4249

Geophysical Report on a Gravity Survey of some
R, RR, NED, BAB, NDI, and TONJA claims
Situated on the East Shore of Babine Lake
at Hawthorn Bay and Hatchery Arm
Omineca Mining Division, B. C.
93L/16E,
Latitude 55°N; Longitude 126°15'W
93M/1E, 1W NTS 93L & 93M
on behalf of
QUINTANA MINERALS CORPORATION
Vancouver, B.C.

Field Work between January 30 and February 15, 1973

Report by: Alan Scott, B.Sc.
Delta, B.C.
March 15, 1973

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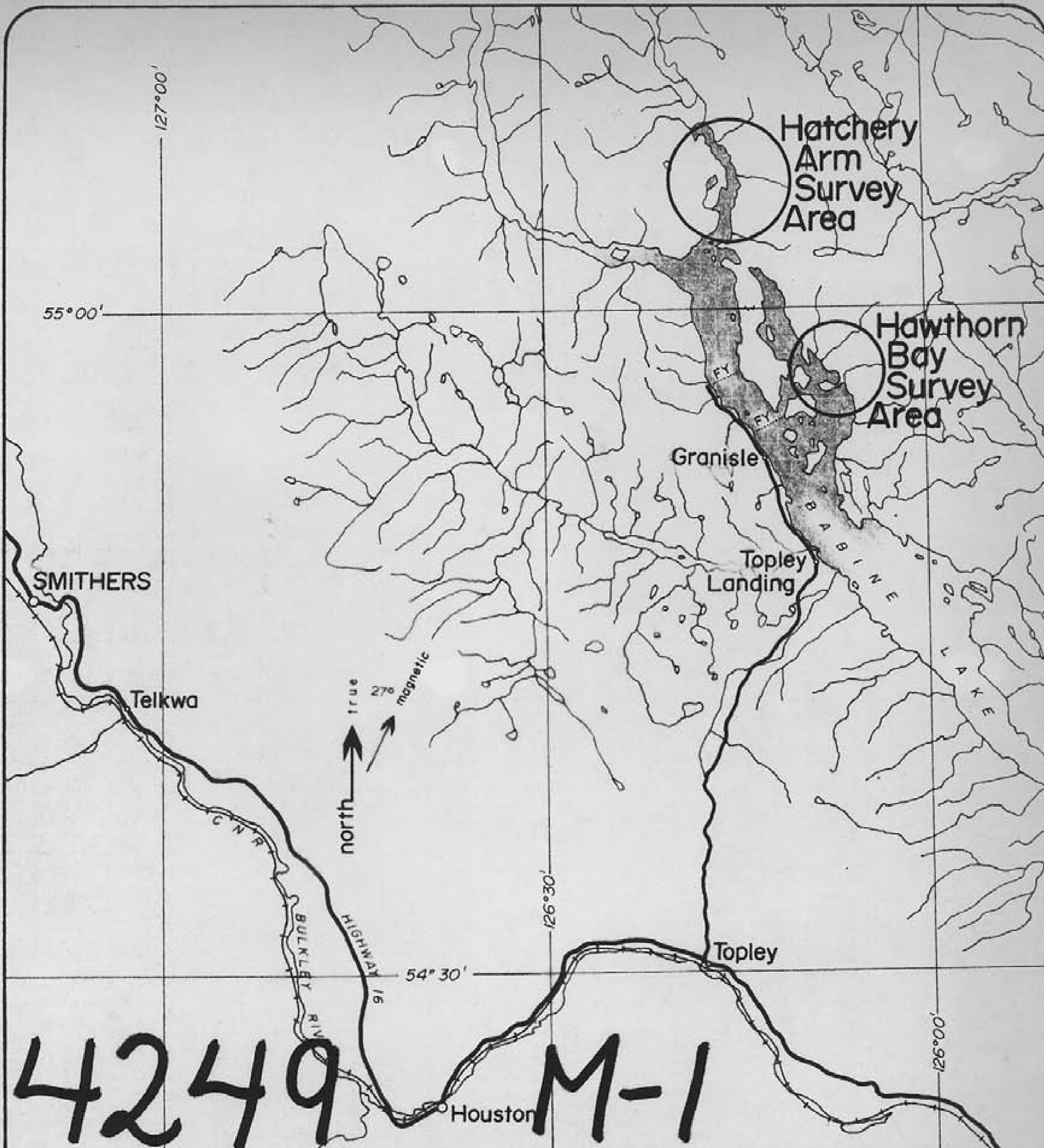


Quintana Minerals Corporation

Hawthorn Bay and Hatchery Arm
Gravity Surveys

Babine Lake Area - Omineca Mining Division

Scale 1: 500000 — 0 5 10 15 miles

Location Map

To accompany a geophysical report by A. SCOTT, B.Sc. dated Feb. 27, 1973

FIGURE I

A-1 INTRODUCTION

Between January 30 and February 15, 1973, the author and an assistant completed some 21.4 line miles of gravity surveying on behalf of Quintana Minerals Corporation of Vancouver, B.C.

Where readings were taken along roads or through the bush a stadia survey was conducted concurrently with the gravity survey to obtain the relative elevation and latitude of the stations. The relative latitude of readings obtained along the lakeshore was by reference to a 1" to 2000' topographic map.

Roughly equal amounts of work were done over two project areas, one at Hawthorn Bay and the other at Hatchery Arm. Both locations are geographic features along the east shore of Babine Lake, B.C.

The purpose of the survey was to determine the depth of overburden in the two areas. This report describes the field procedure, data processing and interpretation techniques employed. The results of the survey are discussed and the geophysical information and computed depths of overburden are presented in graphic form at the rear of the report.

A-2 SUMMARY AND CONCLUSIONS

1. Gravity results can be explained by many different combinations of density contrasts and depths of burial.

2. The particular case of estimating overburden thickness is quite sensitive to:

   a) the selection of the outcrop to outcrop trend, and

   b) the bedrock/overburden density contrast

3. Should future information reveal significant variations in the actual thickness to the estimated thickness at an early stage in any drilling programme that is undertaken, the values of (a) and/or (b) should be adjusted accordingly, to obtain better estimates in the rest of the area.

4. The data was corrected for latitude and elevation at Bouguer densities of 2.5, 2.7, and 2.9 g/cc. The profiles were interpreted using several density contrasts and depths of bedrock. The selected values given in this report are those that best fit the results to the available information.

5. Figure 8 is a contour plan and sectional view of the estimated overburden thicknesses in the Hawthorn Bay survey area, and constitutes the conclusions of that survey.

6. Figure 9 is a sectional view, and figure 10 is a plan view of the estimated overburden thicknesses from the Hatchery Arm survey. These figures constitute the conclusions of the Hatchery Arm survey.

Respectfully submitted

A. Scott, Geophysicist

B-1 LOCATION AND ACCESS

Hawthorn Bay and Hatchery Arm are situated on the east shore of Babine Lake, Omineca Mining Division, B.C. The survey areas are outlined on Figure 1 on the following page.

The Hawthorn Bay survey area is centered about Lat. 54°53' N by Long. 126°07' W and the NTS code is 93L.

The Hatchery Arm survey area is centered about Lat 55°07' N by Long. 126°16' W and the NTS code is 93M.

Access to the areas is by skidoo or boat from Granisle, B.C.

B-2 CLAIMS AND OWNERSHIP

Claims information is shown in Appendix V.

B-3 GEOLOGY

A detailed geological report of the area is to be filed for assessment credits on the adjoining claims by M. Wolfhard of Quintana Minerals Corporation.

B-4 FIELD PROCEDURE

A stadia survey was conducted simultaneously with the gravity survey to obtain the positions and elevations of the gravity stations.

One man went ahead with the gravity meter and rod, and the other followed with the theodolite. Each man had a triangular plywood platform to set on the snow as a level base for setting up the meter and the theodolite. The actual procedure is detailed below:

1. The meter/rod man moves to a new station up the survey line, normally 400 feet, and sets the rod in the middle of the plywood base.

2. While the meter/rod man was moving the surveyor was levelling the theodolite and reading the back horizontal angle. He now reads the rod intercepts and the vertical angle.

3. While the surveyor is moving up the line to the next station the meter/rod man is taking the gravity reading.

This method worked quite efficiently with both men having a roughly equal workload.

