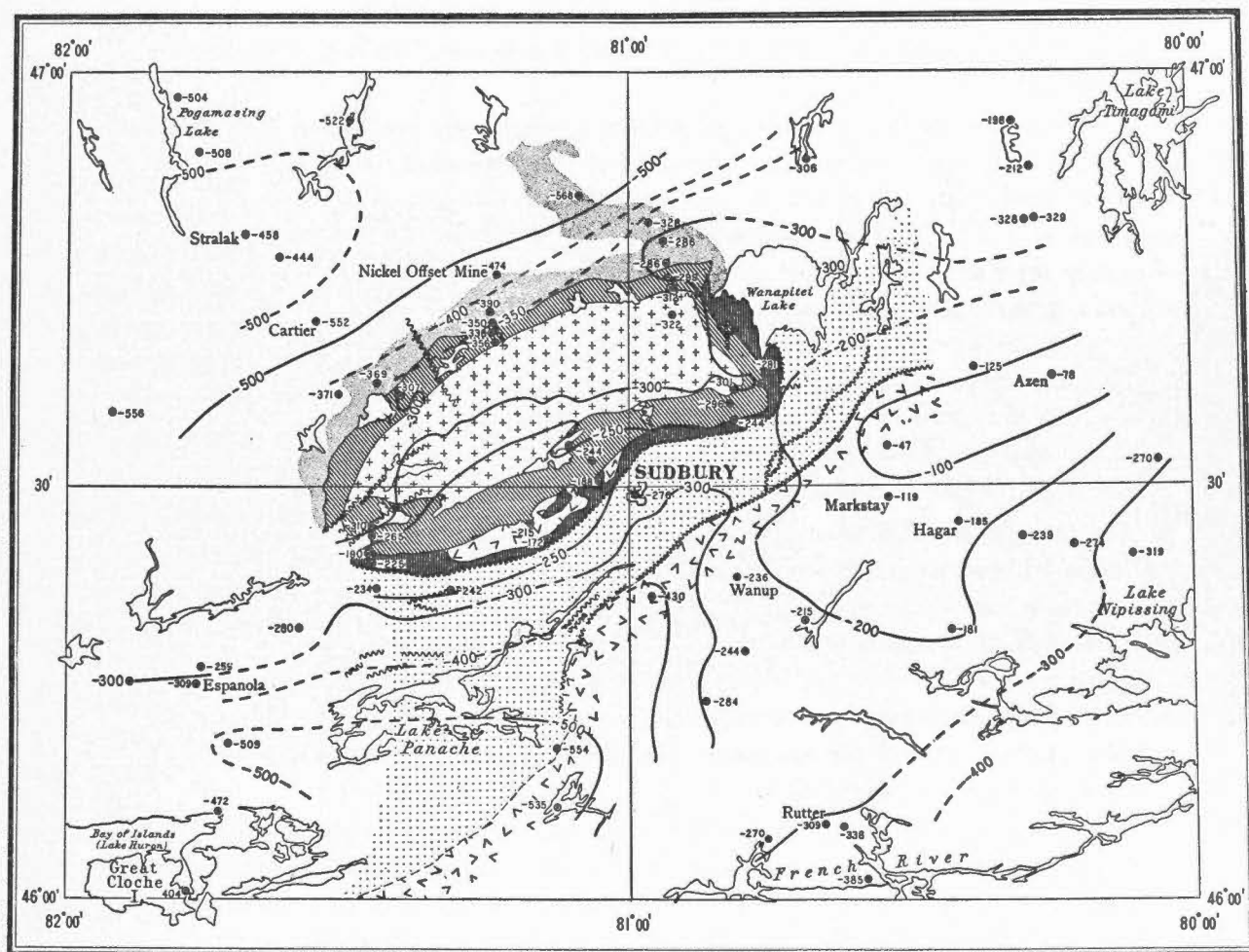


FIGURE 2. Graphical representation of mean gravity anomalies and mean formation densities at 160 stations in the vicinity of Sudbury.

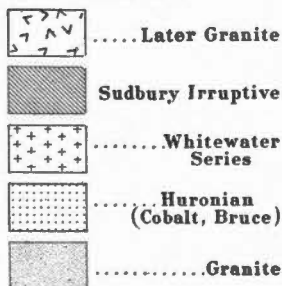
GENERAL FEATURES OF THE GRAVITY FIELD

Figure 3 is a geological sketch map of the surveyed area, and on it contours of the Bouguer anomalies are drawn at 10 mg. intervals (100 gravity units of 1×10^{-4} C.G.S.). The anomalies have a range of about 53 mg. over the area and if the variable density distribution of stations is considered the mean anomaly is not very different from -32 mg.

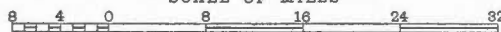


GRAVITY ANOMALIES and GENERAL GEOLOGY
in the
VICINITY OF SUDBURY
ONTARIO

LEGEND



SCALE OF MILES



LEGEND

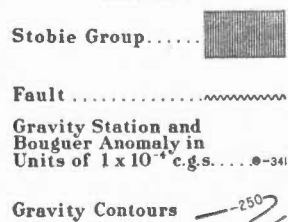


FIGURE 3. Sketch map of Sudbury area showing general geology and gravity anomalies.

The whole area can be roughly divided into four sections corresponding to different anomaly ranges that for the most part are directly related to the surface densities. The largest variations in the anomalies from their general average are for stations outside of the basin. To the northwest the anomalies are all generally low ranging from -40 near the northern side of the basin to -57 mgls. farther north. The prevailing rocks are the Birch Lake and Levack granites and gneisses† which are found to have densities lower than the average for the whole district (see Table 1). The slightly greater anomalies for two stations in the area near Stralak are believed due to a narrow belt of underlying basic volcanic rocks.

Killarney granite and granite gneiss form a large body south and southeast of the fault which limits the southeastern boundary of the Huronian rocks. In this region the gravity anomalies are quite variable and range from -50 mgls. in the west to a maximum amplitude of -5 mgls. about four miles north of the village of Markstay. This high was previously reported by Garland* and, on the assumption of a uniform density for Precambrian granites and gneisses, was interpreted as the gravitational effect of a deep-seated anticline at the base of the granitic layer. However, some forty specimens of granite rocks from this area (see Table 1) showed wide variations in density ranging from 2.59 to 3.15 gms. per c.c. which can be directly correlated with the variation of the Bouguer anomaly. Analysis shows that about 70 per cent of the variance in the anomalies can be accounted for by differences in the densities within these granite masses.

The Bouguer anomalies to the southwest near Lake Panache have amplitudes of about -50 mgls. These, as can better be seen from the closely spaced contours on the gravity map, increase uniformly over a distance of about 10 miles towards the southern edge of the basin. In this region the surface exposures are chiefly Mississagi quartzite of low (2.63 gms. per c.c.) density and scattered sill-like masses of Nipissing diabase. The latter, although of comparatively high density (2.87 gms. per c.c.) appears to have little control over the general trend of the anomalies and the steep gradient of gravity persists to the north regardless of its distribution.

The mean Bouguer anomaly for the basin and proximity is about -30 mgls., not much different from the mean anomaly for the whole survey. Probably the most significant feature of the anomaly pattern is that the contours tend to parallel the general strike of the geological formations with higher values of gravity to the south due to the greater thickness of the norite and to the basic volcanics of the Stobie group which form a band about 2 miles wide along the south side of the basin. These and other relationships are discussed in more detail in the following sections.

CALCULATED ANOMALIES ACROSS THE BASIN

To help in the analysis of the observed anomalies, the attraction was calculated for a hypothetical northwest-southeast section of the basin, corresponding to its minor axis. The structure assumed was according to Collins*** conception, which is the one generally

† *Geol. Surv., Canada*, Map Sheet 871A.

* Garland, G. D., *Publications of the Dominion Observatory*, Vol. XVI, No. 1, pp. 1-58, 1950.

*** Collins, W. H., and Kindle, E. D., "The Life History of the Sudbury Nickel Irruptive II", *Trans. Roy. Soc. Can.*, pp. 27-38, 1935.

