DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 80/82

PRELIMINARY REPORT ON GRAVITY SURVEY IN THE POLDA BASIN AREA.

By

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JULY, 1980.

D.M. No. 125/77

CONTENTS

	PAGE
ABSTRACT	1
INTRODUCTION	1
METHOD	1
RESULTS	2
INTERPRETATION	3
CONCLUSIONS	4

PLANS

		DRAWING NO.
Fig. 1	Polda Basin Gravity Survey Lock-Elliston Topographic Plan	80-418
Fig. 2	Polda Basin Gravity Survey Bouguer Gravity Plan	80-419
Fig. 3	Lock Coal Deposit Gravity Interpretation Model.	80-420

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ABSTRACT

Since coal found near Lock appears to be associated with Bouguer gravity minima within the Polda Basin area, detailed gravity observations were undertaken in an attempt to locate boundaries to the coal bearing areas. This project is not yet complete. Additional observations followed by drilling of possible targets will be required to completely evaluate possible coal bearing areas.

INTRODUCTION

At the request of the Electricity Trust of South Australia and to assist hydrogeological investigations in the area a traverse was established along the Lock to Elliston Road to provide more detailed gravity information in the area adjacent to the Lock coalfield (Fig. 1).

METHOD

Stations were located and levelled at 200 m intervals by Electricity Trust of South Australia surveyors and gravity observations were taken at these stations by Departmental Field Assistant G. Galbraith:

To provide information over a wider area additional observations were made at seismic survey shot points and at drill holes, which had been levelled previously. Additional

stations were later established and levelled by survey personnel of the Department of Mines and Energy along roads crossing the Lock to Elliston Road (Fig. 1).

Gravity observations were tied to the State gravity network and levels to Lands Department third order bench marks.

RESULTS

Bouguer gravity values were calculated by allowing for elevation and latitude effects, and a gravity contour plan prepared (Fig. 2). Results were also recorded on the KIMBA section of the State gravity data file from which computer plots or listings can be obtained.

The known Jurassic coal sequence appears to be associated with a depression related to Bouguer gravity minima in the Lock area. To explain fully the gravity anomaly, a larger thickness of low density material than that present in the Jurassic and younger sediments as determined by drilling must be postulated.

Either older sediments of lower density than is normally consistent with crystalline rocks exist below the Jurassic beds containing the coal series, or there is a density contrast within the crystalline basement.

Densities determined on drill core samples of material from the Colton drill hole suggest that the average density for the core material described as Mt. Wedge grit is low relative to the average value for all surface rocks. (2.67 tonne/m^3).

TABLE 1

COLTON NO. 1

DEPTH	DENSITY (tonne/m^3)	MAGNETIC SUSCEPTIBILITY x 10^{-6} cgs units
110 m	2.16	15
111 m	2.01	30
112 m	2.19	12
113 m	2.27	2
114 m	2.17	11
115 m	2.4	18
116 m	2.5	22
117 m	2.5	22
118 m	2.45	14
119 m	1.84	31
120 m	2.58	15
121 m	2.11	7
122 m	2.23	0
123 m	2.24	4
124 m	2.28	4
average	2.25 $\pm$ 0.18	

Surface samples taken near Talia Caves and from Mt Wedge average 2.42 $\pm$ 0.05 tonne/m^3 for the four samples measured. Assuming less than 10% porosity the bulk density in situ should not exceed 2.5 tonne/m^3.

INTERPRETATION

There is thus the possibility of much older rocks (Proterozoic) of not particularly high metamorphic grade and with consequently low densities existing within the Polda Basin with thicknesses of up to 2 000 m.

Consolidation after deposition of this material could have led to the formation of basins within which the younger sediments were deposited, hence the relation between gravity minima and coal bearing sediments.

The gravity gradient to the north of the known coal area is steeper than elsewhere, probably due to a fault bounding the coal bearing area. To the south the gravity gradient is more gradual suggesting a dipping basement in this area.

Fig. 3 shows a mathematical model which will satisfy the residual gravity values after a north-south regional gradient has been removed.

The Polda pumping station appears to lie in a similar area of negative gravity values displaced to the north of the depression associated with the Lock coalfield.

CONCLUSIONS

The gravity method seems to be the best geophysical reconnaissance method available in this area, but the negative gravity anomalies found require further investigations with seismic methods and drilling. More gravity observations are required to give sufficently detailed cover to permit construction of residual gravity maps after removal of regional effects arising from very deep seated changes in rock type.