The meter/rod man kept notes that show the line and station number, the meter reading and the time of the reading. The surveyor kept notes that show the theodolite location, horizontal angle to the back and fore station, and the vertical angle and rod intercept at the fore station.

Gravity reading were looped to obtain time-drift corrections by checking into a base station at approximately 3 hour intervals.

(B-4 Cont'd.)

Surveying was unnecessary for those readings obtained along the lakeshore, as the lake is a level surface. Readings were taken at readily identifiable features along the shore for plotting purposes and to obtain the northing for the latitude correction of the gravity data.

B-5 DATA REDUCTION

Survey Data

The raw survey data consists of the back and fore horizontal angles and the vertical angle and rod reading of the fore station.

Using standard stadia reduction formula,* a programme was designed to compute the grid coordinates and elevations of the gravity stations in feet north, east and above the starting point. The procedure requires, in addition to the above, that the azimuth of the first line segment is known. This was obtained using a Brunton compass mounted on a tripod.

Gravity Data

The gravity instrument readings are in scale divisions. This was multiplied by the scale factor (1.0084) to obtain readings in gravity units (1 gu equals 0.1 milligals). A standard time drift curve was prepared each day from the base station readings and the data was corrected for this drift. Drift rates varied from 0 to plus/minus 1 gu per hour.

A programme was designed using standard gravity correction procedures** to calculate the latitude, free air and Bouguer corrections. These corrections were applied to the data to give the Bouguer gravity values (at Bouguer densities of 2.5, 2.7 and in some areas 2.9 g/cc.)

* Brinkner, Russell C., Elementary Surveying, 5th Edition, International Textbook Co., 1969.

** Grant and West, Interpretation Theory in Applied Geophysics, McGraw Hill, 1965.

(B-5 Cont'd.)

The survey and gravity data were reduced to the above form in the fi d with the aid of a Compucorp portable programmable calculator, and the best density selected for interpretation.

B-6 GROUND CONTROL

As gravity is extremely sensitive to changes in elevation, and to a lesser extent, to changes in latitude, very accurate locations of the gravity stations is necessary. Errors are on the order of 0.2 gu per 100 foot error in latitude and 0.7 gu per foot error in elevation.

Grid coordinates and elevations were obtained by stadia surveying and reference to prominent features along the lakeshore as discussed previously. A 1" to 2000 feet topographic map was available. This provides an accuracy of plus/minus 100 feet in position and, since the lake is a level surface, an accuracy of plus/minus 0 in elevation.

Only one stadia traverse was closed namely lines A and B at Hawthorn Bay. The traverse was 14,000 feet in length and the closure was 1 foot elevation and 3 feet in position.

C RESULTS AND INTERPRETATION

General

The results are presented in the following forms:

- relative Bouguer gravity values
- residual Bouguer gravity values
- interpreted depths of overburden plans and profiles

The calculation of the relative Bouguer gravity values has been discussed in the data processing section of this report.

Interpretation of the results follows a procedure outlined by Morris and Sultzbach (Mining Geophysics Vol. 2, SEG, 1967). Two basic assumptions are inherent in the procedure. They are that:

1. The density contrast of the overburden to bedrock is specified and
2. The source of the negative residual values is due to this density contrast.

Should future investigations reveal that the computed overburden thicknesses vary significantly from the actual thicknesses, the assumed density contrasts and depths should be readjusted and the data reinterpreted.

The calculation of the residual values is done by fitting a plane by a standard least squares procedure to the Bouguer values at known outcroppings and subtracting the Bouguer values from this plane. The resulting gravity lows in non-outcrop areas are assumed to represent the effect of the overburden/bedrock density contrast.

Profiles of the residuals were prepared and theoretical values were calculated for various density contrasts and bedrock/overburden forms, until the theoretical values matched the observed Bouguer values to within plus/minus 0.5 gu.

C-1 RESULTS AND INTERPRETATION .... HAWTHORN BAY SURVEY

Figure 2 (rear of report) is a base map showing the location of the gravity stations and figure 4 (rear of report) is a plan of the relative Bouguer gravity values (relative to a reading of 510.6 gu at station A_o), at a best fit Bouger density of 2.7 g/cc.

The outcrop to outcrop trend was calculated as the least squares plane to the Bouguer gravity at the 8 outcrops indicated on figure 4 (rear of report). The equation of the plane is g(x,y) equals 534.9 plus (0.00293) x minus (0.00011)y, that is the regional trend dips to the north west at 15 gu/mile west and at 0.6 gu/mile north.

Figure 5 is contoured residual gravity plan (rear of report). Cross-sections AA' and BB' were prepared and a best fit calculation of overburden thicknesses performed. A density contrast of 1.0 is necessary to fit the theoretical sections to the data when known overburden thicknesses at the indicated drill hole sites is taken into account.

Taking bedrock density at the outcrops to be 2.7 g/cc and the bulk of the overburden in this area to be composed of the glacial and glacial fluvial stratified drift at a density of from 1.73 to 2.0 g/cc, the density contrast of 1.0 seems rather high. There is some geological evidence that the underlying bedrock in the vicinity of the gravity low is composed in part of a lighter sedimentary material than the outerlying rocks. This would contribute to the low gravity values in this area and explain the high density contrast necessary to fit the data.

Figure 8 (rear of report) is a contoured plan and profile view of calculated overburden thicknesses in the Hawthorn Bay survey area and constitutes the interpretation of the survey.

C-2 RESULTS AND INTERPRETATION ... HATCHERY ARM

Figure 3 is a base map showing the location of the gravity stations and figure 5 is a plan of the Bouguer gravity values relative to a value of 522.4 gu at station A_o. The Bouguer density selected was 2.5 g/cc. Figures 3 and 5 are

(C-2 cont'd.)

enclosed in the map pocket at the rear of this report.

The outcrop to outcrop trend was computed as the least squares plane to the only three known outcrops in the survey area; at A_{21}, C_3 and in the vicinity of C_{24}. The equation of the plane is g(x,y) equals 535.7 plus (0.00169)x minus (0.000271)y, that is the regional dips to the northwest at 8.9 gu west and 1.4 gu north (per mile).

Observed Bouguer values were subtracted from this trend to give the residual values plotted on figure 7 (rear of report).

The residual values along west shore of the lake (line C) are of low amplitude varying from 7.0 to -3.7 at C_7 and C_{14} respectively. The low amplitude of the values likely indicates a fairly uniform covering of moderately thick overburden.

Overburden is estimated to be greater than 100 feet thick at those stations that have negative residual values (C_{14}, C_{15}, base, C_{21}, B_o, and D_1 to D_3). The rest of the lakeshore readings are positive and overburden thicknesses are estimated at less than 100 feet.

The relatively high values at stations C_4 to C_9 are thought to represent an increase in bedrock density in this area.

Depths of overburden along profile C_3A_{21} (figure 9) have been calculated using a density contrast of 0.5 g/cc. The outcrop at C_3 is rather small and isolated and the gravity reading may not be representative of a true outcrop value. As the calculations are extremely sensitive to the choice of the outcrop to outcrop trend, a low value at this outcrop would tend to increase the calculated depths. Hence values along profile C_3A_{21} should be considered to represent the minimum depths.

(C-2 Cont'd.)

The high amplitude change in residual values between stations B_{18} and B_{40} along profile $C_{24}B_{40}$(figure 9) has been interpreted as the response to a fault/ contact. The best fit model to the profile is for a faulted slab at a density contrast of .35 g/cc that is some 2000 feet thick and that is at a depth of some 50 feet and is dipping vertically.

The effect of such a fault/contact was calculated along the profile and the residuals subtracted from it to obtain the results in figure 9 (b). The trend was adjusted slightly, as indicated, and increases in the depth of overburden were calculated from the adjusted values.

Figure 9(c) is a cross-sectional view showing the location of the fault/contact and the depths of overburden.

Figure 11 is a plan of the survey area showing the estimated and calculated overburden thicknesses.

ALAN SCOTT
Geophysicist

APPENDIX I - CERTIFICATES

NAME:	Alan Scott
EDUCATION:	B.Sc. Geophysics (UBC), 1970
PROFESSIONAL ASSOCIATIONS:	Society Exploration Geophysicists B.C. Geophysical Society
EXPERIENCE:	One year surveying, South Okanagan Lands Project Two years geophysical instrument operator, Geo-X Surveys Ltd. Three years geophysicist, Cochrane Consultants Ltd.

