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RECORD

Record 1981/64

THE 1979 McARTHUR BASIN MAGNETOTELLURIC SURVEY

by

J.P. Cull, A.G. Spence,
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ABSTRACT

Magnetotelluric (MT) surveys were first conducted by BMR in the southern McArthur Basin during 1978; the data were sufficient to justify a further survey in 1979. Seventeen sites were occupied in 1979 along a 200 km traverse across the Bauhinia Shelf. The data at each site were reduced to give plots of apparent resistivity and phase for two orthogonal axes orientated along-strike and cross-strike respectively; geological interpretations have been based on inversions of these data.

A preliminary examination of the resistivity plots at each site reveals marked differences between the major structural units of the Bauhinia Shelf. A predominant two-dimensional (2D) feature is indicated by diverging components of apparent resistivity. This observation is emphasised when the individual components are presented as 2D pseudosections. Consequently the results of one-dimensional (1D) inversion are of limited value. Actual resistivities for each stratigraphic unit cannot be readily resolved because of anisotropy related to steeply dipping structures; correlations must therefore be based on relative values.

Isotropic data at each end of the traverse were inverted in a 1D analysis, revealing well-defined resistivity contrasts. The Roper Group appears to be characterised by resistivity values in the range 20-50 ohm-m. However, very low values (< 10 ohm-m) have been detected at shallow depth in the region of the Limmen Bight River on the eastern end of the traverse. These low values suggest the presence of an aquifer sequence which tends to mask any response from deeper layers. Even so, there is some indication of high values (> 1000 ohm-m) at depths of about 3 km. These values are attributed to McArthur Group rocks which are not detected further west.

Resistivity contrasts near Daly Waters are approximately constant between sites, suggesting lateral uniformity. However, actual values differ markedly from results obtained near the Limmen Bight River.

In particular, there is no indication of a low-resistivity aquifer sequence, and the underlying features can be resolved with greater confidence. Apparent resistivity values for the granitic/metamorphic basement appear to be less than 1000 ohm-m with maximum depths of 9.5 km, changing abruptly to 6.0 km at Daly Waters. There is no indication of any more-resistive layers at shallow depth and so the McArthur Group appears to be absent. The most significant resistivity contrast at shallow depth appears to correlate with the Roper/Tawallah Group boundaries. A similar boundary has been detected by seismic refraction techniques and the major features are identical. There is an abrupt change in depth in this boundary from 2.0 to 4.5 km at Daly Waters with a gradual return to shallow depths further east.

Data from the central sites near Tanumbirini are variable; orthogonal components diverge and continuity between sites cannot be readily detected. Consequently, 1D inversion may not be appropriate. However, major features have been identified in models generated by 2D inversion. An isolated resistive block has been identified at shallow depth near the Limmen Bight River. This block is attributed to McArthur Group rocks but the western extent remains obscure. Steeply dipping zones of high conductivity have been detected and these obscure details in other more resistive units.

1. INTRODUCTION

The 1979 McArthur Basin magnetotelluric (MT) survey (Fig. 1), was designed to determine the nature of the crustal structure to the west of the Batten Trough (Fig. 2).

In 1978, an MT survey was conducted by BMR in the region of the Emu Fault and the Wearyan Shelf to the east (Figs. 1 & 2). The results were consistent with geological models based on the concept of evolution with a graben control (Cull & others, 1981). Abrupt lateral changes in electrical resistivity were readily identified at the western end of the 1978 traverse. These features were related to rapid changes in the thickness of McArthur Group rocks in the region of the Emu Fault.

Further data were required to ensure that the major structural units in the Emu Fault region were adequately identified in terms of electrical response alone. In addition some data were required to delineate the southwestern margin of the McArthur Basin, which is concealed by a surface layer of post-Roper Group sediments (Fig. 2).

Consequently, 17 MT sites were occupied during October and November of 1979 (Table 1; Fig. 5). The primary objective was to obtain data at relatively closely spaced sites along a detailed gravity traverse, established during 1979. Sites were initially occupied approximately 6 km apart in a line extending westwards from Bauhinia Downs homestead and then southwest to the Carpentaria Highway near Tanumbirini homestead (Fig. 1). Sites were also occupied at 30 km intervals along the Carpentaria Highway as far west as Daly Waters to complement a large-scale seismic refraction profile conducted along the highway during 1979 (Collins, 1981).

Data are presented in this Record according to the format adopted for the 1978 survey (Cull & others, 1981). Data processing has been completed and some preliminary interpretations of the resistivity cross-sections have been made. However, there are some aspects of data control that require further investigation, particularly in regard to variations in phase which appear to be unrelated to the apparent resistivity data.

2. GEOLOGY OF THE McARTHUR BASIN

The general geology of the McArthur Basin has been described by Plumb & Derrick (1975); however, a more complete account of the Basin's evolution, stratigraphic columns, palaeographic reconstructions, and tectonic synthesis, has been prepared by Plumb & others (1980). A summary of the geology has been given by Plumb (1977) and the principal facts were indicated by Cull & others (1981). The relevant features are further condensed in this Record.

The McArthur Basin is the relatively undeformed structure within which Carpentarian rocks (1800-1300 m.y.) of the Tawallah, McArthur, and Roper Groups, and their stratigraphic equivalents, were deposited (Figs. 2 & 3). The Basin is bounded by, and unconformably overlies, the Lower Proterozoic rocks of the Pine Creek Inlier in the northwest, the Murphy Inlier in the southeast, and the Arnhem Inlier in the northeast (Fig. 2). In the north, south, and east the Basin extends beneath the unconformable rocks of the Palaeozoic Arafura Basin, the Lower Palaeozoic Georgina and Daly River Basins, and the Mesozoic Carpentaria Basin respectively (Fig. 3); there is no subsurface information available as yet to indicate the full extent of the Basin in these directions.

In its present form the McArthur Basin is essentially a structural basin, but palaeogeographic reconstructions suggest that the depositional limits did not extend very far beyond the present northwestern and northeastern limits. The Murphy Inlier (Fig. 2) in the southeast is, by definition, the boundary between the McArthur Basin and the Northwest Queensland Province farther to the south.

Stratigraphy

The McArthur Basin succession has a maximum composite thickness of about 12 km (Fig. 2), although 10.5 to 11 km is typical of the maximum thickness in the central region. The succession comprises three major subdivisions (Fig. 2): the Tawallah Group and equivalents consist

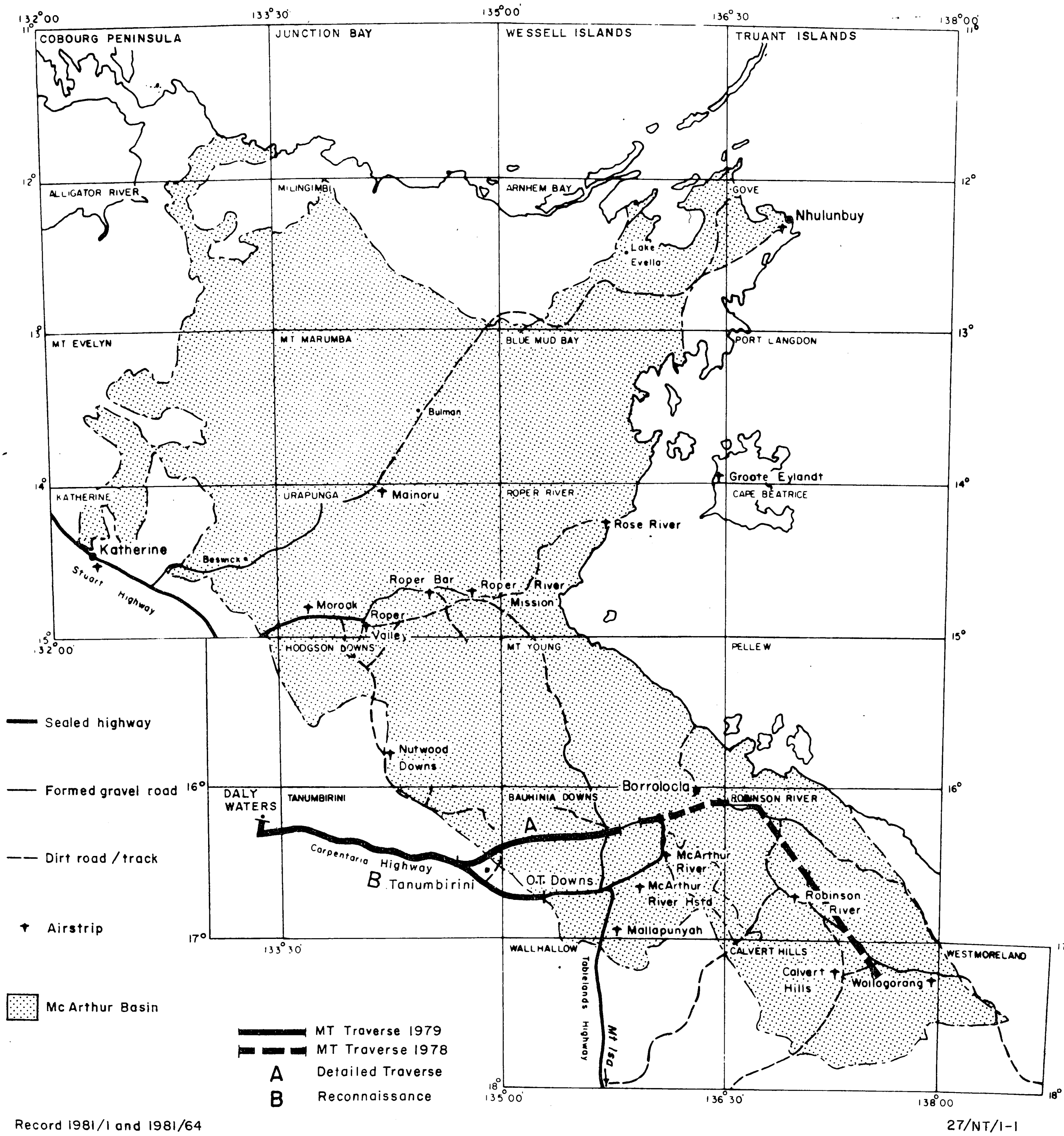

Fig 1 Geographical setting of McArthur basin with index to 1 250 000 sheet areas and principal access.

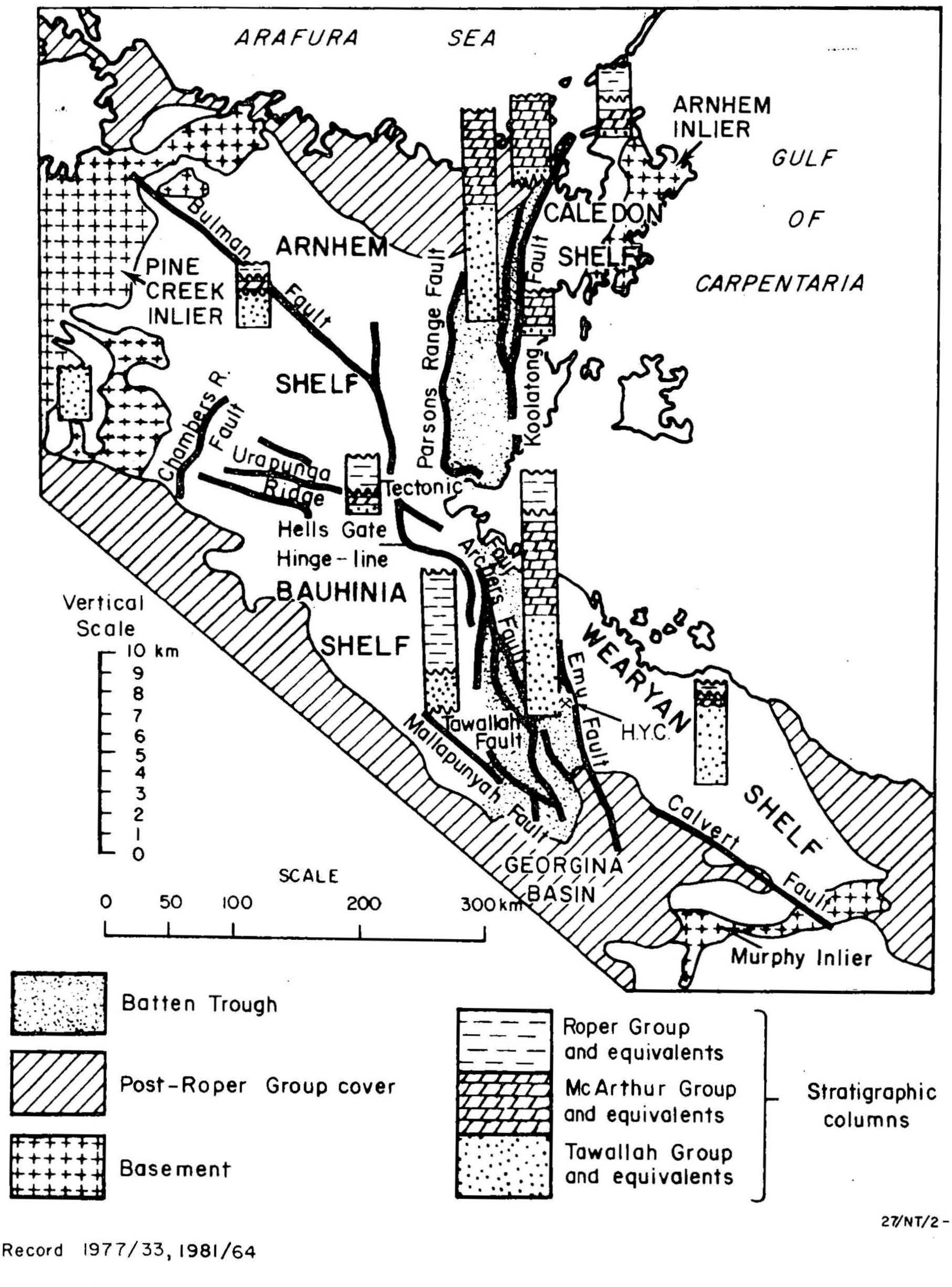

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Figure 2 Major tectonic elements, McArthur Basin (after Plumb & Derrick, 1975)

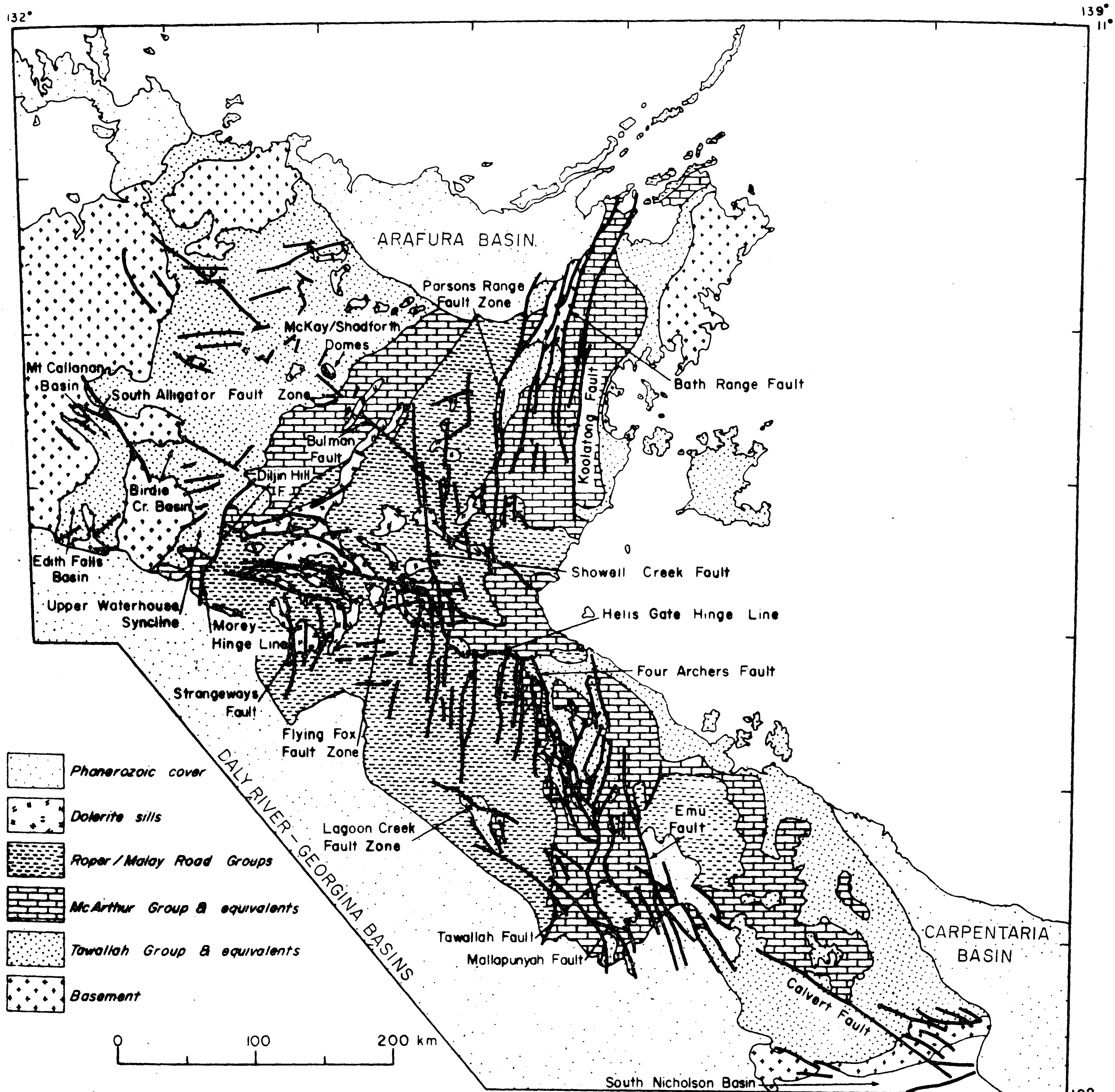

Fig. 3 Geological sketch map–McArthur Basin, (after Plumb, 1977)

