BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

RECORD No 1985/16

MUNDARING GEOPHYSICAL OBSERVATORY

ANNUAL REPORT 1982

by

P.J. Gregson

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CONTENTS

TABLES

FIGURES

SUMMARY

Basic programs in geomagnetism, ionspherics, and seismology continued at the Mundaring Geophysical Observatory during 1982. The main instruments were an Eschenhagen normal-run magnetograph, an IPS type 4B ionosonde, a Worldwide Standard Seismograph, and a Seismic Research Observatory.

Seismographs were operated at Kalgoorlie, Kellerberrin, Kununurra, Marble Bar, Meekatharra, Mundaring, Nanutarra, Narrogin, and Warburton.

A regional seismograph was installed at Ballidu on 27 August.

The annual earthquake lists show details of 224 Western Australian earthquakes, 164 of which occured in the Southwest Seismic Zone.

Isoseismal maps were prepared for earthquakes that occurred near Cadoux on 24 January and 6 February.

1. INTRODUCTION

The Mundaring Geophysical Observatory opened on 18 March 1959, and now controls seismological recording at Ballidu, Kalgoorlie, Kellerberrin, Kununurra Marble Bar, Meekatharra, Mundaring, Nanutarra, Narrogin and Warburton; magnetic recording at Gnangara and ionspheric recording at Mundaring. The seismograph at Narrogin is a Seismic Research Observatory (SRO) and is operated in co-operation with the United States Geological Survey.

Descriptions of the observatory and an outline of activity there to principal events in the observatory's history are given in the appendix.
Discussion of non-routine projects is brief, as details will be reported separately.

2. STAFF AND VISITORS

Observatory staff is listed in Table 1, and other personnel associated with the observatory's operations in Table 2. Staff absences, for reasons other than recreation leave are summarised in Table 3, and conferences attended and addresses given, in Table 4. P.J. Gregson was a member of the Geophysics Advisory Committee, Western Australia Institute of Technology and the seismological data base sub-committee of the Accreditation Technical Experts Natural Disasters (ATEND).

Mr P.J. Gregson was on temporary transfer to headquarters, Canberra, for 6 weeks in August and September. Mr B.A. Gaull was promoted to Science Class 3 on 1 July and will be transfered to headquarters early in January 1983. Mr B.J. Page (Technical Officer, Grade 1) carried out relief duties at Macquarie Island from 23 October through to February 1983.

Mr R. Cechet, Dr P. Lawrence and Miss P. Kelsey were trained in observatory practice in preparation for Antarctic duty in 1983.

Visitors to the observatory during 1982 are listed in Table 5.

3. GEOMAGNETISM

Normal Magnetograph

An Eschenhagen 20mm/hr magnetograph operated continuosly at Gnangara, recording the three components D, H and Z.

Record trace intensities fluctuated on several occasions during January. The recorder lamp intensity potentiometers were cleaned. Two days' records were lost owing to fogging and the lamps not being turned on; total record loss was less than 1%.

The trace and timemark lamps were moved closer to the drum in May to move all traces up the magnetogram. This was necessary to prevent Z timemark and scale value spots moving off the magnetogram during the daytime.

The H-trace ordinate was increased by about 24mm on 23 November in order to reduce the time for which the H ordinate was negative. There were no other

changes in either scale or base values during the year. As in previous years, the Z scale value drifted during the year. It changed from 5.86nT/mm in April to a peak in August of 6.36nT/mm; the drift reversed between September and November. Adpoted baseline and scale values for 1982 are given in Tables 9 and 10 respectively.

The standard deviations of the observed baseline and scale values were:

Element	Baseline value	Scale value
D	1.5 nt (0.2 min)	-
H	1.4 nT	0.02 nT/mm
Z	1.7 nT	0.03 nT/mm

The deviation for the D baseline was slightly higher than that obtained in 1981. This was probably due to more inexperienced operators than in previous years. The other values were similar to those obtained in previous years.

Magnetograph tests

Temperature coefficients. Values of qH = 0.0 nT/ C and qZ = 2.9 nT/ C derived from 1979 and 1980 data were used throughout 1982. Least squares analysis of 1982 baseline values showed that qZ = 3.2 nT/ C, and this value will be used from 1983.

The drift in Z scale value showed a good correlation with temperature. Least-squares analysis gave the following relation:

$$SZ = SZ \quad - 0.05(t-20) \text{ nT/mm}$$

where SZ is the scale value at 20 C.

Orientation. Orientation tests were carried out on all variometers on 21 July and on the H and D variometers on 2 November. Another orientation test was made on the H variometer following an ordinate adjustment on 23 November. Results are given in Table 7 and were consistent with the previous test carried out in May 1981.

Parallax. No tests were performed during 1982 and it was assumed that the parallax remained unchanged from previous years. During 1973 it had been found that the parallax on variation trace time-mark spots (but not on baseline spots or hour lines) was zero on all components. The parallax for other time-marks can be measured from the trace time-marks.

Scale values. A magnetograph calibrator MCO2 was used in conjunction with Helmholtz coils to determine H and Z scale values once weekly. The D scale value was determined using the Helmholtz coils on 21 July and 4 November. The scale value was calculated as 1.09 min/mm (7.47 nT/mm), on both occasions.

Magnetometers

Absolute observations for D,H, and Z values were made at weekly intervals. An Askania magnetometer (S/N 309319, circle 580135) was used throughout the year for D observations. A proton vector magnetometer (PVM B/5/Z) was used for combined observations of F and Z values (cancellation method). The PVM consisted of Elsec vector coils (set B), an MNS-2 proton-precession magnetometer (S/N 5) and sensor (S/N Z). H values were calculated from F and Z values.

Preliminary corrections used during the year were:

(a) PVM B/5/Z : H OnT, Z OnT

(b) Askania declinometer 509319 (circle 580135) : +0.5 minutes.

Comparisons. A series of H observations were made in September and October using QHM293 on the pier NE. Differences from routine baseline values using PVM B/5/2 were determined for 15 values; the mean being:

H.293 - H.B/5/2 = 8.2 +/- 0.8 nT

F comparisons were made by alternate obsevations using the PPM and a first-order magnetic survey Austral instrument on 14 September. Piers NE and NM were used and the instruments were changed during sets of observations. Obsevations made on 5 and 24 August were discarded as being unreliable. The mean of 80 observations was:

F. Austral,35 - F. MNS2,5 = 0.6 +/- 0.7 nT

H comparsions were made through baseline values between the Gnangara PVM pier NM, travelling standard QHM 460's pier NE and DIM 3207 pier NE, between 4 August and 14 September. The mean results were:

H.PVM B/5/Z - H.460 = -2.3 +/- 1.1 nT (18 observations)

H.PVM B/5/Z - H.461 = -2.3 +/- 1.2 nT (18 observations)

H.PVM B/5/Z - H.462 = +1.2 +/- 1.3 nT (14 observations)

H.PVM B/5/Z - H.DIM 3207 = 0.4 +/- 0.4 nT (12 observations)

The mean horizontal intensity was 23310 nT and the pier difference was assumed to be negligible.

D comparisions were made through baselines between the Gnangara declinometer and DIM 3207, between 3 August and 15 September with the result:

D.319 - D.DIM 3207 = -1.7 +/- 0.6 minutes (130 observations)

Reference Marks

The Australian Survey Office (ASO) checked the azimuth of the mark E from pier NE in May (ASO field book 10256). The azimuth determined was 77 23'34" which is 0.4' higher than that being used. The new value was used in all calculations from 1 January 1982.

Two auxiliary reference marks were installed at Gnangara. Their locations with respect to pier NE are shown in Figure 1. Rounds of angle measurements where made on 11 August, 20 September and 7 October and consistent azimuths were obtained for each reference mark. The adopted values based on the ASO azimuth for mark E were:

From Pier NE	Mark E	Mark N	Mark NW
Azimuth	77 23.6'	03 10.4'	190 59.4'
Distance (m)	72.12	122.87	77.18

Accessory equipment

The Askania H visual variograph at Mundaring office was operated throughout the year with minor record losses. The recorder was in August by an Esterline

Angus recorder (ex SRO) as paper and print ribbons were no longer readily available for the original Askania recorder.

A magnetic pulsations tape recorder was operated at the Weir site for the University of Newcastle, until the power supply failed on the 21 December. Recording will be restored early in 1983. Other operational problems were minor.

First order magnetic survey

Mr B.A. Gaull occupied the first order magnetic stations at Port Hedland and Telfer in August; the results will be reported separately.

Data reduction and publication

Magnetograms and reduction data were prepared in monthly batches about six weeks after the end of the month and sent to headquarters for reduction to mean hourly values.

Adopted scale values and baseline values are listed in Tables 9 and 10 respectively.

Monthly and annual mean values of H, D, Z, F and K-index for 1982 are listed in Table 7. The field values were derived from the five local quiet days each month by scaling a mean ordinate for each component from each magnetogram. The F value was calculated from H and Z values. Annual values and secular variation for all components since 1972 are shown in Table 8. Apart from D, recent trends in secular variation continued with H decreasing by 38 nT, Z decreasing in magnitude by 29 nT and the calculated mean value of F rising by 9nT during 1982. The mean value of D remained approximately the same as for 1981.

The routine distribution and publication of data is listed in Table 11. Components of K-index are stored on magnetic tape at headquarters. Checked data for rapid variations, solar flare effects, and principal magnetic storms for 1981 were prepared for the IAGA Bulletin.

Requests for geomagnetic data attended to during the year are listed in Table 14.

4. IONOSPHERICS

Equipment

A quarter-hourly sounding schedule was continued throughout the year using a model 4B ionosonde. The ionosonde spare components and film were supplied by the Ionospheric Prediction Service (IPS), Department of Science and Technology.

The equipment operated satisfactorily during the year. Record loss wa slow, the main cause being the film jamming in the cassette.

Data distribution and publication

The F2 layer critical freqency at each six hours UT and local noon were scaled. The six-hourly values were sent to IPS for distribution internationally and the monthly median of the noon values was telexed to the International Radio Consultative Committee (Geneva) for the determination of the index IF2. The weekly film was sent to IPS Hobart for scaling of the remaining parameters. Hourly values of all parameters are published in the IPS Series D and are

distributed internationally. Ionograms are available on loan within Australia from IPS and internationally through the WDC-A.

5. SEISMOLOGY

Seismograph stations

Permanent seismograph stations were operated throughout 1982 at Kalgoorlie (KLG), Kellerberrin (KLB), Kununurra (KNA), Marble Bar (MBL). Meekatharra (MEK), Mundaring (MUN), Narrogin (NWAO), Nanutarra (NAU) and Warburton (WBN).

The station at Ballidu was upgraded on 27 August and the seismic signals were sent to Mundaring using FM telemetry on Telecom lines.

An insensitive seismograph was operated in the Mundaring office.

Sprengnether MEQ800 field seismographs were operated at Ballidu and Walpole to 27 March and 27 June respectively.

The number of earthquakes reported from each station in 1982 were:

BAL 201 (4 months); KLB 638; KLG 473; KNA 1629; MBL 945;
MEK 817; MUN 890; NAU 842; NWAO 865; WBN 780;
TOTAL: 8080

A summary of record losses from the permanent stations is given in Table 12. The reasons for record loss are discussed under individual station headings.

Ballidu. A Sprengnether MEQ800 field seismograph operated at Ballidu until 6 May. The seismograph was removed from service because 50 Hz hum caused interferrence.

A permanent short-period vertical seismograph was established at a new site at Ballidu (BAL) on 26 August. The seismic signals were transmitted to the Mundaring office on a Telecom line using FM telemetry. The signals were mulitiplexed with signals from Kellerberrin requiring different carrier frequencies to be used from each site. Currently the frequencies used are 1400 Hz (Kellerberrin) and 1700 Hz (Ballidu). A field unit constructed at Mundaring to house the telemetry amplifier, remote calibrator, DC/DC inverter and Statronics power supply (for battery charging) is interchangeable with units at Kellerberrin and Marble Bar. The unit operates from mains power and has a standby 12V battery.

Station details are given in Table 15 and a calibration curve is shown in Figure 2.

Kalgoorlie. A new standard calibration/amplifier rack was installed in November. At the same time general maintenance was carried out and the clock and PS112 power supply were replaced. The existing signal filter was modified to reduce microseismic noise with a period of three seconds. This enabled the magnification at 1.0s to be increased. A calibration curve is shown in Figure 3.

Kellerberrin. This seismograph operated satisfactorily with only minor line outages. Temperature changes at the remote site caused drift in the recording trace early in the year. Adjustments of the temperature compensation on the voltage control oscillator eleminated the problem.

Kununurra. The vault airconditioner was out of service from January to June. However, the milder season (compared) with 1981 enabled the seismograph to keep operating though the EMI clock rate was high at times.

An Egyptian station broardcasting on 12.005MHz interfered with the reception of VNG early in the year making time comparisons difficult. This interference was not so evident later in the year.

The quality of the vertical record was poor. Repeated attempts by the operator to improve it failed. The vertical and north-south components were interchanged on the recording drums in March to ensure quality recording on the vertical component.

Marble Bar. Lightning continued to cause problems at the remote site and resulted in the seismograph being out of service in January and September. In the first instance the fault apparently occurred in the Telecom line, but this could not be cofirmed. On the second occassion the lightning blew out lightning protectors on the Telecom line, burnt out DC wiring in the telemetry field box and blew apart the DC/DC inverter module in the 42/50 amplifier. The field box was replaced temporarily while repairs were made and lightning protectors fitted to the DC power supply input. The repaired unit was returned to service in December.

Excessive drift in the recording trace in March was caused by intermittant ripple on the PS112 power supply for the discriminator. The EMI clock rate became erratic in December and the time display was jumping. Both units were replaced.

Meekatharra. The standby batteries and charger were replaced in April and the EMI clock in September. General maintenance was carried out in November and the PS112 power supply was replaced. A new standard calibration/amplifier rack was installed.