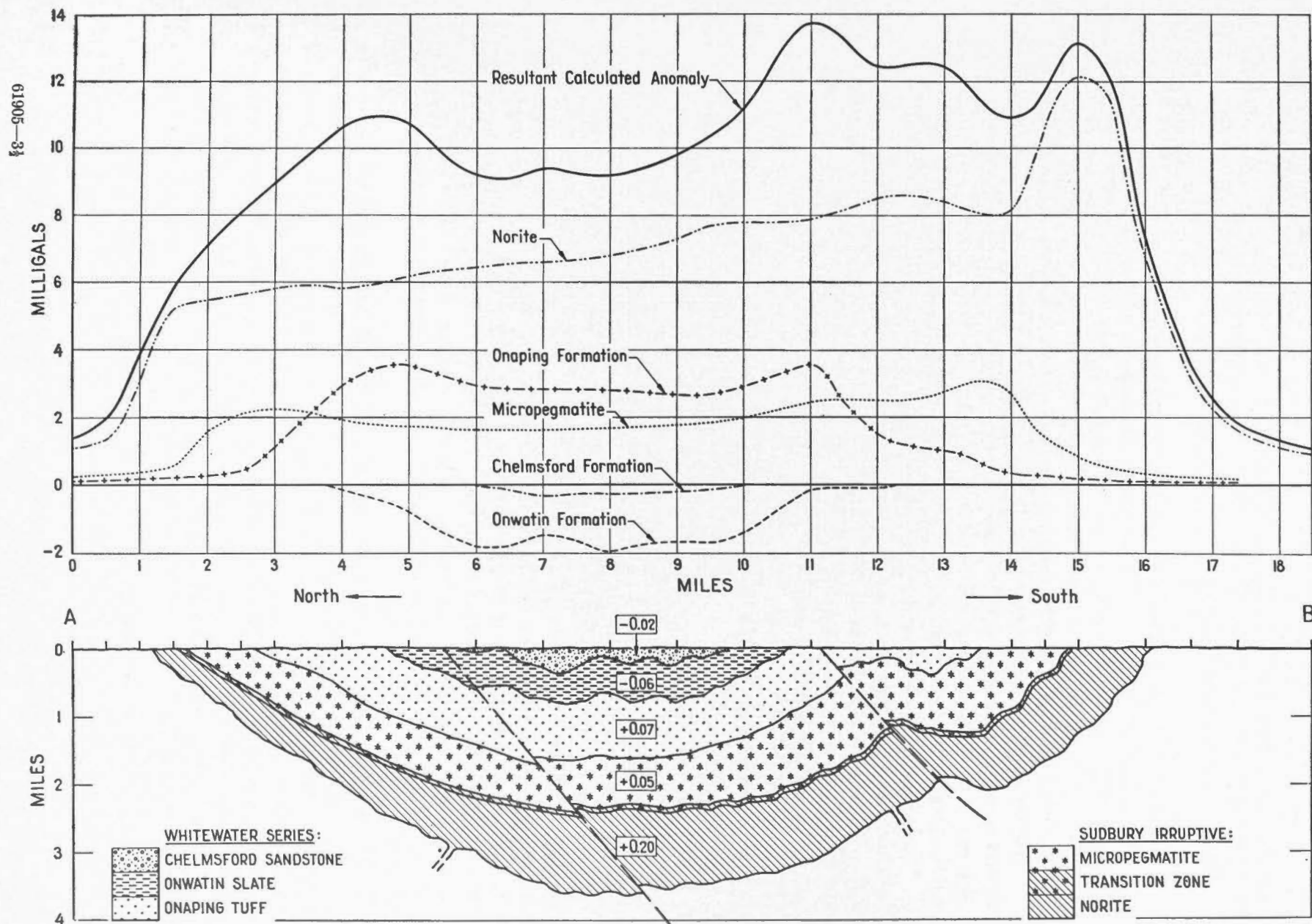


FIGURE 4. Vertical cross-section of Sudbury Nickel irruptive and overlying Whitewater series (after Collins and Kindle) along section line (A-B) shown in Figure 1. The gravitational attraction of each formation and the resultant attraction of the whole section is illustrated.

accepted by most geologists*. Along with his section (line A-B, location map Figure 1) which is reproduced in Figure 4, the calculated values of gravity are given for each phase of the irruptive, for each formation of the Whitewater series, and for the structure as a whole.

The densities employed in the calculations are indicated for each formation and are relative to an assumed value of 2.67 gms. per c.c. for the rocks underlying and surrounding the basin. This value was estimated from the densities in Table 1 and corresponds to the mean density found for the Huronian rocks (the Cobalt and Bruce series) and the Levack and Birch Lake granites, roughly weighted according to their distribution.

Inspection of the curves shows that the norite largely controls the amplitude and general trend of the resultant calculated anomalies. The highs due to its emergence at each end of the section are apparent, as well as the gradual increase in amplitude due to a thickening of the norite from north to south.

The Onaping volcanics produce nearly twice the gravitational effect that the micropegmatite does, not only because of its slightly greater density, but chiefly because the formation as a whole is not as deep. The near surface effects of the Onaping formation are conspicuous in the resultant curve between Miles 4 and 5 and at Mile 11; here the gravity anomalies reach peak values, while the general decrease in gravity over the central portion of the basin is due to the near surface Chelmsford and Onwatin formations, both having densities lower than the other formations.

DISCUSSION OF RESULTS

(a) *Comparison of Observed and Calculated Anomalies*

The observed and calculated gravity anomalies, and geological section† for the profile C-D-E are shown in Figure 5. This profile lies about 2 miles to the east and is nearly parallel to Collins' section shown in Figure 4. The zero or normal value of the computed anomaly curve has been assumed equivalent to a normal value of -40 mgls. on the observed anomaly curve, since the latter reaches this value for stations over the granite masses at both the north and south ends of the profile. The curve I-II-III is the anomaly profile calculated for the irruptive and overlying Whitewater series while I-II-IV includes an estimate of the attraction of the series of formations lying south of the norite between Miles 19 and 23.

There is a striking similarity in the form and amplitude of the computed and observed anomaly profiles, which strongly suggests that the anomaly producing body is similar in form and dimensions to that deduced by Collins from geological considerations. To the north (Mile 3) both observed and calculated curves rise sharply to equal heights over the norite. They diverge over the next few miles and merge again at Mile 10 near the centre of the basin. This departure (a maximum of 4 mgls.) may be due partially to the displacement of the formations by the Sandcherry Creek fault that parallels the gravity profile between Miles 3 and 7 and intersects it near Mile 5. Over the central portion of the

* Cooke, H. C., "Structural Geology of Canadian Ore Deposits", *Bull. Can. Inst. Min. Met.*, p. 585, 1948.

†The geological sections shown in Figures 5, 6, 7 and 8, are somewhat generalized. Although the formations to the south of the norite may have dips somewhat different than shown, they are all steeply dipping. Contacts of the formations were taken from *Geol. Surv., Canada*, Maps 292A, 871A, 872A, and from Collins, W. H., *Bull. Geol. Soc. Am.*, Vol. 47, 1936.

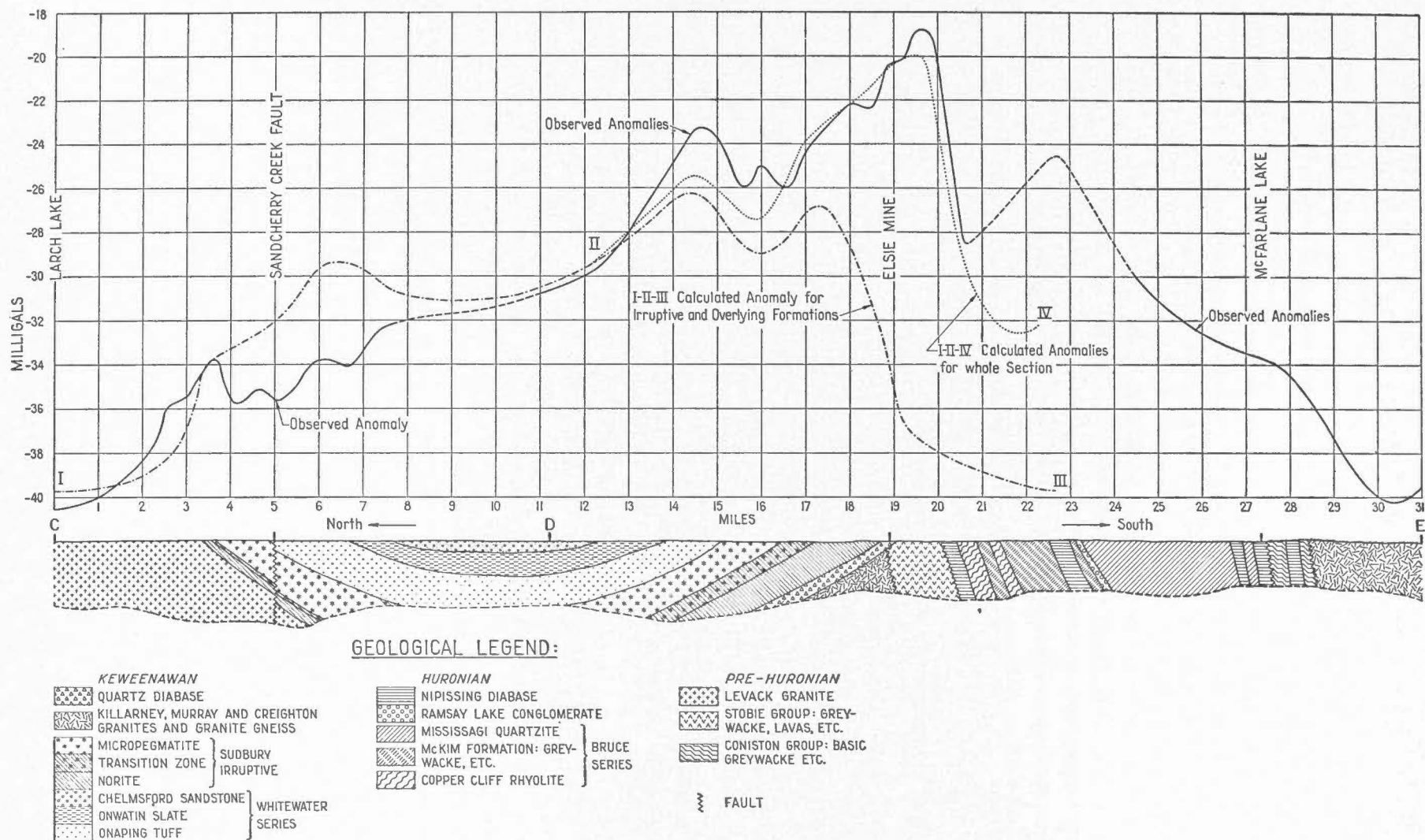


FIGURE 5. Generalized geological section and observed and computed anomalies along section line C-D-E shown in Figure 1.

basin the curves have the same general trend and amplitude and both reach peak values coincident with the Onaping formation between Miles 14 and 15. Continuing to the south the anomaly curves both decrease over the micropegmatite (Mile 16) and both rise again over the norite at Mile 17.

Here the similarity between the observed anomalies and those calculated for the irruptive and overlying formation ends. The latter decreases to zero amplitude while the former continues to rise to a maximum over the Stobie group of sediments and basic volcanics between Miles 19 and 20. The profile I, II, IV shows the anomalies calculated for the whole geological section south to Mile 23, assuming the dips as illustrated and densities from Table 1. To bring the calculated profile into near coincidence with the observed anomalies, as shown, it was necessary to assume depths of 12,000 feet for the Stobie formation and the Nipissing diabase, and 7,000 feet for the McKim and Copper Cliff formation.

(b) *The Shape of the Irruptive at Depth*

These calculations show that the peak observed anomaly over the Stobie formation can be fully accounted for by what may be reasonable assumptions for the depth of the Stobie and for other formations to the south. The calculations, however, do not deny other possible interpretations. While there is little doubt that the greater part of the peak anomaly is due to the Stobie formation, part of the effect may be due to a greater thickness of the intrusive than has been assumed, or the expression of large underground channels through which the irruptive rose.

Indeed there is much to be said for the latter possibility. Cooke* concludes that faulting along the whole southern boundary has brought the Stobie rocks from depth into their present position. Although this faulting post-dates the intrusion of the norite, it may be that an earlier break along this zone played a major role in controlling the rise of the irruptive.