NAME:	David Small
EXPERIENCE:	Several years prospecting in Yukon Two years general exploration with Quintana Minerals

NAME:	J.C. Rossier
EDUCATION:	Vocational training as architectural draftsman
EXPERIENCE:	Siegel Associates 1969-1972 Cochrane Consultants Ltd. 1972-present

APPENDIX II - SURVEY DETAILS

SURVEY:	Gravity and Stadia
SPONSOR:	Quintana Minerals Corporation, Vancouver, B.C
PROPERTIES:	Hawthorn Bay and Hatchery Arm
MINING DIVISION:	Omineca
LOCATION:	East shore of Babine Lake, B.C.

	Hawthorn Bay	Hatchery Arm
SURVEY MAN DAYS:	2 x 5	2 x 5
NUMBER OF READINGS:	70	104
LINE MILES:	10.4	11

STANDBY-MOBILIZATION: 2 x 5 man days

DATA PROCESSING, INTERPRETATION AND REPORT PREPARATION: A Scott 9 days

DRAFTING: J.C. Rossier 3 days

FIELD WORK: A. Scott

D. Small

APPENDIX III - COST

21.4 line miles gravity survey @ $280/mile	$5,992

Declared before me at the City

of Vancouver, in the

Province of British Columbia, this 12th

day of April 1973, A.D.

[signature]

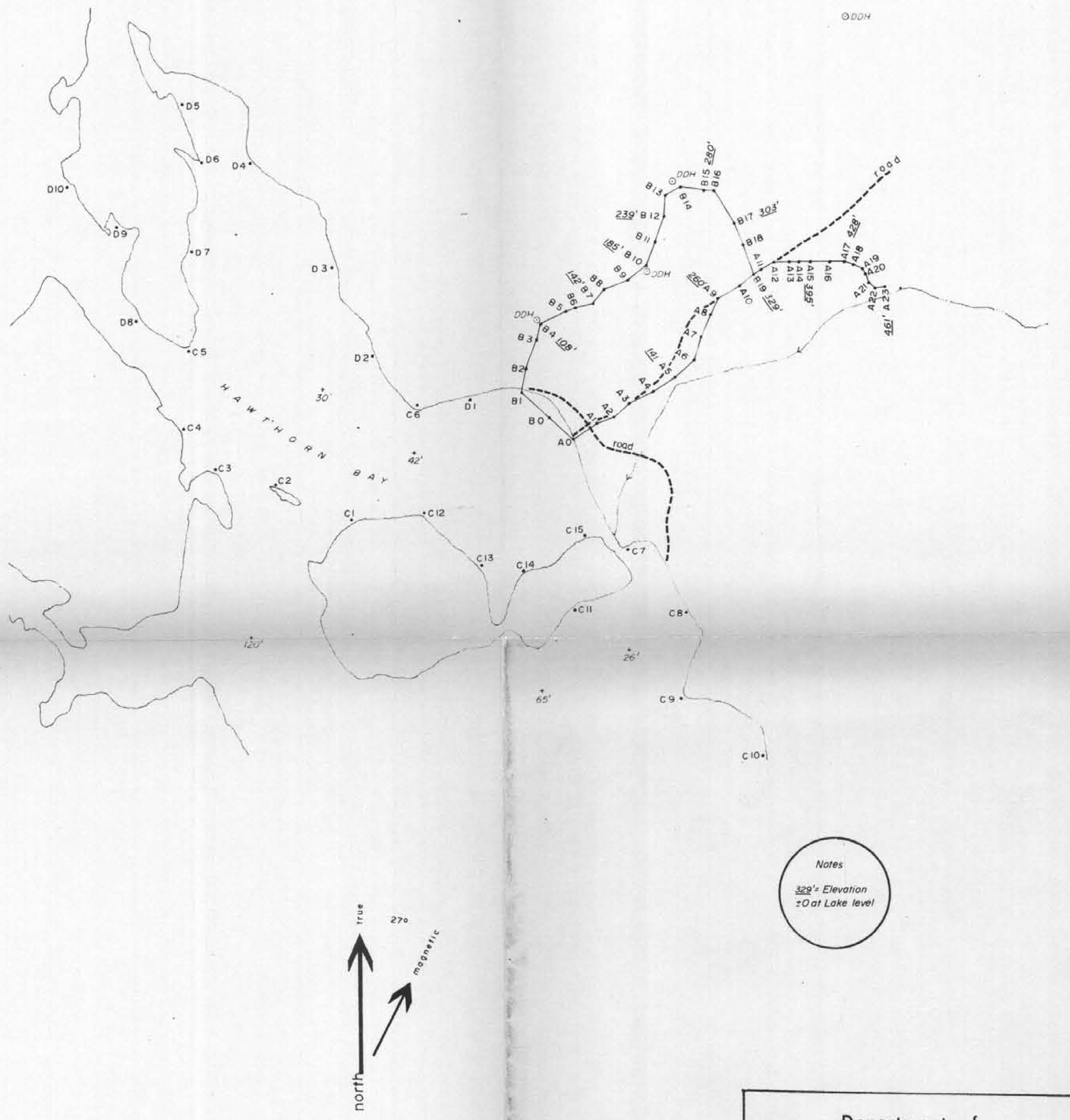
[signature] G. Phelps

A Commissioner for taking Affidavits within British Columbia or
A Notary Public in and for the Province of British Columbia.

SUB-MINING RECORDER

APPENDIX IV - INSTRUMENT SPECIFICATIONS

GRAVITY METER	Scintrex GG-2 (Prospector) 5000 mgal range 1000 divisions x scale constant fine range fine dial constant: 1.0084 gravity units/div. repeat accuracy 0.1 gu instrument drift: less than 1 gu per day
THEODOLITE	TE-DI stadia ratio: 100 stadia constant: 0 telescope power: 24 diameters optical plumbing
CALCULATOR	Compucorp Microscientist trig, log and exp functions 160 programme steps in two steps 10 memories powered by rechargeable ni-cad batteries



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4249 MAP #2

4249 M-2

Quintana Minerals Corporation

Hawthorn Bay Gravity Survey

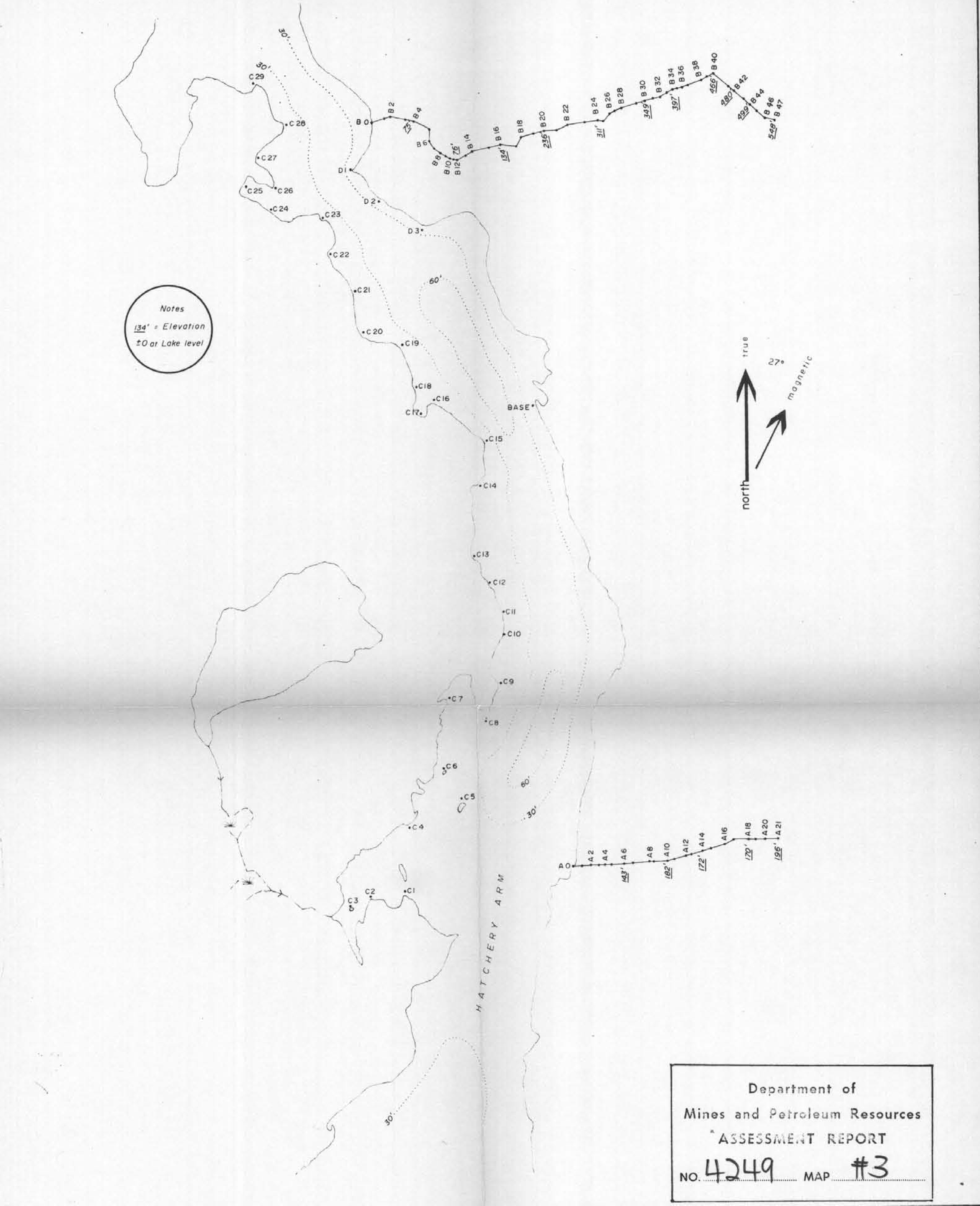
Babine Lake Area - Omineca Mining Division B.C.