The EA310 pre-amplifier was replaced in November by an AS330 amplifier so that the EA310 could be sent to Macquarie Island. The seismograph was re-calibrated and a calibration curve is shown in Figure 4.

Mundaring. Apart from problems with both recorders, the WWSSN seismograph continued to be reliable. The bearings in the LP recorder were replaced in March. The SP recorder motor was replaced in February and July and the recorder dog-clutch in July. The optical system was cleaned and adjusted in April.

System tests were made six times during the year. Adjustments were made to the LP-Z,E and SP-Z seismometer free periods.

The recording lamp blew on four occasions on the high-gain vertical component of the supplementary seismograph because the lamp has to operate on near maximum current. The optics were cleaned and adjusted in September which allowed a slight reduction in current.

The insensitive seismograph at the office operated satisfactorily throughout the year.

Nanutarra. Five weeks of record (10%) were apparently lost in the mail. Problems with pen heat control and broken recording pens plagued the seismograph from early December. Time control was poor when the seismograph was attended by a relief operator.

Narrogin. The seismograph continued to operate satisfactorily. Record loss and equipment faults were minimal. Faults included :

(a) occasional fatal read and write;
(b) failure of arm-position sense lamps of the tape unit;
(c) line outages, including one occassion when the Telecom cable was accidently cut up at the remote site;
(d) failure of the remote site standby batteries to maintain the system during a mains power failure.

No visits were made by personnel from the Albuquerque Seismograph Laboratory.

Warburton. The operation of the station improved significantly over 1981. Record losses were 2.3% compared with 19.3% in 1981. The main problem was maintaining power to operate the seismograph. The reasons were:

(a) frequent and lengthy power failures;
(b) inadequate charging capabilities for the standby batteries; to cope with (a) and
(c) poor maintenance of the standby batteries.

During a maintenance visit in November the standby batteries were replaced by no-maintenance sealed batteries; a 24V inverter was installed to provide enough power for all units during mains failures (previously there was insufficient power for the helicorder amplifier); and the battery charger was replaced by a modified charger which allowed boost-charging for periods controlled by a time switch. The Warburton Community power supply was upgraded at about the same time.

The TAM5 pre-amplifier lost sensitivity in October and the seismometer to console cable broke at about the same time. The cable was repaired and the TAM5 replaced in November. The seismograph was re-calibrated and results were consistent with the previous calibration made in August 1979. A new standard calibration/amplifier rack was installed in November.

Field stations. Sprengnether MEQ seismographs were operated at Ballidu and Walpole until 27 March and 27 June respectively. Station details are given in the 1981 Annual report (Gregson,1982) Both seismographs were withdrawn from service because of 50Hz hum on the recording trace; this was caused by a partial short between the seismometer coil and the frame resulting from moisture in the seismometers. The seismometers were dried and the cases sealed with epoxy resin. Neither seismograph was re-installed as Ballidu was replaced by a telemetry station, and time was not available for re-installation at Walpole.

Accelerographs

Three MO2 accelerographs were operated in the Southwest Seismic Zone, two near Meckering and one near Cadoux. The State Public Works Department (PWD) operated one MO2 at Kununurra (a second was not in operation as the acclerometer block was damaged in December 1981.) The PWD also operated a Kinemetrics SMA-1 accelerograph at Mundaring Weir. Telecom operated three SMA-1 accelerographs in the Wellington St Telephone Exchange,

Earthquakes in the southwest seismic zone triggered accelero graphs. The ground accelerations recorded are summarised in Table 16.

Accelerograms obtained since the installation of the first accelerograph in Western Australia in 1971 were analysed. Acceleration data for more than 40 earthquakes, accelerograph locations and operating periods are now on file at the Observatory and will be reported separately.

Seismicity

Table 13 lists 224 earthquakes of magnitude ML = 2.0 or greater which occurred in Western Australia in 1982. Figures 5 and 6 show epicentres of Western Australian earthquakes with magnitudes ML = 3 or greater and those in the Southwest Seismic Zone respectively.

Southwest Seismic Zone. 164 earthquakes of magnitude ML > 2 were located in the Southwest Seismic Zone. Of these, 117 occurred in the Cadoux area the largest being ML = 4.9 on 6 February 1982. The remaining activity was throughout the zone from Cadoux in the north, to Merredin in the east, Albany in the south.

Pilbara area. The Pilbara was the most active area outside the Southwest Seismic Zone. Seven earthquakes of magnitude greater than 3 occurred in the Broome Port Hedland, Marble Bar area. The largest (ML = 5.3) occurred on November 3 and was located 80km NE of Marble Bar.

Rowley Shoals. Seven earthquakes of magnitude greater than 3 occurred in the vicinity of Rowley Shoals, the location of a magnitude 7.3 earthquake on 23 April 1979. The largest, ML = 4.7, occurred on January 2.

Kununurra area. Only one earthquake, ML = 2.2, was located in the Kununurra,115 km NE of Kununurra.

Other areas. The remaining earthquakes were scattered throughout the state and off-shore. Those above magnitude ML = 4 were 37km SSE Norseman (ML = 4.1), Lake Tobin (ML=5.3), 25km SSW of Learmonth (ML = 4.0) and 100km ESE of Onslow (ML=5.0).

Earthquake intensities and isoseismal maps

Intensity questionnaires were distributed for five earthquakes which occurred during the year.

24 January. Shortly after midday an earthquake of magnitude ML = 4.4 occurred 15 km south of Cadoux. The earthquake was felt over an area of 20,000km , but no damage was reported. The highest intensity reported was MM V from the townsite of Cadoux. Intensity MM IV was felt over an area of radius 45km. The response to felt report questionnaires was poor, presumably because the earthquake was not widely felt. An isoseismal map based on 50 returns is given in Figure 7.

Several other earthquakes from the same location were felt, The two largest had isolated reports of intensity MM .

23 January 2.02 am (local time) ML = 3.8
26 January 7.12 am (local time) ML = 4.4

6 February. Many people in the vicinity of Cadoux were woken by severe shaking caused by an earthquake which occurred shortly after midnight, local time. The magnitude of the earthquake was ML = 4.9 and was located 12km south of Cadoux near the locations of the earthquakes in January 1982. Slight damage occurred near Cadoux in the form of cracked walls, water tanks leaking and small objects broken by falling off shelves.

The isoseismal map (Figure 8), prepared from felt report questionnaires indicates that the earthquake was felt over an area of 90,000km , with intensities of MM IV being experienced upto 110km from the epicentre. The boundaries of the lower intensities are not well defined because the and a majority of the population were asleep.

Residents of the Cadoux area were interviewed to determine the extent of the

higher intensities and an isoseismal map prepared (Figure 9). Intensities of MM VI were experienced at only three farm houses over an area of 8km , located just to the west of the epicentre. Intensities MM V were felt over an area exceeding 1000km . The earthquake was described by residents of Cadoux as the strongest since the series of earthquakes in June 1979. A second earthquake of magnitude ML = 4.6 occurred six minutes later. Resulting intensities were about one lower than the main event.

6 June. A magnitude ML = 4.1 earthquake 37km SSE of Norseman was felt with a maximum intensity of MMV. Population was too sparse to obtain suffficient data to for an isoseismal map. MMIV intensities were experienced up to 80 km from the epicentre.

3 October. A magnitude ML = 5.0 earthquake was located 100km ESE of Onslow. The maximum intensity felt was MMV at Red Hill Homestead 20km from the epicentre. Intensity MMIV was experienced at 80km from the epicentre.

3 November. An earthquake located 80km NE of Marble Bar had a magnitude of ML = 5.3. An intensity of MMIV was experienced 100km from the epicentre.

Data distribution, publication and requests

Preliminary phase data was telexed about five times a week (through the American Embassy, Canberra) to United States Geological Survey (USGS) who published the data together with preliminary earthquake locations in their Earthquake Data Reports (EDR). Monthly batches of preliminary phase data and Western Australian earthquake locations were sent to BMR headquart- ers, Canberra, for distribution with data from other Australian stations. Final phase data was sent through headquarters (about fifteen months after the event) to the International Seismological Centre for publication.

Preliminary monthly lists of Western Australian earthquakes were distributed to ten recipients. This reduced the number of day-to-day queries for data. Requests for seimological data attended to during the year are listed in Table 14. Narrogin SRO magnetic tapes were sent to headquarters for copying before being sent to Albuquerque Seismological Laboratory. Mundaring WWSS seismograms were sent to WDC-A for coping.

All Western Australian seismograms were analysed as part of a headquarters project to determine the duration of recording of all 1980 and 1981 Australian earthquakes. These data will be collated with data from other Australian stations to determine an Australia wide duration magnitude scale.

6. ACKOWLEDGEMENTS

The assistance of the daily attendants listed in Table 2 and the co-operation of Australia Post for housing the seismograph at Marble bar is hereby acknowledged. Remote seimometers and telemetry equipment were located on the properties of K. Quartermaine (Narrogin), V. Wright (Kellerberrin) and T. Malley (Ballidu).

7. REFERENCES

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APPENDIX
PRINCIPAL EVENTS
MUNDARING GEOPHYSICAL OBSERVATORY 1957-1982

1957 May	Geomagnetic recording commenced at Gnangara (La Cour)
1959 Mar 18	Transfer of observatory from Watheroo to Mundaring
1959 Apr 03	Ionospheric recording commenced (Type 2 ionosonde)
1959 Jul 30	MUN seismograph recording commenced (Benioff)
1960 Mar-Oct	Atmospheric noise recording (for CSIRO)
1960 Apr 30	Eschenhagen normal magnetograph replaced La Cour at Gnangara
1960 May 01	Cossor ionosonde replaced type 2
1960 Jun 22	Absolute magnetic observations commenced in new absolute house
1962 Jun	WWSS system commenced recording at MUN
1963 Apr 19-Dec 17	GRV seismograph operation
1963 May 30-Dec 19	NGN seismograph operation
1964 Nov 06	KLG SP seismograph recording commenced
1965 Nov 29-1966 Aug 24	LVS seismograph operation
1965 Nov	KNA SP-Z seismograph recording commenced; operation intermittent till February 1972
1967 Feb	Fremantle Region Upper Mantle Project
1967 Oct 26	MEK SP-Z seismograph recording commenced
1968 Oct-Nov 26	Field seismograph operation at Meckering
1968 Nov 16-1971 Dec 31	AFMAG recording at Mundaring
1970 Jan 01	Routine analysis of KNA seismograms commenced
1970 Feb 26	IPS IIIE ionosonde replaced Cossor
1971 Feb 10-1972 Jul 31	KAA SP-Z seismograph operation
1971 Nov 30	Two MO2 accelerographs installed at Meckering
1972 Feb 29	KNA seismograph upgraded to 3 components
1972 Mar 01	MO2 accelerograph (PWD) installed at Kununurra
1972 Jun 27	Proton scalar magnetometer introduced for Z baseline control
1972 Oct 12-1975 Feb	MBT SP-Z seismograph recording
1972 Nov 16	MO2 accelerograph (PWD) at Kununurra
1973 Jan 31	Mobile SP-Z recording at various sites in SW seismic zone started
1973 Mar 01	MEK reduced to 3 component SP
1973 Mar 30	KLG reduced to SP-Z
1973 May 23	MUN 2 Wood Andersons installed
1973 May 25	MUN Benimore SP-Z withdrawn; Benioff SP-Z started
1974 Apr 01	Proton vector coils introduced for Z baseline control
1974 May 01	Proton vector coils introduced for H baseline control
1974 Jun 17-31	Riometer recording at Mundaring during solar eclipse
1974 Sep-1978 Jun	GLS SP-Z recording
1975 Jul 18-Nov 19	Earthtide recording at Mundaring
1975 Mar	Magnetic pulsation recording commenced at Mundaring
1975 Mar 19-Aug 15, Dec 18, 1981 Jul 20	SWV SP-Z recording
1975 Sep 02-1976 Feb 05	NWAO SP-Z recording
1976 Mar 27	NWAO Seismic Research Observatory commenced
1976 Jun	MBL SP-Z recording commenced
1976 Sep-1977 Nov 27	XMI SP-Z recording
1976 Oct	Special ionospheric sounding, solar eclipse (23 Oct)
1977 Nov 28	A third MO2 accelerograph installed at Meckering
1978 Feb	A fourth MO2 accelerograph installed at Meckering
1978 Jun 27	WBN SP-Z recording commenced

APPENDIX (Contd)

1980 Apr 19	NAU SP-Z recording commenced
1981 Aug 07-1982 Mar 27	BAL SP-Z recording
1981 Sep 23	KLB SP-Z recording commenced
1981 Nov 19-1982 Jun 27	Walpole SP-Z field recording
1982 Aug 26	BAL SP-Z recording commenced

TABLE 1
OBSERVATORY STAFF 1982

Officer	Designation
P.J. Gregson	Geophysicist Class 3
E.P. Paull	Geophysicist Class 2
B.A. Gaull	Geophysicist Class 1 (Class 3 from 1 July)
G. Woad	Technical Officer Grade 2
B.J. Page	Technical Officer Grade 1
M.A. Bousfield (Mrs)	Clerical Assistant Grade 3

TABLE 2
ASSOCIATED PERSONNEL 1982

Name	Nature of Duties
B. Carling	Daily attendant, Gnangara
P. Maddren	Daily attendant, Kalgoorlie
R. Tatham	Daily attendant, Marble Bar (to 27 Oct)
L. Sasold	Daily attendant, Marble Bar (from 28 Oct)
A. Riach	Daily attendant, Meekatharra
J. Roberts	Daily attendant, Kunnunurra
L. Logue	Daily attendant, Nanutarra (to 6 Dec)
M. Raven	Daily attendant, Nanutarra (from 7 Dec)
A. Marshall	Daily attendant, Warburton
W. Howe	Daily attendant, Walpole
R. Carr	Daily attendant, Ballidu (to August)
R. Cechet	Antarctic trainee (5 Jul to 20 Aug)
P. Lawrence	Antarctic trainee (5 Jul to 20 Aug)
P. Kelsey	Antarctic trainee (18 Oct to 31 Dec)
C. Nardini	Ground maintenance (to July)
Sunny Gardens	Ground maintenance (from July)
L. Page	Cleaning (to 19 Oct)
M. Ferguson	Cleaning (from 4 Nov)

TABLE 3
OBSERVATORY STAFF ABSENCES 1982

Nature of absences	No. of man-days
Sick leave	38
Special leave	5
Furlough	14
Military leave	13
Attendance at outstations and field operations	47
Temporary transfer	84
Conferences and training	10
Total	216

TABLE 4
CONFERENCES, ADDRESSES AND TRAINING 1982

Officer	Date	Conference
B.J. Page	Feb 15-19	Introduction to computers and micro-processors, Telecom Perth
P.J. Gregson	May 21	Magnitude seminar, Canberra
		Committees
P.J. Gregson		Geophysics Advisory Committee, Western Australian Institute of Technology
P.J.Gregson		Seismological data base sub-committee of the Accreditation Technical Experts Natural Disasters (ATEND)

TABLE 5
VISITORS 1982

Visitor	Institution
M. McMullan	Ionospheric Prediction Service
G. Sands	Aerodata Services
N. Uren	WA Institute of Technology
S. Gunson	WA Institute of Technology
R. Pidgeon	WA Institute of Technology
D. Denham	Bureau of Mineral Resources
R. Tracy	Bureau of Mineral Resources
P. Davies	Bureau of Mineral Resources
D. May	Consulting Engineering Co.
R. Warner	Uranium Enrichment Corporation
N. Grega	Uranium Enrichment Corporation
R. Home	Melbourne University
F. Valentine	USGS. Project Magnet
I. Everingham	Department of Mineral Resources, Fiji
I. Nikoloff	Perth Observatory
J. Kailis	Royal Insurance Co.