There is little evidence from the gravity measurements to support Coleman's conception of the configuration of the nickel irruptive at depth. He suggested that the irruptive was intruded as a large laccolithic sheet and that its present form resulted from collapse following the intrusion. He supposed that "the source of the magma was immediately beneath the longer axis of the area . . ." and that "the fissure from which the molten rock came was probably somewhat curved, being concave to the northwest . . ." (see coloured frontispiece, Coleman†, 1905). In the frontispiece referred to, this fissure is only vaguely defined and of indefinite dimensions, but appears to be a few miles in width. Assuming that below the main norite mass as shown in Figure 4, the channel through which the irruptive rose is a wedge-shaped fissure extending along the main axis, and tapers to a width of a fraction of a mile at great depth, such a configuration for the irruptive would produce about twice the anomaly over the basin than has been observed. Alternatively a funnel-shaped body 5 miles in diameter at the base of the main norite body and tapering to a stock or neck 1 mile in diameter at a depth of 7 miles would produce an additional anomaly of about 5 mgls. The gravity measurements would reveal either of these possibilities if they existed.

*Cooke, A. H., "Structural Geology of Canadian Ore Deposits", *Bull. Can. Inst. Min. Met.*, p. 587, 1948.
†Coleman, A. P., *Ont. Bur. Mines*, vol. XIV, Pt. III, p. 12, 1905, and *J. Geol.*, vol. XV, p. 763, 1907.

On the other hand if the magma rose through a single channel in the form of a cylindrical neck or plug 1 mile in diameter, and extending to great depth below the main body of the intrusive, the effect of such a body at the surface would be less than one-half a milligal and indistinguishable from other effects.

It may therefore be concluded, that although gravity measurements are incapable of outlining conduits below the main body of the irruptive should they have diameters of 1 mile or less, they deny the existence of a fissure or neck having the dimensions suggested by Coleman and others. The most probable location of the channel through which the irruptive rose would seem to be along the southern boundary.

Finally it should be emphasized that good agreement between observed and computed effects is not always conclusive evidence for the reality of the structure assumed for the calculations. Uniqueness of gravity interpretation depends upon the number of auxiliary aids available. In this investigation, we have a fair knowledge of the surface densities, the position of the geological contacts and the dips of the formations. While these all provide some measure of control and limit the number of possible solutions, they are insufficient to permit unique interpretation.

It is clear from Figure 4 that within the limits imposed by the controls just mentioned, an overall change in the magnitude of the resultant anomaly curve could result from variations in the thicknesses of any one of the formations. It is therefore impossible from the existing data to refine the estimate already given for the configuration of the irruptive at depth. On the other hand, a seismic profile across the basin, if sufficient velocity contrast between the formations is found to exist, might provide the necessary control to remove some of the ambiguity from this interpretation of the gravity measurements.

OTHER RELATIONSHIPS

No further quantitative analysis of the anomalies has been attempted. Referring again to Figure 5, to the south of the Stobie, the observed values drop sharply over the less dense Copper Cliff formation and rise to a secondary peak near Mile 23, presumably due to the Nipissing diabase. From here to the fault separating the Huronian rocks from the Coniston group and the Killarney granites and gneisses, the anomalies decrease; south of the fault the gradient is somewhat steeper and the anomalies reach their minimum value in a distance of 2 miles.

As mentioned in a previous section the magnitude of the anomalies over the Mississagi formation is greater than one would expect considering its lower than average density. However, the steep gradient to the north over the Mississagi, persists the full length of the basin; this is clearly demonstrated by the closely spaced contours in Map 1, and by Figure 6 which is a north-south profile to the west, over nearly the same succession of rocks as shown in Figure 5. Although the gradient could be the reflection of heavy masses at great depths to the south of the norite, it can be fully accounted for by the McKim and Ramsay Lake conglomerate formations, should they be underlying and dipping to the south at a somewhat smaller angle than illustrated. This interpretation which is synonymous with the statement that the Mississagi formation thins to the north is in agreement with Collins'* description of the Mississagi and with Cooke** who described the general

*Collins, W. H., *Geol. Surv., Canada Mem.* 143, p. 44, 1925.

**Cooke, H. C., *Geol. Surv., Canada Bull.* 3, p. 37, 1945.

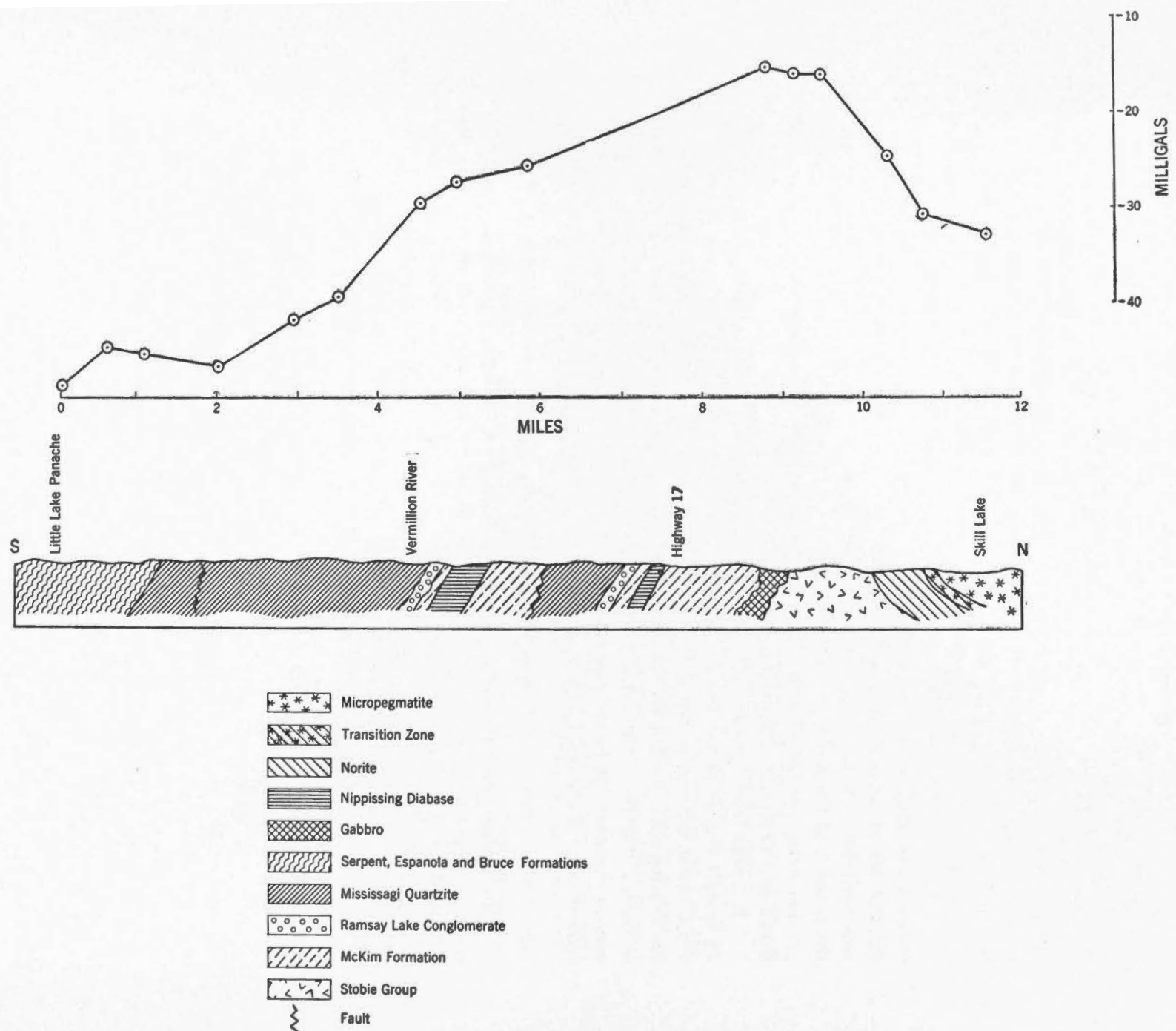


FIGURE 6. Gravity anomalies and geological section for the traverse (F-G) shown in location map.

structure of the McKim formation as that of a homocline facing to the south or southeast. From Lake Panache, to the north, the average change in gravity over the Mississagi is about 15 mgls. and for a density contrast of 0.1 gms. per c.c. could represent a thinning to the north of about 10,000 feet.

Figure 7 shows the observed gravity anomalies from observations along the highway between Milnet to the northeast of the basin and Sudbury and along the road south of Sudbury to Horseshoe Lake. The general trend of the anomalies is much the same as before with maximum values to the south. More conspicuous, however, is the low over the centre of the basin near Mile 24 where the anomalies are about four mgls. lower than over the corresponding position along the section on Figure 5. It may also be observed from Map 1 that about 3 miles north of this location the anomalies are smaller still with a minimum amplitude of about -38 mgls. While a general decrease in the anomalies could be the expression of an overall thinning of the irruptive, these variations occur over relatively short distances which suggests a more shallow origin.

The structure of the Whitewater sediments, usually referred to as a basin-shaped syncline, is more aptly described as a complex synclinorium.† Coleman†† describes the Chelmsford sandstone‡ as forming a succession of anticlines parallel to the principal axis of the main structure, and that "the synclines between the anticlinal hills are always buried so that a complete fold is never seen". For one location he estimates the total height of the fold (from trough to crest) to measure 400 to 500 feet, which implies a depth of over 200 feet of drift* between the anticlinal ridges. The gravity minima referred to in the previous paragraph are in a drift covered area partly underlain by Chelmsford sandstones and partly by Onwatin slates. They may reasonably be interpreted as reflecting the combined effect of the folding described above and the varying thicknesses of overburden, since 200 feet of drift, suitably distributed, can produce an anomaly of more than 2 mgls.

Finally, it will be noticed that the gravity maximum over the norite to the north is both higher and broader than over the corresponding portion of the section shown in Figure 5. These differences are believed due to the greater thickness of the norite on this section (seven-tenths of a mile compared to three-tenths of a mile in the section of Figure 5) and to the variation in density within the granite masses to the north of the norite. These granites have variable densities (see Figure 7) which increase all the way from Milnet, south to the norite contact.