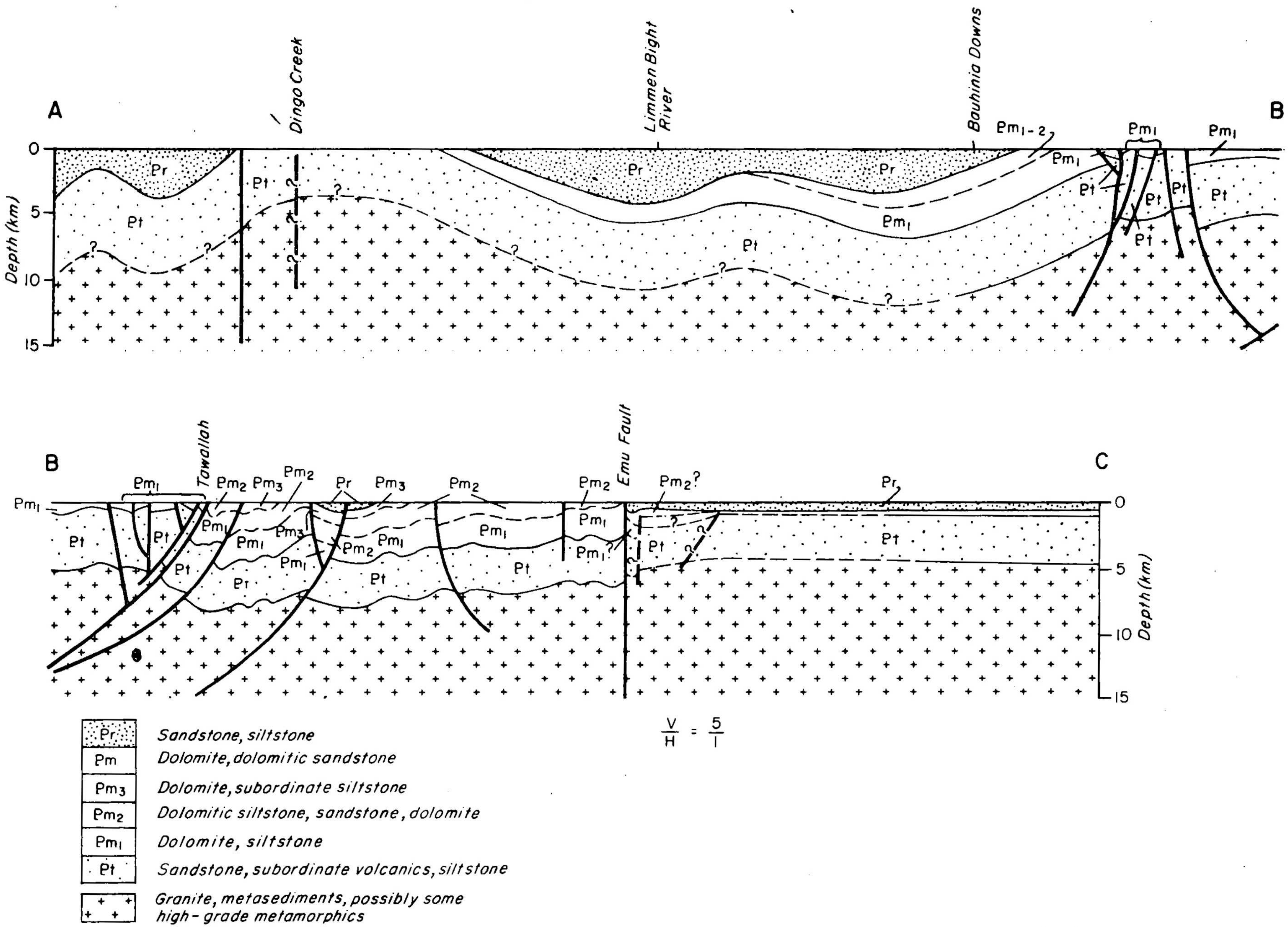

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Fig. 4 Geological cross-sections from surface mapping in the Mc Arthur Basin (AB: 1979 MT Traverse; BC: 1978 MT Traverse; see Fig.5) of quartz-rich arenites, subordinate basic volcanics, carbonates, and lutites, and is up to 6 km thick; this is followed by a dominantly carbonate sequence, the McArthur Group and equivalents, which is up to 5.5 km thick; this is overlain with regional unconformity by the Roper Group and equivalent sediments, which consist of alternating quartz arenites and micaceous lutites up to 5 km thick.

Structure and Tectonics

Structurally, the McArthur Basin contains belts of shallow-dipping strata in the east and west, progressively younging towards a meridional zone of intense and complex block faulting (Fig. 3); stratigraphic displacements of up to 7.5 km occur across these meridional faults, exposing the basement in small inliers. A prominent zone of westerly-trending faults, the Flying Fox Fault Zone, bisects the western stable block. Bedding dips rarely exceed 5° on the stable blocks, and even in the meridional deformed belt rarely exceed 20° except adjacent to faults. The suggested geological section along the 1978 and 1979 MT traverses is indicated in Fig. 4.

A fundamental concept in the current models for the evolution of the McArthur Basin is the hypothesis that the Batten Trough (Fig. 2) formed as a syndepositional graben, with sudden changes in the depositional thickness at the boundary faults. The concept is derived from the observation that the shelf sequences are much thinner than those in the trough. However, it is not known with any certainty whether the changes in thickness occur suddenly at the faults or gradually over tens of kilometres (the 1978 MT traverse (Fig. 5) was designed to resolve these principal structural features in terms of electrical response).

3. GEOPHYSICAL CONSTRAINTS

Prior to 1978, geophysical data in the McArthur Basin region were obtained mainly to assist routine regional geological mapping. Structural interpretations were based on surface sampling with limited control from regional gravity and aeromagnetics. Critical features identified in this process were therefore subject to the current more detailed geophysical investigations.

Gravity

Regional structure is indicated using gravity observations on maps drawn at a scale of 1:2 500 000. Data have been obtained for this purpose at intervals of 11 km over the whole of McArthur Basin. Only general trends can be detected at this scale with a total variation less than 200 $\mu m.s^{-2}$; there is no obvious relationship to lateral changes in the sedimentary cover, and most anomalies are tentatively ascribed to variations in the basement. The prevalence of low-grade metamorphics and granites in the basement suggests a very low density contrast with the overlying sediments. However, one of the major density contrasts appears to originate from the dolomites of the McArthur Group, and this should greatly assist the interpretation of critical features in the evolutionary concept. Adequate resolving power in indicated by an earlier reconnaissance gravity traverse from Normanton, east of survey area, to Daly Waters (Neumann, 1964), which shows marked short-wavelength anomalies that are not apparent in the regional data.

Detailed gravity profiles

A detailed gravity survey across the Batten Fault Zone and the Bauhinia and Wearyan Shelves was completed during 1979 and 1980. Traverses with a combined length of 570 km were completed by 1979 and preliminary interpretations were presented by Anfiloff (1979); more data were obtained in 1980 along two traverses totalling 500 km in length (Anfiloff, 1981). A number of important short-wavelength anomalies were detected which were not indicated by the regional gravity coverage. These anomalies can be related directly to specific geological formations, and the repeated occurrence of some geological formations along different traverses may allow density contrasts to be evaluated. Small density contrasts are apparent at all depths in the basin sequence, but the largest contrasts occur in the upper part.

A good correlation is suggested between gravity and basement shape across the Batten Fault Zone. Basement depths appear to become very shallow in the Robinson River area. A small fault anomaly has been detected near Borroloola associated with the Emu Fault, but no major anomaly of long wavelength can be detected where the main traverse crosses the Emu Fault farther south. There is, however, a steep, short-wavelength 30 $\mu m.s^{-2}$ anomaly across the Fault, which may indicate complex and compensating variations in density at shallow depth.

The lack of a substantial long-wavelength anomaly across the Emu Fault would appear to rule out any sudden change in thickness of the McArthur Group dolomites. However, it is possible that these rocks have densities similar to the underlying Tawallah Group sandstone. In addition it is possible that there are compensating gravity features associated with deep structures in the Basin.

Magnetics

During 1963-64, an aeromagnetic survey was conducted over about 7500 km^2 in the region to the north and west of McArthur River, (Young, 1965). Many of the major geological structures can be identified in the data, but basic volcanics within the successions complicate calculations of depth to true basement. All the intense magnetic anomalies occur over outcrops of the volcanic rocks. The data assist with the extrapolation of regional structures into areas of no outcrop, but depth to basement calculations will require integrated geological-geophysical interpretation to separate out the effects of the volcanics, etc. from the sequence.

Seismic profiles

Seismic reflection techniques can often be used to define structural features with great precision. However, the data must be obtained in profiles extending over distances of tens of kilometres and energy must be sufficient to penetrate to depths of 10 km. In the McArthur Basin all signal levels are reduced by the thick carbonates of the McArthur group, and consequently, very large shots must be used as a matter of routine. The cost of any such survey soon escalates. Furthermore, there is no ready access to many of the critical areas of geological importance.

Many of these difficulties can be avoided (accepting a loss in resolution) by using long-range seismic refraction profiles. A major survey of this type was conducted by BMR in 1979 to investigate velocity structure in the crust and upper mantle (Collins, 1981). A long refraction line of 300 km, between Daly Waters and the HYC mine, and one shorter line of 100 km, between Borroloola and the Murphy Inlier, were recorded on each side of the Emu Fault (Fig. 5). Shots of up to 2000 kg at each end of the 300 km traverse were recorded at stations spaced at 15 km intervals. For the 100-km traverse, the charge size was 400 kg and the recording stations were positioned at 5 km intervals. Good reflection and refraction arrivals were recorded at all locations, except between Daly Waters and O.T. Downs, where deep weathering of Cretaceous rocks probably masked the deeper seismic reflections and refractions.

A preliminary interpretation of the refraction data on the western side of the Emu Fault shows a broad transition from crust to mantle at depths from 35-50 km. At Daly Waters there is a near-surface layer 4 km thick with a velocity of 4.6 $km.s^{-1}$. This wedges out eastwards and there is no evidence for it east of O.T. Downs: it probably represents Roper Group or equivalent sediments. Between O.T. Downs and HYC Mine, the surface layer has a velocity of 5.8-5.9 $km.s^{-1}$: it correlates directly with carbonates of the McArthur Group. A similar velocity is recorded from below the Roper Group at Daly Waters. Other refractors have been detected west of the Emu Fault with major velocities of 6.9 $km.s^{-1}$ at depths of about 20 km and a transition from 6.9 to 7.5 $km.s^{-1}$

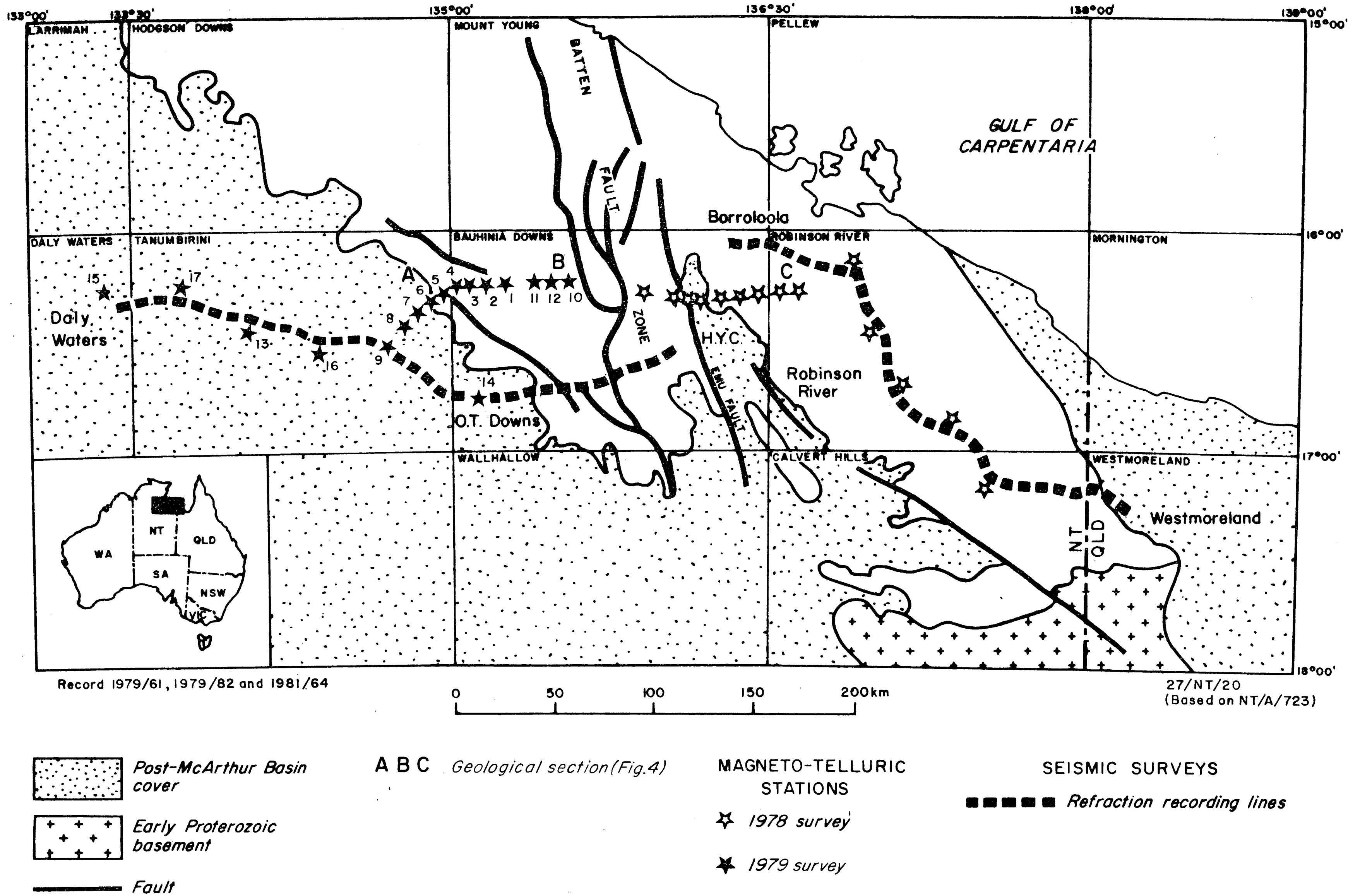

Fig. 5 Magnetotelluric Traverse Localities

at 30-35 km depth. Such gradients are characteristic of the middle to lower crust. However, in the region of the Batten Trough, the basement of the McArthur Basin sediments remains undefined because of the masking effect of the high-velocity carbonates at the surface.

Vertical seismic recordings were also made at each shot site. A characteristic wide band of reflection tentatively correlates with the 6.2 $km.s^{-1}$ intracrustal refractor to the east of the Emu Fault; a similar reflection band appears near the HYC Mine to the west of the Fault. The vertical displacement within the basement rocks between these bands is 1.8 km upwards on the west side of the Fault. A tentative identification and correlation of basement across the Emu Fault gives a depth of 3.9 km near the HYC Mine to the west of the Fault, and 5.7 km at Starvation Hill, to the east. Because there is reasonable stratigraphic control of the McArthur Group to the west of the Fault, these depths imply that the Tawallah Group must thin towards the Emu Fault Zone.

4. THE MAGNETOTELLURIC METHOD

The magnetotelluric method is a geophysical technique for mapping subsurface electrical conductivity. Observations are made of the natural transient magnetic field together with its associated electric field. A detailed description is given by Vozoff (1972) and the basic principles of the BMR system are described by Cull & others (1981).