TABLE 6
ORIENTATION TESTS 1982

Component	Reference	Magnet	Orientation	N pole
21 July				
H	23327 nT	East	0.1	South
D	3°19.4′W	North	0.5	West
Z	53714 nT	North	0.4	Up
2 November				
H	23317	East	0.5	South
D	3°20.1′W	North	0.3	West
23 November	(after ordinate adjustment)			
H	23317	East	0.1	North

TABLE 7

PRELIMINARY MONTHLY MEAN GEOMAGNETIC VALUES AND K-INDICES, 1982

Month	D(West)	H,nT	Z,nT	F,nT	K
January	3°19.2'	23359	53695	58556	2.15
February	20.2	320	712	560	3.36
March	19.4	333	704	554	2.18
April	19.3	317	708	551	2.50
May	18.9	334	711	561	2.23
June	19.4	321	708	553	2.42
July	19.4	327	714	561	2.98
August	19.6	308	724	562	2.75
September	19.1	294	727	559	3.14
October	19.3	311	718	558	2.57
November	20.1	317	724	566	2.77
December	20.0	309	728	566	2.93
Mean	3 19.5	23321	53714	58558	2.66

TABLE 8

GEOMAGNETIC ANNUAL MEAN VALUES (AND SECULAR CHANGE) 1972-1982

Year	D	I	H,nT	X,nT	Y,nT	Z,nT	F,nT	Notes
1972	-3°05.2'	-66°04.0'	23726	23692	-1278	-53454	58483	C
	(-2.6)	(-2.2)	(-40)	(-41)	(-14)	(-6)	(-9)	
1973	07.8	06.2	686	651	-1292	460	472	C
	(-2.1)	(-2.8)	(-44)	(-45)	(-12)	(-17)	(- 2)	
1974	09.9	09.0	642	606	-1304	477	470	C
	(-1.6)	(-2.3)	(-34)	(-35)	(-10)	(-19)	(+ 2)	
1975	11.5	11.3	608	571	-1314	496	474	C
	(-0.9)	(-2.9)	(-48)	(-41)	(- 4)	(-32)	(+12)	
1976	12.4	14.2	567	530	-1318	528	486	C
	(-0.8)	(-2.8)	(-49)	(-39)	(- 6)	(-29)	(+11)	
1977	13.6	17.0	528	491	-1324	557	497	C
	(-1.5)	(-2.5)	(-47)	(-48)	(- 8)	(-39)	(+17)	
1978	15.1	20.5	481	443	-1332	596	514	C
	(-0.6)	(-2.6)	(-37)	(-38)	(- 7)	(-28)	(+11)	
1979	16.5	23.1	444	405	-1339	624	525	C
	(-1.3)	(-2.6)	(-33)	(-35)	(- 7)	(-28)	(+11)	
1980	17.8	25.7	409	370	-1346	652	536	C
	(-2.1)	(-3.2)	(-45)	(-45)	(-12)	(-33)	(+14)	
1981	19.9	28.9	364	325	-1358	685	550	D
	(+0.4)	(-3.0)	(-43)	(-43)	(+ 5)	(-29)	(+ 8)	
1982	19.5	31.9	321	282	-1353	714	558	D

Notes: C Preliminary values = Mean daily values, 10 days
D Preliminary values = Mean daily values, 5 days

TABLE 9

ADOPTED SCALE VALUES, GNANGARA MAGNETOGRAPH 1982

Date from	UT h	UT m	Scale Value	Explanation
HORIZONTAL INTENSITY			So (nT/mm)	
Jan 01	01	00	2.44	
Jul 01	01	00	2.45	
Aug 01	01	00	2.46	
Sep 01	01	00	2.45	
Nov 23	04	00	2.43	
DECLINATION			SD (min/mm)	
Jan 01	01	00	1.07	
VERTICAL INTENSITY			SZ (nT/mm)	
Jan 01	01	00	5.86	
Mar 26	01	00	5.88	Drift due to temperature through to November
Apr 01	01	00	5.90	
Apr 06	01	00	5.92	
Apr 11	01	00	5.94	
Apr 16	01	00	5.96	
Apr 21	01	00	5.98	
Apr 26	01	00	6.00	
May 01	01	00	6.02	
May 05	01	00	6.04	
May 09	01	00	6.06	
May 13	01	00	6.08	
May 17	01	00	6.10	
May 21	01	00	6.12	
May 25	01	00	6.14	
May 29	01	00	6.16	
Jun 02	01	00	6.18	
Jun 06	01	00	6.20	
Jun 10	01	00	6.22	
Jun 14	01	00	6.24	
Jun 18	01	00	6.26	
Jun 22	01	00	6.28	
Jun 26	01	00	6.30	
Jun 30	01	00	6.32	
Jul 04	01	00	6.34	
Jul 07	01	00	6.36	
Aug 16	01	00	6.34	
Aug 20	01	00	6.32	
Aug 24	01	00	6.30	
Aug 28	01	00	6.28	
Sep 01	01	00	6.26	
Sep 05	01	00	6.24	
Oct 09	01	00	6.22	
Oct 11	01	00	6.20	
Oct 13	01	00	6.18	
Oct 15	01	00	6.16	
Oct 17	01	00	6.14	
Oct 19	01	00	6.12	
Oct 21	01	00	6.10	
Oct 23	01	00	6.08	
Oct 25	01	00	6.06	
Oct 26	01	00	6.04	

TABLE 9 (Contd)

Oct 28	01	00	6.02
Oct 29	01	00	6.00
Oct 31	01	00	5.98
Nov 01	01	00	5.96
Nov 03	01	00	5.94
Nov 04	01	00	5.92
Nov 06	01	00	5.90
Nov 07	01	00	5.88
Nov 09	01	00	5.86
Nov 10	01	00	5.84

TABLE 10

ADOPTED BASELINE VALUES (UNCORRECTED) AT 20°C

GNANGARA MAGNETOGRAPH 1982

Date 1982	UT h	m	Baseline Value	Explanation
HORIZONTAL INTENSITY			BHs (nT)	
Jan 01	01	00	23299	
Feb 01	01	00	23300	
May 01	01	00	23299	
Aug 01	01	00	23300	
Sep 01	01	00	23301	
Nov 23	04	00	23241	Ordinate adjustment
DECLINATION			BD (W)	
Jan 01	01	00	3 04.1	
Mar 01	01	00	3 04.0	
May 01	01	00	3 03.9	
Jun 01	01	00	3 03.8	
Aug 01	01	00	3 03.7	
Sep 01	01	00	3 03.8	
Oct 01	01	00	3 03.9	
Nov 01	01	00	3 04.0	
VERTICAL INTENSITY			BZs (nT)	
Jan 01	01	00	53435	
Jan 11	01	00	53434	
Jan 21	01	00	53433	
Feb 01	01	00	53432	
Feb 11	01	00	53431	
Feb 21	01	00	53430	
Jun 01	01	00	53429	
Jun 16	01	00	53428	
Jul 01	01	00	53427	
Jul 11	01	00	53426	
Jul 21	01	00	53425	
Sep 01	01	00	53426	
Oct 01	01	00	53425	
Oct 04	01	00	53424	
Oct 14	01	00	53425	
Oct 17	01	00	53426	
Oct 20	01	00	53427	
Oct 23	01	00	53428	
Oct 26	01	00	53429	
Oct 29	01	00	53430	
Nov 01	01	00	53431	
Nov 04	01	00	53432	
Nov 07	01	00	53433	
Nov 23	01	00	53432	
Dec 01	01	00	53431	
Dec 08	01	00	53430	
Dec 16	01	00	53429	
Dec 24	01	00	53428	

TABLE 11

ROUTINE DISTRIBUTION OF GEOMAGNETIC DATA 1982

Weekly K-indices

Carpentaria Exploration Pty Ltd, SA
Carpenraria Exploration Pty Ltd, Perth
Scintrex Pty Ltd, West Perth
Geopeko, Gorden NSW

Broken Hill Pty Ltd, Perth
Uranerz Australia Pty Ltd, Subiaco

Basic Aerosurveys Pty Ltd, Guildford
Aerodata McPhar Pty Ltd, Subiaco
Esso Minerals, Nedlands
Hamersley Exploration Pty Ltd, Tom Price

Seltrust Mining Co. Pty Ltd, Perth
Duval Mining Co. Australia Ltd, Perth

Monthly	K-indices	Rapid variations	Principal storms	Preliminary mean values	Magnetogram 16mm copy
BMR, Canberra	*1	*1	*1	*1	
IPS, Sydney	*	*			
WDC A, Washington	*	*	*		*
WDC C1, Denmark	*	*	*		
WDC C2, Kyoto	*	*	*		
Observatory de Elbo		*2			
Institute de Physiques du Globe	*				

Data published

1. Geophysical Observatory Report, Bureau of Mineral Resources, Geology and Geophysics

2. IAGA Bulletin, Geomagnetic data

TABLE 12
SEISMOGRAPH RECORD LOSS, 1982

Photographic Recorders	MUN (WWSSN)						MUN	SUP		KNA		
	SP-Z	SP-N	SP-E	LP-Z	LP-N	LP-E	Z	N	E	Z	N	E
Late/no change										21	21	21
Paper off drum/ reversed			24	24								
Drum translation	48	48	48	48	48	48				41	41	41
Recorder failure	55	53	53	17								
DC power										46	46	46
AC power												
Recorder lamp	27	23	16				98					
Total hours	130	124	141	89	48	48	98			108	108	108
Percentage	1.5	1.4	1.6	1.0	0.5	0.5	1.1			1.2	1.2	1.2

Visual Recorders	NWAO				KLB	BAL	KLG	MEK	WBN	NAU	MBL
	SP-Z	LP-Z	LP-N	LP-E							
Late/no change	8	8	8	8			74	90	105	505	33
Pen translation		14			15		36				17
Pen broke		2					14				12
Recorder failure	4									528	
DC power							4				
AC power	13	13	13	8			6		115		24
Clock											
Pre-amplifier											66
+/- 12V power										12	509
Other(see text)										840	537
Maintenance	3	3	3	7	1	1		8	29		3
Line outage	5	5	5	5	11						
Total hours	33	33	33	33	27	1	134	98	249	1885	1228
Percentage	0.4	0.4	0.4	0.4	0.3	0.0	1.5	1.1	2.8	21.5	15.0