Figure 8 is an east-west profile over the basin between Skead to the east through Hanmer, Chelmsford and Larchwood to Levack to the west. The variation in the gravity anomalies are for the most part what one would expect from the relationships developed in the previous sections. The anomaly curve rises sharply from a minimum over the granite to the west of Levack with peak values over the norite and Onaping formations. With minor variations higher values occur across the full length of the basin. Since this profile follows the highway, the variations from the general trend are largely due to the

†Yates, A. B., "Structure of Canadian Ore Deposits", *Bull. Can. Inst. Min. Met.*, pp. 596-617, 1948.

††Coleman, A. P., *Ont. Bur. Mines*, vol. XIV, pp. 96-99, 1905.

‡Burrows, A. G. and Rickaby, H. C., *Ont. Dept. Mines*, vol. XXXVIII, Pt. III, 1929.

*Interpretation of geophysical results showed that the depth of glacial drift at Falconbridge ranges from 80 to 180 feet.—Slichter, L. B., *Geophysical Prospecting*, 1929.

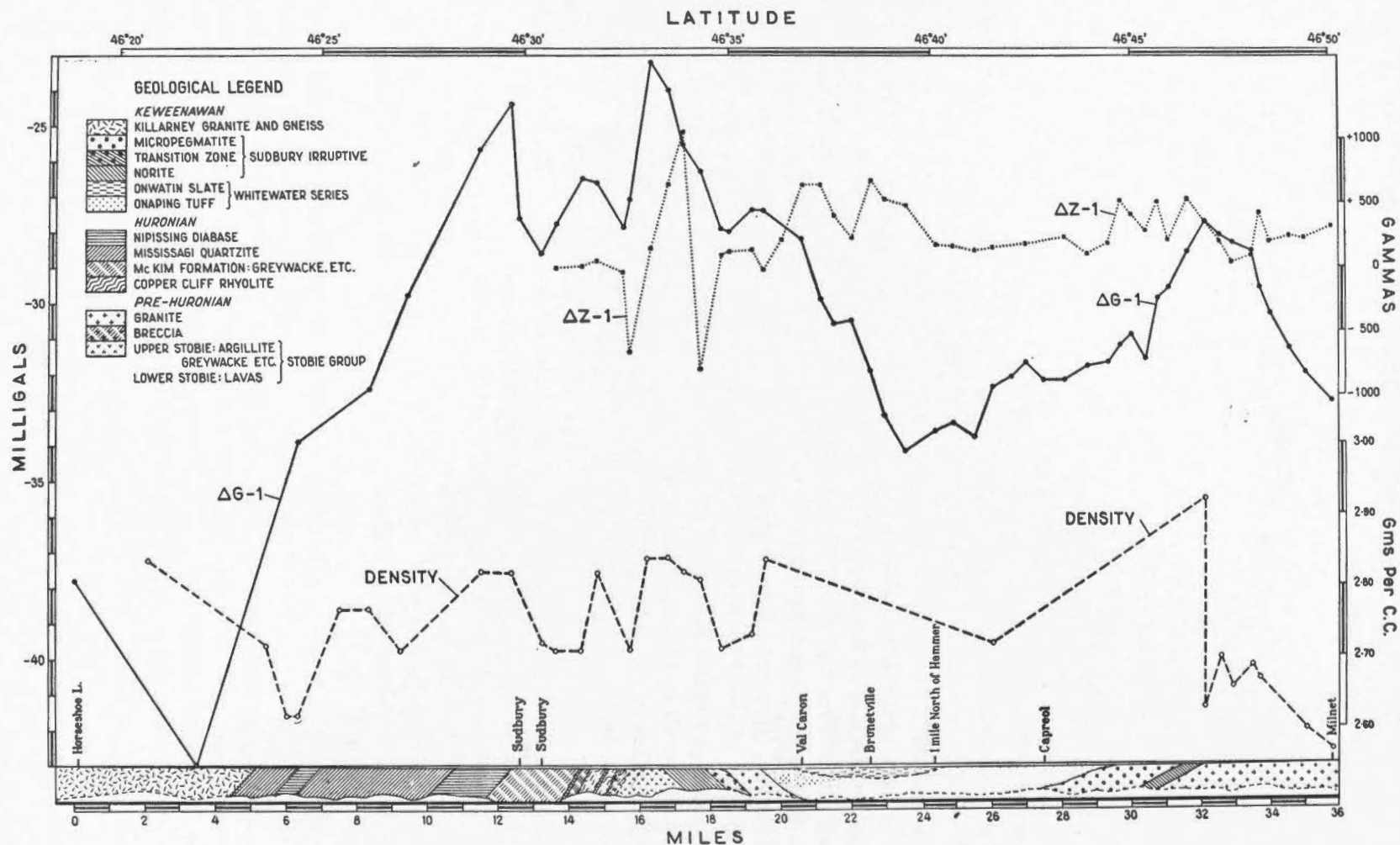


FIGURE 7. Gravity anomalies (ΔG) and vertical magnetic anomalies (ΔZ), for the north-south traverse (H-J) along the highway between Milnet and Sudbury and on the road south to Horseshoe Lake.

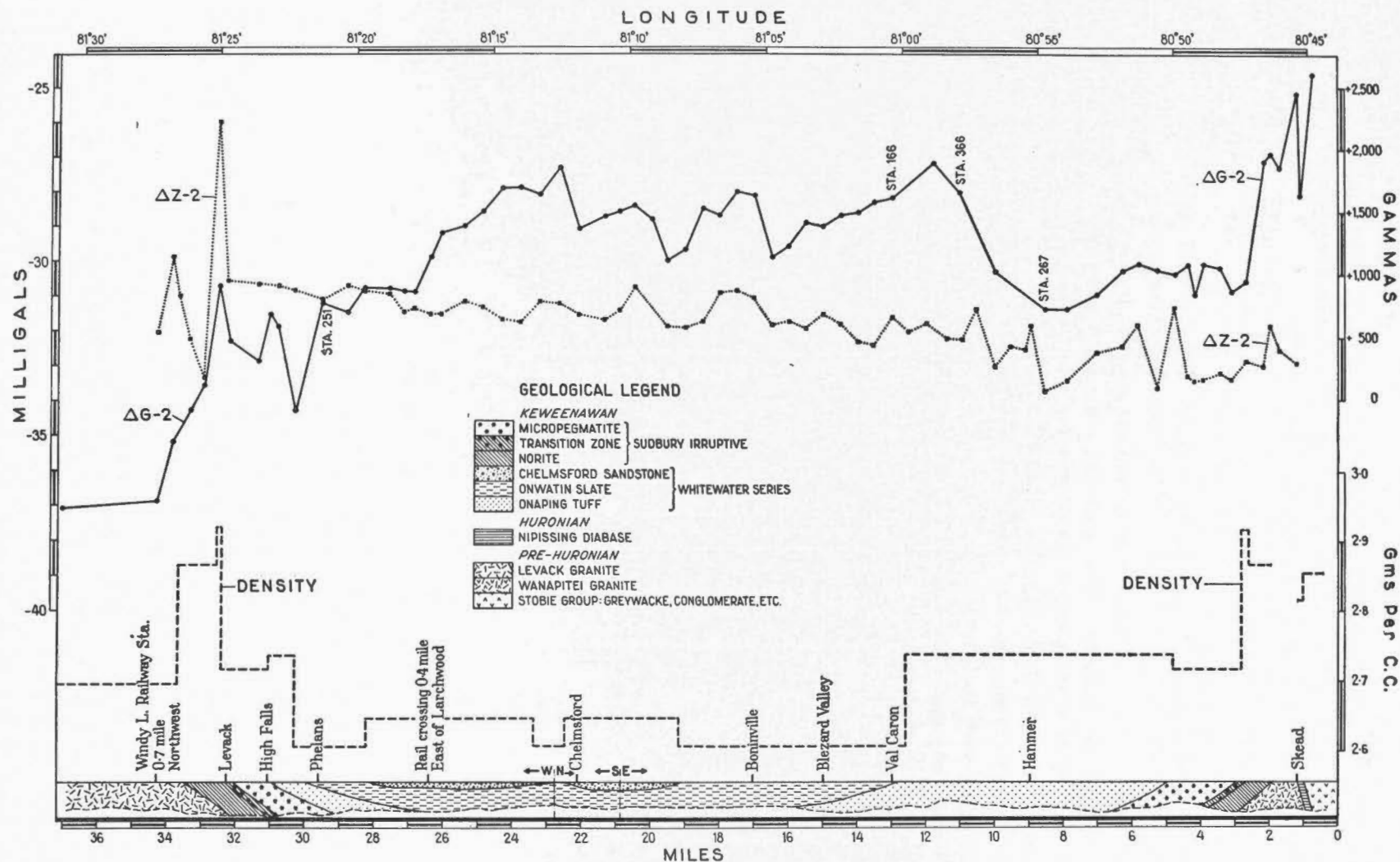


FIGURE 8. Gravity anomalies (ΔG) and vertical magnetic anomalies (ΔZ), along the highway traverse (K-L) between Levack to the east and Skead to the west.

relative proximity of the Stobie-norite masses to the south. The high to the east is believed to be controlled by large inclusions of metamorphosed Stobie rocks within the Wanapitei granite* which forms a large body to the east of the norite.

MAGNETIC MEASUREMENTS

Observations of the vertical magnetic intensity over the basin were limited to the two profiles illustrated in Figures 7 and 8. The observations were made in 1948 by G. D. Garland, with an Askania magnetometer and are referred to the Dominion Observatory magnetic station at Sudbury. The maximum anomalies on both profiles occur over outcrops of the irruptive, the greatest peak occurring near Levack (*see* Figure 8) and having an amplitude of nearly 2,200 gammas. Lesser anomalies occur over the Onaping formation. Still smaller anomalies but amounting to as much as 500 gammas, a considerable anomaly, occur over the Onwatin and Chelmsford formations. Apart from these variations, whose steep gradients suggest a surface, or near surface origin for the anomaly producing bodies, there is little or no evidence from the magnetic results to indicate the kind of structure one would expect from geological considerations of the area.

*Cooke, H. C., *Geol. Surv., Canada, Bull. 3*, p. 51, 1946.