D. McPHARLIN

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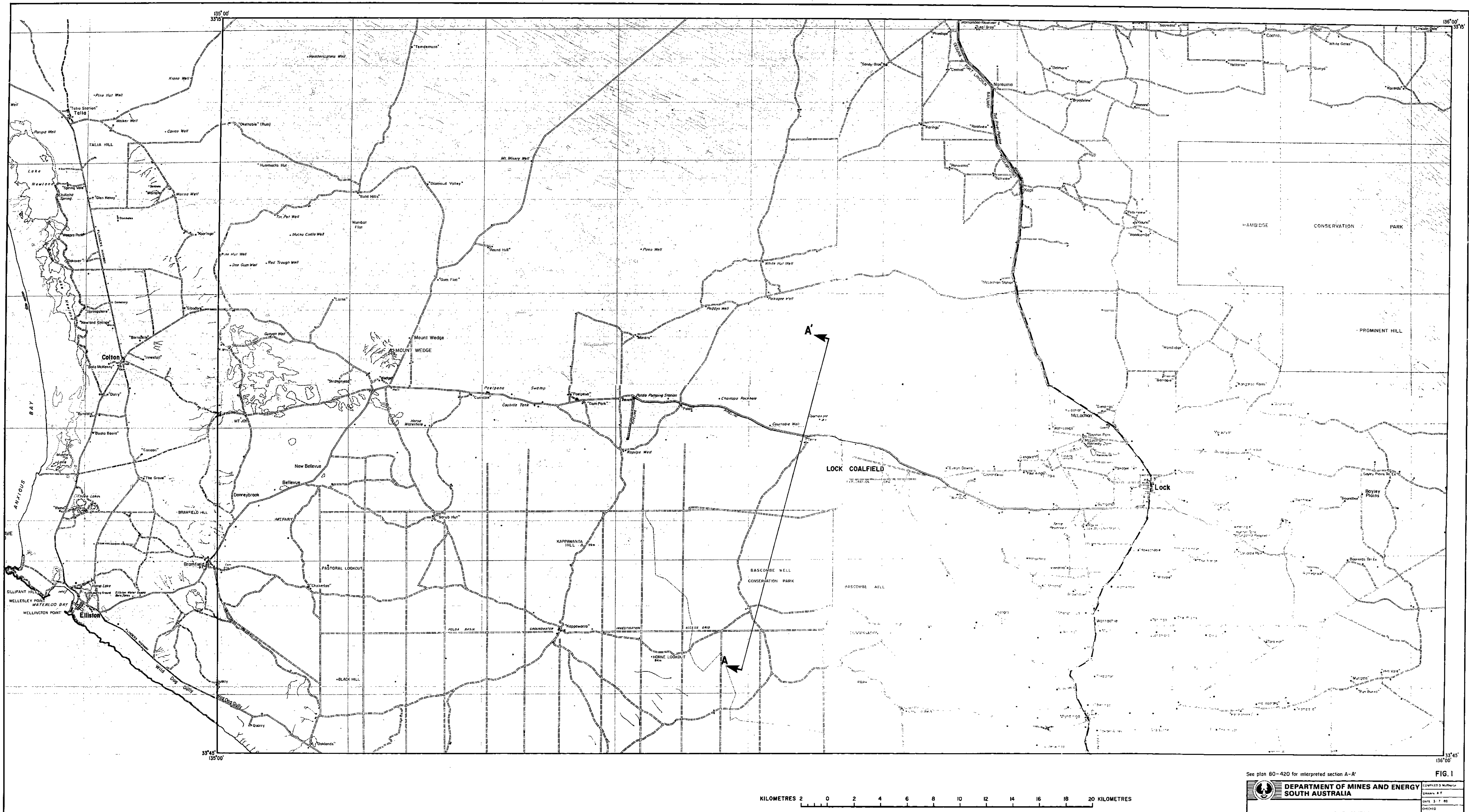

See plan 80–420 for interpreted section A–A'

FIG. 1

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POLDA BASIN GRAVITY SURVEY

LOCK–ELLISTON TOPOGRAPHIC PLAN

COMPILED D McPharlin	
DRAWN A F	
DATE 3-7-80	
CHECKED	
C.G.O. DATE	
SCALE 1:100 000	
PLAN NUMBER	80-418

135° 00'
33° 15'

136° 00'
33° 15'

33° 45'
135° 00'

33° 45'
136° 00'

X-29·9 Regional survey data point (from Kimba 1:250 000 sheet)