TABLE 13

WESTERN AUSTRALIAN EARTHQUAKES 1982

DATE 1982	ORIGIN UT	LAT °S	LONG °E	DEP Km	MAG	LOCALITY	N	A
JAN	02 063633	16.68	120.21	37	4.7 ML	ROWLEY SHOALS	7	B
	04 082201.3	31.02	166.74	10G	1.5 ML	4 KM NNW KONNONGORRING	3	B
	05 202756.9	30.76	117.10		2.3 ML	CADOUX AREA	3	B
	09 060820.3	21.41	120.20	10	4.0 ML	45 KM SE MARBLE BAR	8	B
	10 011157.2	30.76	117.10	10G	2.4 ML	2 KM W CADOUX, FELT MMII	3	A
	10 171841.5	30.82	117.96	10G	1.6 ML	10 KM E BENCUBBIN	3	B
	10 191639.8	30.84	117.14	5	2.1 ML	8 KM S CADOUX	4	A
	13 083706.9	15.77	127.91	10G	2.2 ML	90 KM W KUNUNURRA	2	C
	13 160343.4	30.73	117.07	10G	2.2 ML	6 KM NW CADOUX	3	A
	13 165331.0	30.73	117.07	10G	2.0 ML	6 KM NW CADOUX	4	A
	17 153553	37.53	121.65	10G	3.2 ML	360 KM S ESPERANCE	4	D
	22 180240.3	30.93	117.11	5G	3.8 ML	18 KM S CADOUX, FELT MMV	8	A
	22 191326.7	30.93	117.11	5G	2.2 ML	18 KM S CADOUX	2	B
	24 040620.0	30.90	117.12	5G	4.3 ML	15 KM S CADOUX, FELT MMV	8	A
	24 071922.4	30.92	117.15	5G	2.7 ML	17 KM S CADOUX	2	B
	25 102619.0	30.77	117.16	10G	2.8 ML	3 KM E CADOUX	4	B
	25 232658.7	30.91	117.13	5G	4.4 ML	16 KM S CADOUX, FELT MMV	7	A
	27 231255.6	27.35	125.39	10G	3.6 ML	145 KM SW WARBURTON	4	C
	30 012735.5	31.02	116.74	10G	2.2 ML	4 KM NNW KONNONGORRING	3	B
FEB	01 131813.5	30.88	117.12	10G	2.2 ML	12 KM S CADOUX	3	A
	01 203801.4	30.88	117.11	10G	2.7 ML	13 KM S CADOUX	3	A
	02 190224.7	30.83	117.16	10G	2.0 ML	8 KM SSE CADOUX	3	A
	02 200912.8	30.88	117.12	10G	2.2 ML	12 KM S CADOUX	3	A
	02 202430.9	30.87	117.10	10G	2.8 ML	12 KM SSW CADOUX	3	A
	04 065435.5	31.71	117.07	10G	2.0 ML	10 KM SE MECKERING	4	A
	05 142409.1	30.89	117.12	10G	3.1 ML	13 KM S CADOUX	5	A
	05 143418.9	30.88	117.12	10G	3.2 ML	12 KM S CADOUX	4	A
	06 152439.5	30.88	117.15	10	4.9 ML	12 KM SSE CADOUX FELT MMVI	8	A
	06 153036.7	30.87	117.10	10	4.6 ML	12 KM S CADOUX, FELT MMV	6	A
	06 154232.8	30.88	117.11	10	2.2 ML	12 KM S CADOUX	3	A
	06 165658.9	30.88	117.12	10	2.3 ML	12 KM S CADOUX	3	A
	06 170022.5	30.88	117.11	10	2.3 ML	12 KM S CADOUX	3	A
	06 170851.3	30.88	117.09	10	2.2 ML	11 KM S CADOUX	3	A
	06 211216.1	30.87	117.09	10	2.0 ML	11 KM S CADOUX	3	A
	06 232604.6	30.89	117.09	10G	2.1 ML	13 KM S CADOUX	3	A
	07 033055.0	30.90	117.09	10G	2.6 ML	15 KM S CADOUX	3	A
	07 091033.7	30.89	117.12	10G	2.4 ML	13 KM S CADOUX	3	A
	07 112040.4	30.87	117.10	10G	2.0 ML	10 KM S CADOUX	3	B
	07 130731.4	30.89	117.09	10G	4.1 ML	13 KM S CADOUX	6	A
	07 141654.4	30.87	117.10	10G	2.0 ML	10 KM S CADOUX	3	A
	07 162146.9	30.89	117.09	10G	2.0 ML	14 KM S CADOUX	3	A
	07 172522.4	30.89	117.09	10G	2.9 ML	14 KM S CADOUX	4	A
	07 180619.1	30.87	117.10	10G	2.7 ML	13 KM S CADOUX	3	A
	07 182921.4	30.88	117.12	10G	2.5 ML	12 KM S CADOUX	3	A
	07 183333.5	30.89	117.11	10G	3.4 ML	14 KM S CADOUX	4	A
	07 185357.2	30.87	117.10	10G	2.3 ML	10 KM S CADOUX	3	A

TABLE 13 (Contd)

DATE 1982	ORIGIN UT	LAT°S	LONG°E	DEP Km	MAG	LOCALITY	N	A
FEB 08	020304.6	30.89	117.09	10G	2.1 ML	13 KM S CADOUX	3	A
08	033737.	16.58	120.22	37R	3.1 ML	ROWLEY SHOALS	3	C
08	043934.5	30.89	117.10	10G	4.1 ML	13 KM S CADOUX	4	A
08	142313.	12.54	123.38	37R	3.6 ML	20 KM W CARTIER IS	3	D
08	161137.7	30.88	117.11	10G	3.9 ML	12 KM S CADOUX	3	A
08	191252.5	30.75	117.05	0	2.4 ML	7 KM WNW CADOUX	3	A
08	201401.7	30.87	117.09	10G	2.2 ML	12 KM S CADOUX	3	A
09	034936.6	30.89	117.09	10G	2.0 ML	13 KM S CADOUX	3	A
09	121331.8	30.89	117.09	10G	2.0 ML	13 KM S CADOUX	3	A
09	121420.7	30.89	117.09	10G	2.2 ML	13 KM S CADOUX	3	A
09	160403.0	30.89	117.10	10G	2.2 ML	14 KM S CADOUX	3	A
09	200312.6	30.89	117.12	10G	2.5 ML	13 KM S CADOUX	3	A
09	201717.5	30.89	117.09	10G	2.9 ML	14 KM S CADOUX	3	A
09	220624.3	30.87	117.09	10G	3.4 ML	12 KM S CADOUX	4	A
10	155527.0	30.73	117.11	10G	2.0 ML	4 KM N CADOUX	3	A
12	144318.2	30.89	117.10	10G	2.4 ML	14 KM S CADOUX	3	A
13	082700.0	22.00	126.60	10	5.3 ML	50 KM E TOBIN LAKE	9	B
13	135546.6	30.78	117.06	10G	2.2 ML	5 KM W CADOUX	3	A
14	111946.0	22.00	126.60	10G	3.3 ML	50 KM E TOBIN LAKE	3	D
15	050642.9	30.89	117.09	10G	2.7 ML	14 KM S CADOUX	3	A
18	195546.3	30.87	117.10	10G	2.4 ML	14 KM S CADOUX	3	A
18	202527.9	30.88	117.12	10G	2.5 ML	12 KM S CADOUX	3	A
18	203027.0	30.87	117.12	10G	2.2 ML	12 KM S CADOUX	3	A
19	011125.	18.70	123.24	30	4.3 ML	135 KM SE BROOME	9	C
19	093611.9	18.84	118.43	10	3.4 ML	160 KM N PORT HEDLAND	4	C
19	202640.	22.29	113.90	10	3.6 ML	20 KM W LEARMONTH	4	B
20	020420.8	31.20	116.44	0	1.5 ML	8 KM W CLACKLINE	3	A
20	052624.1	31.64	117.09	10	3.5 ML	10 KM E MECKERING, FELT IV	8	A
21	230610.4	30.75	117.08	0	2.8 ML	4 KM WNW CADOUX	3	A
23	121344.8	31.67	116.97	10G	2.0 ML	6 KM SW MECKERING	3	A
24	130356.8	30.89	117.10	10G	2.3 ML	14 KM S CADOUX	3	B
24	140908.6	30.78	117.13	10G	2.0 ML	1 KM E CADOUX	3	B
25	105330.4	31.42	116.65	10	1.8 ML	21 KM SW GOOMALLING	4	A
26	061645.5	30.79	118.56	10G	2.1 ML	14 KM NNE MUKINBUDIN	3	B
26	090257.2	30.87	117.12	10G	2.0 ML	12 KM S CADOUX	3	A
26	152433.	17.67	122.49	37R	3.8 ML	50 KM NE BROOME	5	B
26	172853.1	20.08	116.34	26	2.9 ML	75 KM NW DAMPIER	3	C
26	204331.5	30.87	117.12	10G	2.7 ML	10 KM S CADOUX	4	A
27	184301.5	18.86	121.18	37R	3.3 ML	120 KM WSW BROOME	5	C
28	125621.6	30.89	117.09	10G	2.1 ML	13 KM S CADOUX	3	A
MAR 04	224016.4	30.89	117.09	10G	2.1 ML	14 KM S CADOUX	4	A
04	234409.5	16.49	120.11	37R	3.9 ML	270 KM NW BROOME	7	C
05	085422.7	30.88	117.11	10G	2.5 ML	12 KM S CADOUX	4	A
06	070946.9	30.83	117.08	10G	2.0 ML	6 KM SW CADOUX	2	B
07	063644.8	30.87	117.10	10G	2.3 ML	12 KM SSW CADOUX	3	B
08	013217.1	31.71	117.03	10G	2.0 ML	10 KM SSE MECKERING	3	B
08	075453.9	30.87	117.10	10G	2.0 ML	10 KM S CADOUX	3	A
08	231628.0	30.70	117.10	5	3.5 ML	5 KM NNE CADOUX	6	A
09	000229.6	30.70	117.12	5	2.4 ML	8 KM N CADOUX	4	A

TABLE 13 (Contd)

DATE 1982	ORIGIN UT	LAT°S	LONG°E	DEP Km	MAG	LOCALITY	N	A
MAR	10 173036.4	30.67	117.12	10G	2.8 ML	11 KM N CADOUX	4	A
	10 213038.2	30.78	117.17	10G	2.4 ML	5 KM E CADOUX	4	A
	11 142053.9	15.71	120.19	37R	4.2 ML	260 KM NW BROOME	8	C
	13 181720.0	23.36	120.71	10G	3.0 ML	75 KM NW MUNDIWINDI	4	C
	17 042907.6	14.86	127.51	10G	3.6 ML	90 KM NW WYNDHAM	3	C
	17 220145.	19.38	113.08	10G	2.8 ML	270 KM NNW EXMOUTH	3	B
	20 100422.5	30.88	117.12	10G	3.7 ML	12 KM S CADOUX	5	A
	21 015719.1	30.88	117.12	10G	2.0 ML	12 KM S CADOUX	2	A
	25 190410.8	30.75	117.10	10G	2.0 ML	3 KM NW CADOUX	3	A
	26 074246.8	30.89	117.11	10G	2.7 ML	14 KM S CADOUX	3	A
	27 154312.0	22.47	114.00	10G	4.0 ML	25 KM SSW LEARMONTH	7	C
	28 210402.	25.57	116.02	10G	3.0 ML	60 KM W ERONG STATION	3	C
	28 224004.9	30.75	117.16	10G	2.0 ML	4 KM NE CADOUX	2	B
	29 035037.8	33.41	117.78	10G	2.0 ML	3 KM S DUMBLEYUNG	3	B
	30 204349.2	14.86	129.36	10G	2.2 ML	115 KM NE KUNUNURRA	3	C
	31 023243.9	30.78	117.16	10G	2.0 ML	12 KM S CADOUX	2	B
	31 062550.5	30.75	117.10	10G	2.1 ML	3 KM NW CADOUX	2	B
	31 175351.0	31.29	117.38	10G	2.1 ML	8 KM S WYALKATCHEM,FELT III	3	B
APR	02 160339.0	30.73	117.08	10G	2.5 ML	5 KM NW CADOUX	3	B
	05 185320.3	30.79	117.07	10G	2.0 ML	6 KM SW CADOUX	2	B
	09 053636.3	30.88	117.12	10G	2.1 ML	10 KM S CADOUX	2	B
	15 070008.4	30.89	117.09	10G	2.0 ML	13 KM SW CADOUX	2	B
	15 175032.1	30.89	117.12	10G	3.9 ML	13 KM S CADOUX, FELT MMIV	5	A
	20 120400.1	30.87	117.10	10G	3.4 ML	10 KM SSW CADOUX	5	A
	20 210342.4	30.73	117.08	10G	2.1 ML	5 KM NW CADOUX	2	B
	22 144438.0	15.71	120.19	37R	3.5 ML	260 KM NW BROOME	2	D
	23 095441.4	30.89	117.09	10G	2.0 ML	13 KM SSW CADOUX	2	B
	28 105916.2	33.41	117.73	7	2.0 ML	9 KM S DUMBLEYUNG	3	B
	28 150150.0	26.55	110.92	10G	3.3 ML	430 KM NW GERALDTON	3	D
	30 105542.1	22.23	120.72	10G	2.7 ML	160 KM SE MARBLE BAR	3	C
MAY	07 213432.5	30.89	116.45	0G	1.3 ML	22 KM N CALINGIRI	3	B
	08 121512.5	30.75	117.10	10G	2.0 ML	3 KM NW CADOUX	3	B
	09 014655.0	30.87	117.10	10G	1.8 ML	12 KM SSW CADOUX	3	B
	10 065201.1	30.87	117.10		2.0 ML	12 KM SSW CADOUX	3	B
	10 114449.0	31.63	116.99	0	2.1 ML	3 KM SW MECKERING	3	A
	11 073302.4			10G	2.5 ML	146 KM FROM MARBLE BAR	1	
	12 224304.0	35.04	117.93	10G	2.1 ML	ALBANY, FELT MMIII	2	B
	18 072553.0	32.22	117.38	10G	2.9 ML	22 KM S QUAIRADING	3	A
	20 122822.6	30.75	117.10	10G	2.1 ML	3 KM NW CADOUX	2	B
	21 160328.8	31.46	119.49	10G	2.0 ML	30 KM SSE SOUTHERN CROSS	4	C
	22 044730.0	32.24	117.39	10G	2.1 ML	24 KM S QUAIRADING	3	A
	22 203137.5				1.5 ML	48 KM FROM MARBLE BAR	1	
	24 124618.0	32.21	117.38	10G	1.8 ML	20 KM S QUAIRADING	3	A
	26 004640.2	31.63	117.63	10G	1.7 ML	8 KM W KELLERBERIN	2	C
	26 175554.2	22.24	120.83	10G	3.4 ML	150 KM SE MARBLE BAR	5	C
	30 171929.4	30.73	117.08	10G	2.3 ML	5 KM N OF CADOUX	3	B
	30 171929.4	30.73	117.08	10G	2.3 ML	5 KM N OF CADOUX	3	B

TABLE 13 (Contd)