APPENDIX

PRINCIPAL FACTS FOR GRAVITY STATIONS

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' ''	° ' ''	Ft.			
1	Hagar.....	80 25.0	46 27.3	691	980.7028	0.0071	-0.0164
2	Sudbury.....	81 00.0	46 29.8	881	.6860	.0044	- .0256
3	80 59.1	46 29.6	874	.6893	.0074	- .0224
4	80 59.3	46 30.7	845	.6893	.0030	- .0258
5	80 59.0	46 31.3	876	.6897	.0054	- .0245
6	80 59.2	46 31.7	910	.6881	.0064	- .0246
7	80 58.8	46 32.3	913	.6875	.0052	- .0259
8	80 58.9	46 32.5	948	.6866	.0072	- .0251
9	80 58.9	46 33.0	967	.6900	.0117	- .0212
10	80 59.0	46 33.4	978	.6892	.0113	- .0220
11	80 59.1	46 33.8	965	980.6891	0.0094	-0.0235
12	80 59.3	46 34.2	969	.6886	.0087	- .0243
13	80 59.6	46 34.7	993	.6864	.0080	- .0259
14	81 00.3	46 34.9	982	.6872	.0075	- .0260
15	81 00.6	46 35.4	976	.6889	.0079	- .0254
16	81 00.4	46 35.7	1,005	.6876	.0089	- .0254
17	81 00.5	46 36.1	940	.6918	.0063	- .0258
18	Val Caron.....	81 00.5	46 36.6	931	.6927	.0056	- .0262
19	81 00.5	46 37.1	927	.6919	.0037	- .0279
20	81 00.5	46 37.3	925	.6916	.0029	- .0286
21	81 00.5	46 37.8	930	980.6922	0.0032	-0.0285
22	81 00.5	46 38.2	939	.6909	.0021	- .0299
23	81 00.5	46 38.6	940	.6901	.0008	- .0312
24	81 00.5	46 39.2	955	.6891	.0003	- .0322
25	80 59.9	46 39.2	957	.6897	.0011	- .0315
26	80 59.2	46 39.2	960	.6894	.0011	- .0316
27	80 58.5	46 39.2	955	.6894	.0007	- .0319
28	80 57.9	46 39.2	957	.6903	.0017	- .0309
29	80 57.3	46 39.2	985	.6895	.0035	- .0300
30	80 58.9	46 31.3	863	.6906	.0051	- .0243
31	80 58.4	46 31.3	866	980.6896	0.0043	-0.0252
32	80 57.8	46 31.3	868	.6996	.0046	- .0250
33	80 57.1	46 31.3	872	.6889	.0043	- .0254
34	80 56.5	46 31.3	875	.6883	.0039	- .0259
35	80 56.7	46 39.2	973	.6906	.0036	- .0296
36	80 56.1	46 39.0	971	.6902	.0033	- .0298
37	Hanmer Station.....	80 55.5	46 39.1	969	.6919	.0046	- .0284
38	80 55.5	46 39.6	975	.6891	.0016	- .0316
39	80 55.3	46 39.9	976	.6895	.0017	- .0316
40	80 55.2	46 40.3	975	.6903	.0018	- .0314
41	80 55.0	46 40.9	985	980.6903	0.0018	-0.0318
42	Capreol.....	80 55.8	46 42.6	1,004	.6932	.0040	- .0302
43	80 55.1	46 41.3	992	.6918	.0034	- .0304
44	80 55.1	46 41.8	1,004	.6922	.0041	- .0301
45	80 55.2	46 42.1	1,013	.6924	.0048	- .0297
46	80 55.8	46 43.1	1,020	.6930	.0045	- .0302

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' "	° ' "	Ft.			
47	80 55.5	46 43.7	1,039	·6932	·0056	— ·0298
48	80 55.6	46 44.1	1,046	·6935	·0059	— ·0297
49	80 55.8	46 44.4	1,022	·6959	·0057	— ·0292
50	80 55.8	46 44.8	1,021	·6968	·0059	— ·0289
51	80 55.8	46 45.1	1,036	980·6957	0·0057	—0·0296
52	80 55.8	46 45.3	1,037	·6977	·0075	— ·0279
53	80 55.7	46 46.2	1,018	·7015	·0081	— ·0266
54	80 55.4	46 46.6	1,040	·7016	·0097	— ·0257
55	80 55.6	46 47.3	1,061	·7008	·0099	— ·0263
56	80 55.8	46 45.7	1,019	·6996	·0062	— ·0276
57	80 55.6	46 46.9	1,058	·7005	·0099	— ·0261
58	80 55.8	46 47.7	1,063	·7010	·0096	— ·0266
59	80 56.1	46 47.9	1,059	·7006	·0085	— ·0276
60	80 56.8	46 48.2	1,049	·7009	·0074	— ·0283
61	80 57.1	46 48.7	1,070	980·6994	0·0071	—0·0293
62	80 57.2	46 49.0	1,080	·6999	·0082	— ·0286
63	80 57.6	46 49.1	1,081	·6986	·0068	— ·0300
64	Milnet.....	80 57.8	46 49.8	1,082	·6988	·0060	— ·0308
65	80 55.5	46 39.3	971	·6912	·0038	— ·0293
66	81 01.1	46 36.6	937	·6922	·0056	— ·0263
67	81 01.7	46 36.6	934	·6920	·0052	— ·0266
68	81 02.3	46 36.5	932	·6919	·0050	— ·0267
69	Blezard Valley.....	81 03.0	46 36.5	932	·6916	·0047	— ·0270
70	81 03.7	46 36.5	927	·6920	·0046	— ·0269
71	81 04.3	46 36.5	922	980·6916	0·0038	—0·0276
72	81 04.9	46 36.5	923	·6912	·0035	— ·0279
73	81 05.6	46 36.5	926	·6909	·0035	— ·0280
74	81 05.6	46 36.0	905	·6927	·0041	— ·0268
75	Boninville.....	81 05.6	46 35.6	908	·6926	·0049	— ·0261
76	81 06.2	46 35.6	911	·6925	·0051	— ·0260
77	81 06.8	46 35.6	902	·6924	·0041	— ·0267
78	81 07.5	46 35.6	906	·6923	·0044	— ·0265
79	81 08.1	46 35.6	902	·6914	·0030	— ·0277
80	81 08.5	46 35.6	903	·6910	·0027	— ·0280
81	81 09.2	46 35.6	905	980·6920	0·0040	—0·0268
82	81 09.8	46 35.6	898	·6929	·0042	— ·0264
83	Chelmsford.....	81 12.0	46 35.0	885	·6920	·0030	— ·0271
84	81 10.4	46 35.6	900	·6926	·0040	— ·0266
85	81 11.0	46 35.6	902	·6922	·0038	— ·0269
86	81 11.0	46 34.9	898	·6916	·0039	— ·0267
87	81 11.9	46 34.4	885	·6924	·0043	— ·0258
88	81 11.9	46 34.1	888	·6924	·0050	— ·0252
89	81 12.6	46 34.1	880	·6929	·0047	— ·0253
90	81 13.3	46 34.1	885	·6918	·0041	— ·0261
91	81 14.1	46 34.1	890	980·6916	0·0044	—0·0259
92	81 14.7	46 34.1	889	·6916	·0044	— ·0259
93	81 15.4	46 34.2	885	·6914	·0036	— ·0266
94	81 16.0	46 34.2	885	·6910	·0032	— ·0270
95	81 16.9	46 34.2	923	·6885	·0043	— ·0272

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' "	° ' "	Ft.			
96	81 17.2	46 34.3	880	·6905	·0021	— ·0279
97	81 17.8	46 34.8	879	·6904	·0011	— ·0289
98	81 18.2	46 35.2	879	·6910	·0011	— ·0289
99	81 18.8	46 35.2	889	·6905	·0015	— ·0288
100	81 19.5	46 35.2	892	·6903	·0016	— ·0288
101	81 20.1	46 35.2	887	980.6898	0.0007	—0.0295
102	81 21.0	46 35.2	889	·6875	— ·0015	— ·0318
103	Phelans.....	81 21.1	46 34.6	905	·6882	·0016	— ·0292
104	81 22.0	46 34.6	954	·6821	·0002	— ·0323
105	81 22.6	46 34.9	966	·6843	·0031	— ·0299
106	81 23.0	46 35.4	1,001	·6833	·0046	— ·0295
107	81 22.9	46 36.1	1,015	·6828	·0043	— ·0303
108	81 23.3	46 36.4	1,047	·6806	·0048	— ·0309
109	Levack (Railway Station).....	81 24.4	46 36.1	1,088	·6783	·0067	— ·0303
110	81 24.4	46 36.6	1,174	·6741	·0099	— ·0301
111	81 24.7	46 37.0	1,218	980.6735	0.0128	—0.0287
112	81 24.8	46 37.3	1,164	·6759	·0096	— ·0300
113	81 27.1	46 37.5	1,199	·6691	·0059	— ·0349
114	81 26.4	46 37.3	1,170	·6723	·0066	— ·0332
115	81 26.0	46 37.1	1,113	·6763	·0056	— ·0323
116	81 25.3	46 37.2	1,198	·6721	·0092	— ·0316
117	80 55.5	46 38.5	956	·6901	·0025	— ·0301
118	80 55.5	46 38.1	952	·6899	·0025	— ·0299
119	80 54.9	46 38.1	967	·6895	·0035	— ·0294
120	80 54.1	46 38.1	966	·6896	·0035	— ·0294
121	80 53.0	46 38.1	968	980.6898	0.0040	—0.0290
122	80 52.0	46 38.1	969	·6905	·0047	— ·0283
123	80 52.1	46 38.1	971	·6906	·0050	— ·0281
124	80 50.8	46 37.9	988	·6891	·0054	— ·0283
125	80 50.2	46 37.8	998	·6882	·0056	— ·0284
126	80 49.7	46 37.4	1,006	·6875	·0113	— ·0281
127	80 49.5	46 37.0	992	·6867	·0048	— ·0290
128	80 49.2	46 36.7	1,005	·6865	·0062	— ·0281
129	80 48.5	46 36.7	1,107	·6902	·0095	— ·0282
130	80 48.1	46 37.0	1,112	·6796	·0090	— ·0289
131	80 47.5	46 37.3	1,118	980.6800	0.0095	—0.0286
132	80 46.9	46 37.2	1,121	·6833	·0131	— ·0251
133	80 46.6	46 37.4	1,130	·6832	·0136	— ·0249
134	80 46.2	46 37.8	1,083	·6861	·0115	— ·0254
135	80 45.6	46 38.0	1,056	·6903	·0128	— ·0231
136	Skead Station.....	80 45.4	46 39.3	956	·6952	·0064	— ·0261
137	80 55.7	46 31.3	862	·6887	·0030	— ·0263
138	80 54.8	46 31.3	872	·6904	·0057	— ·0240
139	80 54.1	46 31.4	875	·6897	·0051	— ·0247
140	80 52.9	46 30.9	877	·6894	·0058	— ·0241
141	80 52.3	46 31.0	866	980.6866	0.0018	—0.0277
142	80 50.4	46 30.7	841	·6864	— ·0003	— ·0289
143	80 50.4	46 29.5	822	·6874	·0007	— ·0273
144	Coniston.....	80 51.0	46 29.1	817	·6831	— ·0035	— ·0313