Scale : 1 inch = 2000 feet   2000' 0 2000 feet

Base Map

To accompany a geophysical report by A. SCOTT, B. Sc. dated february 27, 1973

FIGU



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4249 MAP #3

Quintana Minerals Corporation

Hatchery Arm Gravity Survey

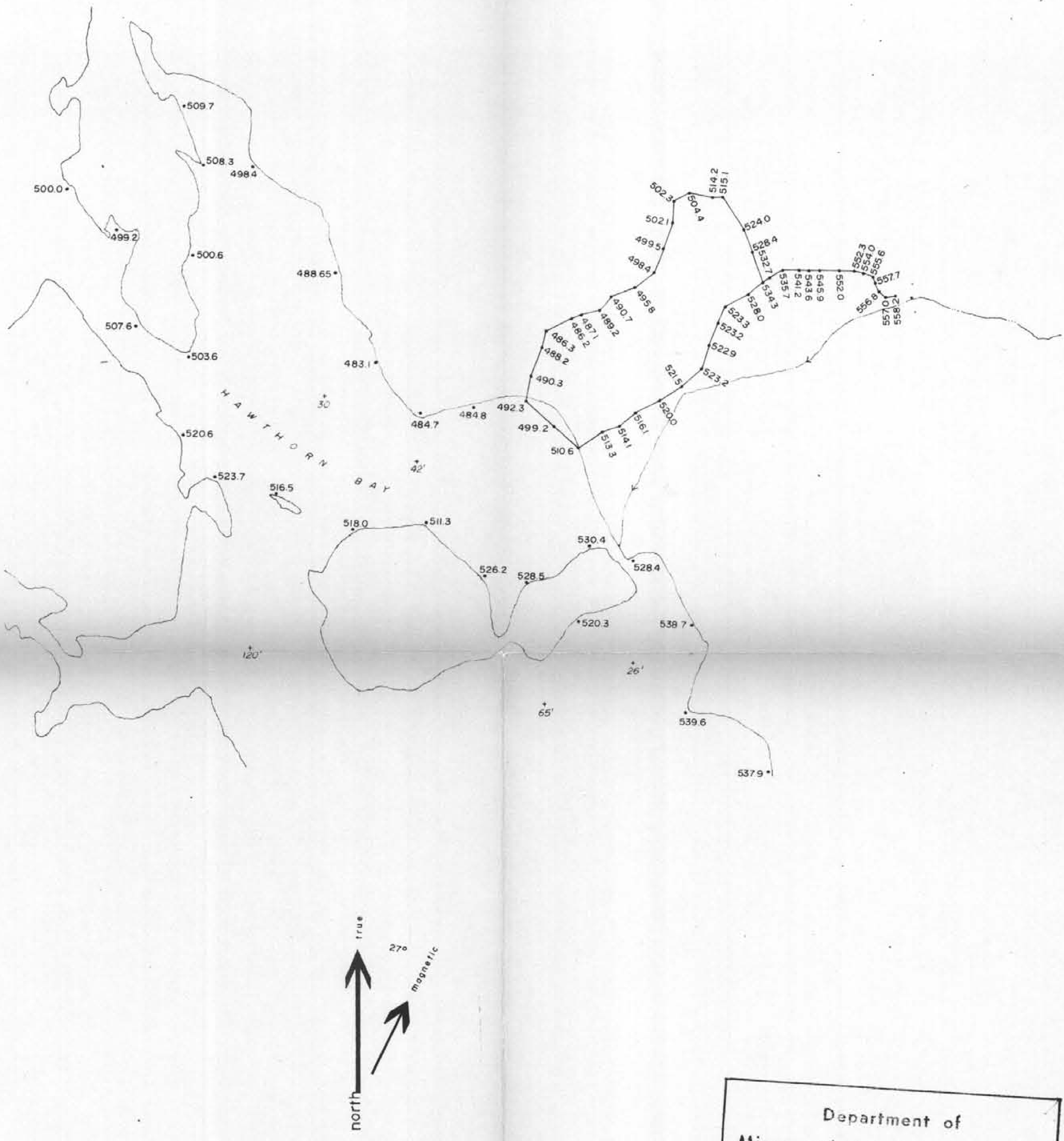
Babine Lake Area - Omineca Mining Division B.C.