DATE 1982	ORIGIN UT	LAT°S	LONG°E	DEP Km	MAG	LOCALITY	N	A
JUN	01 180118.5	30.74	117.09	10G	2.3 ML	4 KM NW CADOUX	3	B
	02 183245.7	30.76	117.08	10G	2.0 ML	3 KM SSW CADOUX	2	B
	06 140616.0	32.51	121.96	10G	4.1 ML	37 KM SSE NORSEMAN	6	B
	06 201224.3	30.73	117.08	10G	2.3 ML	5 KM NW CADOUX	3	B
	11 141945.5	32.21	117.37	10G	2.0 ML	20 KM S QUAIRADING	3	B
	13 170112.8	24.47	115.30	10G	2.4 ML	60 KM N GASCOYNE JUNCTION	3	C
	16 151326.4	18.05	118.47	37R	4.5 ML	60 KM S ROWLEY SHOALS	7	C
	17 212146.4	30.73	117.08	10G	2.3 ML	5 KM NW CADOUX	3	B
	20 025718.0	30.74	117.08	10G	2.6 ML	4 KM NW CADOUX	5	B
	23 113959.2	22.00	126.60	10	3.3 ML	50 KM E TOBIN LAKE	5	B
	23 174021.0			10G	2.1 ML	107 KM FROM MARBLE BAR	1	
	24 163210.5			10G	2.6 ML	228 KM FROM KUNUNURRA	1	
	27 211621.7	31.27	118.32	0	2.4 ML	24 KM N MERREDIN	5	B
	30 073804.5	30.74	117.05	10G	2.4 ML	4 KM N CADOUX	3	A
	30 075723.2	30.74	117.09	10G	3.1 ML	4 KM NW CADOUX	5	B
JUL	01 172029.0	33.52	127.22	37	3.5 ML	250 KM SW EUCLA	4	C
	02 033130.3	31.68	117.02	10G	2.1 ML	6 KM S MECKERING	3	A
	03 161018.9			10G	2.6 ML	263 KM FROM MEEKATHARRA	1	
	04 070526.0	26.47	131.01	10G	3.5 ML	120 KM S AYERS ROCK (SA)	3	D
	05 144459.8			10G	1.5 ML	68 KM FROM MARBLE BAR	1	
	05 201813.1	30.75	117.09	10G	2.3 ML	5 KM WNW CADOUX	2	B
	08 210128.5			10G	1.8 ML	52 KM FROM MARBLE BAR	1	
	10 084239.3	31.27	118.29	0	2.1 ML	24 KM N MERREDIN	4	B
	11 022205.4	22.93	114.47	10G	3.2 ML	85 KM SSE LEARMONTH	3	D
	27 172614.8	30.79	117.07	10G	2.3 ML	6 KM SW CADOUX	2	B
	28 192309.8	30.75	117.10	10G	2.1 ML	3 KM NW CADOUX	2	B
AUG	02 125541.4	31.68	116.96	10G	2.8 ML	7 KM SSW MECKERING	4	B
	04 220052.0	29.28	117.31	10G	3.1 ML	35 KM W PAYNES FIND	4	C
	06 091438.0	30.73	117.08	10G	2.3 ML	5 KM NW CADOUX	2	B
	07 015319.8	31.70	117.05	10G	1.7 ML	9 KM SSE MECKERING	3	A
	18 184538.5	33.42	117.76	10G	2.0 ML	10 KM S DUMBLYUNG	3	B
	24 023241.0	26.41	131.42	10G	4.5 ML	110 KM SSE AYERS ROCK	9	C
	28 222006.0	32.58	116.74	10G	2.4 ML	33 KM W PINGELLY	5	A
	29 164800.3				1.8 ML	47 KM FROM MARBLE BAR	1	
	30 184824.0	30.74	117.12	10G	2.1 ML	2 KM N CADOUX	4	A
	31 222920.0	30.72	117.13	10G	2.8 ML	5 KM N CADOUX	4	A
SEP	01 014137.3	30.73	117.12	10G	2.1 ML	4 KM N CADOUX	3	A
	03 150010.5	22.22	113.79	10G	2.5 ML	30 KM W LEARMONTH	3	C
	05 142045.1	31.25	118.30	0	2.0 ML	27 KM N MERREDIN	4	A
	11 101501.0	30.33	123.03	10G	3.4 ML	70 KM E CUNDEELEE	5	B
	14 121903.5	30.87	118.00	10G	2.2 ML	16 KM ESE BENCUBBIN	5	B
	19 152215.0	29.38	114.09	10G	2.1 ML	80 KM W DONGARA	3	C
	24 171936.2	30.89	117.16	10G	2.2 ML	13 KM SSE CADOUX	3	A
	28 053106.6	30.70	117.15	10G	2.2 ML	8 KM NNE CADOUX	3	A
OCT	01 171851.4	30.86	118.00	10G	2.0 ML	15 KM ESE BENCUBBIN	3	B
	01 191317.7	30.83	117.07	10G	3.4 ML	8 KM SSW CADOUX	4	A
	02 064841.3	30.83	117.04	10G	2.6 ML	10 KM SW CADOUX	3	A
	03 170044	22.09	115.85	10G	5.0 ML	60 KM NE NANUTARRA	9	A
	09 233354.7	31.02	116.74	10G	2.2 ML	4KM NW KONNONGORRING MMIII	4	A

TABLE 13 (Contd)

DATE 1982	ORIGIN UT	LAT°S	LONG°E	DEP Km	MAG	LOCALITY	N	A
OCT	10 025630.6	31.00	116.74	7	3.0 ML	6 KM NNW KON'GORRING,MMIII	6	A
	10 031220.0	31.02	116.76	10G	2.0 ML	3 KM N KONNONGORRING	3	A
	13 201817.6	30.74	117.08	10G	2.0 ML	5 KM NW CADOUX	3	B
	14 200918.9	30.71	117.00	10G	2.0 ML	7 KM N CADOUX	3	B
	14 204434.6	33.63	118.33	10G	2.2 ML	18 KM WSW PINGRUP	3	C
	14 204604.1	33.63	118.33	10G	2.0 ML	18 KM WSW PINGRUP	3	C
	16 120343.1	33.63	118.33	10G	2.0 ML	18 KM WSW PINGRUP	3	C
	20 210045.1	30.53	117.21	19	2.2 ML	27 KM NNE CADOUX		
	21 180652.5	31.74	116.91	10G	1.4 ML	17 KM SW MECKERING, MMIV	4	A
	24 204215.3	30.85	117.20	10G	2.2 ML	11 KM SE CADOUX	3	A
	25 02375705	33.64	118.41	0	2.0 ML	8 KM W PINGRUP	3	B
	28 184321.5	31.28	117.39	10G	2.3 ML	12 KM S WYALLKATCHEM	4	A
	29 101621.1	30.71	117.21	10G	2.0 ML	6 KM S CADOUX	3	A
	30 022302.1	30.75	117.10	10G	2.5 ML	3 KM NW CADOUX	4	A
NOV	03 024032.0	20.53	120.48	37R	5.2 ML	105 KM NE MARBLE BAR MMIV	10	B
	03 133700.4	30.65	117.15	10G	2.4 ML	12 KM N CADOUX	4	A
	08 181851.5			10G	2.0 ML	88 KM FROM KNA	2	
	16 154130.5	30.74	117.11	10G	2.5 ML	4 KM N CADOUX	5	A
	20 020026.0	19.02	127.18	19	4.2 ML	130 KM E CHRISTMAS CREEK	6	B
	24 161203.1	32.33	117.40	10G	2.5 ML	23 KM S QUAIRADING	5	A
	25 222433.2				2.1 ML	MECKERING	3	
	29 164302.4	32.21	117.39	10G	2.0 ML	20 KM S QUAIRADING	4	A
DEC	06 172815.8	27.35	113.57	10G	2.3 ML	80 KM NW KALBARRI	3	D
	07 144003.0	16.88	120.25	37R	4.5 ML	240 KM NW BROOME	9	B
	13 161937.4	27.56	113.02	10G	3.0 ML	120 KM W KALBARRI	2	D
	14 125433.0	22.00	126.39	10G	3.4 ML	30 KM E TOBIN LAKE	4	C
	16 143124.0	18.32	121.15	37R	3.5 ML	120 KM WSW BROOME	4	C
	20 211925.2	30.38	117.11	10G	2.0 ML	2 KM S KALANNIE	3	B
	21 215919.5	32.11	117.19	10G	3.0 ML	22 KM WSW QUAIRADING	7	A
	22 022154.1	32.11	117.09	10G	2.4 ML	22 KM WSW QUAIRADING	4	A
	31 031623.2	18.00	126.39	10G	2.8 ML	100 KM NNE CHRISTMAS CREEK	2	D

FOOTNOTES:

UT = Universal time. Western standard time = UT + 8 hours.
DEP = Depth of earthquake in kilometers.
G = Nominal depth.
R = Restrained depth.
MAG = Magnitude
ML = Richter magnitude
N = Number of stations that recorded the earthquake.
A = Accuracy of location.
A = +/- 0.05 degree
B = +/- 0.10 "
C = +/- 0.20 "
D = +/- 0.50 "

TABLE 14
REQUESTS FOR DATA 1982

Institution	Type of data	No
Australian National University	Seismogram copies	26
University of California	"	2
Teledyne Geotech	"	6
Hokkaido University, Japan Dept. Geology and Geophysics	"	3
Yale University Lamont Doherty Geological Observatory	"	8
Columbia University	"	10
University Fridericiana Karlsuhe	"	6
Royal Insurance Co.	Isoseismal maps	2
Engineering Consulting Co.	Earthquake risk data	1
Dept. of Mineral Resources, Fiji	ISC data	20
J.W. Dallimore & Sons	M.M. scale	1
Western Australian Institute of Technology	Earthquake plot	1
Various Insurance Co.'s	Earthquake data lists (various 1973-1982)	13
State Emergency Service	Earthquake data list 1972-1982	1
Hancock and Wright	" 1965-1980	1
Various Insurance Co.'s	Earthquake information	25
A. Sabitay Consultants	Magnetogram copies	4
Australian National University	"	2
Project Magnet	"	3
Uranerz Aust. Pty. Ltd.	"	3
Tesla-10	"	13
W.A. Agricultual Department	Gnangara K indices 1958	1
Western Australian Institute of Technology	Magnetic storm data	1
Various	Magnetic field values	13

TABLE 15

BALLIDU SEISMOGRAPH STATION DETAILS

Code

BAL

Co-ordinates

Latitude	30°36.39'S
Longitude	117°42.43'E
Elevation	300 m
Foundation	Pre Cambrian granite

Parameters

Component	SP-Z
To	1.0s
Magnification	26K at 1.0s
	293K at 0.15s (peak)
Recording speed	60mm/min

Instrumentation

Seismometer	Willmore Mk2
Telemetry amplifier	Geotech AS320
Discriminator	Geotech XD410
Recorder	Sprengnether 4279
Recorder amplifier	Geotech AR311
Power and time	From SRO system

Installation Date

27 August 1982

TABLE 16
ACCELEROGRAM DATA 1982

YR	MN	DY	UT	LAT	LONG	ML	LOC	H/E	COM	T(S)	ACC	R	DUR
82	02	20	0527	31.62	117.07	3.5	ME-K	(15)/(11)	SZ	0.04	3.4		
RUMBLING AT ME-Z FOR AN ESTIMATED 20 SECS,									N	0.04	10.8	15.0	14.1
FELT REPORT MM111-1V									E	0.04	9.8		
							ME-M	(11)/(4)	SZ	0.02	2.1		
									N	0.02	4.7	12.9	6.3
									E	0.02	11.8		
82	02	23	1214	31.69	116.92	2.0	ME-K	(7)/6	SZ	0.03	2.0		
									N	0.03	10.8	12.5	4.7
									E	0.03	5.9		
82	02	24	2339	31.70	116.97	1.5	ME-K	3/1	PZ	0.02	1.0		
									N	0.02	2.0	2.5	
									E	0.02	1.0		
									SZ	0.02	2.0		4.7
									N	0.02	1.0	4.5	
									E	0.02	3.9		
									LZ	0.02	4.9		
									N	0.03	8.8	15.5	
									E	0.03	11.8		
82	02	21	2306	30.73	117.13	2.8	CA-K	2.5/2	PZ	0.04	9.8		
Felt at 2 nearby farmhouses									N	0.02	5.9	12.9	
at MM1V.									E	0.02	5.9		
									SZ	0.04	49.0		15.4
									N	0.03	49.0	75.3	
									E	0.03	29.4		
									LZ	0.04	53.9		
									N	0.04	39.2	77.3	
									E	0.04	39.2		
82	03	08	2316	30.70	117.10	3.5	CA-K	(10)/(4)	LZ	0.05	9.8		
									N	0.05	7.8	17.2	12.0
									E	0.05	11.8		
82	03	10	1730	30.73	117.08	2.7	CA-K	(10)/(4)	SZ	0.03	2.0		
									N	0.03	0.6	2.2	1.8
									E	0.03	0.6		
82	03	17	1708	30.72	117.13	1.8	CA-K	(2)/(1)	SZ	0.03	3.4		
									N	0.02	1.0	3.7	1.7
									E	0.03	1.0		
82	03	20	1004	30.91	117.14	3.7	CA-K	(25)/(22)	SZ	0.04	3.8		
									N	0.03	1.0	4.1	3.4
									E	0.03	1.0		
82	04	02	1604	30.76	117.11	2.5	CA-K	(6)/(5)	SZ	0.04	9.8		
									N	0.03	0.6	9.9	2.3
									E	0.03	1.0		

TABLE 16 (Contd)