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' "	° ' "	Ft.			
145	80 58.0	46 30.0	897	·6888	·0084	— ·0222
146	80 56.2	46 29.4	852	·6850	·0012	— ·0278
147	80 54.2	46 29.1	908	·6777	— ·0003	— ·0312
148	80 54.2	46 28.2	912	·6749	— ·0014	— ·0325
149	80 54.2	46 29.6	885	·6827	·0018	— ·0284
150	80 52.4	46 29.1	845	·6820	— ·0019	— ·0307
151	80 56.3	46 30.3	899	980·6881	0·0074	—0·0232
152	Garson Junction.....	80 54.9	46 31.9	888	·6885	·0044	— ·0259
153	80 54.8	46 32.2	901	·6893	·0060	— ·0247
154	80 54.2	46 32.5	918	·6882	·0061	— ·0252
155	80 52.5	46 33.0	954	·6851	·0056	— ·0269
156	80 51.7	46 33.0	958	·6835	·0044	— ·0283
157	80 51.7	46 33.1	970	·6842	·0060	— ·0270
158	80 51.7	46 33.3	975	·6870	·0090	— ·0242
159	80 50.9	46 34.3	974	·6899	·0103	— ·0229
160	80 50.9	46 34.7	961	·6906	·0091	— ·0236
161	80 50.9	46 35.1	954	980·6871	0·0044	—0·0281
162	80 50.5	46 35.5	965	·6867	·0044	— ·0285
163	80 49.8	46 35.9	1,017	·6850	·0070	— ·0276
164	Garson.....	80 51.7	46 33.8	953	·6908	·0100	— ·0225
165	80 51.2	46 32.1	905	·6881	·0053	— ·0255
166	80 50.4	46 31.5	861	·6864	·0037	— ·0290
167	80 50.2	46 30.2	821	·6837	— ·0041	— ·0321
168	Wanapitei Station.....	80 46.9	46 29.2	797	·6908	·0022	— ·0249
169	Sudbury.....	81 00.9	46 29.5	902	·6827	·0035	— ·0272
170	81 01.7	46 29.5	893	·6837	·0037	— ·0267
171	81 03.0	46 30.1	925	980·6895	0·0116	—0·0199
172	81 03.5	46 30.8	967	·6897	·0148	— ·0182
173	81 03.8	46 31.1	982	·6871	·0131	— ·0203
174	81 04.1	46 31.7	970	·6867	·0106	— ·0224
175	81 05.3	46 32.5	885	·6915	·0062	— ·0240
176	Azilda Station.....	81 06.2	46 33.1	890	·6924	·0067	— ·0237
177	81 02.5	46 29.5	900	·6835	·0042	— ·0265
178	81 03.4	46 30.4	944	·6920	·0154	— ·0168
179	81 03.7	46 31.0	991	·6884	·0153	— ·0184
180	81 04.8	46 32.2	916	·6908	·0089	— ·0223
181	81 05.5	46 33.1	889	980·6931	0·0073	—0·0230
182	81 05.5	46 33.7	881	·6936	·0061	— ·0239
183	81 05.5	46 34.1	900	·6936	·0074	— ·0233
184	81 05.5	46 34.9	902	·6950	·0077	— ·0230
185	81 05.5	46 37.7	914	·6907	·0003	— ·0308
186	81 01.7	46 35.7	1,012	·6873	·0091	— ·0254
187	81 03.0	46 35.7	929	·6927	·0067	— ·0249
188	81 04.2	46 35.7	902	·6933	·0049	— ·0259
189	81 06.8	46 37.7	919	·6902	·0003	— ·0310
190	81 06.8	46 38.6	931	·6900	— ·0001	— ·0318
191	81 06.7	46 36.6	911	980·6901	0·0011	—0·0299
192	81 08.0	46 36.5	907	·6920	·0028	— ·0281
193	81 08.0	46 34.7	905	·6933	·0066	— ·0242

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' ''	° ' ''	Ft.			
194	81 08.0	46 33.9	894	·6941	·0076	— ·0229
195	81 08.0	46 33.1	889	·6941	·0083	— ·0220
196	81 07.0	46 33.9	905	·6949	·0094	— ·0214
197	81 06.9	46 34.8	909	·6933	·0069	— ·0241
198	81 09.0	46 34.7	903	·6933	·0064	— ·0243
199	81 10.1	46 34.7	904	·6926	·0058	— ·0250
200	81 00.1	46 31.8	977	·6836	·0081	— ·0252
201	81 00.4	46 31.4	989	980.6825	0.0087	—0.0250
202	81 00.4	46 30.9	1,004	·6794	·0077	— ·0265
203	81 00.5	46 30.3	915	·6837	·0046	— ·0266
204	Clarabelle Station.....	81 03.3	46 29.9	945	·6892	·0135	— ·0187
205	81 03.8	46 29.6	940	·6897	·0140	— ·0181
206	81 04.2	46 29.3	962	·6836	·0104	— ·0223
207	Copper Cliff.....	81 04.2	46 28.6	857	·6887	·0067	— ·0225
208	Copper Cliff Station.....	81 04.5	46 27.7	860	·6869	·0065	— ·0228
209	81 05.9	46 26.7	862	·6861	·0074	— ·0219
210	81 07.2	46 25.8	864	·6865	·0094	— ·0201
211	81 08.5	46 25.2	820	980.6860	0.0056	—0.0224
212	81 08.9	46 26.3	909	·6894	·0157	— ·0152
213	Creighton.....	81 10.8	46 27.5	999	·6815	·0145	— ·0195
214	Creighton Shaft.....	81 11.2	46 27.8	1,008	·6824	·0157	— ·0186
215	81 09.1	46 26.8	946	·6840	·0131	— ·0192
216	81 09.9	46 27.2	973	·6814	·0124	— ·0208
217	80 59.0	46 36.5	935	·6932	·0066	— ·0252
218	80 58.0	46 36.5	1,001	·6885	·0081	— ·0260
219	80 58.0	46 37.3	938	·6910	·0036	— ·0284
220	80 56.7	46 37.4	941	·6911	·0037	— ·0283
221	80 55.5	46 37.3	947	980.6902	0.0036	—0.0287
222	80 56.7	46 38.2	963	·6898	·0033	— ·0295
223	80 57.9	46 38.2	960	·6899	·0031	— ·0296
224	80 59.2	46 38.2	956	·6894	·0022	— ·0303
225	81 07.7	46 33.4	890	·6940	·0079	— ·0225
226	81 09.6	46 33.9	888	·6939	·0068	— ·0234
227	81 11.0	46 33.9	889	·6931	·0061	— ·0242
228	81 08.9	46 33.9	893	·6940	·0074	— ·0230
229	81 11.0	46 33.0	887	·6948	·0089	— ·0213
230	81 11.0	46 32.3	970	·6884	·0114	— ·0217
231	81 12.2	46 33.1	879	980.6942	0.0075	—0.0225
232	81 13.5	46 33.2	883	·6935	·0070	— ·0231
233	81 15.0	46 33.3	890	·6924	·0064	— ·0239
234	81 16.0	46 33.4	885	·6919	·0053	— ·0249
235	81 16.0	46 32.5	881	·6915	·0058	— ·0242
236	81 17.2	46 32.5	866	·6910	·0039	— ·0256
237	81 18.8	46 32.5	863	·6903	·0029	— ·0265
238	81 01.8	46 39.1	948	·6882	·0051	— ·0334
239	81 01.8	46 38.2	940	·6896	·0009	— ·0311
240	81 03.1	46 38.2	941	·6900	·0014	— ·0306
241	81 04.1	46 38.2	938	980.6900	0.0011	—0.0308
242	81 03.1	46 37.3	940	·6905	·0033	— ·0288