Scale : 1 inch = 2000 feet 2000' 0 2000 feet

Base Map

To accompany a geophysical report by A. SCOTT, B.Sc. dated february 27, 1973

FIGURE 3



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4249 MAP #4

Quintana Minerals Corporation

Hawthorn Bay Gravity Survey

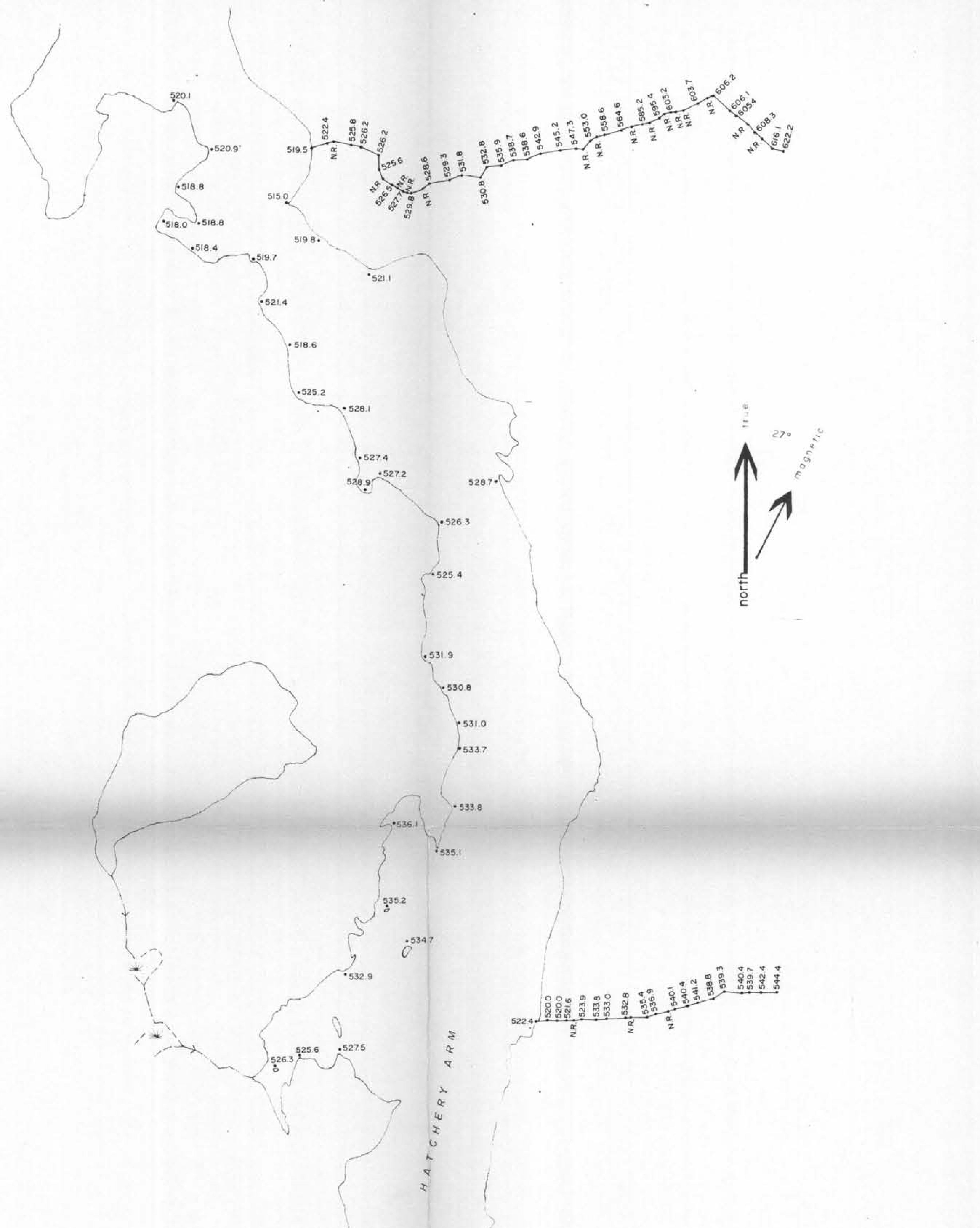
Babine Lake Area - Omineca Mining Division B.C.

Scale : 1 inch = 2000 feet   2000' 0 2000 feet

Relative Bouguer Gravity Plan (ρB = 2.7 g/cc)

To accompany a geophysical report by A. SCOTT, B. Sc. dated february 27, 1973

FIGURE 4



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4249 MAP #5

Quintana Minerals Corporation

Hatchery Arm Gravity Survey

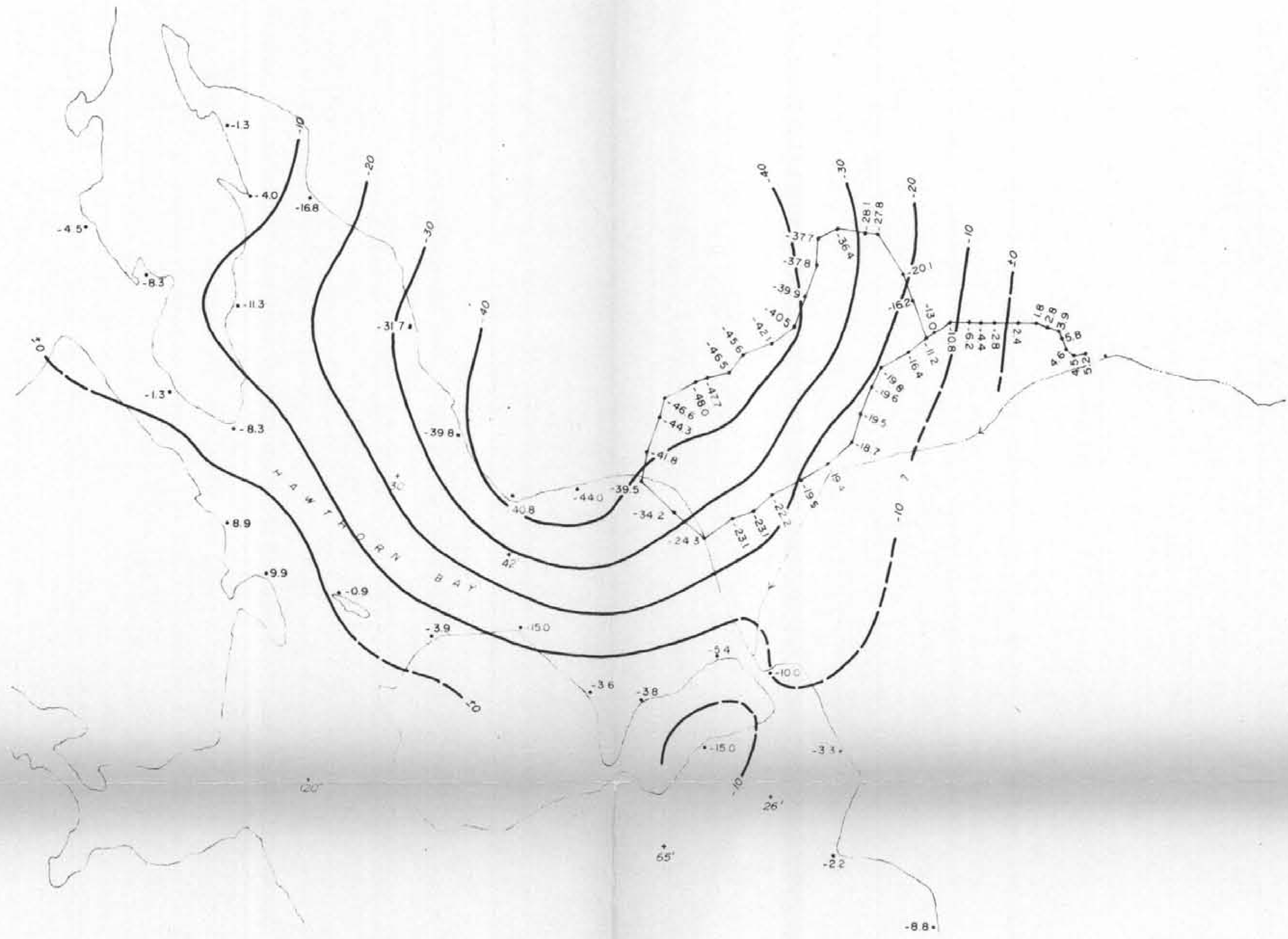
Babine Lake Area - Omineca Mining Division B.C.

Scale : 1 inch = 2000 feet   2000' 0 2000 feet

Relative Bouguer Gravity Plan (ρB = 2.5 g/cc)

To accompany a geophysical report by A. SCOTT, B.Sc. dated february 27, 1973

FIGURE 5



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ASSESSMENT REPORT
NO. 4249 MAP #6