Penetration of an electromagnetic (EM) field at the surface of the Earth varies according to the frequency of oscillation ($f = 1/T$ Hz, where T = period in seconds) and the electrical resistivity (ρ ohm-m) of the layers encountered. A measure of penetration is given by the 'skin depth', the depth (d) at which field amplitude has dropped to 1/e of its surface amplitude at a particular frequency; it is defined by the expression $d = \frac{1}{2}\sqrt{\rho T}$ km. The ratio of induced electric to magnetic field at various frequencies is used to calculate apparent resistivity (i.e., the resistivity of a uniform earth which gives the measured E/H ratio) as a function of frequency. Apparent resistivity curves may then be used for the production of 1-dimensional (1D) layered resistivity models, and finally, in some cases, 2-dimensional (2D) resistivity models.

In 1D modelling, the EM fields are related to the resistivity and thickness of horizontal layers. In 2D modelling, the EM fields are related to resistivity changes in two directions, the vertical direction and one horizontal direction. In the other horizontal direction, the strike direction, there is assumed to be no variation.

The EM field over 1D structures can be expressed as closed analytical functions of the resistivity and thickness of each layer; the solution of these functions is described elsewhere (Vozoff, 1972). However, these solutions are applicable only in simple geological situations, and a more complex 2D transmission surface analogy based on numerical techniques may be required to solve the critical Maxwell equations (Jupp & Vozoff, 1977).

Data Files

During 1979, MT data were recorded at 17 sites (Table 1) in the McArthur Basin using standard digital techniques. Induction coil magnetometers were buried underground (2 m deep in the case of Z components) to reduce noise interference and to provide greater thermal stability. The induced electric (E) field was measured using electrodes made of cadmium rods inserted in porous pots containing supersaturated cadmium chloride solution. The porous pots were buried in contact with moist earth and a covering was provided to protect against movements by wind and wildlife. Wire similar to seismic cable was used to connect the electrodes to the amplifiers. No shielding was required because of the low source impedances involved. All connecting wires were covered with sand or soil every few metres to prevent induced EMF's caused by wind moving the wires.

Data were recorded in seven overlapping frequency bands giving the required dynamic range with maximum economy in the number of data points. Digital sampling rates were varied to accommodate the maximum frequencies as follows:

Frequency Band (Hz)	Rate (samples/sec)	Number of samples	Min. samples/ cycle	No. cycles (min.)
0.001 - 0.012	0.2	4096	16	20
0.01 - 0.033	0.5	1024	15	20
0.03 - 0.12	1	1024	8	30
0.1 - 0.55	4	1024	7	25
0.5 - 2.5	20	1024	8	25
2.5 -12.5	100	1024	8	25
10 -40	250	1024	6	40

Sites were occupied for periods of up to 2 days, during which time up to 150 bands were recorded on disc and transferred to tape.

Full utilisation of the digital equipment permitted a very large amount of data to be acquired and processed on site. Most of the Fourier analysis and tensor rotations were carried out while further data were being acquired in order to provide information on quality control. For this purpose, plots were generated indicating tensor impedance as a function of frequency. Noise levels were assessed by visual inspection and additional data were recorded in suspect bands. However, no attempt was made to proceed with interpretative modelling in the field.

5. PRESENTATION AND PROCESSING OF MAGNETOTELLURIC DATA

Magnetotelluric data are generally recorded in the time domain as a matter of convenience, however the apparent resistivity is a function of frequency. The data are therefore transformed to the frequency domain by means of a Fast Fourier Transform algorithm. The Cooley-Tukey method was used in the field during further simultaneous recording to transform the demultiplexed data bands.

The resulting data were corrected for the frequency response and gain characteristics of the input amplifiers and filters; the data were then stored on tape and programs were run to generate sets of averaged cross-power spectra and averaged auto-power spectra.

Spectra generated for each site were averaged to ten points per decade of frequency to improve the statistics of the transformed data. The principal axes were determined by tensor rotation, and the corresponding apparent resistivity and phase curves were generated for E-along-strike and E-cross-strike components. These data were averaged to 10 points per decade in non-overlapping bands. The final data sets were subjected to statistical screening (Moore, 1977) and the averaged values are presented in Table 2. These values are adopted for all subsequent interpretations.

A preliminary examination of the resistivity data at each site indicates that structural trends are predominantly two or three dimensional. The E-along and E-cross-strike components appear to diverge at all sites, notably at long periods. However, for Sites 7-9, 11-15, and 17 there is some agreement at periods less than 1 second. This range corresponds to skin depths commonly less than 5 km. One-dimensional models can therefore be formulated to detect the extent of major units within the Basin sequence. Interpretations based on 1D inversions are considered in more detail in the following section.

<u>Pseudosections</u>

Values of apparent resistivity at each site are readily compared using 2D pseudosections. Sites are plotted horizontally on a linear scale and representative apparent resistivities are plotted vertically beneath the site positions on a logarithmic scale; the resistivities are then contoured. Pseudosections for the McArthur Basin have been generated for the E-along and E-cross-strike resistivity components in two profiles designated A and B (Figs. 1, 6, & 7). This type of presentation can indicate the current flow paths which are directly related to lateral changes in conductivity.

The principal features of the geological structures can be inferred from the more resistive section (E-cross strike) on Traverse A (Fig. 6a). Three main blocks can be identified. A region of low resistivity is evident near sites 10, 11, 12 corresponding to a local

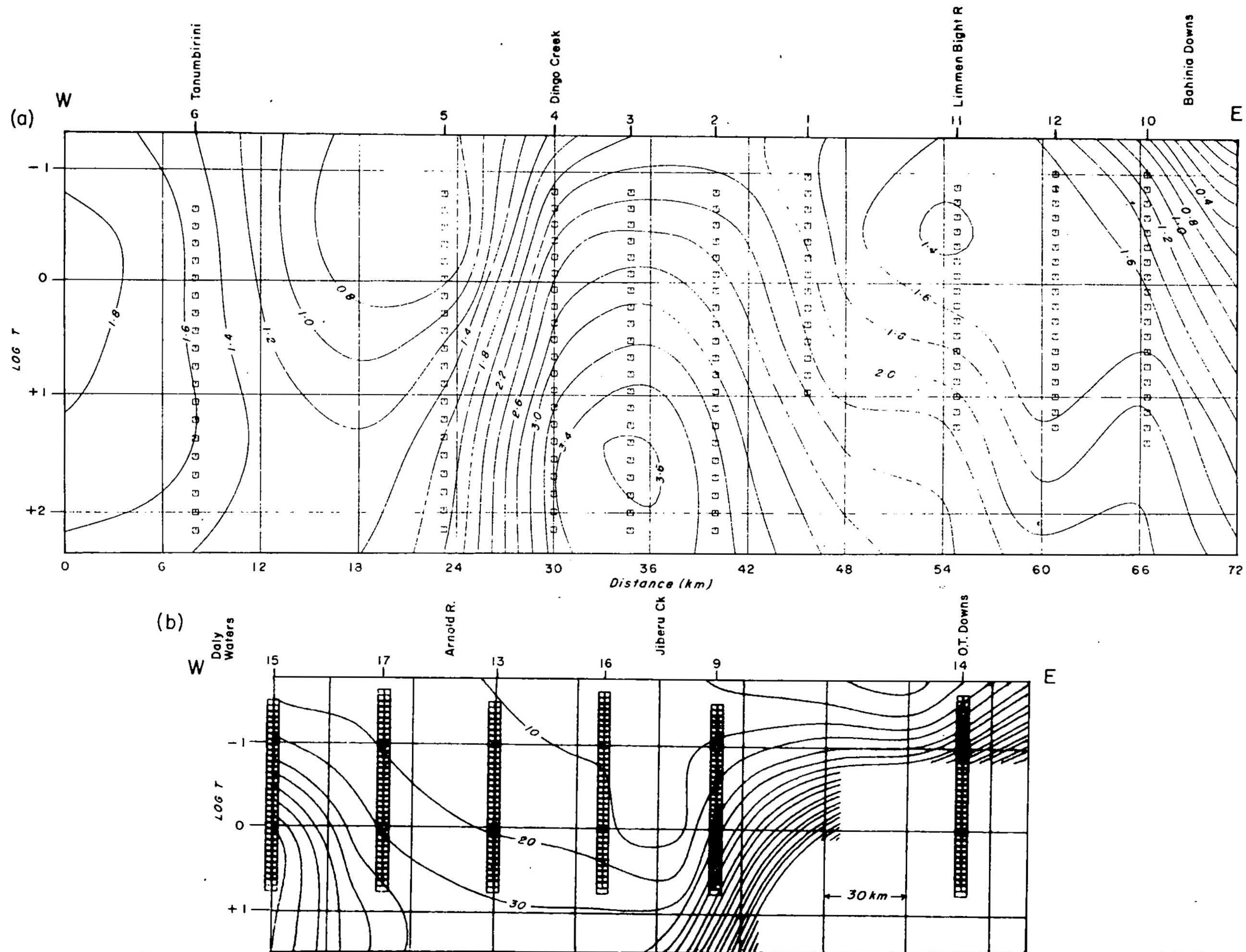

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Fig.6 (a) Resistivity pseudosection – Traverse A
(b) Apparent resistivity profile – Traverse B, E-cross strike

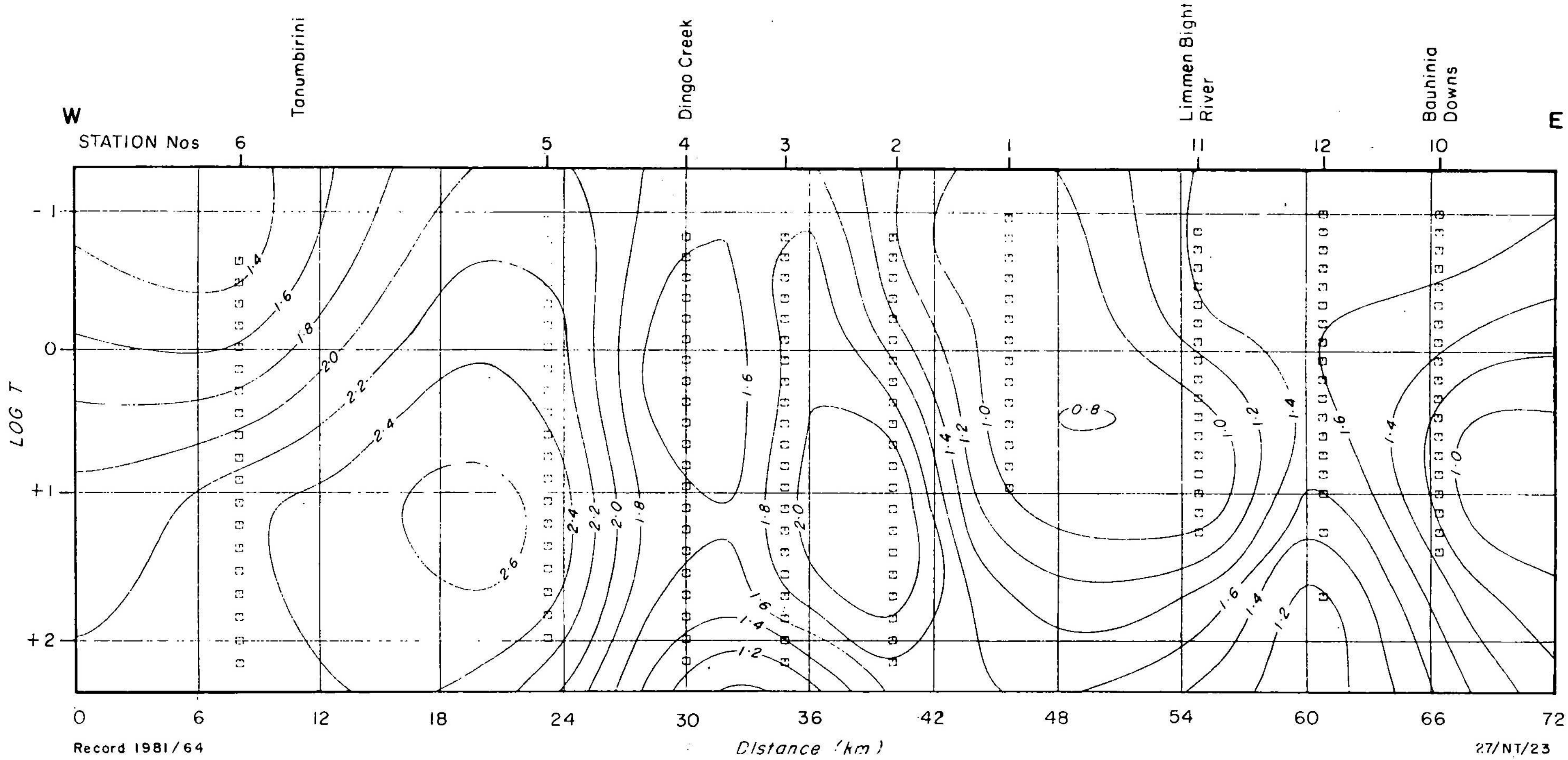

Fig. 7 Pseudosection of field data – Traverse A, E-along strike

cover of Adelaidean sediments identified as part of the Roper Group; the MT results indicate that this group extends to depths of about 4 km. Surface geology indicates an aquifer sequence emerging at the surface between Sites 1 and 2 and dip is consistent with that inferred from the resistivity contours (flowing springs were observed near Site 1). A central block of high resistivity can be correlated with an outcrop of the Tawallah Group between Sites 2 and 4. Steeply dipping contours near Site 4 indicate transition to Roper Group rocks across a possible fault zone.

Along Traverse B (Fig. 1), contours on the high resistivity section are much more regular (Fig. 6b). A uniform structure is suggested with some indication of thinning to the west. The most obvious feature is the trend to high resistivity at Site 14 near O.T. Downs. This location corresponds to the eastern end of Traverse A, and outcropping Tawallah Group; further perturbations are attributed to McArthur Group rocks concealed at depth.

6. INTERPRETATION

Interpretation of processed MT data is based initially on the production of an electrical model incorporating calculated conductivity and spatial parameters in order to define the distance, depth, and thickness of the major structural units; the resulting electrical model must then be related to the geological controls in a manner consistent with the limits imposed by the design criteria of the survey.

The first stage in any interpretation consists of 1D modelling for each component at each site: an algorithm for computer application has been developed for this purpose (Vozoff & Jupp, 1975), and a layered model can be obtained for each of the orthogonal components at each site. However, where 2D or 3D structures are encountered, this procedure may cause gross errors. In fact, 1D inversions are often based on resistivity data alone since the phase data are not generally compatible with the layered model (Oldenburg, 1979; Ting & Hohmann, 1981). However, the data at sites 7-9, 11-15, and 17 were considered to be isotropic at periods less than 1 second. Consequently, phase data at these sites have been included to resolve shallow structure and to emphasise major features at greater depth, particularly the sense and rates of change in resistivity (Kao & Rankin, 1980).

Two-dimensional geological sections can be constructed from composite one-dimensional MT inversion models only for isotropic situations. Most of the 1979 McArthur Basin data are highly anisotropic, but some major features can be identified in a composite profile based on inversion of the more resistive components (E-across strike) at each site. These results are generally considered more reliable than those generated by the low-resistivity components except in the case of regions containing features that resemble a conductive dyke (Vozoff & Jupp, 1975; Vozoff, 1972). It must be emphasised however that the parameters in each model are not resolved with equal precision. A damping factor is assigned so that initial values defining the starting model are allowed to vary only at rates that are related to the magnitude of their effect on the total response. For example, highly resistive layers do not significantly attenuate the EM signals and consequently they produce little surface response; thin resistive layers are usually highly damped but, when some response is detected, the sensitivity depends on thickness rather than resistivity (Oldenburg, 1979; Vozoff & Jupp, 1975). Correlations between sites must therefore contain a subjective element, so that 'resistive' blocks can be related even when actual values of resistivity appear to vary.