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' ''	° ' ''	Ft.			
243	81 04.3	46 37.3	938	.6901	.0026	— .0294
244	80 53.0	46 38.9	970	.6904	.0035	— .0295
245	80 53.0	46 39.8	972	.6915	.0034	— .0297
246	80 51.5	46 39.0	973	.6916	.0049	— .0283
247	80 54.2	46 39.0	964	.6910	.0034	— .0295
248	80 56.8	46 39.8	972	.6890	.0030	— .0322
249	80 56.7	46 41.1	964	.6913	.0005	— .0323
250	81 00.5	46 40.0	969	.6892	.0005	— .0325
251	81 00.6	46 41.2	963	980.6923	0.0013	—0.0315
252	81 00.6	46 41.8	930	.6906	— .0044	— .0361
253	80 59.2	46 40.1	964	.6888	— .0005	— .0333
254	80 59.2	46 40.8	959	.6890	— .0018	— .0344
255	80 54.2	46 39.8	971	.6908	.0026	— .0305
256	80 58.1	46 40.0	966	.6892	.0003	— .0326
257	81 01.8	46 37.3	945	.6905	.0037	— .0285
258	81 10.0	46 36.4	906	.6911	.0019	— .0289
259	80 56.7	46 32.1	891	.6894	.0053	— .0250
260	80 55.5	46 33.0	903	.6902	.0059	— .0249
261	80 54.2	46 33.0	927	980.6887	0.0066	—0.0250
262	80 53.5	46 33.0	922	.6892	.0067	— .0247
263	Falconbridge.....	80 49.1	46 34.6	1,088	.6840	.0146	— .0224
264	81 12.3	46 35.9	897	.6917	.0025	— .0281
265	81 12.8	46 37.0	916	.6911	.0020	— .0292
266	81 13.4	46 37.7	903	.6917	.0004	— .0304
267	81 14.7	46 38.6	908	.6920	— .0003	— .0312
268	81 13.5	46 39.1	934	.6904	— .0002	— .0320
269	81 14.7	46 37.7	888	.6911	— .0017	— .0319
270	Rutter.....	80 39.6	46 06.2	679	.6593	— .0058	— .0289
271	81 16.0	46 37.7	896	980.6901	—0.0020	—0.0325
272	81 17.2	46 36.9	882	.6901	— .0021	— .0321
273	81 18.5	46 36.9	884	.6915	— .0005	— .0306
274	81 18.5	46 36.0	883	.6896	— .0010	— .0311
275	81 18.8	46 33.5	902	.6884	— .0032	— .0275
276	Larchwood Station.....	81 17.7	46 34.3	890	.6902	.0027	— .0276
277	81 19.1	46 34.3	865	.6905	.0007	— .0288
278	81 20.4	46 34.3	883	.6903	.0021	— .0280
279	81 22.3	46 33.4	863	.6905	.0018	— .0276
280	81 23.6	46 33.4	865	.6867	— .0018	— .0313
281	81 24.6	46 33.4	867	980.6886	+0.0003	—0.0293
282	81 13.0	46 39.7	927	.6916	— .0005	— .0321
283	81 15.2	46 42.9	1,078	.6824	— .0003	— .0370
284	81 15.0	46 42.2	1,082	.6842	+ .0029	— .0339
285	81 15.1	46 42.0	1,181	.6789	+ .0072	— .0330
286	81 15.1	46 41.8	1,164	.6792	+ .0062	— .0334
287	81 15.0	46 41.6	1,151	.6905	+ .0066	— .0326
288	81 14.9	46 41.4	1,122	.6828	.0064	— .0318
289	81 14.6	46 40.8	1,035	.6858	.0022	— .0331
290	81 14.8	46 41.2	1,051	.6848	.0021	— .0337

GRAVITY IN THE SUDBURY BASIN AND VICINITY

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PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' "	° ' "	Ft.			
291	.....	81 14.6	46 41.0	1,043	980.6852	0.0020	−0.0335
292	.....	81 13.4	46 40.0	969	.6895	.0009	− .0322
293	.....	81 14.2	46 40.4	1,022	.6855	.0012	− .0336
294	Kirk.....	80 12.6	46 26.0	678	.6927	− .0023	− .0254
295	.....	80 25.0	46 25.7	766	.6929	+ .0067	− .0194
296	Appelby Corner.....	80 25.0	46 24.4	750	.6911	.0053	− .0202
297	.....	80 25.0	46 22.7	745	.6892	.0055	− .0199
298	.....	80 26.0	46 19.8	687	.6922	.0074	− .0161
299	.....	80 26.3	46 18.4	657	.6880	.0025	− .0199
300	.....	80 26.0	46 15.0	673	.6780	− .0010	− .0239
301	.....	80 26.0	46 13.2	686	980.6726	−0.0024	−0.0258
302	.....	80 26.0	46 11.5	682	.6654	− .0074	− .0306
303	.....	80 26.0	46 09.7	658	.6592	− .0131	− .0355
304	Noelville.....	80 26.0	46 08.5	709	.6521	− .0137	− .0378
305	.....	80 26.0	46 06.3	723	.6463	− .0148	− .0394
306	.....	80 28.2	46 06.3	717	.6483	− .0134	− .0378
307	.....	80 29.5	46 06.3	724	.6491	− .0120	− .0366
308	.....	80 32.3	46 06.3	717	.6501	− .0116	− .0361
309	.....	80 33.3	46 06.3	634	.6548	− .0147	− .0363
310	.....	80 34.7	46 06.1	609	.6542	− .0173	− .0381
311	.....	80 36.6	46 06.3	694	980.6524	−0.0115	−0.0351
312	.....	80 38.3	46 06.3	609	.6608	− .0111	− .0318
313	Bigwood.....	80 35.8	46 02.2	634	.6484	− .0149	− .0365
314	French River.....	80 34.2	46 01.3	630	.6464	− .0160	− .0374
315	.....	80 35.8	46 04.2	661	.6498	− .0141	− .0366
316	.....	80 22.8	46 06.3	680	.6471	− .0181	− .0412
317	.....	81 00.2	46 27.0	871	.6802	+ .0018	− .0278
318	.....	80 59.6	46 26.1	902	.6744	.0003	− .0304
319	.....	80 55.1	46 25.9	756	.6801	− .0074	− .0331
320	Wanup.....	80 48.8	46 23.6	745	.6889	+ .0038	− .0216
321	Burwash.....	80 47.8	46 18.6	727	980.6816	0.0023	−0.0224
322	McVitties.....	80 50.9	46 16.9	695	.6784	− .0013	− .0250
323	.....	80 52.7	46 24.7	792	.6838	+ .0015	− .0255
324	Whitefish.....	81 19.2	46 22.7	809	.6830	.0053	− .0221
325	Worthington.....	81 27.1	46 22.9	775	.6862	.0050	− .0214
326	Turbine.....	81 30.8	46 22.3	710	.6866	.0002	− .0240
327	Cartier.....	81 33.7	46 42.2	1,378	.6472	− .0062	− .0532
328	Benny.....	81 37.8	46 47.0	1,267	.6719	+ .0008	− .0424
329	.....	81 30.4	46 36.5	1,363	.6577	.0113	− .0351
330	.....	81 34.9	46 37.6	1,259	.6499	− .0079	− .0508
331	Levack Mine.....	81 22.2	46 39.2	1,110	980.6820	+0.0078	−0.0300
332	Levack.....	81 23.6	46 38.1	1,058	.6841	.0067	− .0294
333	Warren.....	80 18.6	46 26.5	690	.6960	.0014	− .0221
334	River Valley.....	80 11.0	46 35.0	788	.7139	.0158	− .0111
335	Desaulniers.....	80 06.7	46 33.0	787	.6970	.0018	− .0250
336	Field.....	80 01.7	46 31.4	752	.6885	− .0076	− .0332
337	Sudbury.....	80 59.1	46 28.9	810	.6908	+ .0039	− .0237
338	Nepewassi Lake.....	80 41.5	46 20.3	656	.6913	.0352	− .0195

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' "	° ' "	Ft.			
339	West Bay.....	80 12.7	46 13.8	640	·6767	— ·0035	— ·0253
340	Wawiashkashi Lake.....	80 17.6	46 48.8	851	·7111	— ·0018	— ·0308
341	Wanapitei Lake.....	80 45.3	46 39.9	880	980.6999	+0.0031	—0.0269
342	Onaping Lake.....	81 30.4	46 56.0	1,350	·6726	— ·0042	— ·0502
343	Shakwa Lake.....	81 58.7	46 46.9	1,387	·6508	— ·0088	— ·0561
344	Acheson Lake.....	81 54.9	46 35.3	1,070	·6549	— ·0172	— ·0536
345	Windy Lake.....	81 26.8	46 37.0	1,060	·6794	+ ·0038	— ·0323
346	South East Bay.....	80 40.7	46 54.0	1,034	·7102	·0067	— ·0286
347	Bigwood Lake.....	81 05.7	46 51.0	1,211	·6688	— ·0136	— ·0548
348	Annie Lake.....	81 08.1	46 11.0	769	·6367	— ·0272	— ·0534
349	Lake Panache.....	81 30.1	46 13.6	725	·6488	— ·0231	— ·0478
350	Gough Lake.....	81 58.2	46 19.0	844	·6620	— ·0068	— ·0356
351	McGregor Lake.....	81 43.3	46 03.8	582	980.6498	—0.0210	—0.0408
352	Tyson Lake.....	81 07.8	46 06.9	660	·6389	— ·0290	— ·0515
353	.....	81 21.4	46 16.9	792	·6575	— ·0131	— ·0401
354	.....	81 20.0	46 21.9	763	·6823	+ ·0015	— ·0245
355	.....	81 20.0	46 21.4	790	·6785	·0010	— ·0259
356	.....	81 21.7	46 17.4	898	·6548	— ·0066	— ·0371
357	.....	81 21.5	46 17.8	807	·6601	— ·0104	— ·0379
358	.....	81 21.3	46 18.6	736	·6647	— ·0137	— ·0388
359	.....	81 21.0	46 19.4	776	·6671	— ·0087	— ·0352
360	.....	81 20.6	46 19.8	741	·6715	— ·0082	— ·0335
361	.....	81 19.7	46 20.4	761	980.6737	—0.0051	—0.0310
362	.....	81 19.9	46 22.1	770	·6843	+ ·0038	— ·0224
363	.....	81 19.8	46 22.2	803	·6839	·0064	— ·0210
364	.....	81 29.4	46 21.0	806	·6741	— ·0013	— ·0288
365	Nairn.....	81 34.9	46 20.0	722	·6804	— ·0014	— ·0260
366	.....	81 28.6	46 22.7	748	·6861	+ ·0027	— ·0228
367	.....	81 29.0	46 20.3	763	·6741	— ·0049	— ·0309
368	.....	81 28.1	46 19.5	791	·6704	— ·0042	— ·0311
369	.....	81 31.3	46 18.9	682	·6750	— ·0089	— ·0322
370	.....	81 30.4	46 19.9	769	·6736	— ·0037	— ·0298
371	.....	81 32.4	46 19.4	689	980.6799	—0.0041	—0.0276
372	.....	81 33.4	46 19.8	690	·6832	— ·0013	— ·0248
373	.....	81 34.3	46 19.9	766	·6793	+ ·0018	— ·0243
374	.....	81 27.8	46 23.0	769	·6865	·0046	— ·0216
375	.....	81 28.0	46 23.9	736	·6895	·0031	— ·0219
376	.....	81 28.1	46 24.6	790	·6887	·0064	— ·0205
377	.....	81 28.1	46 25.2	969	·6824	·0160	— ·0170
378	.....	81 27.9	46 26.0	941	·6801	·0099	— ·0222
379	.....	81 27.7	46 26.3	1,000	·6747	·0096	— ·0245
380	(Fairbank Lake).....	81 27.6	46 27.3	970	·6735	·0040	— ·0290
381	Espanola.....	81 46.1	46 15.9	672	980.6739	—0.0065	—0.0293
382	Webbwood.....	81 52.7	46 16.0	661	·6759	— ·0056	— ·0282
383	Verner.....	80 07.6	46 24.7	670	·6867	— ·0071	— ·0299
384	Lavigne.....	80 10.2	46 19.6	641	·6850	— ·0037	— ·0257
385	.....	80 14.9	46 21.8	677	·6898	+ ·0011	— ·0220
386	.....	80 21.3	46 21.8	658	·6919	·0015	— ·0211
387	Hagar.....	80 25.0	46 27.3	691	·7028	·0071	— ·0165