YR	MN	DY	UT	LAT	LONG	ML	LOC	H/E	COM	T(S)	ACC	R	DUR
82	04	14	0012	30.78	117.13	1.5	CA-K	(7)/(7)	SZ	0.03	3.8		
Felt nearby for 4 secs.									N	0.02	1.1	4.1	4.7
									E	0.02	1.2		
82	04	15	1217	30.77	117.12	1.4	CA-K	(6)/(6)	SZ	0.03	2.7		
Felt nearby.									N	0.03	1.1	7.5	1.7
									E	0.03	6.9		
82	04	15	1750	30.85	117.16	3.9	CA-K	20/17	SZ	0.03	4.6		
Felt nearby at MM1V,									N	0.03	1.1	5.0	
felt for 7 secs.									E	0.03	1.7		8.1
									LZ	0.03	49.0		
									N	0.03	24.5	55.1	
									E	0.05	5.9		
82	04	17	1506	30.74	117.12	1.3	CA-K	4/3	PZ	0.03	0.2		
Felt for 1 1/2 secs.									N	0.03	0.6	0.9	
									E	0.03	0.6		0.6
									SZ	0.03	5.9		
									N	0.02	7.8	10.9	
									E	0.02	4.9		
82	04	20	1204	30.88	117.12	3.4	CA-K	(20)/(19)	SZ	0.03	2.9		
									N	0.03	4.9	9.7	2.9
									E	0.03	7.8		
82	04	20	2103	30.75	117.10	2.1	CA-K	6/5	PZ	0.03	3.9		
Felt for 3 1/2 secs.									N	0.03	1.0	5.0	
									E	0.03	2.9		5.8
									SZ	0.03	5.9		
									N	0.03	3.9	8.6	
									E	0.03	4.9		
82	05	08	1215	30.76	117.11	2.0	CA-K	6/5.5	PZ	0.03	2.0		
Felt nearby at MM1V									N	0.03	0.6	2.2	
									E	0.03	0.6		5.8
									SZ	0.03	19.6		
									N	0.03	5.9	22.7	
									E	0.03	9.8		
82	05	20	0728	30.76	117.17	1.4	CA-K	6/5.5	SZ	0.03	3.9		
Felt nearby at MM1V									N	0.03	3.9	6.2	2.9
									E	0.03	2.9		
82	07	02	0331	31.69	117.01	2.1	ME-K	3/3	PZ	0.02	1.0		
** Trace very faint.									N	0.02	2.7	3.3	
Event felt 7 km away at about MM111									E	0.02	1.7		3.6
									SZ	0.045	7.6		
									N	**	>16	>18	
									E	0.03	4.0		
82	07	16	2006	30.72	117.13	1.8	CA-K	(5)/(1)	SZ	0.04	2.0		
									N	0.04	1.1	3.3	1.6
									E	0.04	2.4		

TABLE 16 (Contd)

82	07	28	1923	30.78	117.08	2.1	CA-K	(10)/(9)	SZ	0.04	9.8		
									N	0.04	2.2	10.1	1.6
									E	0.04	0.6		
82	08	02	1256	31.71	117.01	2.8	ME-K	3.5/3	PZ	0.025	3.0		
Felt at nearby farmhouse MM1V,									N	0.025	9.1	10.9	
Felt at another 9 km away at MM111.									E	0.02	5.1		
									SZ	0.035	5.1		
Double event.									N	0.035	4.3	10.0	8.0
									E	0.035	7.5		
									LZ	0.035	19.6		
									N	0.025	35.3	59.1	
									E	0.03	43.1		
Second event occurred 37 secs						2.2	ME-K	3.5/3	PZ	0.03	3.4		
later-assume same location									N	0.03	0.5	4.8	
as event above.									E	0.025	3.4		3.6
									LZ	0.035	3.0		
									N	0.035	5.9	8.7	
									E	0.035			
82	08	06	0915	30.76	117.16	2.2	CA-K	(7)/(5)	LZ	0.04	9.8		
Felt MM1V at two nearby farms									N	0.04	2.8	10.8	8.8
									E	0.04	3.5		
82	08	12	1503	30.76	117.10	1.4	CA-K	(7)/(6)	LZ	0.04	4.2		
Felt MM1V									N	0.04	2.2	4.9	5.9
									E	0.04	1.2		
82	08	21	2156	30.76	117.12	1.4	CA-K	(6)/(4.5)	SZ	0.03	2.8		
Felt MM1V									N	0.03	1.7	6.7	7.1
									E	0.03	5.9		
82	08	31	2229	30.77	117.11	2.3	CA-K	6/5	PZ	0.03	2.0		
									N	0.03	0.6	4.7	
									E	0.03	0.6		7.1
									SZ	0.05	7.8		
									N	0.025	1.6	8.7	
									E	0.025	3.4		

KEY TO ACCELEROGRAM DATA

YR = YEAR
MN = MONTH
DY = DAY
UT = UNIVERSAL TIME
LAT = LATITUDE (DEGREES SOUTH)
LONG = LONGITUDE (DEGREES EAST)
ML = RICHTER MAGNITUDE
LOC = ACCELEROGRAPH LOCATION
H/E = HYPOCENTRAL DISTANCE / EPICENTRAL DISTANCE
COM = COMPONENT
T(S) = GROUND PERIOD IN SECONDS
ACC = PEAK GROUND ACCELERATION IN CENTIMETRES PER SECOND SQUARED
R = RESULTANT ACCELERATION IN CENTIMETRES PER SECOND SQUARED
DUR = DURATION IN SECONDS WHILE GROUND ACCELERATION REMAINED ABOVE 0.5 CENTIMETRES PER SECOND SQUARED