Quintana Minerals Corporation

Hawthorn Bay Gravity Survey

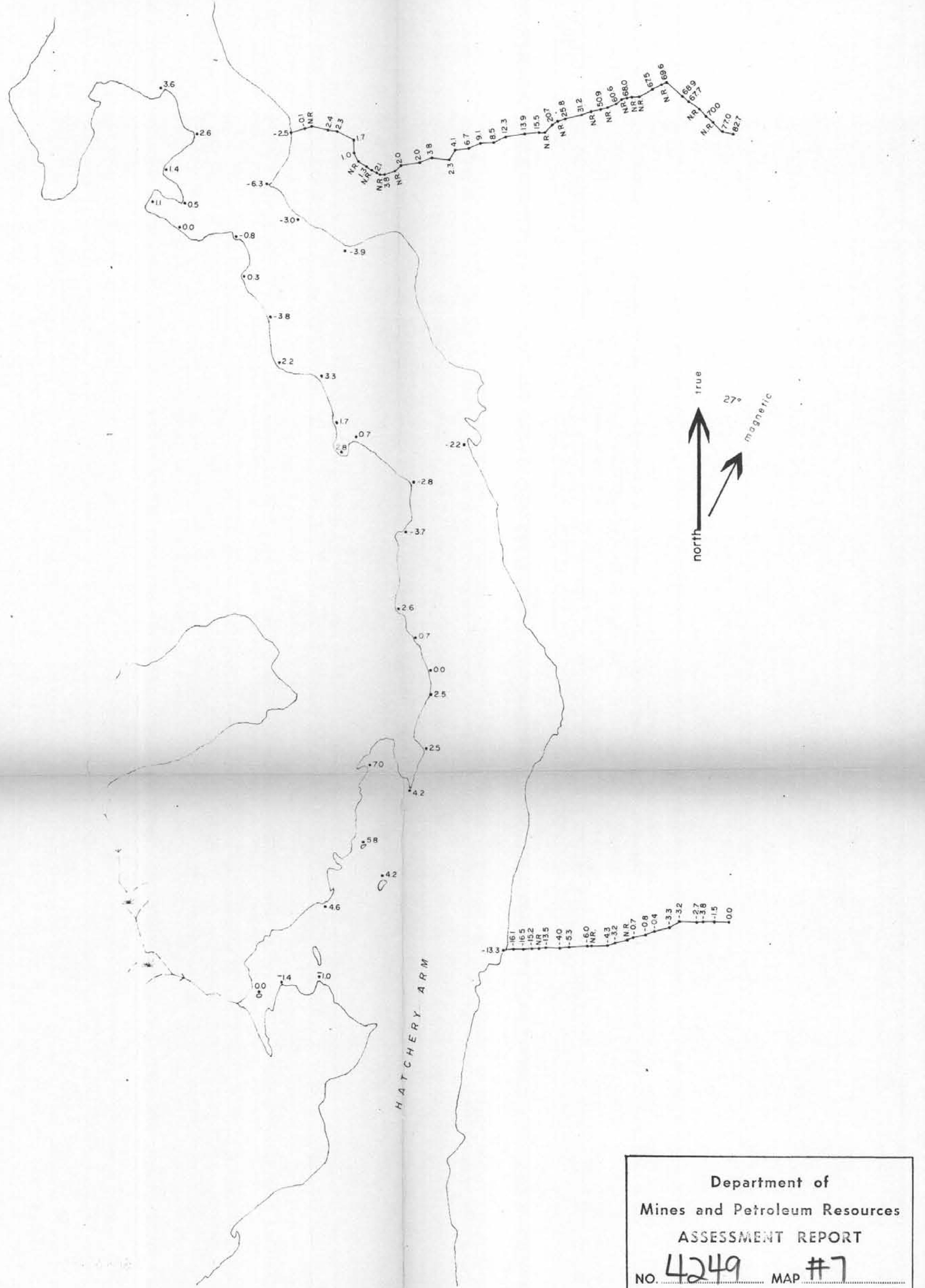
Babine Lake Area - Omineca Mining Division B.C.

Scale : 1 inch = 2000 feet   2000' 0 2000 feet

Residual Bouguer Gravity Plan (ρB = 2.7 g/cc)

To accompany a geophysical report by A. SCOTT, B. Sc. dated february 27, 1973

FIGURE 6



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NO. 4249 MAP #7

Quintana Minerals Corporation

Hatchery Arm Gravity Survey

Babine Lake Area - Omineca Mining Division B.C.

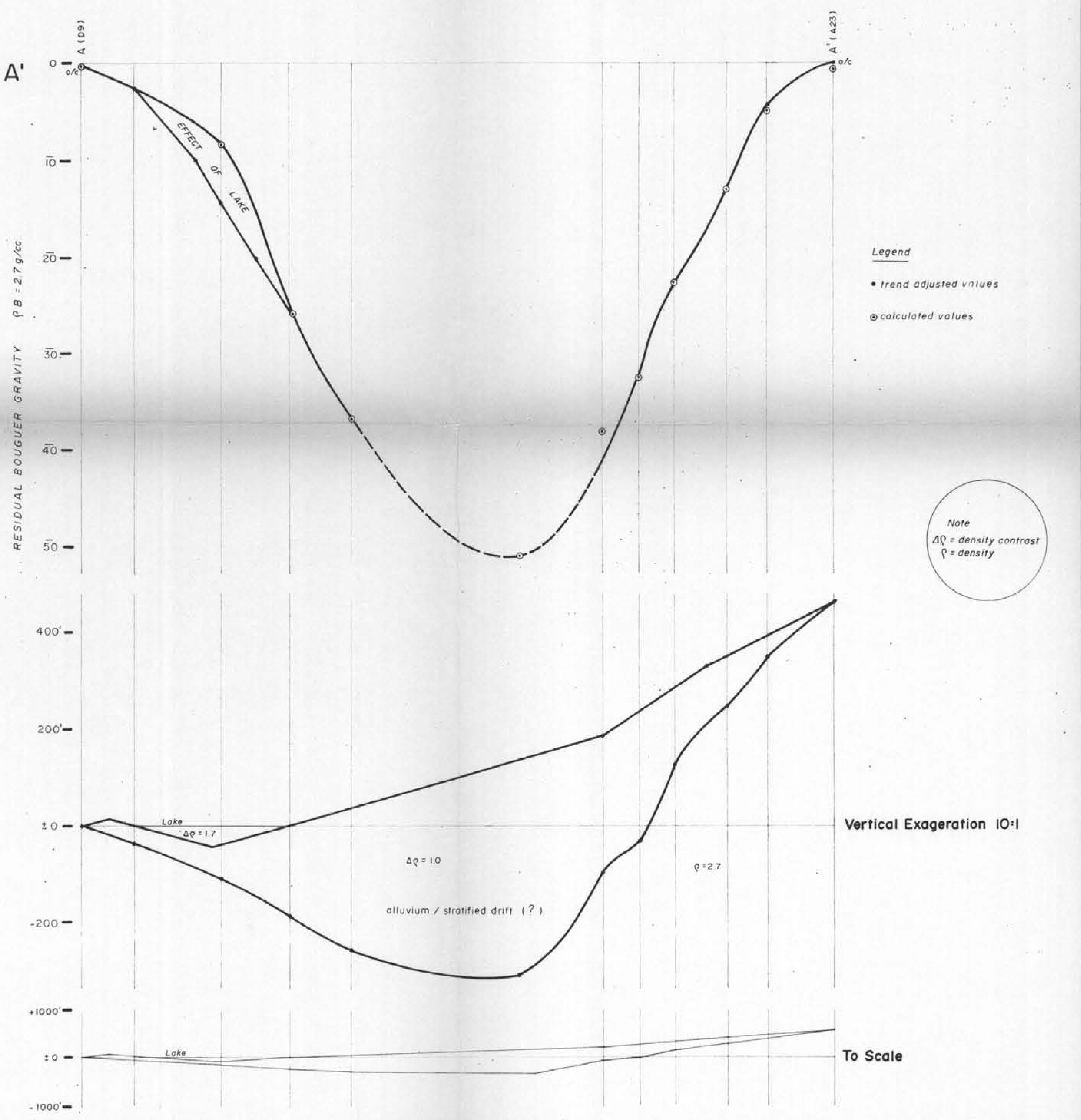
Scale : 1 inch = 2000 feet   2000' 0 2000 feet

Residual Bouguer Gravity Plan (ρB = 2.5 g/cc)