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' "	° ' "	Ft.			
388	Hugel.....	80 17.5	46 29.6	728	.7035	.0078	— .0170
389	.....	80 14.8	46 33.2	799	.7096	.0152	— .0120
390	River Valley.....	80 11.0	46 35.5	793	.7147	.0163	— .0107
391	Azen.....	80 14.8	46 38.0	764	980.7252	+0.0203	—0.0057
392	Glen Afton.....	80 17.8	46 38.9	766	.7240	.0179	— .0081
393	.....	80 17.0	46 42.7	849	.7042	.0002	— .0287
394	.....	80 18.1	46 45.2	866	.7028	— .0033	— .0328
395	Brightwater River.....	80 16.8	46 49.2	886	.7095	— .0008	— .0309
396	.....	80 17.1	46 53.2	962	.7227	+ .0136	— .0192
397	.....	80 18.6	46 56.4	1,057	.7232	.0182	— .0178
398	Rivière Veuve.....	80 25.2	46 32.2	756	.7147	.0178	— .0080
399	Markstay.....	80 32.6	46 29.6	707	.7118	.0142	— .0099
400	.....	80 32.7	46 33.0	866	.7146	.0268	— .0027
401	.....	80 32.6	46 35.4	875	980.7176	0.0270	—0.0028
402	Sudbury.....	81 00.0	46 29.8	881	.6860	.0044	— .0256
403	.....	80 52.2	46 21.7	738	.6840	.0011	— .0240
404	Paddy Creek.....	80 54.0	46 20.9	754	.6744	— .0058	— .0314
405	Horseshoe Lake.....	80 54.7	46 18.9	718	.6692	— .0113	— .0358
406	.....	81 00.4	46 26.1	930	.6759	+ .0045	— .0272
407	.....	81 00.6	46 24.8	862	.6761	.0002	— .0291
408	Rheault.....	80 59.5	46 24.4	766	.6784	— .0059	— .0320
409	.....	81 02.2	46 23.5	866	.6723	— .0012	— .0307
410	.....	81 04.0	46 22.8	895	.6690	— .0008	— .0312
411	.....	80 57.9	46 22.2	827	980.6624	—0.0128	—0.0410
412	.....	80 50.1	46 20.6	728	.6831	+ .0010	— .0238
413	.....	80 48.9	46 15.7	700	.6772	— .0002	— .0241
414	Burwash C.N.R.....	80 51.9	46 14.5	692	.6736	— .0028	— .0264
415	Burwash.....	80 54.0	46 13.3	663	.6682	— .0091	— .0317
416	Wanup C.P.R.....	80 48.8	46 23.6	745	.6889	+ .0038	— .0215
417	.....	80 46.3	46 26.4	797	.6945	+ .0101	— .0179
418	Worthington.....	81 27.4	46 23.1	775	.6862	.0047	— .0217
419	Espanola.....	81 45.9	46 15.7	672	.6740	— .0061	— .0289
420	.....	81 42.7	46 11.5	722	.6447	— .0243	— .0489
421	Whitefish Falls.....	81 43.7	46 06.7	597	980.6487	—0.0248	—0.0452
422	Birch Island.....	81 46.6	46 04.1	590	.6511	— .0192	— .0393
423	McGregor Bay.....	81 46.8	46 01.1	592	.6474	— .0182	— .0384
424	Chelmsford.....	81 11.9	46 35.2	886	.6918	+ .0026	— .0276
425	.....	81 13.4	46 39.3	935	.6910	.0002	— .0316
426	.....	81 14.3	46 43.8	1,184	.6770	.0029	— .0375
427	Nickel Offset Mine.....	81 14.4	46 45.5	1,331	.6627	— .0001	— .0454
428	.....	81 15.9	46 36.9	871	.6927	— .0005	— .0301
429	.....	81 14.4	46 36.9	923	.6913	+ .0030	— .0284
430	.....	81 12.9	46 37.0	911	.6910	.0014	— .0296
431	Chudleigh.....	80 23.2	46 38.5	792	980.7196	0.0166	—0.0105
432	Washagami.....	80 26.6	46 38.5	789	.7193	.0160	— .0109
433	Crerar.....	80 32.9	46 37.8	851	.7079	.0115	— .0175
434	Sudbury Junction.....	80 54.1	46 31.4	875	.6897	.0051	— .0247
435	Anstice.....	81 03.0	46 54.2	1,185	.6794	— .0102	— .0506
436	Raphoe.....	81 07.5	46 59.4	1,241	.6741	— .0181	— .0604

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Continued*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' ''	° ' ''	Ft.			
437	St. Cloud.....	80 48.0	46 24.0	749	·6916	+ ·0063	— ·0192
438	Waterfall.....	80 50.1	46 19.3	709	·6901	— ·0019	— ·0260
439	Romford.....	80 52.4	46 29.1	845	·6820	— ·0019	— ·0307
440	Geneva.....	81 33.5	46 45.1	1,381	·6521	— ·0050	— ·0524
441	Stralak.....	81 42.4	46 48.5	1,351	980·6677	+0·0023	—0·0438
442	Pogamising.....	81 46.5	46 54.7	1,158	·6836	— ·0094	— ·0488
443	Fluorite.....	81 49.0	46 58.6	1,195	·6876	— ·0077	— ·0484
444	Bayswater Station.....	80 45.2	46 05.2	647	·6637	— ·0029	— ·0250
445	Hartley Bay Station.....	80 45.5	46 01.9	619	·6568	— ·0075	— ·0286
446	Pickrel River Station.....	80 43.6	46 00.3	638	·6508	— ·0093	— ·0311
447	Delamere.....	80 42.4	46 10.1	655	·6725	— ·0007	— ·0230
448	Paget.....	80 44.4	46 13.9	689	·6766	+ ·0008	— ·0226
449	Porlock.....	80 49.1	46 11.5	593	·6715	— ·0097	— ·0299
450	.....	81 00.4	46 30.5	955	·6824	+ ·0067	— ·0258
451	.....	80 50.1	46 34.2	1,013	980·6901	+0·0143	—0·0202
452	.....	80 45.0	46 39.6	949	·6997	·0097	— ·0226
453	.....	81 08.4	46 25.2	817	·6860	·0053	— ·0226
454	.....	81 08.2	46 26.7	944	·6882	·0172	— ·0149
455	.....	81 06.7	46 27.2	884	·6903	·0129	— ·0173
456	.....	81 08.4	46 26.3	920	·6870	·0144	— ·0170
457	.....	81 09.0	46 26.3	895	·6899	·0149	— ·0156
458	.....	81 09.0	46 25.6	884	·6867	·0117	— ·0184
459	.....	81 09.6	46 25.6	883	·6888	·0137	— ·0163
460	.....	81 08.8	46 25.4	816	·6892	·0081	— ·0197
461	.....	81 08.4	46 25.4	815	980·6876	0·0064	—0·0213
462	.....	81 10.0	46 23.0	778	·6902	— ·0009	— ·0274
463	.....	81 11.2	46 21.5	774	·6757	— ·0035	— ·0298
464	.....	81 11.5	46 20.5	757	·6746	— ·0047	— ·0305
465	.....	81 07.8	46 24.5	830	·6818	+ ·0033	— ·0249
466	.....	81 07.0	46 23.2	780	·6773	— ·0039	— ·0305
467	.....	81 11.7	46 27.3	997	·6833	+ ·0163	— ·0176
468	.....	81 12.4	46 26.9	944	·6868	·0155	— ·0167
469	.....	81 13.5	46 26.5	915	·6859	·0124	— ·0187
470	.....	81 14.7	46 26.1	859	·6849	·0068	— ·0225
471	.....	81 05.2	46 25.4	828	980·6824	0·0025	—0·0257
472	.....	81 04.7	46 24.1	853	·6747	— ·0010	— ·0300
473	.....	81 05.3	46 23.2	813	·6727	— ·0054	— ·0330
474	.....	81 03.5	46 26.4	834	·6842	+ ·0033	— ·0251
475	.....	81 02.9	46 25.6	854	·6811	·0033	— ·0258
476	.....	81 02.6	46 25.2	859	·6759	— ·0008	— ·0301
477	.....	81 02.5	46 24.4	751	·6802	+ ·0040	— ·0310
478	.....	81 22.7	46 23.4	824	·6864	·0091	— ·0190
479	.....	81 22.6	46 24.5	886	·6879	·0147	— ·0155
480	.....	81 23.3	46 25.3	977	·6832	·0174	— ·0159
481	.....	81 23.7	46 25.9	1,024	980·6748	+0·0126	—0·0223
482	.....	81 23.7	46 26.2	1,024	·6907	·0080	— ·0269
483	.....	81 23.4	46 26.9	968	·6738	·0047	— ·0283
484	Mond Station.....	81 23.3	46 24.9	905	·6870	·0150	— ·0158
485	.....	81 22.3	46 21.9	840	·6790	·0054	— ·0232

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Concluded*

Station		Longitude	Latitude	Elevation	Observed Gravity	Gravity Anomalies	
No.	Name					Free Air	Bouguer
		° ' "	° ' "	Ft.			
486	81 23.5	46 21.2	752	·6821	·0013	— ·0244
487	81 22.8	46 20.8	749	·6800	— ·0005	— ·0260
488	McKerrow Station.....	81 45.4	46 17.1	685	·6804	— ·0006	— ·0239
489	81 44.8	46 18.6	828	·6807	+ ·0110	— ·0173
490	81 46.0	46 19.3	852	·6795	·0110	— ·0181
491	81 45.9	46 20.2	960	980·6744	0·0148	—0·0180
492	81 54.0	46 17.1	663	·6728	— ·0103	— ·0328
493	81 52.6	46 17.5	668	·6755	— ·0077	— ·0304
494	81 48.7	46 18.4	764	·6793	+ ·0039	— ·0222