·-96 Detailed traverse data point

Contour interval 1·0 milligal

KILOMETRES 2 0 2 4 6 8 10 12 14 16 18 20 KILOMETRES

Density for bouguer correction 2·67 t/m³

FIG. 2

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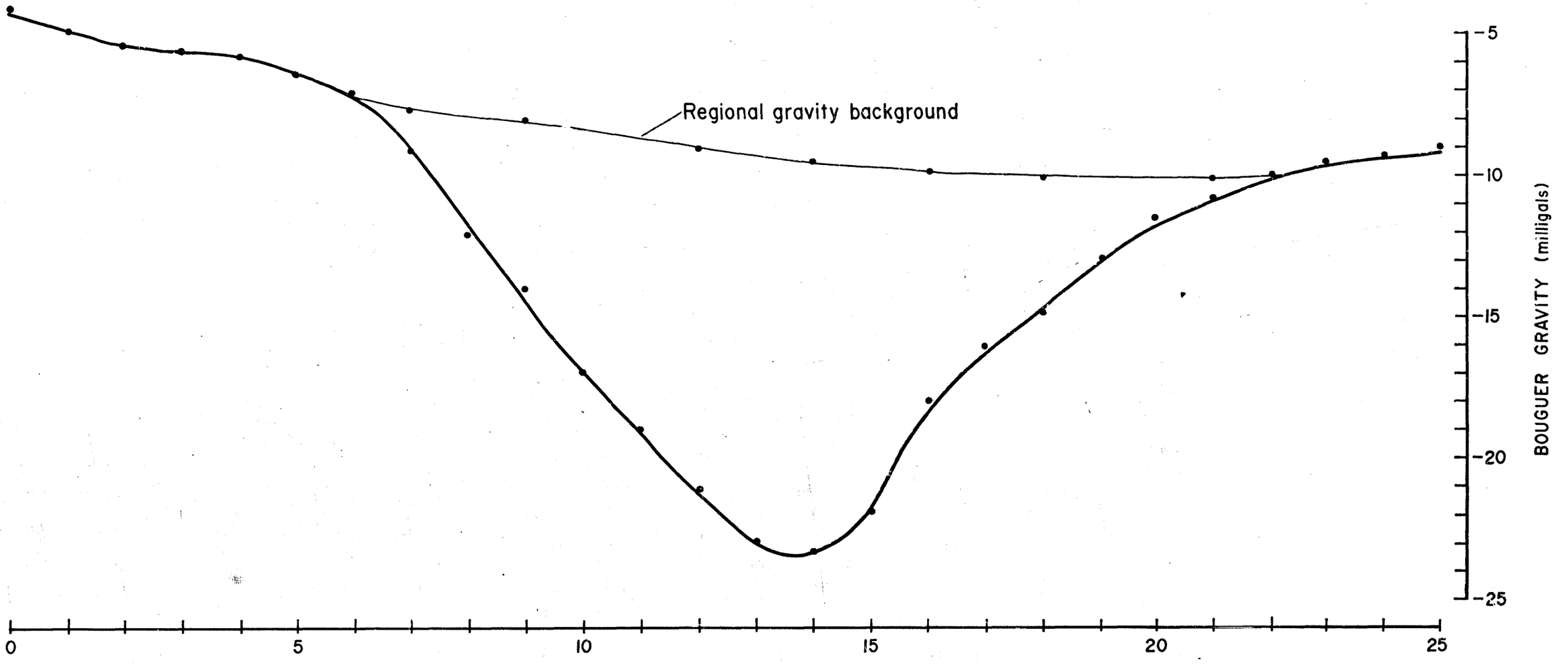
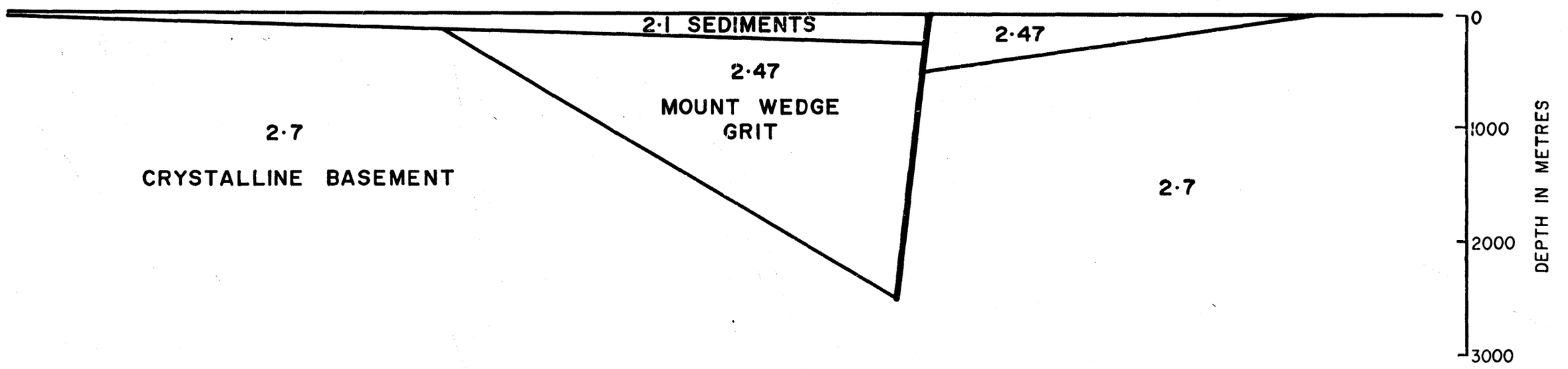
POLDA BASIN GRAVITY SURVEY
BOUGUER GRAVITY PLAN

DRAWN
DATE
RECEIVED
DATE
SCALE 1:50 000
PLAN NUMBER
80-419

A

A'





For location of section see plan 80-418

FIG. 3

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LOCK COAL DEPOSIT
GRAVITY INTERPRETATION MODEL

COMPILED	D. McP.
DRAWN	A.F.
DATE	3·7·80
CHECKED	
CDO	22·7·80 DATE
SCALE	—
PLAN NUMBER	80-420

1981