The 1D results are summarised in Tables 3 & 4; the contoured values (Fig. 8) suggest a highly complex resistivity profile consistent with the trends suggested by the previous pseudosections. Significant lateral changes are required to accommodate data from neighbouring sites and large uniform layers appear to be rare. Some continuity is evident between Sites 10, 11, and 12, with a highly conductive zone acting as a marker at depths near 1500 m. This layer, is interpreted as an aquifer trending to the surface near Site 1 where the previous continuity becomes obscure. High conductivities at shallow depths are also noted west of Site 7 but there is no comparable

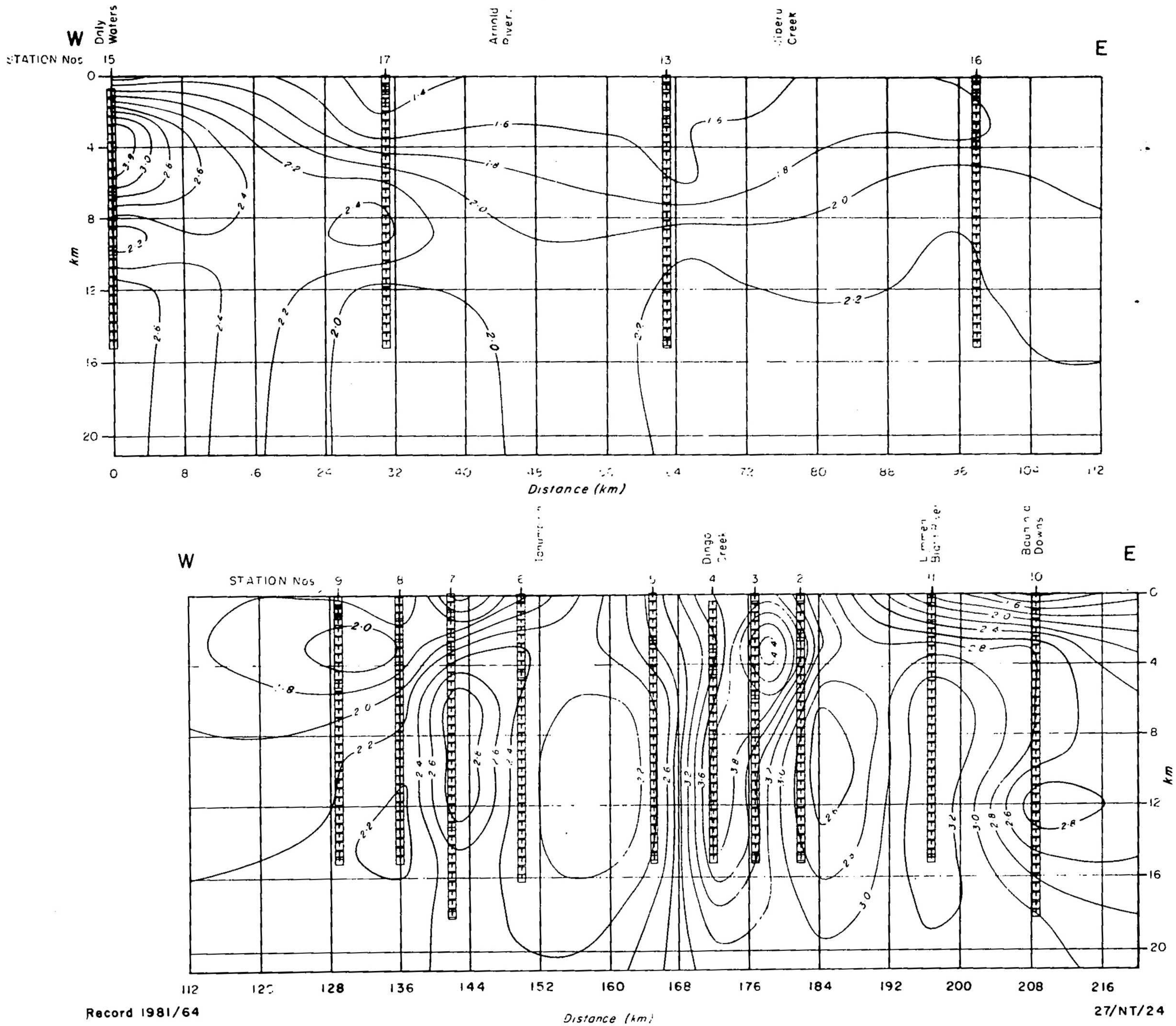

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Fig. 8 Resistivity cross-sections based on 1D inversions diagnostic progression in the individual profiles. This return to high conductivities near the surface suggests further intervals of Roper Group rocks in the west, but the change in character of the conductivity profile must then be attributed to variations in porosity or salinity of associated aquifers.

Highly resistive basement rocks appear to be confined to the region east of Site 3. Values of resistivity exceed 1 k ohm-m at depths near 3 km for Sites 10, 11, and 12. There is no evidence for such values at Site 1 and some thinning of surface layers is suggested at Site 11. These observations are consistent with the postulated boundaries of the highly resistive McArthur Group rocks. However, any estimates of basement depth are complicated by the presence of shallower conductive zones. Basement parameters become highly damped during 1D inversion and many diagnostic features can no longer be resolved. Most of the data at Site 1 are affected in this way, and the apparent lack of any resistive layer may not be conclusive.

Lateral continuity in resistivity structures can be detected again west of Site 16. There is, however, a significant change in the character of the resistivity profile from east to west of site 16. In particular, there is no indication west of Site 16 for a layer at shallow depth (< 5 km) with values exceeding 1 k ohm-m. This suggests that there is no carbonate sequence equivalent to the McArthur Group that occurs east of Site 3. Basement west of Site 16 appears to be characterised by resistivity values in the range 500-1000 ohm-m. Such values are at the lower limit of the range for igneous and metamorphic rocks and are well below common values for carbonates. Resistivities attributed to major units are summarised in Table 5.

A maximum value of 9.5 km has been calculated for depth to basement near Site 13. An abrupt change is evident near Daly Waters (Site 15) with depths of 6 km indicated. A similar trend can be noted in depths calculated for conductive layers that appear to correlate with the Tawallah Group. Resistivities generally increase from values near 50 ohm-m to values near 150 ohm-m at depths ranging from 5.5 km near Site 13 to 2.0 km near Site 15 (Daly Waters) respectively. It appears therefore that most of the thinning occurs in the Roper Group.

The resistivity groupings and the depths obtained by 1D inversions of MT data are supported by the preliminary seismic refraction results (Collins, 1981). A major refractor detected in the region west of Site 7 appears to correlate with a resistivity boundary between the Roper and Tawallah Groups. The primary features in each model are identical. There is an abrupt change in depth at Daly Waters, and surface layers become thinner towards the east. However, the MT data suggest a maximum thickness for the Roper Group near Site 13, rather than at Site 17 as suggested by seismic data.

2D Models

The computer program for 2D inversion involves a least squares error algorithm similar to the one used for 1D analysis (Jupp & Vozoff, 1977); approximately 3000 seconds of CPU time are required on a 1.5 microsecond computer. Restrictions on the available computer memory and central processor time currently limit some of the interpretation capabilities. In particular, the only parameter allowed to vary is resistivity; it is necessary that the spatial dimensions of the model remain fixed. However, the 2D model is built of resistivity 'blocks' with two spatial dimensions plus the parameter of resistivity. If inversion indicates that the resistivity of one block is the same as that of an adjacent block the boundary between the blocks can be removed so that the two become one. Hence, by judicious manipulation of the starting model and a number of re-inversions, an adequate 2D section can be obtained.

Resistivity data for both horizontal components at each site were provided as input for a 2D section on Traverse A. Approximate models were formulated from the results of 1D inversion with some qualitative correlations provided by inspection of the relevant pseudosections. The resistivities assigned to each block comprising the model were then varied during inversion until the model response resembled the field data. The primary features of the composite 1D profile are preserved (Fig. 9), but more detail is available concerning parameter sensitivity (Fig. 10).

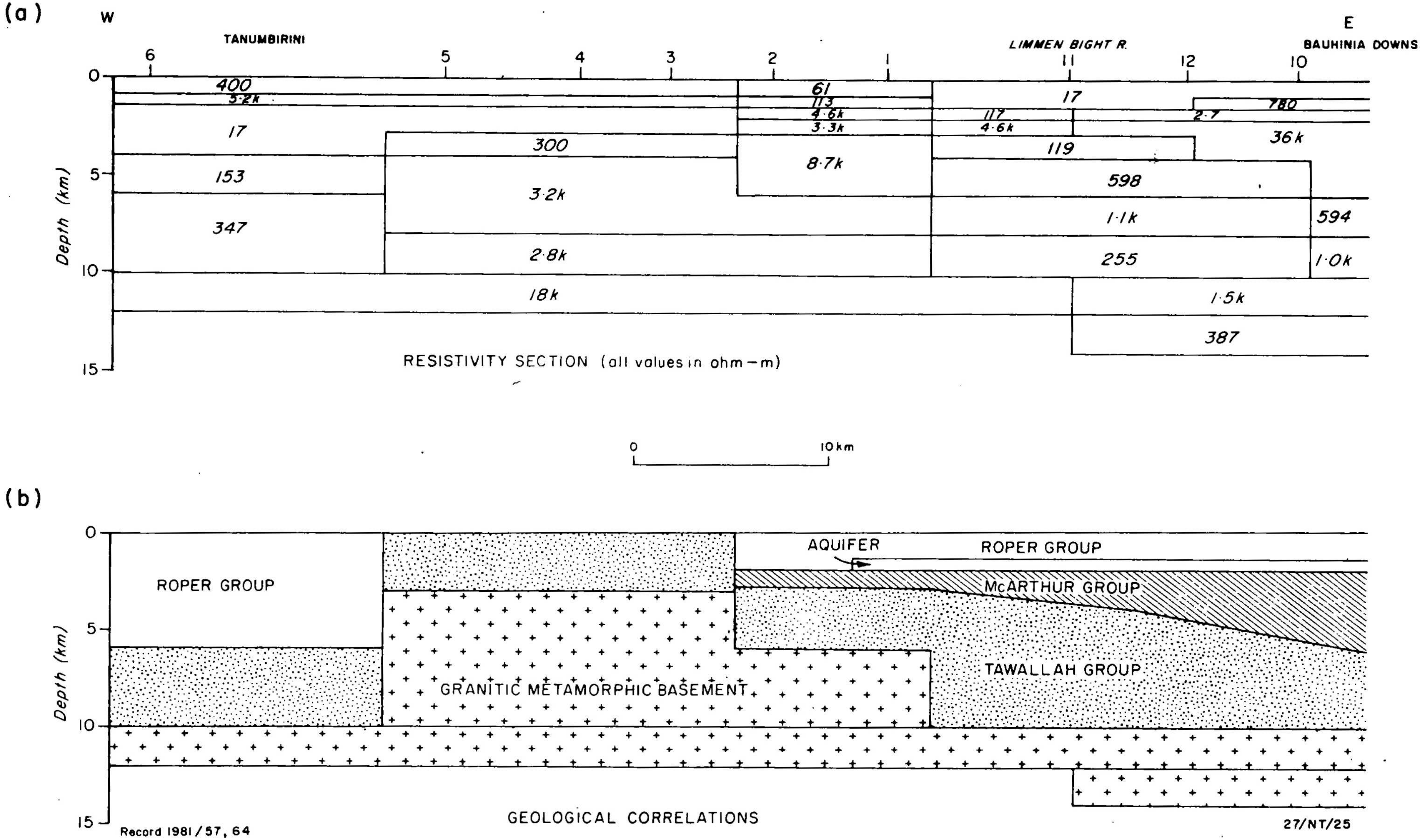
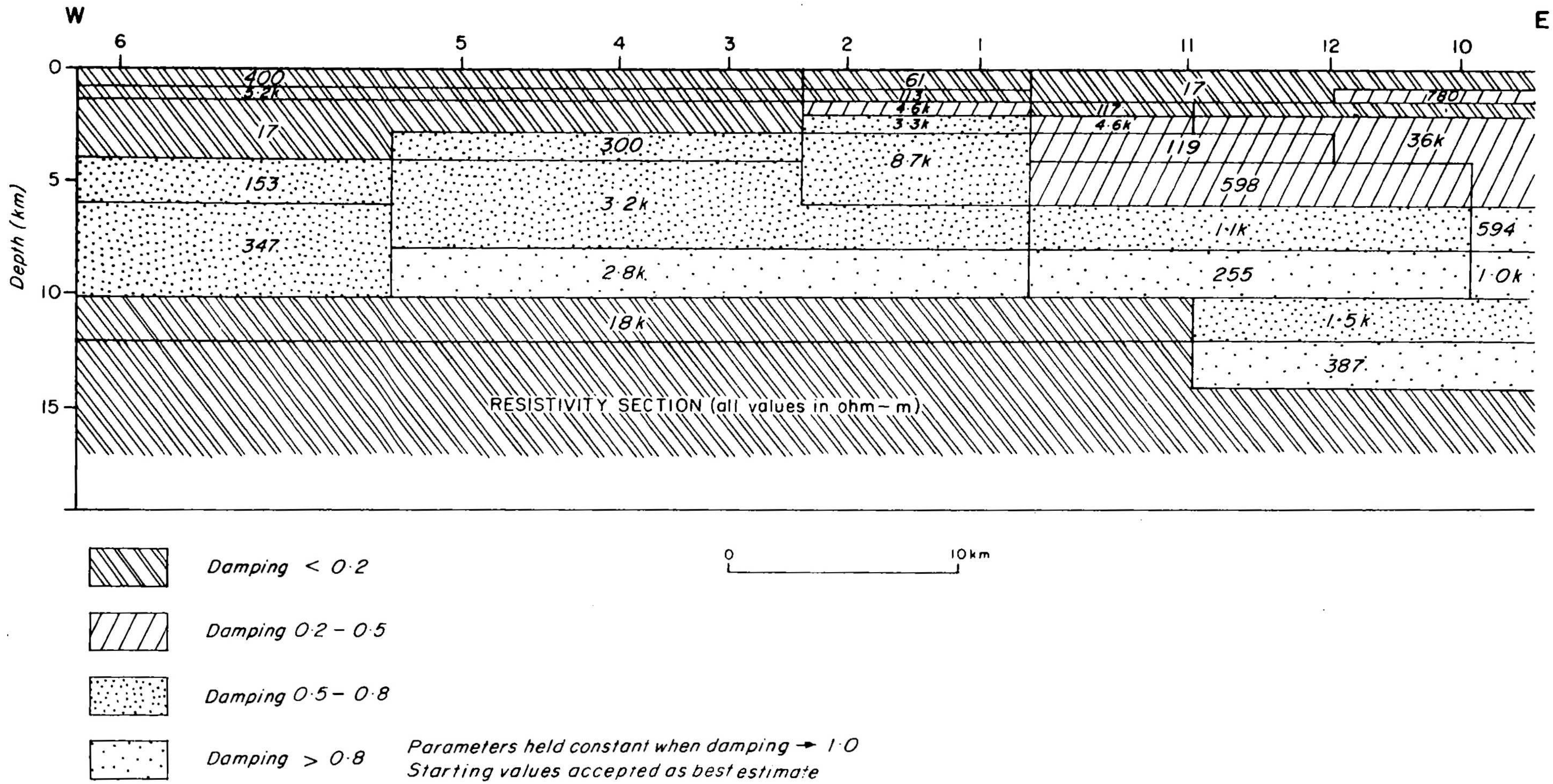


Fig.9 (a) Resistivity cross-section with (b) geological interpretation based on 2D inversions



Record 1981/64

27/NT/26

Fig. 10 Sensitivity of parameters in 2D solution

The most obvious feature remains the highly resistive block at depths from 2-6 km in the eastern part of the section. This block may indicate the extent of McArthur Group rocks, but there is considerable damping generated by highly conductive surface layers. The central part of the section is highly disturbed and interpretation remains contentious. There is some indication of resistive elements trending to the surface at depths of about 1 km in the western region. This may indicate an extension of the McArthur Group with considerable thinning, but actual values of resistivity appear to be less than those for the principal eastern block. Other blocks of high resistivity appear at depths greater than 4 km in the western end of the section. Again, these blocks are highly damped, but values are consistent with shallow basement of crystalline or low grade metamorphic rocks rather than carbonate sequences.

Magnetotelluric data obtained in 1979 indicate that the major structural features in the McArthur Basin can be characterised in terms of electrical response. However estimates of depth and thickness for individual units are complicated by the lateral response of the structure. The principal trends have been identified using 1D models and lateral boundaries have been suggested in 2D approximations. New computing techniques including 3D models with variable boundaries are required to allow more detailed analysis.

7. REFERENCES

ANFILOFF, W., 1979, in McArthur Basin Research, March Quarter, 1979 (K.A. Plumb, co-ordinator). Bureau of Mineral Resources, Australia, Record 1979/44 (unpublished).

ANFILOFF, W., 1981, in McArthur Basin Research, July-December, 1980 (K.A. Plumb, co-ordinator). Bureau of Mineral Resources, Australia, Record 1981/20 (unpublished).

COLLINS, C.D.N., 1981 - Crustral seismic investigations in Northern Australia, 1979: Operational report. Bureau of Mineral Resources, Australia, Record 1981/2 (unpublished).

CULL, J.P., SPENCE, A.G., MAJOR, J.A., KERR, D.W., & PLUMB, K.A., 1981 - The 1978 McArthur Basin magnetotelluric survey. Bureau of Mineral Resources, Australia, Record 1981/1 (unpublished).