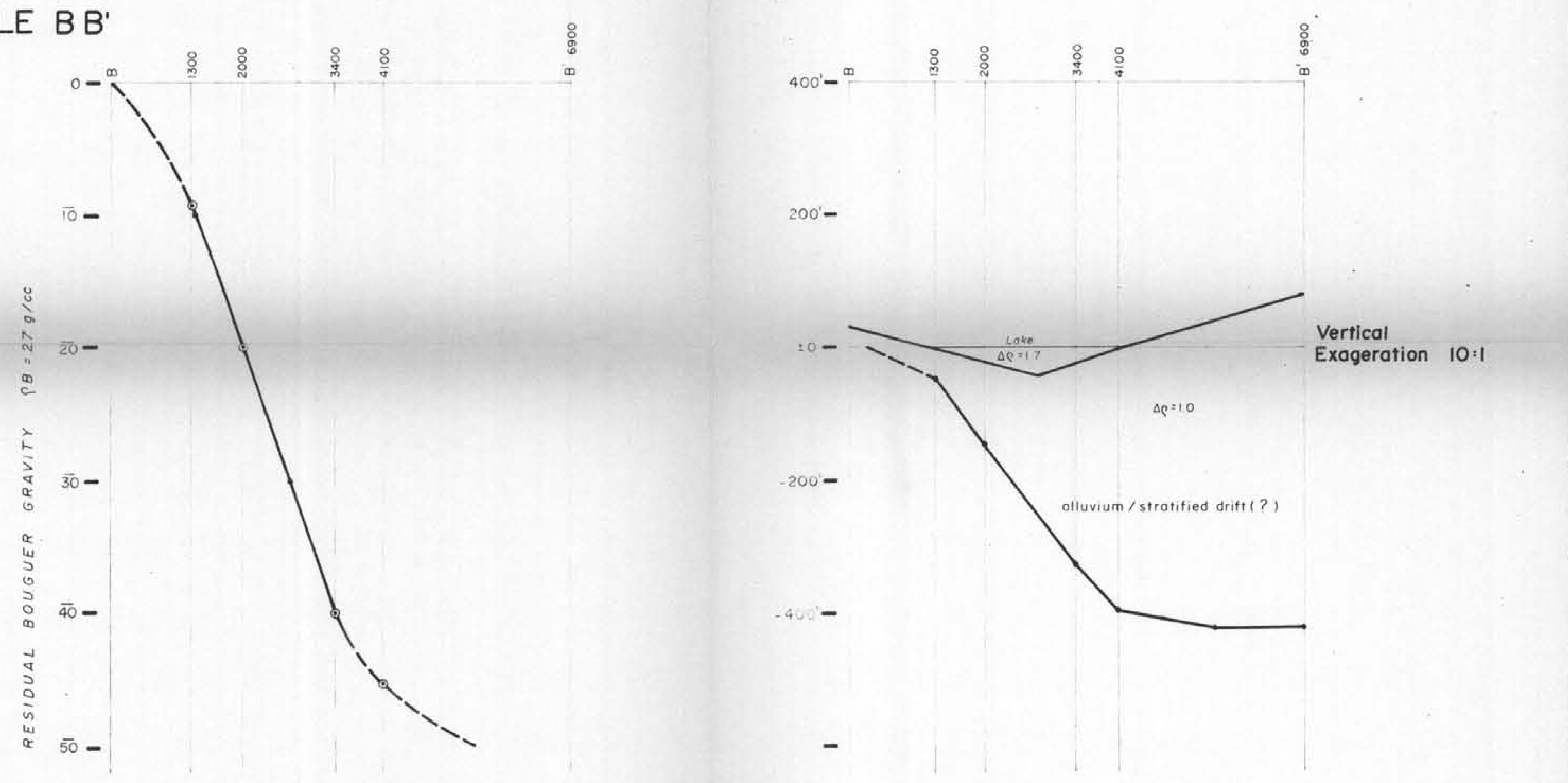
To accompany a geophysical report by A. SCOTT, B.Sc. dated february 27 1973

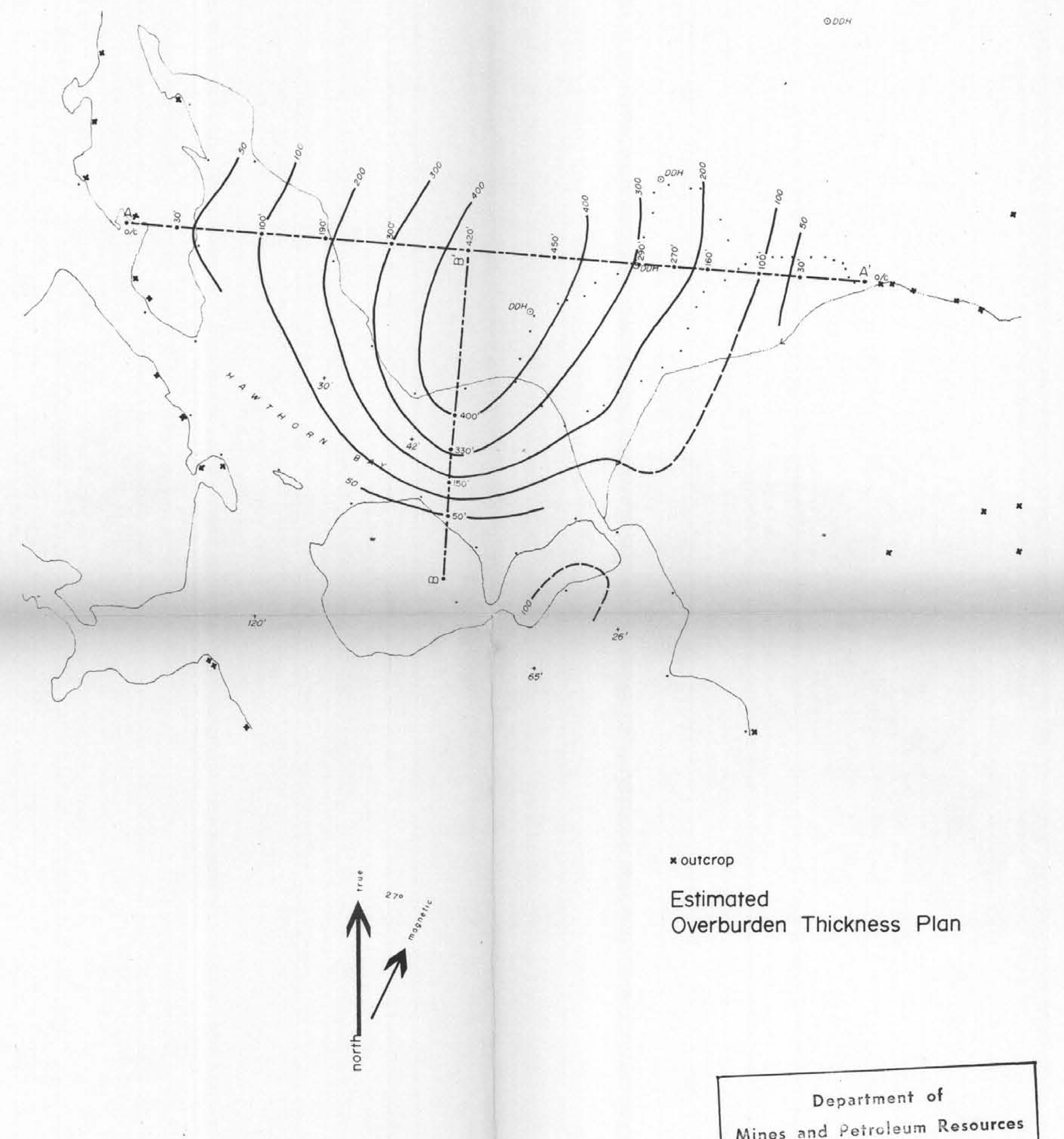
FIGURE 7

PROFILE A A'



PROFILE B B'