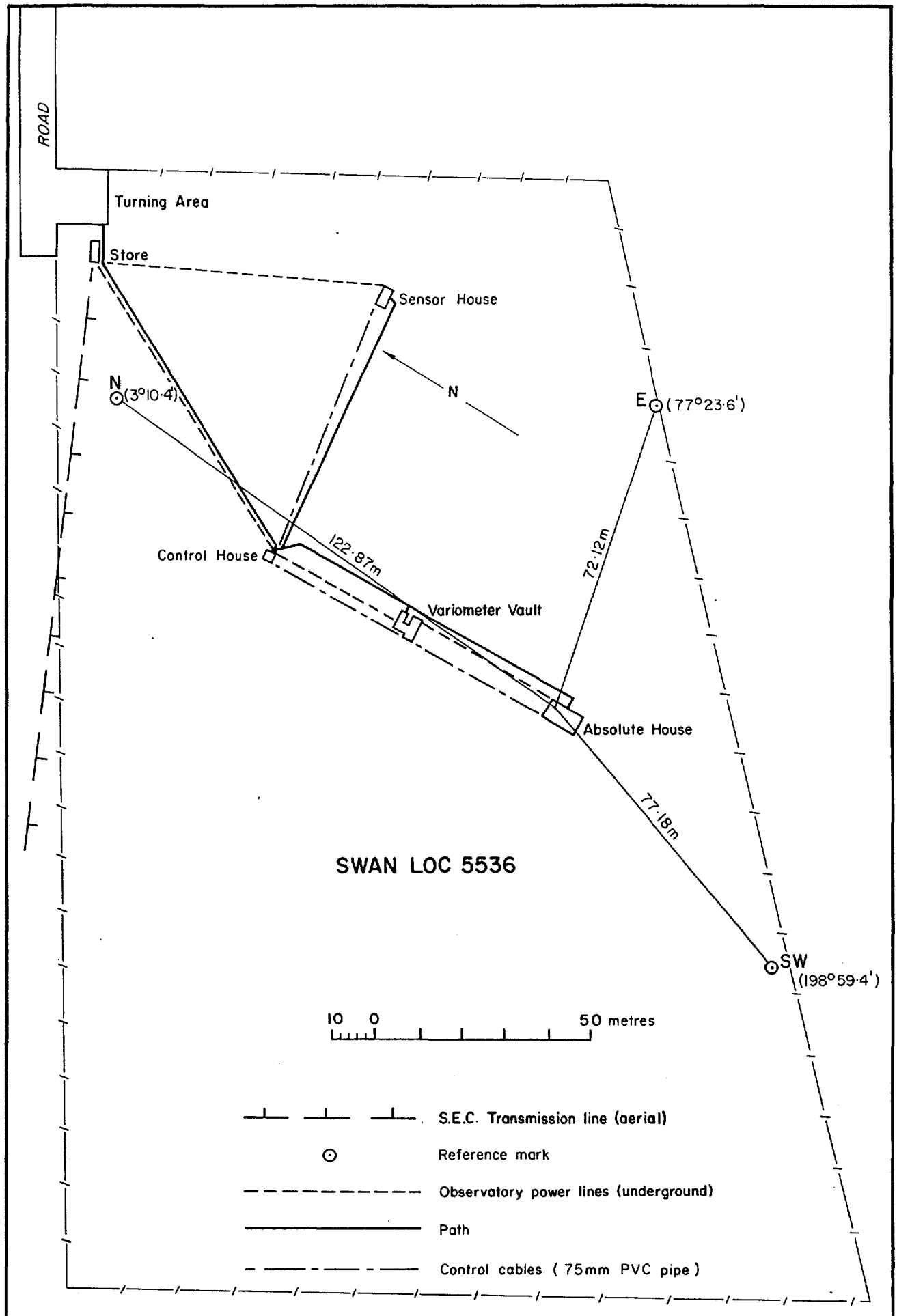


FIG.1 REFERENCE MARKS N, E, SW, GNANGARA

Record 1985/16

24/H50-14/1

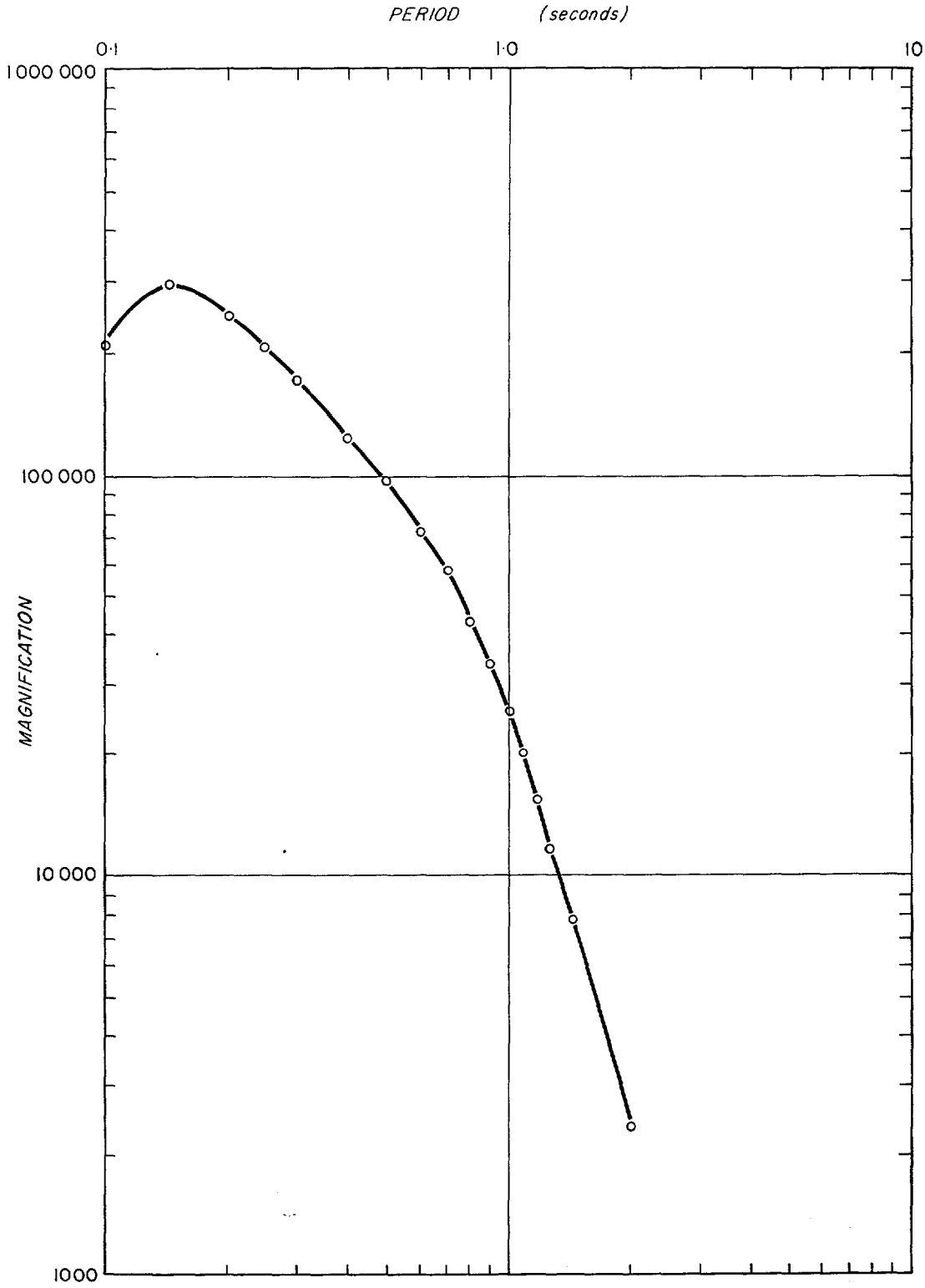


Fig 2 Calibration curve, Ballidu seismograph from 26 August 1982

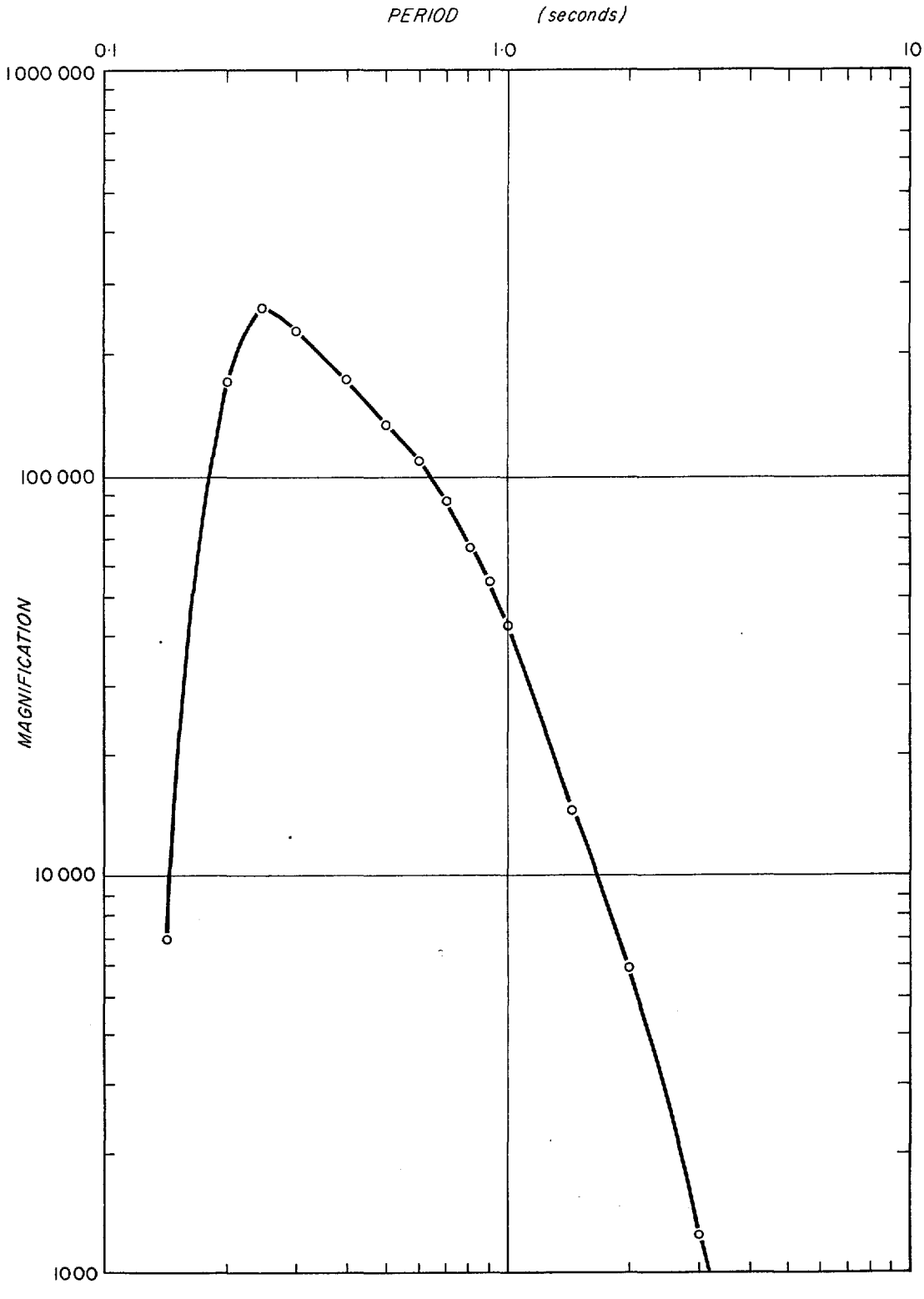


Fig 3 Calibration curve, Kalgoorlie seismograph
from 16 November 1982

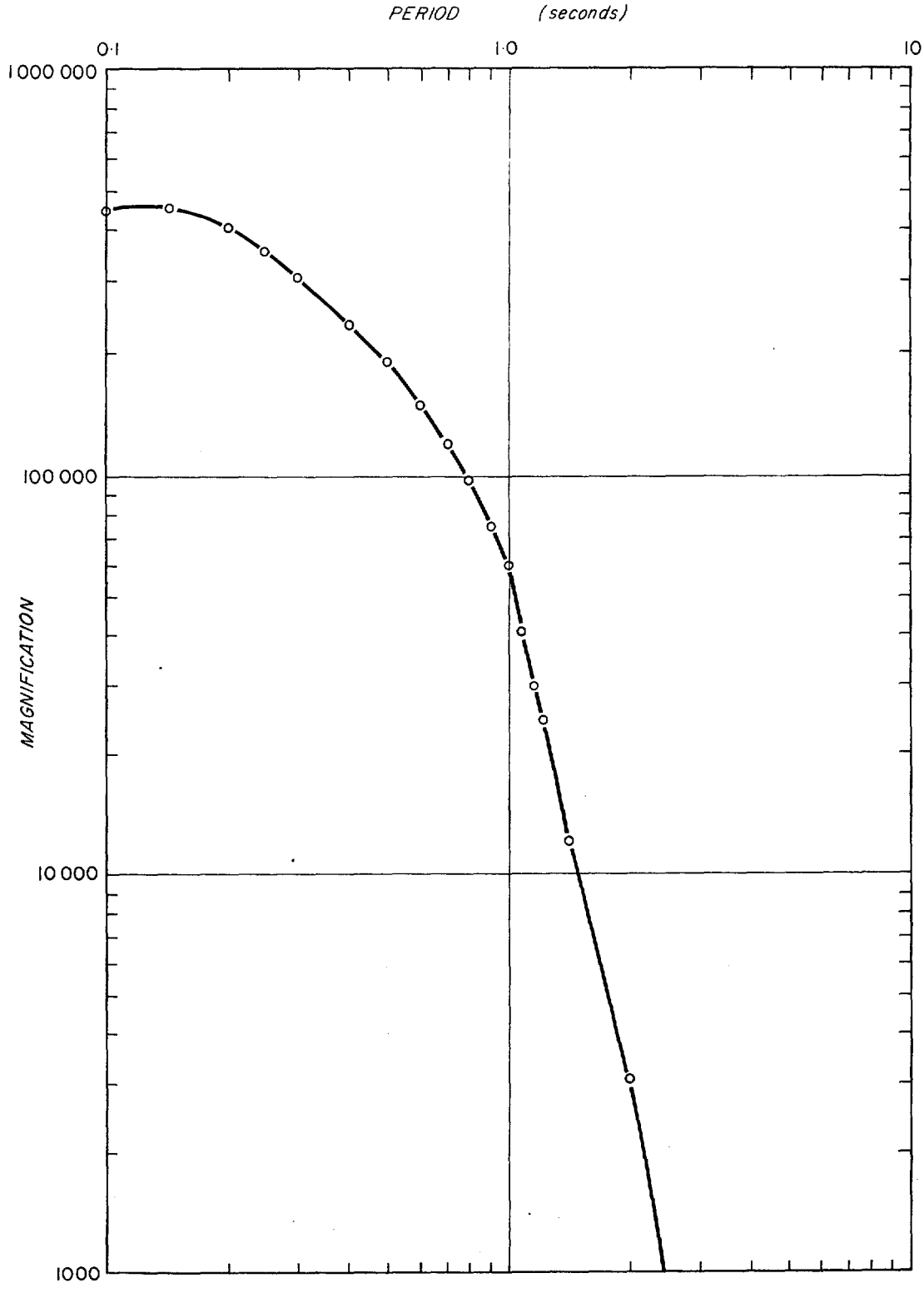


Fig 4 Calibration curve, Meekatharra seismograph from 23 November 1982

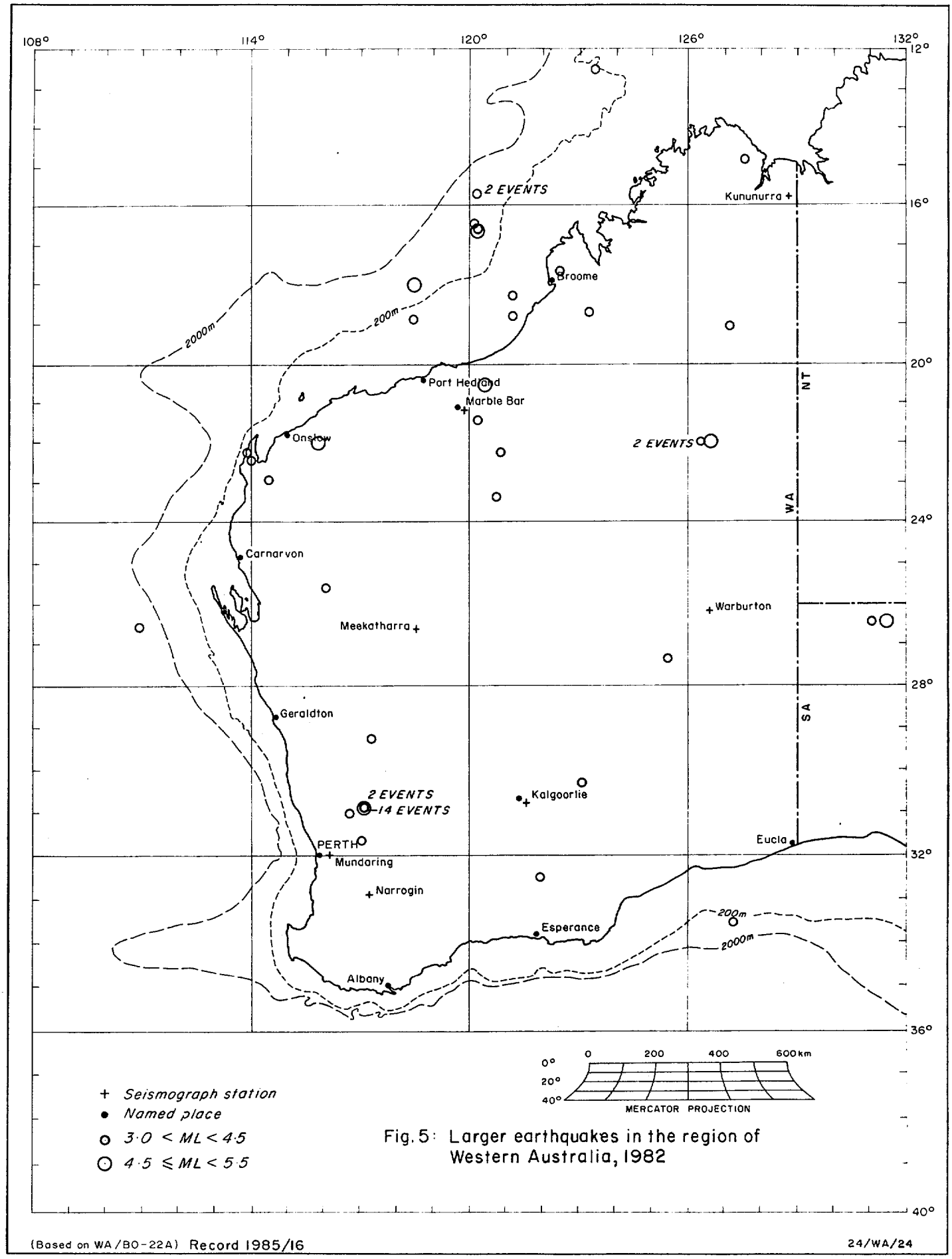


Fig. 5: Larger earthquakes in the region of Western Australia, 1982

(Based on WA/BO-22A) Record 1985/16

24/WA/24

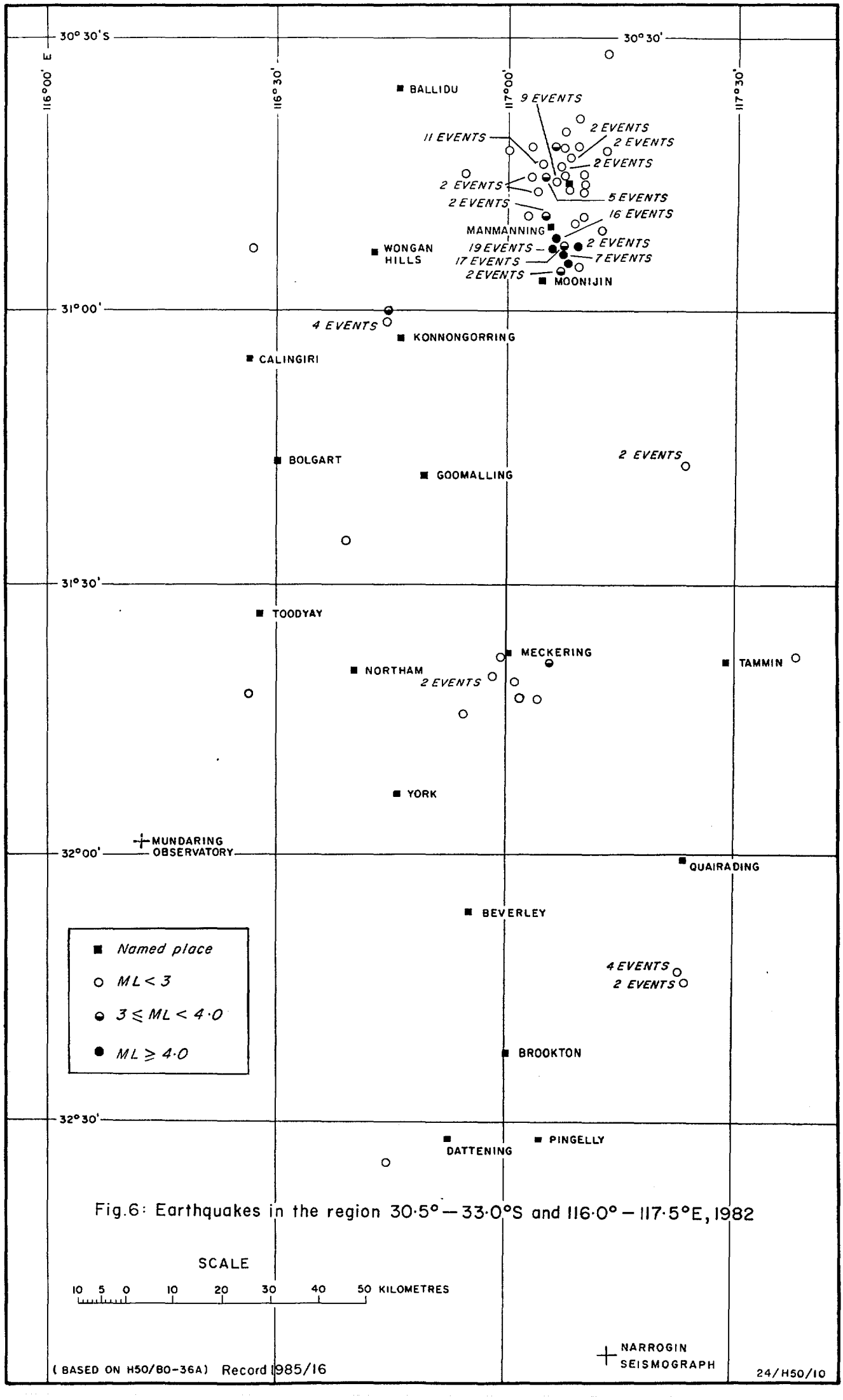


Fig.6: Earthquakes in the region 30·5° — 33·0°S and 116·0° — 117·5°E, 1982

ISOSEISMAL MAP OF THE CADOUX EARTHQUAKE, WESTERN AUSTRALIA
24 JANUARY 1982

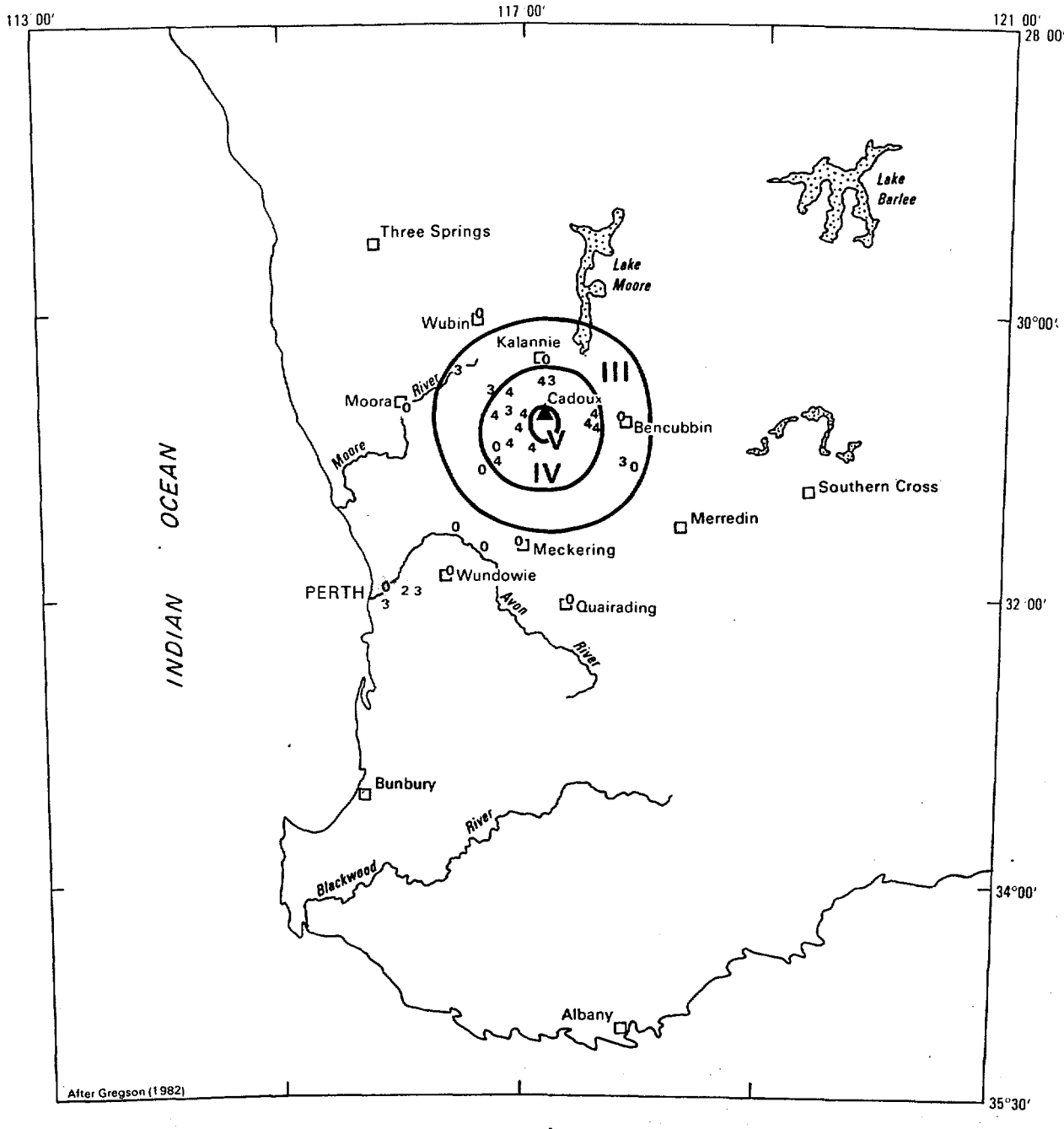
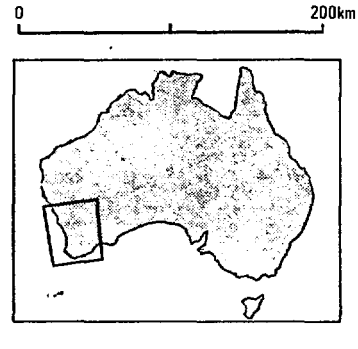


Fig. 7