JUPP, D.L.B., & VOZOFF, K., 1977 - Two-dimensional magnetotelluric inversion. Geophysical Journal of the Royal Astronomical Society, 50, 333-352.

KAO, D., & RANKIN, D., 1980 - Magnetotelluric response on inhomogeneous layered earth. Geophysics, 45, 1993-1802.

MOORE, R.F., 1977 - Screening and averaging magnetotelluric data prior to one-dimensional inversion. Bureau of Mineral Resources, Australia, Record 1977/78 (unpublished).

NEUMANN, F.J.G., 1964 - Normanton to Daly Waters reconnaissance gravity survey, QLD and NT 1954-60. Bureau of Mineral Resources, Australia, Record 1964/131 (unpublished).

OLDENBURG, D.W., 1979 - One-dimensional inversion of natural source magnetotelluric observations. Geophysics, 44, 1218-1244.

PLUMB, K.A., 1977 - McArthur Basin Project. Bureau of Mineral Resources, Australia, Record 1977/33 (unpublished).

PLUMB, K.A., & DERRICK, G.M., 1975 - Geology of the Proterozoic rocks of northern Australia. In KNIGHT, C.L. (Editor) - ECONOMIC GEOLOGY OF AUSTRALIA AND PAPUA NEW GUINEA - METALS. Australian Institute of Mining and Metallurgy, Melbourne.

PLUMB, K.A., DERRICK, G.M., & WILSON, I.H., 1980 - Precambrian geology of the McArthur River-Mount Isa region, Northern Australia. In HENDERSON, R.A., & STEPHENSON, P.J. (Editors) - THE GEOLOGY AND GEOPHYSICS OF NORTHEASTERN AUSTRALIA, pp.71-88. Geological Society of Australia, Queensland Division, Brisbane.

TING, S.C., & HOHMANN, G.W., 1981 - Integral equation modelling of three-dimensional magnetotelluric response. Geophysics, 46, 182-197.

VOZOFF, K., 1972 - The magnetotelluric method in the exploration of sedimentary basins. Geophysics, 37(1), 98-141.

VOZOFF, K., & JUPP, D.L.B., 1975 - Joint inversion of geophysical data. Geophysical Journal of the Royal Astronomical Society, 42, 977-991.

YOUNG, G.A., 1965 - McArthur River Area, aeromagnetic survey 1963-64. Bureau of Mineral Resources, Australia, Record 1965/173 (unpublished).

TABLE 1. 1979 MAGNETOTELLURIC SITE LOCATIONS

SITE NO.	MAP (1)	LATITUDE (°S)	LONGITUDE (°E)	ORIENTATION (2)
1	BAUHINIA DOWNS	16.2097	135.1479	54
2	BAUHINIA DOWNS	16.2252	135.0971	73
3	BAUHINIA DOWNS	16.2366	135.0518	70
4	BAUHINIA DOWNS	16.2522	135.0078	65
5	TANUMBIRINI	16.2639	134.9455	80
6	TANUMBIRINI	16.2789	134.8037	81
7	TANUMBIRINI	16.3378	134.7463	77
8	TANUMBIRINI	16.4063	134.6882	19
9	TANUMBIRINI	16.4863	134.6283	06
10	BAUHINIA DOWNS	16.2323	135.3412	01
11	BAUHINIA DOWNS	16.2272	135.2318	01
12	BAUHINIA DOWNS	16.2295	135.2910	89
13	SCARLET HILL	16.3567	133.9350	19
14	OT DOWNS	16.7283	135.2043	81
15	DALY WATERS	16.3020	133.4159	50
16	AMUNGEE	16.5000	134.3349	14
17	SCARLET HILL	16.2783	133.6483	09

(1) MAP refers to name of 1:100 000 Sheet area.

(2) ORIENTATION refers to magnetic azimuth of X co-ordinate on the original survey axes.

TABLE 2. 1979 MAGNETOTELLURIC DATA - AVERAGED VALUES

Note:

(1) Site numbers correspond with TABLE 1 Locations.

(2) XY, YX are orthogonal components rotated according to the direction of principal strike.

(3) In general, XY indicates E-cross strike for high resistivity.

(4) Ap. Res. indicates apparent resistivity (ohm-m).

(5) Phase refers to phase difference in E and H (degrees).

(6) Period applies to narrow band (seconds).

SITE 1

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
1.000	.4467E-01	7.656	-47.33	53.83	-33.40
2.000	.5623E-01	4.670	-48.00	66.40	-27.80
3.000	.7079E-01	7.338	-45.33	64.11	-33.75
4.000	.8913E-01	6.916	-47.08	67.59	-35.24
5.000	.1122	6.836	-45.00	83.39	-40.18
6.000	.1413	7.262	-49.45	83.57	-41.88
7.000	.1778	7.183	-51.04	77.31	-42.30
8.000	.2239	7.416	-51.37	76.61	-46.35
9.000	.2818	7.231	-50.48	70.64	-47.56
10.00	.3548	7.454	-49.38	70.52	-49.03
11.00	.4467	9.188	-49.53	72.13	-51.89
12.00	.5623	8.802	-49.61	76.69	-48.56
13.00	.7079	9.338	-52.29	84.87	-47.95
14.00	.8913	9.700	-56.02	87.52	-46.33
15.00	1.122	9.486	-60.58	89.84	-47.04
16.00	1.413	9.032	-64.74	87.71	-45.69
17.00	1.778	9.732	-63.60	85.39	-49.54
18.00	2.239	8.621	-59.50	87.97	-47.95
19.00	2.818	8.502	-58.71	89.18	-46.74
20.00	3.548	8.409	-53.39	90.90	-42.07
21.00	4.467	7.304	-58.94	94.90	-48.38
22.00	5.623	6.575	-43.08	89.28	-37.53
23.00	7.079	7.831	-13.50	116.7	-43.21
24.00	8.913	7.048	-44.33	106.3	-41.15
25.00	11.22	6.114	-15.40	128.8	-46.03
26.00	14.13	5.337	-22.00	132.3	-46.23
27.00	17.78	3.782	-28.30	138.5	-45.34
28.00	22.39	2.853	-36.67	138.3	-47.18
29.00	28.18	4.917	-41.33	163.5	-42.96
30.00	35.48	4.460	-26.00	167.6	-41.96
31.00	44.67	4.560	-79.00	173.9	-44.98
32.00	56.23	3.111	-34.50	153.0	-48.80
33.00	89.13	4.130	-41.00	179.0	-64.25

SITE 2

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
34.00	.7079E-01	249.1	-15.82	12.90	-39.31
35.00	.8913E-01	245.0	-20.78	14.24	-40.03
36.00	.1122	435.3	-25.79	22.39	-46.34
37.00	.1413	385.1	-27.59	23.31	-43.92
38.00	.1778	269.7	-33.06	15.88	-44.54
39.00	.2239	298.7	-35.73	19.34	-45.74
40.00	.2818	345.6	-34.06	21.54	-46.86
41.00	.3548	333.0	-35.91	23.96	-43.65
42.00	.4467	436.9	-37.45	21.83	-48.72
43.00	.5623	442.8	-38.62	23.91	-39.84
44.00	.7079	543.1	-38.44	34.92	-38.48
45.00	.8913	577.9	-38.88	38.74	-38.63
46.00	1.122	619.9	-40.86	52.35	-34.46
47.00	1.413	649.4	-41.88	54.82	-37.92
48.00	1.778	666.2	-39.69	56.36	-41.55
49.00	2.239	678.3	-46.35	59.05	-37.68
50.00	2.818	694.2	-48.68	58.69	-38.32
51.00	3.548	660.7	-48.30	62.65	-38.95
52.00	4.467	610.8	-50.63	84.10	-37.66
53.00	5.623	551.7	-53.30	86.80	-36.92
54.00	7.079	690.1	-48.78	96.04	-37.16
55.00	8.913	689.5	-47.91	97.46	-35.83
56.00	11.22	713.1	-48.12	117.5	-38.67
57.00	14.13	682.1	-45.27	121.7	-38.34
58.00	17.78	632.7	-43.65	130.3	-37.58
59.00	22.39	649.1	-40.30	138.5	-38.50
60.00	28.18	679.0	-36.38	135.1	-41.15
61.00	35.48	809.0	-35.36	165.5	-41.87
62.00	44.67	901.8	-33.09	173.8	-44.42
63.00	56.23	1006.	-31.96	191.7	-53.48
64.00	70.79	1054.	-30.57	181.9	-55.19
65.00	89.13	1167.	-29.00	165.6	-46.79
66.00	112.2	1531.	-27.60	201.3	-66.52

SITE 3

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
67.00	.4467E-01	179.2	-5.333	126.4	-30.55
68.00	.7079E-01	200.5	-12.63	97.76	-40.94
69.00	.8913E-01	233.6	-17.57	113.9	-44.04
70.00	.1122	390.6	-20.34	106.1	-50.00
71.00	.1413	351.9	-22.34	104.4	-53.76
72.00	.1778	221.9	-27.40	86.75	-55.28
73.00	.2239	251.4	-25.00	81.58	-62.34
74.00	.2818	352.3	-27.40	83.25	-52.81
75.00	.3548	326.1	-26.78	78.06	-50.58
76.00	.4467	398.9	-25.72	83.86	-59.21
77.00	.5623	475.1	-27.22	80.56	-55.13
78.00	.7079	688.7	-28.68	82.67	-50.12
79.00	.8913	718.2	-27.92	86.30	-45.92
80.00	1.122	1064.	-34.03	94.95	-46.37
81.00	1.413	1110.	-32.19	96.43	-47.76
82.00	1.778	1012.	-32.45	102.2	-56.44
83.00	2.239	1265.	-34.21	88.29	-45.53
84.00	2.818	1099.	-37.80	86.81	-53.50
85.00	3.548	1119.	-39.21	89.23	-55.12
86.00	4.467	1042.	-45.73	91.15	-61.77
87.00	5.623	969.5	-34.88	84.67	-50.94
88.00	7.079	1391.	-35.29	75.91	-49.34
89.00	8.913	1482.	-38.67	93.57	-44.51
90.00	11.22	1822.	-40.56	89.88	-45.22
91.00	14.13	1981.	-37.68	98.70	-46.74
92.00	17.78	2001.	-35.69	94.18	-47.26
93.00	22.39	2263.	-34.52	89.50	-48.66
94.00	28.18	2303.	-37.00	88.55	-47.56
95.00	35.48	2697.	-33.60	98.95	-49.31
96.00	44.67	3458.	-36.14	96.14	-49.48
97.00	56.23	3820.	-36.13	109.2	-56.78
98.00	70.79	3418.	-33.33	96.46	-62.96
99.00	89.13	3388.	-26.50	92.20	-48.53
100.0	112.2	5150.	-38.00	104.8	-69.96

SITE 4

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
101.0	.7079E-01	162.0	-17.40	58.24	-49.20
102.0	.8913E-01	140.6	-22.10	55.90	-54.05
103.0	.1122	288.7	-26.18	68.25	-59.77
104.0	.1413	255.5	-29.71	56.86	-65.26
105.0	.1778	212.8	-33.89	27.21	-54.50
106.0	.2239	199.0	-23.75	24.00	-48.45
107.0	.2818	292.1	-21.00	19.71	-62.70
108.0	.3548	256.1	-32.00	24.40	-67.70
109.0	.4467	304.5	-27.50	28.68	-52.27
110.0	.5623	344.5	-26.87	27.33	-56.84
111.0	.7079	407.5	-30.00	28.10	-60.37
112.0	.8913	455.3	-29.69	26.01	-57.00
113.0	1.122	552.7	-35.95	31.60	-55.62
114.0	1.413	542.3	-36.00	28.38	-59.52
115.0	1.778	609.6	-31.71	30.92	-52.42
116.0	2.239	551.8	-34.33	30.70	-50.20
117.0	2.818	641.7	-42.19	25.80	-54.07
118.0	3.548	643.5	-40.50	27.04	-42.30
119.0	4.467	831.5	-55.17	27.86	-68.47
120.0	5.623	863.8	-46.82	26.19	-52.60
121.0	7.079	942.2	-42.22	27.43	-53.41
122.0	8.913	912.9	-43.56	32.37	-50.64
123.0	11.22	979.2	-41.88	30.55	-51.24
124.0	14.13	892.5	-42.16	30.49	-48.86
125.0	17.78	983.7	-38.43	30.01	-49.18
126.0	22.39	868.7	-35.55	28.10	-50.48
127.0	28.18	1106.	-35.41	33.05	-46.51
128.0	35.48	1187.	-33.00	27.77	-47.10
129.0	44.67	1513.	-32.36	44.46	-59.14
130.0	56.23	1711.	-34.13	39.80	-42.22
131.0	70.79	2012.	-32.55	35.66	-58.39
132.0	89.13	1509.	-22.50	29.69	-33.55
133.0	112.2	2324.	-33.67	27.90	-60.47

SITE 5

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
134.0	.4467E-01	1.329	-78.50	136.7	-17.81
135.0	.5623E-01	1.070	-66.00	157.2	-18.03
136.0*	.7079E-01	2.208	-55.38	199.0	-26.92
137.0	.8913E-01	2.529	-53.92	233.9	-33.92
138.0	.1122	2.435	-47.63	222.2	-39.60
139.0	.1413	2.940	-54.20	216.7	-42.27
140.0	.1778	2.483	-42.50	203.1	-43.77
141.0	.2239	2.356	-42.00	206.1	-48.75
142.0	.2818	4.935	-51.00	178.5	-49.32
143.0	.3548	5.447	-67.38	191.4	-44.97
144.0	.4467	5.210	-50.38	182.7	-49.31
145.0	.5623	5.567	-33.22	182.5	-44.13
146.0	.7079	5.488	-31.40	204.1	-43.80
147.0	.8913	6.127	-33.46	203.4	-44.63
148.0	1.122	8.396	-38.91	226.2	-42.51
149.0	1.413	8.330	-31.92	219.3	-44.40
150.0	1.778	9.663	-48.06	227.4	-45.84
151.0	2.239	11.01	-39.19	227.0	-46.59
152.0	2.818	14.80	-35.93	221.3	-50.79
153.0	3.548	15.54	-32.88	245.7	-46.25
154.0	4.467	17.15	-44.00	239.7	-49.76
155.0	5.623	13.67	-43.99	283.0	-51.93
156.0	7.079	19.38	-45.38	271.2	-46.59
157.0	8.913	19.93	-42.83	277.1	-44.83
158.0	11.22	21.43	-41.96	304.7	-43.44
159.0	14.13	22.87	-44.09	299.3	-42.65
160.0	17.78	18.34	-39.48	301.8	-42.65
161.0	22.39	17.55	-41.77	306.0	-42.61
162.0	28.18	19.37	-38.43	362.3	-43.77
163.0	35.48	24.38	-35.00	367.6	-42.10
164.0	44.67	27.76	-32.11	386.0	-43.37
165.0	56.23	32.62	-30.92	368.7	-47.07
166.0	70.79	32.13	-32.67	496.2	-57.73
167.0	89.13	31.37	-40.00	410.1	-48.22
168.0	112.2	41.90	-32.50	490.0	-61.25

SITE 6

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
169.0	.4467E-01	29.54	-20.67	11.84	-21.46
170.0	.5623E-01	26.65	-21.75	10.06	-21.08
171.0	.7079E-01	39.06	-31.25	13.11	-26.06
172.0	.8913E-01	37.04	-33.74	15.15	-28.40
173.0	.1122	47.82	-39.45	23.61	-31.33
174.0	.1413	47.46	-40.12	23.55	-34.77
175.0	.1778	40.27	-44.48	25.96	-34.73
176.0	.2239	35.81	-40.29	27.26	-37.49
177.0	.2818	37.81	-41.31	28.40	-37.49
178.0	.3548	36.40	-36.93	27.49	-39.66
179.0	.4467	52.62	-39.94	33.31	-38.57
180.0	.5623	53.38	-40.18	34.91	-37.48
181.0	.7079	58.55	-43.40	39.19	-35.63
182.0	.8913	59.49	-43.68	42.33	-34.24
183.0	1.122	60.46	-44.71	47.98	-32.29
184.0	1.413	59.03	-47.08	53.52	-32.49
185.0	1.778	59.66	-46.97	53.23	-37.03
186.0	2.239	54.75	-52.93	62.09	-33.25
187.0	2.818	47.84	-56.30	68.72	-32.77
188.0	3.548	43.96	-53.11	73.11	-33.40
189.0	4.467	42.42	-58.08	75.21	-34.03
190.0	5.623	42.99	-58.34	71.70	-33.75
191.0	7.079	36.19	-55.20	95.10	-30.02
192.0	8.913	35.14	-59.87	99.36	-30.60
193.0	11.22	39.59	-58.94	119.0	-32.53
194.0	14.13	34.42	-58.68	123.3	-33.62
195.0	17.78	26.10	-55.69	133.4	-34.04
196.0	22.39	27.43	-53.82	149.1	-31.51
197.0	28.18	27.01	-49.76	177.4	-33.47
198.0	35.48	30.25	-48.71	206.1	-35.25
199.0	44.67	29.58	-45.07	240.0	-36.73
200.0	56.23	31.16	-39.00	248.1	-42.57
201.0	70.79	33.43	-40.10	267.0	-45.81
202.0	89.13	34.21	-32.67	247.2	-42.94
203.0	112.2	51.36	-43.20	295.0	-56.08