× outcrop

Estimated
Overburden Thickness Plan

Department of
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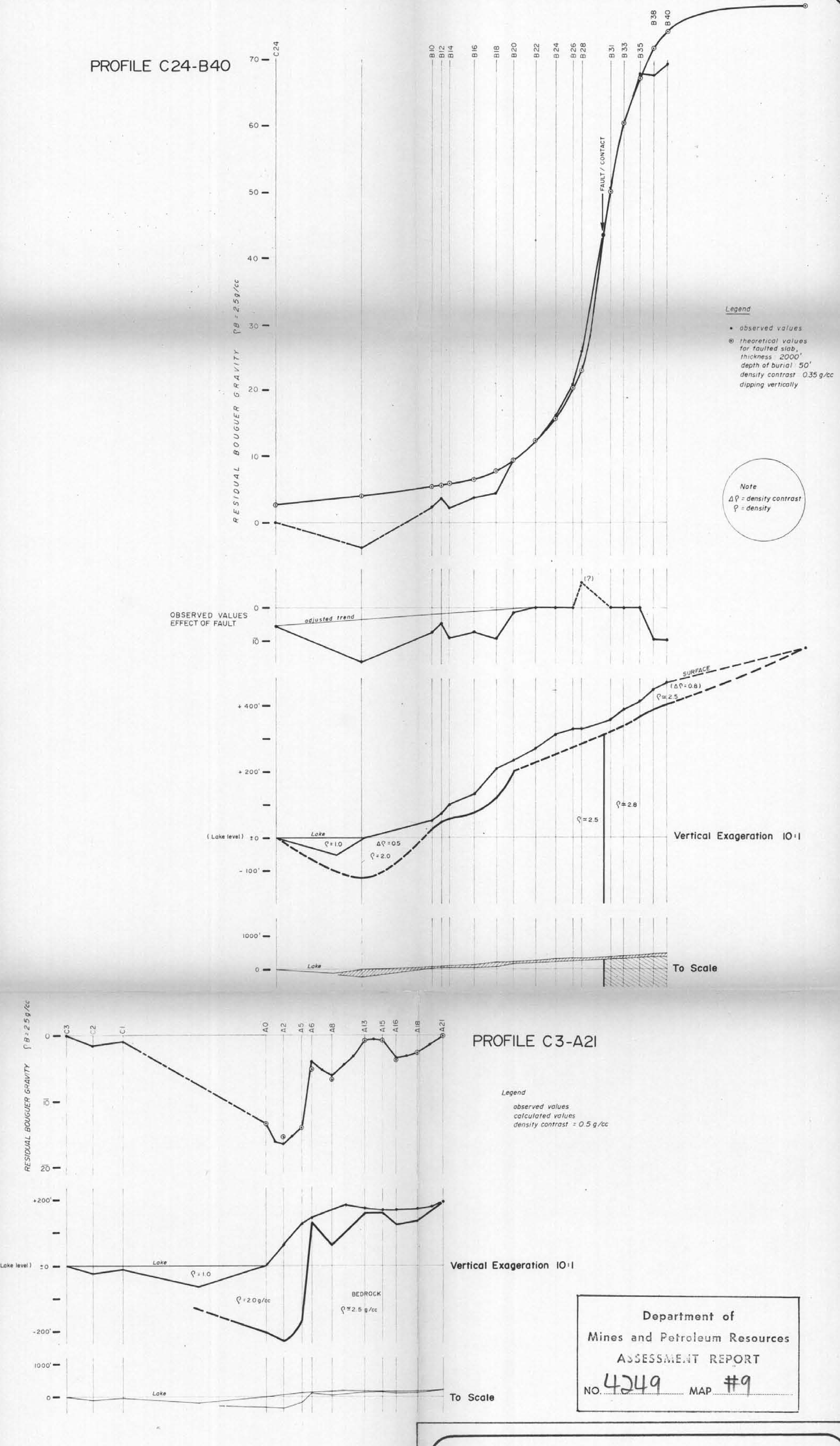
Quintana Minerals Corporation
Hawthorn Bay Gravity Survey
Babine Lake Area - Omineca Mining Division B.C.
Scale : 1 inch = 2000 feet 2000' 0 2000 feet
Interpretation Plan and Profiles
To accompany a geophysical report by A. SCOTT, B. Sc. dated february 27, 1973

FIGURE 8



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ASSESSMENT REPORT
NO. 4249 MAP #9

Quintana Minerals Corporation

Hatchery Arm Gravity Survey

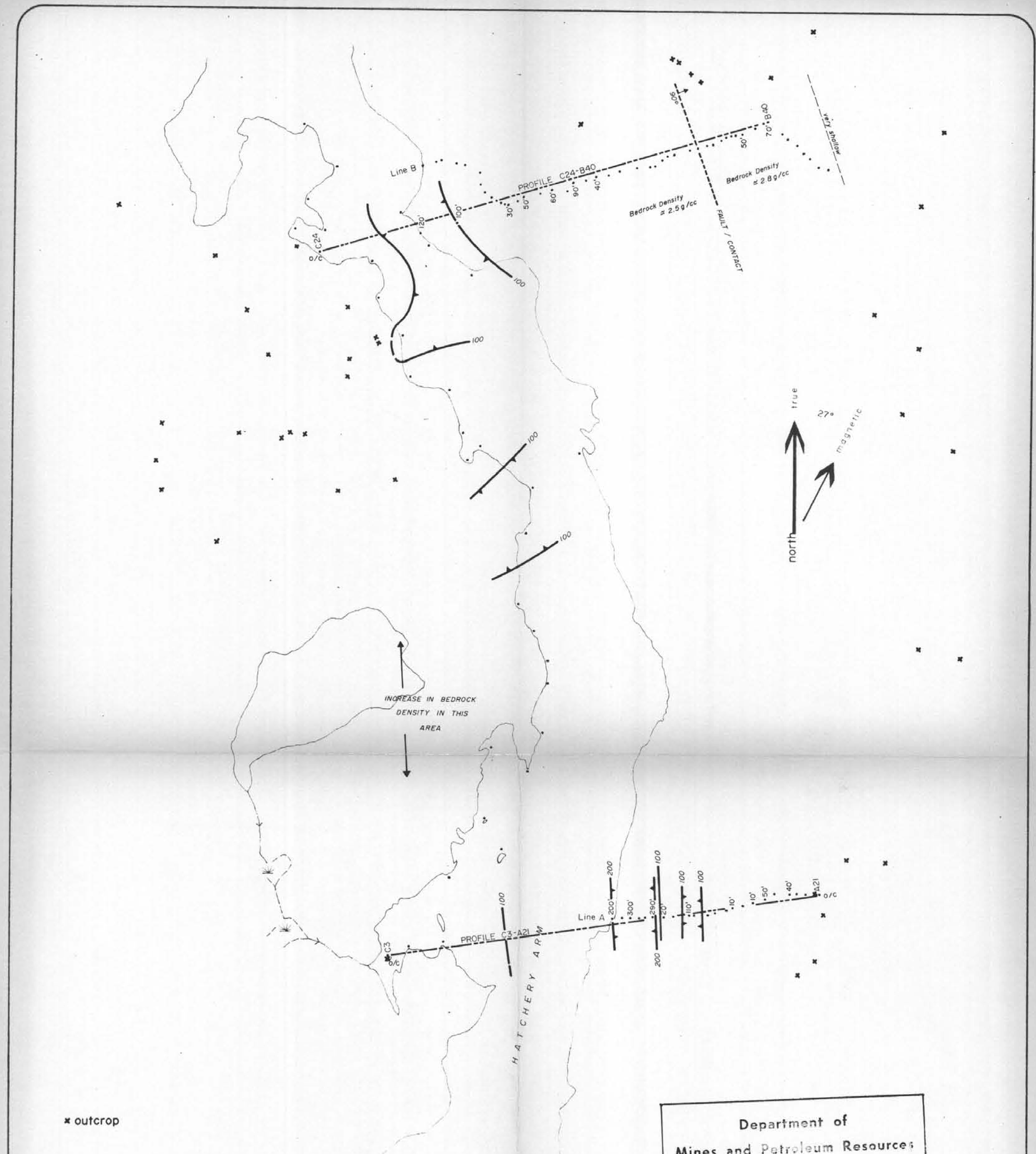
Babine Lake Area - Omineca Mining Division B.C.

Scale : 1 inch = 2000 feet   2000' 0 2000 feet

Interpretation Profiles

To accompany a geophysical report by A. SCOTT, B.Sc. dated february 27, 1973

FIGURE 9



Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4249 MAP #10

Quintana Minerals Corporation

Hatchery Arm Gravity Survey

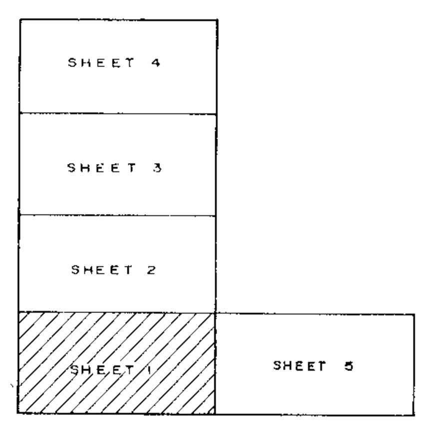
Babine Lake Area - Omineca Mining Division B.C.

Scale : 1 inch = 2000 feet   2000' 0 2000 feet

Interpretation Plan

To accompany a geophysical report by A. SCOTT, B.Sc. dated february 27, 1973

FIGURE 10



INDEX FOR ADJOINING SHEETS

QUINTANA MINERALS CORPORATION

BABINE PROJECT

CLAIM MAP

BRITISH COLUMBIA

SCALE

FEET 2000 0 2000 4000 6000 8000 FEET

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4349 MAP #11

December, 1971