DATE : 24 JANUARY 1982
TIME : 04:06:19 UT
MAGNITUDE : 4.3 ML, 3.5 MB
EPICENTRE : 30.90°S, 117.12°E
DEPTH : 5 km

▲ EPICENTRE
IV ZONE INTENSITY DESIGNATION (MM)
4 EARTHQUAKE FELT (MM)
0 EARTHQUAKE NOT FELT

Record 1985/16

ISOSEISMAL MAP OF THE CADOUX EARTHQUAKE, WESTERN AUSTRALIA
6 FEBRUARY 1982

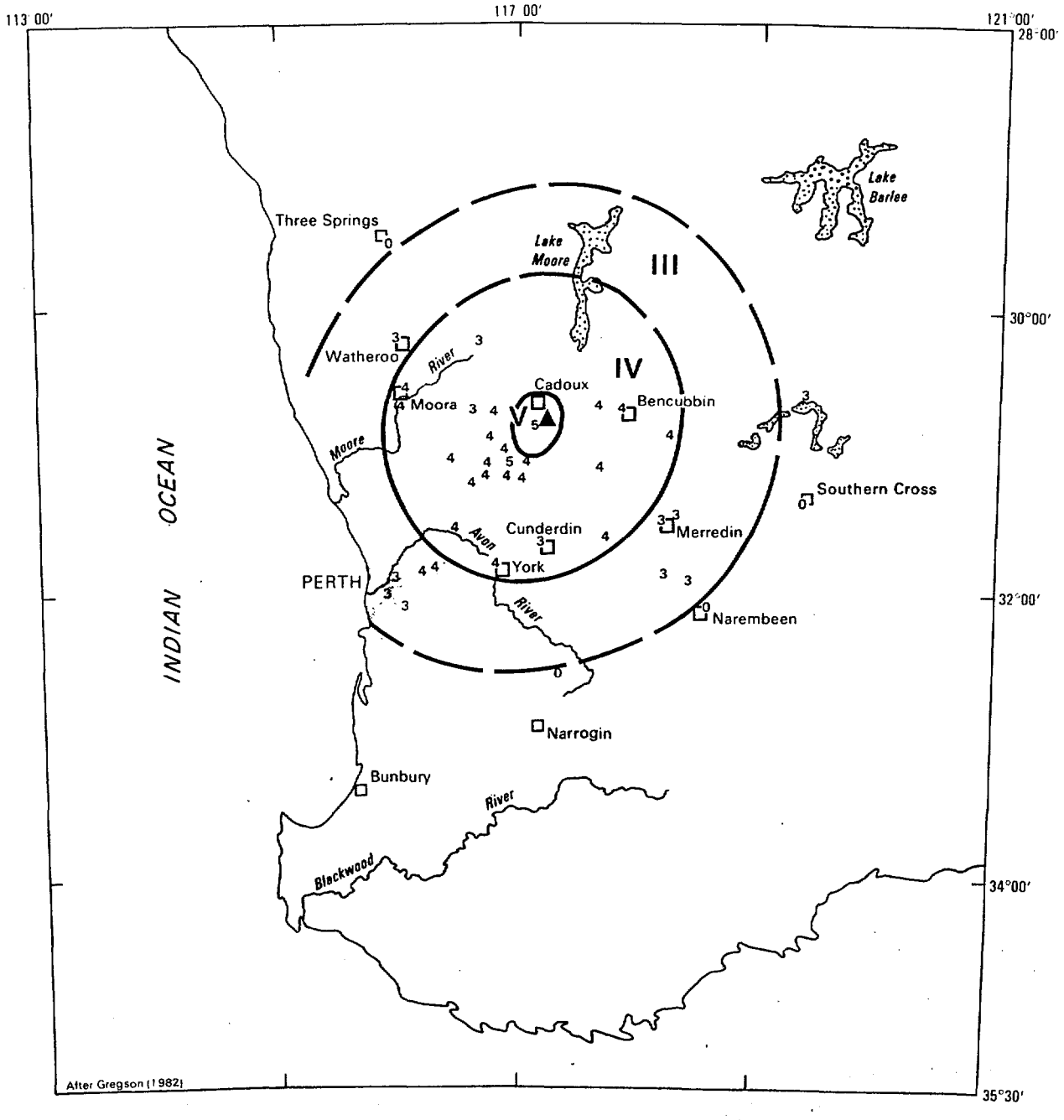


Fig. 8

0 200km

DATE : 6 FEBRUARY 1982
TIME : 15:24:38.4
MAGNITUDE : 4.9 ML(MUN), 4.7 MB
EPICENTRE : 30.88°S 117.15°E
DEPTH : 7 km

▲ EPICENTRE
IV ZONE INTENSITY DESIGNATION (MM)
4 EARTHQUAKE FELT (MM)
0 EARTHQUAKE NOT FELT

ISOSEISMAL MAP OF THE CADOUX EARTHQUAKE, WESTERN AUSTRALIA 6 FEBRUARY 1982

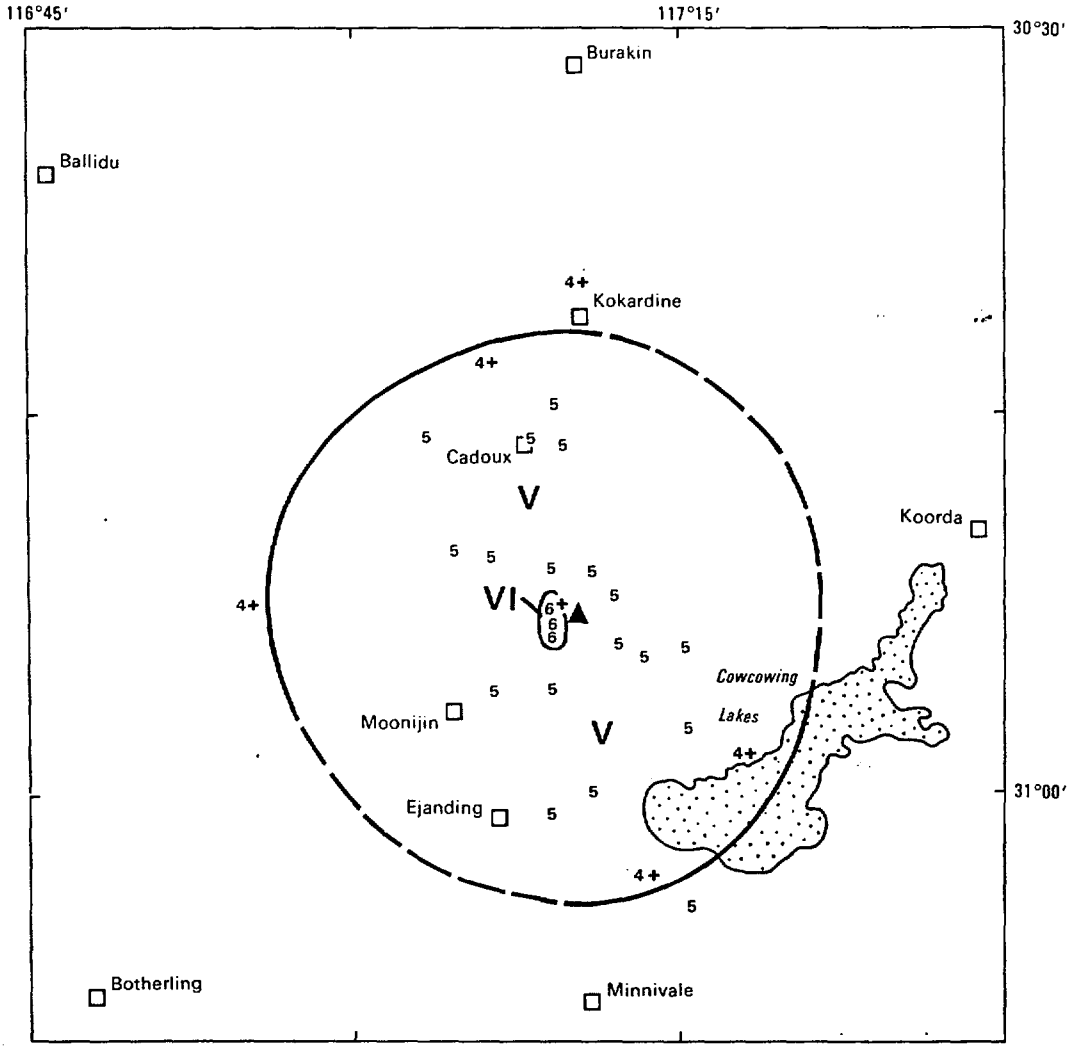


Fig. 9

DATE : 6 FEBRUARY 1982
TIME : 15:24:38.4 UT
MAGNITUDE : 4.9 ML (MUN)
EPICENTRE : 30.87°S 117.16°E
DEPTH : 7 km

▲ EPICENTRE
IV ZONE INTENSITY DESIGNATION (MM)
4 EARTHQUAKE FELT (MM)
0 EARTHQUAKE NOT FELT