SITE 7

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
204.0	.4467E-01	6.577	-13.25	3.632	-17.20
205.0	.5623E-01	6.553	-15.00	2.695	-19.55
206.0	.7079E-01	9.321	-18.86	9.005	-26.62
207.0	.8913E-01	9.215	-22.46	8.945	-26.99
208.0	.1122	15.12	-28.59	11.45	-32.45
209.0	.1413	13.65	-31.39	11.39	-36.53
210.0	.1778	10.79	-34.29	11.69	-40.89
211.0	.2239	10.22	-39.86	11.91	-44.20
212.0	.2818	9.399	-42.93	11.37	-46.57
213.0	.3548	9.105	-37.07	11.19	-42.02
214.0	.4467	12.92	-41.42	14.23	-50.06
215.0	.5623	13 84	-44.75	14.05	-48.80
216.0	.7079	14.29	-45.50	13.80	-50.13
217.0	.8913	14.63	-48.82	14.22	-48.21
218.0	1.122	14.39	-48.65	13.38	-49.13
219.0	1.413	13.95	-50.31	13.72	-48.12
220.0	1.778	13.98	-42.84	14.19	-53.88
221.0	2.239	14.27	-50.64	12.58	-48.10
222.0	2.818	13.70	-52.75	13.00	-45.81
223.0	3.548	12.67	-60.14	13.87	-39.11
224.0	4.467	11.27	-61.00	17.14	-37.47
225.0	5.623	12.05	-65.43	18.15	-35.01
226.0	7.079	14.79	-61.67	22.27	-30.47
227.0	8.913	12.46	-56.22	24.93	-26.26
228.0	11.22	9.276	-59.62	31.67	-27.96
229.0	14.13	9.172	-65.59	32.55	-26.60
230.0	17.78	6.122	-62.95	37.87	-26.87
231.0	22.39	6.005	-56.52	40.46	-29.62
232.0	28.18	5.946	-61.45	51.72	-29.04
233.0	35.48	6.169	-51.29	57.90	-27.98
234.0	44.67	5.979	-48.18	61.68	-28.59
235.0	56.23	6.568	-53.00	72.65	-33.11
236.0	70.79	11.93	-35.50	78.05	-40.35
237.0	89.13	9.965	-39.00	80.68	-37.38

SITE 8

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
238.0	.4467E-01	11.17	-8.500	19.93	-18.07
239.0	.7079E-01	7.395	-16.50	12.40	-12.40
240.0	.8913E-01	9.467	-28.57	21.86	-28.98
241.0	.1122	15.04	-34.50	24.18	-31.57
242.0	.1413	13.66	-38.54	32.86	-38.97
243.0	.1778	18.46	-33.43	32.77	-42.80
244.0	.2239	16.29	-50.40	33.35	-47.02
245.0	.2818	16.36	-41.33	41.96	-56.88
246.0	.3548	19.01	-58.58	31.74	-55.57
247.0	.4467	15.01	-41.00	33.29	-43.99
248.0	.5623	14.82	-38.44	26.95	-49.86
249.0	.7079	25.71	-45.86	26.77	-49.49
250.0	.8913	25.56	-43.09	27.50	-49.11
251.0	1.122	22.94	-49.69	29.75	-47.84
252.0	1.413	21.66	-52.31	28.10	-51.29
253.0	1.778	19.37	-52.13	26.84	-50.73
254.0	2.239	22.10	-58.27	29.76	-47.74
255.0	2.818	20.87	-63.00	28.23	-50.30
256.0	3.548	20.23	-44.83	28.71	-43.54
257.0	4.467	44.43	-44.67	28.89	-44.28
258.0	5.623	37.72	-47.00	27.73	-46.01
259.0	7.079	20.26	-55.67	28.07	-45.11
260.0	8.913	20.29	-54.20	31.99	-31.83
261.0	11.22	23.53	-57.36	36.11	-28.15
262.0	14.13	21.05	-58.16	48.34	-28.42
263.0	17.78	15.62	-54.67	54.71	-24.31
264.0	22.39	14.09	-48.03	62.59	-23.60
265.0	28.18	14.09	-47.72	70.55	-23.21
266.0	35.48	14.45	-46.13	83.38	-23.05
267.0	44.67	17.17	-39.83	100.1	-24.51
268.0	56.23	21.48	-38.70	116.7	-24.26
269.0	70.79	27.66	-39.77	127.5	-26.22
270.0	89.13	30.19	-31.67	147.4	-32.13
271.0	112.2	33.74	-40.25	131.1	-32.40

SITE 9

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
272.0	.7079E-01	4.989	-11.25	8.007	-20.63
273.0	.8913E-01	4.060	-21.00	8.184	-52.20
274.0	.1122	8.204	-23.44	13.30	-29.51
275.0	.1413	9.108	-24.62	11.89	-33.29
276.0	.1778	11.61	-49.00	9.977	-33.18
277.0	.2239	13.28	-23.67	10.11	-55.27
278.0	.2818	9.475	-19.67	8.976	-41.70
279.0	.3548	10.50	-27.50	8.734	-51.98
280.0	.4467	14.96	-27.57	11.52	-47.81
281.0	.5623	13.89	-28.13	14.58	-47.67
282.0	.7079	15.12	-41.20	18.00	-46.10
283.0	.8913	15.31	-41.27	15.70	-40.07
284.0	1.122	19.71	-43.78	18.66	-40.05
285.0	1.413	19.24	-44.00	17.59	-51.14
286.0	1.778	14.94	-49.50	21.34	-49.23
287.0	2.239	18.09	-50.33	21.96	-55.34
288.0	2.818	20.31	-51.00	18.41	-45.93
289.0	3.548	17.35	-52.80	19.21	-45.22
290.0	4.467	15.86	-54.00	20.67	-32.55
291.0	5.623	11.30	-36.00	21.08	-36.08
292.0	7.079	25.91	-58.33	21.29	-32.35
293.0	8.913	19.02	-53.00	22.27	-32.32
294.0	11.22	15.25	-40.14	29.95	-26.53
295.0	14.13	14.36	-54.88	31.87	-27.44
296.0	17.78	14.02	-50.00	37.78	-23.68
297.0	22.39	13.77	-42.73	39.22	-24.83
298.0	28.18	18.79	-43.50	45.61	-25.49
299.0	35.48	18.00	-32.50	56.94	-26.72
300.0	44.67	20.44	-31.75	58.00	-26.88
301.0	56.23	21.09	-35.50	38.90	-42.10
302.0	70.79	23.33	-46.33	89.14	-22.70
303.0	89.13	25.37	-39.25	89.60	-31.30
304.0	112.2	31.20	-46.00	119.0	-45.00

SITE 10

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
305.0	.3548E-01	11.35	-26.00	21.00	-18.80
306.0	.4467E-01	15.10	-32.65	21.62	-25.90
307.0	.5623E-01	15.44	-31.60	28.39	-28.23
308.0	.7079E-01	14.90	-37.20	27.51	-29.80
309.0	.8913E-01	17.70	-40.27	32.98	-36.31
310.0	.1122	18.53	-44.00	34.87	-41.33
311.0	.1413	18.27	-47.68	37.09	-47.26
312.0	.1778	18.25	-49.17	37.04	-51.17
313.0	.2239	17.57	-52.52	32.03	-55.69
314.0	.2818	17.59	-52.21	34.27	-61.52
315.0	.3548	16.39	-49.56	27.54	-65.78
316.0	.4467	13.95	-51.93	29.11	-68.66
317.0	.5623	14.34	-50.35	22.86	-69.18
318.0	.7079	13.31	-47.80	21.12	-75.84
319.0	.8913	12.94	-41.95	17.81	-74.06
320.0	1.122	13.70	-36.00	15.47	-74.51
321.0	1.413	15.08	-30.82	11.34	-76.12
322.0	1.778	16.71	-26.58	9.946	-76.83
323.0	2.239	20.43	-27.28	7.923	-78.91
324.0	2.818	25.00	-28.11	6.835	-69.37
325.0	3.548	27.91	-26.00	6.085	-62.51
326.0	4.467	36.70	-24.24	6.142	-65.37
327.0	5.623	37.99	-25.36	5.422	-63.47
328.0	7.079	43.48	-24.29	6.205	-59.24
329.0	8.913	52.89	-23.13	8.610	-56.25
330.0	11.22	51.75	-31.40	9.370	-62.47
331.0	14.13	54.93	-31.60	6.999	-41.60
332.0	17.78	71.59	-33.00	7.240	-51.90
333.0	22.39	79.70	-29.60	7.088	-37.80
334.0	28.18	88.15	-35.60	6.760	-59.80
335.0	35.48	83.56	-34.50	12.81	-70.44
336.0	44.67	98.34	-45.34	10.15	-71.07
337.0	56.23	102.5	-48.67	8.132	-49.60
338.0	70.79	79.36	-47.67	5.801	-69.06
339.0	89.13	72.16	-50.00	5.056	-50.40
340.0	112.2	94.71	-50.00	5.750	-11.70

SITE 11

	PERIOD	XY AP.RES	XY PHASE	YX AP.RES	YX PHASE
341.0	.4467E-01	10.94	-24.92	21.95	-28.28
342.0	.5623E-01	10.41	-29.50	21.33	-25.67
343.0	.7079E-01	13.74	-28.46	30.63	-33.72
344.0	.8913E-01	16.19	-30.31	33.37	-38.29
345.0	.1122	21.00	-34.95	35.71	-43.65
346.0	.1413	23.47	-38.52	39.33	-49.18
347.0	.1778	22.70	-40.74	35.26	-53.73
348.0	.2239	23.02	-44.67	36.78	-58.74
349.0	.2818	23.01	-45.06	35.61	-66.23
350.0	.3548	25.70	-45.04	31.19	-66.82
351.0	.4467	23.16	-47.12	24.60	-75.34
352.0	.5623	23.76	-45.19	22.27	-72.78
353.0	.7079	23.31	-43.72	20.51	-73.63
354.0	.8913	23.06	-41.20	17.28	-75.54
355.0	1.122	22.45	-36.64	13.99	-73.27
356.0	1.413	24.90	-31.03	11.63	-75.55
357.0	1.778	27.05	-26.94	9.899	-66.06
358.0	2.239	34.11	-25.55	8.271	-70.43
359.0	2.818	40.29	-22.91	6.958	-64.89
360.0	3.548	44.14	-26.62	6.264	-53.32
361.0	4.467	62.34	-22.55	6.774	-67.23
362.0	5.623	66.38	-25.45	6.079	-70.04
363.0	7.079	76.34	-20.40	6.815	-44.87
364.0	8.913	77.29	-27.83	5.895	-61.20
365.0	11.22	95.01	-20.67	6.617	-54.84
366.0	14.13	119.9	-27.67	5.445	-26.95
367.0	17.78	84.42	-35.70	9.230	-76.80
368.0	22.39	56.20	-36.00	8.730	-62.50
369.0	28.18	149.0	-27.00	3.659	-30.30
370.0	35.48	209.0	-46.00	5.595	-83.40
371.0	44.67	230.0	-43.00	4.640	-77.60
372.0	56.23	204.6	-39.50	4.630	-12.00
373.0	70.79	258.0	-55.00	6.450	-53.10
374.0	89.13	185.0	-43.50	5.801	-69.06

SITE 12

	PERIOD	XY AP.RES	XY PHASE	YX AP.RES	YX PHASE
375.0	.2818E-01	53.80	-11.50	44.90	-10.60
376.0	.3548E-01	32.97	-22.43	22.76	-21.00
377.0	.4467E-01	27.23	-24.28	21.33	-24.61
378.0	.5623E-01	30.61	-13.97	21.68	-22.67
379.0	.7079E-01	31.27	-31.22	31.54	-32.33
380.0	.8913E-01	36.15	-33.10	32.13	-35.85
381.0	.1122	39.12	-40.43	37.57	-41.32
382.0	.1413	39.88	-44.46	41.08	-43.76
383.0	.1778	51.54	-47.27	38.13	-50.86
384.0	.2239	44.82	-53.04	42.54	-57.68
385.0	.2818	40.74	-62.40	39.91	-53.75
386.0	.3548	38.36	-55.73	21.49	-56.95
387.0	.4467	39.42	-55.08	29.92	-60.09
388.0	.5623	31.33	-61.48	29.23	-67.10
389.0	.7079	28.07	-63.09	27.24	-65.54
390.0	.8913	22.62	-64.15	25.58	-67.43
391.0	1.122	17.64	-43.91	17.00	-57.09
392.0	1.413	13.87	-61.40	14.23	-52.30
393.0	1.778	16.74	-57.78	18.33	-47.33
394.0	2.239	17.82	-48.96	17.70	-35.18
395.0	2.818	18.50	-48.35	21.00	-47.67
396.0	3.548	16.51	-41.50	22.04	-39.57
397.0	4.467	17.30	-55.20	28.83	-44.90
398.0	5.623	25.48	-54.90	25.86	-36.83
399.0	7.079	59.70	-69.00	62.40	-64.00
400.0	8.913	33.93	-61.67	48.60	-50.00
401.0	11.22	50.80	-85.00	43.70	-7.000
402.0	14.13	25.78	-45.00	53.16	-55.00
403.0	17.78	59.73	-43.45	31.11	-65.00
404.0	22.39	86.60	-10.90	69.20	-51.00
405.0	28.18	11.80	-35.00	57.60	-80.00
406.0	56.23	31.40	-57.40	31.18	-78.00
407.0	70.79	31.30	-68.30	6.450	-53.10

SITE 13

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
408.0	.7079E-01	12.80	-33.00	22.29	-38.73
409.0	.8913E-01	11.16	-44.20	23.26	-42.92
410.0	.1122	10.82	-47.30	26.21	-43.52
411.0	.1413	11.42	-49.62	27.03	-47.92
412.0	.1778	11.05	-50.95	23.39	-50.77
413.0	.2239	12.23	-55.56	25.01	-52.13
414.0	.2818	11.16	-50.84	23.77	-54.95
415.0	.3548	11.24	-50.75	19.73	-47.51
416.0	.4467	14.35	-51.90	23.52	-59.24
417.0	.5623	14.82	-49.45	22.36	-53.91
418.0	.7079	14.43	-50.90	22.22	-51.14
419.0	.8913	14.47	-51.79	22.49	-52.61
420.0	1.122	14.52	-51.92	21.49	-48.09
421.0	1.413	15.41	-50.42	21.82	-49.38
422.0	1.778	12.57	-42.64	22.39	-52.22
423.0	2.239	15.30	-49.08	21.15	-46.71
424.0	2.818	14.29	-48.81	18.31	-41.11
425.0	3.548	13.88	-47.85	19.85	-40.23
426.0	4.467	15.61	-39.06	24.10	-37.50
427.0	5.623	13.46	-46.81	22.18	-39.67
428.0	7.079	16.82	-38.83	27.97	-32.24
429.0	8.913	17.38	-45.11	32.88	-30.39
430.0	11.22	17.54	-38.00	34.39	-36.42
431.0	14.13	16.42	-52.89	36.78	-33.24
432.0	17.78	23.31	-42.42	50.80	-27.52
433.0	22.39	23.65	-46.76	53.66	-26.06
434.0	28.18	21.56	-43.34	59.40	-22.07
435.0	35.48	24.15	-41.76	71.75	-22.91
436.0	44.67	27.24	-42.53	83.40	-21.60
437.0	56.23	27.62	-34.25	96.21	-22.34
438.0	70.79	29.01	-31.00	129.7	-28.07
439.0	89.13	27.89	-25.43	135.9	-22.95
440.0	112.2	39.69	-35.71	175.9	-37.06

SITE 14

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
441.0	.4467E-01	20.79	-19.64	10.00	-26.46
442.0	.5623E-01	24.02	-24.50	12.29	-28.04
443.0	.7079E-01	22.68	-24.07	10.74	-35.62
444.0	.8913E-01	23.57	-26.25	12.02	-40.58
445.0	.1122	33.18	-27.60	13.71	-41.77
446.0	.1413	32.11	-30.46	13.72	-43.45
447.0	.1778	32.33	-30.12	13.92	-44.48
448.0	.2239	33.12	-31.62	14.37	-45.17
449.0	.2818	35.80	-29.69	16.95	-48.30
450.0	.3548	33.62	-29.35	16.05	-43.92
451.0	.4467	39.64	-31.06	17.22	-47.19
452.0	.5623	49.86	-28.86	18.06	-36.80
453.0	.7079	58.87	-26.71	20.91	-34.03
454.0	.8913	64.09	-24.85	22.55	-31.84
455.0	1.122	77.84	-24.25	27.26	-28.62
456.0	1.413	87.84	-21.55	32.30	-26.19
457.0	1.778	94.99	-22.13	34.85	-28.38
458.0	2.239	111.7	-21.48	40.53	-24.13
459.0	2.818	131.4	-21.92	49.52	-24.00
460.0	3.548	147.4	-22.08	55.65	-24.87
461.0	4.467	176.0	-25.44	70.89	-25.59
462.0	5.623	185.5	-22.32	72.55	-30.82
463.0	7.079	235.5	-23.63	91.24	-25.14
464.0	8.913	229.8	-26.11	91.74	-24.10
465.0	11.22	276.9	-27.88	132.4	-28.21
466.0	14.13	323.8	-26.46	145.2	-24.85
467.0	17.78	332.8	-31.85	207.3	-26.20
468.0	22.39	317.5	-32.33	228.4	-27.98
469.0	28.18	384.6	-29.96	286.8	-30.04
470.0	35.48	414.4	-32.13	268.0	-32.31
471.0	44.67	442.0	-31.82	730.9	-48.29
472.0	56.23	506.1	-31.38	561.4	-49.89
473.0	70.79	629.7	-32.43	381.2	-50.78
474.0	89.13	628.1	-32.38	343.1	-38.32
475.0	112.2	753.8	-34.63	386.2	-60.35

SITE 15

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
476.0	.4467E-01	16.67	-44.20	38.75	-51.23
477.0	.5623E-01	19.88	-47.50	38.03	-51.56
478.0*	.7079E-01	21.85	-49.07	38.65	-58.43
479.0	.8913E-01	22.77	-50.88	39.78	-61.88
480.0	.1122	22.82	-46.49	32.96	-62.05
481.0	.1413	24.15	-50.79	31.68	-65.14
482.0	.1778	21.07	-50.49	34.62	-67.93
483.0	.2239	20.81	-49.91	34.01	-68.56
484.0	.2818	22.92	-44.51	25.05	-66.81
485.0	.3548	21.05	-43.09	19.82	-62.16
486.0	.4467	24.38	-43.18	22.20	-62.03
487.0	.5623	29.18	-36.33	20.29	-52.04
488.0	.7079	36.88	-34.86	20.94	-47.18
489.0	.8913	42.00	-32.12	21.76	-43.64
490.0	1.122	52.29	-32.30	23.45	-39.92
491.0	1.413	55.47	-29.64	23.63	-37.75
492.0	1.778	59.45	-26.88	25.42	-42.55
493.0	2.239	69.04	-31.54	29.76	-36.41
494.0	2.818	73.18	-32.42	33.94	-33.02
495.0	3.548	75.36	-32.03	35.66	-32.95
496.0	4.467	74.23	-38.03	42.75	-31.31
497.0	5.623	69.98	-39.44	44.45	-28.60
498.0	7.079	82.27	-41.05	55.20	-25.60
499.0	8.913	95.73	-38.44	59.77	-30.97
500.0	11.22	105.7	-36.77	73.12	-26.86
501.0	14.13	109.1	-40.79	79.79	-24.39
502.0	17.78	108.5	-39.91	101.3	-22.14
503.0	22.39	101.7	-44.60	121.5	-20.00
504.0	28.18	117.8	-42.66	138.4	-22.84
505.0	35.48	116.4	-47.15	183.2	-23.89
506.0	44.67	104.4	-48.81	207.5	-19.89
507.0	56.23	96.77	-50.00	228.9	-19.86
508.0	70.79	86.65	-49.64	280.8	-19.84
509.0	89.13	75.64	-45.75	326.7	-21.71
510.0	112.2	104.3	-49.25	436.6	-34.29

SITE 16

	PERIOD	XY AP.RES	XY PHASE	YX AP.RES	YX PHASE
511.0	.4467E-01	2.556	-19.17	4.510	-17.84
512.0	.5623E-01	3.630	-20.00	4.354	-21.38
513.0	.7079E-01	3.258	-23.76	6.302	-24.93
514.0	.8913E-01	3.637	-26.48	7.289	-25.32
515.0	.1122	5.637	-29.73	10.29	-29.30
516.0	.1413	5.862	-31.99	10.69	-31.08
517.0	.1778	6.804	-35.30	10.64	-35.70
518.0	.2239	7.148	-37.32	11.46	-39.18
519.0	.2818	8.588	-37.06	11.03	-44.85
520.0	.3548	8.842	-41.04	10.18	-41.83
521.0	.4467	8.703	-39.87	11.82	-44.67
522.0	.5623	9.547	-38.54	12.00	-43.55
523.0	.7079	11.30	-39.25	14.26	-43.85
524.0	.8913	10.81	-40.71	14.58	-44.49
525.0	1.122	11.75	-42.39	14.22	-44.57
526.0	1.413	11.91	-41.82	14.87	-45.43
527.0	1.778	11.45	-34.40	14.26	-50.35
528.0	2.239	11.30	-42.58	14.15	-46.52
529.0	2.818	14.28	-40.56	14.08	-41.37
530.0	3.548	15.33	-45.08	14.94	-38.98
531.0	4.467	14.73	-41.79	15.29	-42.09
532.0	5.623	14.71	-49.50	13.50	-49.95
533.0	7.079	15.71	-46.00	18.75	-33.80
534.0	8.913	19.09	-54.11	18.85	-25.70
535.0	11.22	14.85	-52.64	23.03	-33.19
536.0	14.13	14.80	-46.23	24.13	-27.99
537.0	17.78	13.60	-46.95	28.76	-31.10
538.0	22.39	14.18	-47.00	31.22	-25.90
539.0	28.18	13.96	-41.19	38.09	-28.08
540.0	35.48	15.43	-38.47	44.38	-23.50
541.0	44.67	19.48	-32.54	54.00	-23.81
542.0	56.23	21.59	-31.54	60.87	-26.39
543.0	70.79	25.13	-28.79	75.76	-28.51
544.0	89.13	23.44	-42.25	77.71	-22.60
545.0	112.2	34.42	-33.50	98.45	-36.53

SITE 17

		XY		YX	
	PERIOD	AP.RES	PHASE	AP.RES	PHASE
546.0	.4467E-01	16.97	-37.50	27.36	-37.36
547.0	.5623E-01	16.36	-32.67	28.37	-41.28
548.0	.7079E-01	21.39	-42.08	28.66	-44.81
549.0	.8913E-01	23.07	-46.70	33.43	-49.89
550.0	.1122	18.04	-49.08	33.76	-53.81
551.0	.1413	18.59	-54.95	32.71	-55.76
552.0	.1778	18.34	-57.09	23.62	-55.88
553.0	.2239	17.03	-54.13	22.45	-62.32
554.0	.2818	17.77	-54.64	19.74	-60.24
555.0	.3548	19.39	-52.52	17.14	-59.68
556.0	.4467	17.17	-53.17	17.37	-62.72
557.0	.5623	18.64	-52.62	19.24	-55.80
558.0	.7079	18.76	-53.38	19.26	-57.91
559.0	.8913	17.67	-53.67	19.22	-56.59
560.0	1.122	15.93	-53.70	18.76	-55.97
561.0	1.413	14.83	-53.23	18.52	-55.84
562.0	1.778	14.41	-52.81	13.71	-59.11
563.0	2.239	14.64	-53.21	15.65	-52.41
564.0	2.818	15.17	-50.58	14.60	-51.51
565.0	3.548	13.42	-46.54	15.35	-49.75
566.0	4.467	14.44	-44.41	16.04	-44.16
567.0	5.623	14.10	-46.15	16.29	-39.25
568.0	7.079	17.53	-40.93	18.63	-36.66
569.0	8.913	17.68	-34.27	18.83	-35.46
570.0	11.22	22.44	-37.76	17.78	-29.78
571.0	14.13	22.44	-37.16	20.01	-28.87
572.0	17.78	23.23	-32.50	24.93	-30.44
573.0	22.39	23.93	-34.95	28.02	-27.96
574.0	28.18	25.16	-35.18	32.61	-26.62
575.0	35.48	27.47	-35.00	36.62	-24.06
576.0	44.67	33.39	-41.36	43.96	-23.29
577.0	56.23	31.00	-39.06	48.97	-21.61
578.0	70.79	38.31	-38.93	61.96	-27.58
579.0	89.13	40.20	-39.83	65.51	-21.13
580.0	112.2	42.54	-36.75	94.33	-36.28

TABLE 3. RESULTS OF 1D INVERSION - COMPONENT 1

Note:

(1) Site numbers correspond to locations in TABLE 1.

(2) I refers to the number of the resistivity layer.

(3) RO (I) is the calculated layer resistivity (ohm-m).

(4) Z (I) is the depth to base of each layer (m).

(5) BOUND (1), (2) indicate a range of acceptable solutions.

(6) DAMPING indicates parameter constraint. For values near 1.0, starting values are accepted as best estimate. Solution is the most sensitive for values near 0.0.

MCARTHUR 1979 SITE # 01 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	8.0000	8.0000	8.0000	1.0000
2	4.0000	4.0000	4.0000	1.0000
3	42.2616	42.1762	42.3472	.9752
4	.5318	.4638	.6098	.1954
5	117.8703	117.1649	118.5800	.9685
6	149.4604	148.6139	150.3116	.9725
7	83.3316	83.2005	83.4630	.9926
8	.5826	.5722	.5931	.9287

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	199.9998	197.6016	202.4272	.6133
2	602.8738	583.4464	622.9480	.0504
3	948.4220	922.1875	975.4028	.0231
4	1358.0378	1311.0696	1406.6885	.0175
5	4423.3428	4412.4805	4434.2314	.9876
6	8242.2559	8202.0234	8282.6855	.9775
7	11008.0960	10643.2440	11385.4530	.0025

MCARTHUR 1979 SITE 02 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	30.0000	30.0000	30.0000	1.0000
2	50.0000	50.0000	50.0000	1.0000
3	1342.4851	1342.0554	1342.9150	.9838
4	14110.0160	14099.3960	14120.6430	.9766
5	2063.6445	2060.9204	2066.3721	.9612
6	454.7919	441.9180	468.0409	.1937
7	29.7483	29.7380	29.7587	.9472
8	2182.0757	2109.8926	2256.7280	.1994

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	150.0000	147.8994	152.1304	.3622
2	158.5058	156.5139	160.5231	.3557
3	265.2788	265.0844	265.4733	.9646
4	2446.7095	2431.2451	2462.2725	.8141
5	2881.8838	2793.8359	2972.7065	.0957
6	23242.1600	22903.3950	23585.9340	.0446
7	24953.7340	24623.1370	25288.7700	.0336

MCARTHUR 1979 SITE 03 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	30.0000	30.0000	30.0000	1.0000
2	50.0000	50.0000	50.0000	1.0000
3	4176.1807	4175.3154	4177.0459	.9946
4	73320.5470	73291.6410	73349.4530	.9917
5	114.6716	114.6352	114.7080	.9525
6	1938.1956	1878.1201	2000.1926	.1900
7	5404.4541	5376.4814	5432.5723	.8712
8	5727.7822	5491.4463	5974.2900	.2199

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	150.0000	146.2556	153.8402	.3547
2	152.5410	148.7967	156.3795	.3557
3	260.3370	260.2175	260.4567	.9880
4	6028.1328	5837.9541	6224.5068	.0318
5	6430.7754	6226.7754	6641.4590	.0230
6	94909.7810	90742.0780	99268.9060	.0362
7	120108.0000	119963.6400	120252.5300	.9681

MCARTHUR 1979 SITE 04 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	50.0000	50.0000	50.0000	1.0000
3	5596.9150	5583.1367	5610.7275	.9357
4	610.1045	609.7457	610.4635	.9790
5	54.9062	54.8796	54.9329	.8885
6	8647.3301	8642.4824	8652.1816	.9786
7	33.7437	33.7290	33.7584	.9473
8	2042.5942	1970.5371	2117.2861	.1208

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(1)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	49.3446	50.6641	.6755
2	88.7095	86.7094	90.7557	.4401
3	3345.2310	3328.0601	3362.4902	.8372
4	3876.7671	3801.4761	3953.5488	.0611
5	4508.5293	4428.5107	4589.9941	.0276
6	21973.1210	21587.8830	22365.2340	.0316
7	23623.1990	23217.7850	24035.6910	.0240

MCARTHUR 1979 SITE 05 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	89.9999	89.9999	89.9999	1.0000
2	1.0000	1.0000	1.0000	1.0000
3	18.3593	17.6238	19.1255	.0003
4	768.0045	767.9379	768.0712	.9996
5	2750.0015	2750.0015	2750.0015	1.0000
6	6.0300	5.7024	6.3764	.7388
7	135.9999	135.9999	135.9999	1.0000
8	114.0000	114.0000	114.0000	1.0000

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	153.3802	148.9201	157.9739	.0001
2	214.4703	209.9205	219.1187	.0000
3	5525.0488	4895.6533	6235.3613	.5153
4	5752.4336	5746.8613	5758.0117	.9937
5	5976.6113	5620.6494	6355.1172	.0719
6	8063.1904	7739.1533	8400.7949	.0168
7	11094.8120	10993.8110	11196.7420	.9712

MCARTHUR 1979 SITE06 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	5.0000	5.0000	5.0000	1.0000
2	40.0000	40.0000	40.0000	1.0000
3	1179.5115	1178.3972	1180.6267	.9760
4	7.1593	7.1560	7.1627	.8546
5	474.7411	474.5661	474.9163	.9768
6	.7641	.7641	.7641	.9895
7	13.4218	13.1985	13.6488	.4162
8	110.7011	109.8135	111.5959	.8535

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	49.7303	50.2711	.8362
2	67.9373	67.5418	68.3351	.8399
3	1209.5017	1191.5046	1227.7708	.0309
4	1477.4097	1457.8674	1497.2139	.0231
5	4838.6514	4763.7490	4914.7314	.0411
6	4908.6201	4826.4883	4992.1494	.0478
7	12247.6460	12014.3690	12485.4530	.1206

MCARTHUR 1979 SITE 07 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	2.0000	2.0000	2.0000	1.0000
2	30.0000	30.0000	30.0000	1.0000
3	.9399	.9384	.9414	.9160
4	95.4760	95.4221	95.5299	.9923
5	28.9906	28.9560	29.0253	.9850
6	.9141	.8609	.9707	.2136
7	23.8549	23.8441	23.8658	.9924
8	12.2356	11.7926	12.6953	.7245

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	49.9397	50.0604	.9287
2	993.9509	981.9203	1006.1289	.0023
3	1110.3616	1096.7078	1124.1853	.0040
4	1860.9482	1853.0017	1868.9287	.9490
5	2409.3428	2355.1094	2464.8247	.0058
6	4017.7920	3901.3550	4137.7041	.0280
7	4726.1992	4704.6191	4747.8779	.9434

MCARTHUR 1979 SITE 08 C: 1 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	5.0000	5.0000	5.0000	1.0000
2	100.0000	100.0000	100.0000	1.0000
3	1.2961	1.2762	1.3162	.8955
4	128.7941	128.4186	129.1708	.9877
5	5.1797	5.1035	5.2571	.8723
6	3.5666	3.4991	3.6354	.9143
7	4.8385	4.1355	5.6611	.0432
8	22.2826	19.0044	26.1262	.0135

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	150.0001	147.0937	152.9640	.8119
2	1102.3350	1055.4871	1151.2622	.0103
3	1257.5288	1197.5757	1320.4834	.0118
4	2233.4644	1935.8176	2576.8765	.1233
5	2570.4058	2375.2422	2781.6050	.5736
6	2730.9658	2477.2734	3010.6382	.6085
7	6851.6963	6075.5371	7727.0117	.0197

MCARTHUR 1979 SITE 09　　　　C: 1 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	2.0000	2.0000	2.0000	1.0000
2	50.0000	50.0000	50.0000	1.0000
3	206.3301	152.9359	278.3657	.7217
4	8.3532	5.3769	12.9770	.0317
5	4.2598	3.3560	5.4070	.0033
6	87.5068	77.8914	98.3092	.9013
7	165.5085	161.1324	170.0034	.9749
8	.8778	.4597	1.6764	.0682

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	75.4361	132.5625	.7313
2	233.8039	121.0957	451.4137	.3972
3	947.9319	803.6172	1118.1628	.0080
4	2006.9639	1506.4131	2673.8379	.0047
5	5463.5654	4651.9678	6416.7568	.0025
6	12639.5740	11441.7150	13962.8400	.9143
7	18814.4060	16539.2190	21402.5780	.0010

MCARTHUR 1979 SITE 10 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	5.0000	5.0000	5.0000	1.0000
2	20.0000	20.0000	20.0000	1.0000
3	74.8318	62.3205	89.8548	.6567
4	3.7209	2.5554	5.4180	.3253
5	595.8356	532.2997	666.9552	.8843
6	10.1543	10.0037	10.3071	.9199
7	944.1176	941.5000	946.7424	.9928
8	14.3587	8.9289	23.0905	.0393

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	45.2955	55.1931	.7903
2	194.3634	133.4939	282.9875	.2714
3	682.7787	578.5771	805.7469	.0086
4	1157.3337	996.2382	1344.4790	.0298
5	12274.4020	9254.5098	16279.7320	.0132
6	13645.6520	10087.0530	18459.6880	.0125
7	23759.2500	17707.0590	31880.0550	.0084

MCARTHUR 1979 SITE 11 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	12.3791	11.7504	13.0414	.0181
2	40.2932	39.6257	40.9719	.8223
3	260.1559	258.2273	262.0989	.9228
4	3.8708	3.8511	3.8905	.8493
5	2152.0435	2119.1284	2185.4697	.9212
6	59.6046	53.7803	66.0597	.3928

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	290.7082	269.7314	313.3163	.1832
2	433.6840	416.0355	452.0812	.5637
3	1398.7307	1354.5620	1444.3396	.0060
4	1721.6077	1676.5273	1767.9001	.0083
5	31714.1170	30087.0230	33429.2030	.0153

MCARTHUR 1979 SITE 12 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	.9512	.9011	1.0041	.2848
2	815.5479	789.3535	842.6115	.9404
3	5.8435	5.2999	6.4429	.0029
4	42.5589	37.9459	47.7326	.0072
5	4848.7617	4847.8027	4849.7217	.9995
6	.3845	.3547	.4168	.8557

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	11.4384	10.9009	12.0024	.2970
2	1169.2683	1135.2122	1204.3459	.0003
3	2065.8242	1957.8921	2179.7061	.0009
4	15215.5410	11901.5370	19452.3360	.4253
5	18819.8400	18089.2730	19579.9100	.0009

MCARTHUR 1979 SITE 13 C: 1 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	8.0000	8.0000	8.0000	1.0000
2	60.0001	60.0001	60.0001	1.0000
3	8.1408	7.6533	8.6594	.0000
4	70.9594	70.6110	71.3095	.9453
5	2.4485	2.4273	2.4699	.8621
6	88.0945	88.0617	88.1273	.9961
7	118.3280	118.2672	118.3889	.9965
8	34.5151	30.2002	39.4464	.0049

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	99.9999	98.5434	101.4778	.7824
2	454.7286	426.3209	485.0292	.0234
3	3224.3643	2990.6299	3476.3662	.0020
4	6423.2764	5905.6670	6986.2520	.0047
5	7715.0518	7163.6641	8308.8809	.0087
6	8666.1113	8654.8457	8677.3926	.9893
7	9504.3105	9332.9688	9678.7969	.8911

MCARTHUR 1979 SITE 14 C: 1 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	11.3665	10.1416	12.7394	.0055
2	319.7862	307.4241	332.6453	.7633
3	42.4011	40.3902	44.5122	.6434
4	262.0176	258.8927	265.1802	.9364
5	1153.6548	1134.0918	1173.5552	.9506
6	1054.6638	869.7345	1278.9143	.0162
7	297.7262	294.3727	301.1179	.8679
8	1301.3447	1178.0952	1437.4883	.0008

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	181.7590	159.1357	207.5986	.0219
2	1563.7463	1413.8247	1729.5657	.0425
3	2391.8125	2195.5083	2605.6685	.0511
4	3096.1758	2871.4175	3338.5269	.7305
5	4466.4189	4434.3994	4498.6699	.9802
6	31350.2890	25244.9220	38932.2110	.0441
7	36002.8130	29429.9370	44043.6720	.0280

MCARTHUR 1979 SITE #-15 C: 1 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	20.0000	20.0000	20.0000	1.0000
2	75.4254	67.0716	84.8196	.5166
3	29.1236	27.3813	30.9767	.0001
4	57.2089	56.4530	57.9749	.8885
5	1416.9663	1344.9978	1492.7856	.9338
6	1452.0388	1368.8713	1540.2593	.9327
7	300.6425	290.5058	311.1329	.9529
8	61.8029	57.7592	66.1297	.0000

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	12.4534	10.7996	14.3604	.6381
2	66.9453	58.1033	77.1329	.1929
3	1897.6711	1163.2048	3095.8911	.1177
4	2209.9517	1403.1663	3480.6187	.1134
5	4337.6494	4322.9482	4352.4014	.9960
6	6629.7266	4579.0293	9598.8203	.5766
7	7586.9004	6480.5801	8882.0840	.0129

MCARTHUR 1979 SITE # 16 C: 110.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I.	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	3.0000	3.0000	3.0000	1.0000
2	599.9999	599.9999	599.9999	1.0000
3	9.7138	9.5467	9.8839	.0000
4	14.4856	13.9129	15.0818	.8677
5	192.9334	192.0861	193.7845	.9903
6	478.3564	476.3560	480.3653	.9934
7	534.7804	531.9990	537.5763	.9923
8	124.9365	96.0910	162.4411	.0218

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	120.0000	118.8978	121.1125	.7366
2	440.3348	430.7072	450.1776	.0352
3	9345.3789	6042.8369	14452.8300	.2651
4	10647.5900	8604.4805	13175.8300	.0815
5	11836.6070	11371.0800	12321.1930	.9300
6	13192.7250	13122.4060	13263.4200	.9919
7	14496.5490	11689.2540	17978.0430	.6841

MCARTHUR 1979 SITE 17 C: 1 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	20.0000	20.0000	20.0000	1.0000
3	1231.0518	1221.3569	1240.8235	.9742
4	7.8025	6.1655	9.8741	.1612
5	13.0001	11.1012	15.2239	.0804
6	72.3172	57.4875	90.9724	.8422
7	144.4100	123.4122	168.9806	.8806
8	31.5945	24.6643	40.4719	.0754

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	87.7266	113.9904	.3596
2	105.4532	91.3880	121.6832	.3539
3	673.4198	565.2130	802.3420	.0187
4	1222.6692	961.2847	1555.1272	.0579
5	4566.7344	3931.0352	5305.2344	.0251
6	7163.6953	4522.1455	11348.2710	.7242
7	11128.1680	8465.7344	14627.9240	.0402

TABLE 4. RESULTS OF 1D INVERSION - COMPONENT 2

Note:

(1) Site numbers correspond to locations in TABLE 1.

(2) I refers to the number of the resistivity layer.

(3) RO (I) is the calculated layer resistivity (ohm-m).

(4) Z (I) is the depth to base of each layer (m).

(5) BOUND (1), (2) indicate a range of acceptable solutions.

(6) DAMPING indicates parameter constraint. For values near 1.0, starting values are accepted as best estimate. Solution is the most sensitive for values near 0.0.

MCARTHUR 1979 SITE # 01 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	50.0000	50.0000	1.0000
2	100.0000	100.0000	100.0000	1.0000
3	269.6058	246.4405	294.9486	.5574
4	468.4466	438.0185	500.9884	.6692
5	43.6978	39.3800	48.4891	.5740
6	128.9184	117.2083	141.7984	.0146
7	286.3407	271.7360	301.7303	.7557
8	70.0392	58.0478	84.5076	.0121

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	96.5055	103.6210	.8105
2	498.4648	433.1219	573.6656	.2784
3	990.4803	921.5936	1064.5161	.6302
4	2275.0811	2138.0190	2420.9297	.0223
5	3250.6807	3027.4414	3490.3813	.0386
6	14963.7660	12915.6000	17336.7300	.0275
7	24634.0120	22093.3790	27466.8050	.0112

MCARTHUR 1979 SITE 02 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	20.0000	20.0000	20.0000	1.0000
3	796.1224	794.7979	797.4492	.9674
4	9.3054	9.2555	9.3556	.7404
5	112.3779	107.2952	117.7013	.1657
6	160.4134	157.7686	163.1025	.0002
7	156.5594	156.0989	157.0211	.9795
8	.3197	.3179	.3215	.9768

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	95.2181	105.0219	.3381
2	104.5841	99.8732	109.5172	.2897
3	537.9027	518.2986	558.2483	.0413
4	758.4034	732.6195	785.0948	.0393
5	3074.3579	2942.0879	3212.5747	.4377
6	39848.4220	39808.7190	39888.1640	.9928
7	47636.1950	47181.7890	48094.9770	.0001

MCARTHUR 1979 SITE 03 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	50.0000	50.0000	1.0000
2	599.9999	599.9999	599.9999	1.0000
3	1900.6604	1895.4814	1905.8535	.9356
4	7.3605	7.3559	7.3651	.9066
5	1110.7581	1110.4089	1111.1074	.9863
6	6.6757	6.6703	6.6811	.9123
7	779.2845	778.6471	779.9226	.9878
8	4.7150	4.6016	4.8312	.8248

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	199.9998	199.0875	200.9164	.8394
2	584.6228	581.0508	588.2168	.8488
3	2254.0801	2220.1255	2288.5542	.0103
4	2563.1269	2527.9507	2598.7969	.0089
5	8718.9688	8565.6895	8874.9902	.0063
6	9833.3223	9669.9180	9999.4863	.0063
7	29815.5660	29190.7730	30453.7340	.0094

MCARTHUR 1979 SITE 04 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	50.0000	50.0000	1.0000
2	100.0000	100.0000	100.0000	1.0000
3	2.8785	2.8586	2.8986	.8763
4	30.4499	30.4108	30.4890	.9799
5	118.6384	118.2570	119.0211	.9679
6	14.0434	13.3370	14.7872	.0035
7	41.8387	41.6039	42.0748	.9720
8	1.0578	.9936	1.1262	.7383

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	99.4047	100.5988	.8853
2	1246.6765	1206.1809	1288.5317	.0062
3	1451.3845	1403.3774	1501.0339	.0113
4	1705.1394	1684.3630	1726.1721	.8775
5	2521.4995	2356.6899	2697.8350	.0091
6	15013.5230	13074.0800	17240.6680	.3311
7	17873.2620	17056.4410	18729.1990	.0070

MCARTHUR 1979 SITE 05 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	20.0000	20.0000	20.0000	1.0000
2	89.9999	89.9999	89.9999	1.0000
3	11901.1430	11891.7300	11910.5620	.9753
4	225.3768	225.3614	225.3922	.9973
5	17.4245	17.4212	17.4279	.9432
6	201.6514	197.4193	205.9741	.1004
7	99.4495	99.4437	99.4553	.9992
8	.6507	.6503	.6511	.9870

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0001	98.7490	101.2670	.5719
2	104.1196	102.8019	105.4543	.5808
3	2561.4531	2553.8257	2569.1035	.8926
4	2634.7744	2579.8623	2690.8550	.0435
5	2835.5029	2776.1235	2896.1523	.0247
6	66011.3120	65929.5000	66093.2340	.9863
7	69564.4220	68064.7340	71097.1560	.0266

MCARTHUR 1979 SITE06 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	20.0000	20.0000	20.0000	1.0000
3	363.4417	355.3976	371.6678	.8328
4	13.3642	13.2078	13.5224	.8149
5	540.9758	532.0594	550.0416	.8715
6	192.8478	183.9092	202.2209	.1648
7	315.0803	299.4444	331.5327	.1126
8	8.2043	8.1333	8.2760	.9375

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	97.0060	103.0864	.5054
2	140.7530	134.7780	146.9928	.3358
3	1559.9478	1515.5120	1605.6865	.0475
4	1973.0779	1936.1360	2010.7246	.0231
5	4588.9375	4228.9902	4979.5215	.3504
6	16018.7540	14817.1990	17317.7460	.2691
7	70954.1870	68158.8750	73864.1410	.0404

MCARTHUR 1979 SITE 07 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	5.0000	5.0000	5.0000	1.0000
2	40.0000	40.0000	40.0000	1.0000
3	.9259	.9250	.9268	.9275
4	380.7479	380.6685	380.8273	.9943
5	4.2335	4.2249	4.2421	.8017
6	851.2307	850.3235	852.1389	.9787
7	319.1281	318.7735	319.4832	.9726
8	30.7219	29.7245	31.7528	.5796

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0001	99.6007	100.4010	.8642
2	1055.6392	1042.2632	1069.1868	.0058
3	1160.8911	1145.1780	1176.8201	.0067
4	2371.9341	2298.4478	2447.7700	.0249
5	3137.6123	3062.9268	3214.1191	.0198
6	13415.5530	13384.0160	13447.1640	.9450
7	17906.7970	17326.6370	18506.3830	.0720

MCARTHUR 1979 SITE 08 C: 2 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	12.0000	12.0000	12.0000	1.0000
2	2000.0005	2000.0005	2000.0005	1.0000
3	3189.5835	3176.2041	3203.0190	.9953
4	3.1786	2.7293	3.7018	.7231
5	20.2487	18.9146	21.6769	.8000
6	265.0372	264.8323	265.2422	.9948
7	17.8133	16.9217	18.7518	.7100
8	129.1880	121.0170	137.9107	.0001

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	300.0001	289.9664	310.3809	.6915
2	682.6014	677.1626	688.0840	.9913
3	1207.6255	1143.6858	1275.1399	.0327
4	1523.0935	1419.8608	1633.8318	.0375
5	2446.0171	2179.4375	2745.2036	.3715
6	2701.1548	2344.5088	3112.0537	.2718
7	4033.6030	3548.8042	4584.6299	.0327

MCARTHUR 1979 SITE 09 C: 2 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	199.9998	199.9998	199.9998	1.0000
3	30.9120	30.7405	31.0845	.9848
4	234.1553	233.6815	234.6301	.9935
5	279.6071	279.6027	279.6115	.9997
6	7.6488	5.9577	9.8200	.2178
7	24.7620	19.3438	31.6980	.0044
8	168.5547	155.6258	182.5578	.0007

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	249.9999	239.7137	260.7276	.7066
2	785.2611	639.5763	964.1306	.4457
3	804.7690	670.3704	966.1125	.4957
4	918.6909	918.2878	919.0941	.9950
5	928.2284	862.5325	998.9282	.0944
6	1542.8567	1292.2732	1842.0308	.0370
7	5192.7949	4373.7051	6165.2803	.0022

MCARTHUR 1979 SITE 10 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	80.0000	80.0000	80.0000	1.0000
3	404.7053	296.2952	552.7813	.4796
4	.8312	.4991	1.3843	.1142
5	178.2088	178.0027	178.4151	.9974
6	68.1790	67.9284	68.4305	.9913
7	76.4223	76.2994	76.5453	.9926
8	2.9495	2.1362	4.0725	.0134

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	46.6549	53.5849	.8512
2	268.2334	181.3961	396.6412	.2545
3	1605.9207	1431.8665	1801.1323	.0030
4	2067.0376	1804.2163	2368.1445	.0090
5	2964.9790	2938.0981	2992.1060	.9808
6	3741.1973	3735.3052	3747.0986	.9954
7	4521.9199	3632.1689	5629.6279	.0065

MCARTHUR 1979 SITE 11 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	80.0000	80.0000	80.0000	1.0000
3	236.9631	199.3194	281.7163	.7736
4	50.5794	49.5722	51.6070	.9429
5	230.0513	229.7996	230.3033	.9980
6	11.2234	11.1379	11.3095	.9867
7	1.4755	1.3066	1.6663	.0055
8	4.8982	4.8819	4.9146	.9983

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	88.1093	113.4953	.8448
2	330.8947	207.5527	527.5348	.5382
3	822.7864	715.1570	946.6138	.4482
4	918.2766	812.4270	1037.9172	.7507
5	954.5870	640.9678	1421.6572	.3176
6	988.6066	881.6219	1108.5737	.0184
7	17357.6290	16229.4530	18564.2270	.9839

MCARTHUR 1979 SITE 12 C: 210.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	9.0000	9.0000	9.0000	1.0000
2	120.0000	120.0000	120.0000	1.0000
3	.3713	.3712	.3714	.9608
4	61.4882	61.4855	61.4909	.9977
5	135.1078	135.0995	135.1161	.9972
6	306.9739	306.9473	307.0004	.9964
7	129.4255	129.4225	129.4286	.9991
8	.0404	.0404	.0405	.9669

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0001	99.7758	100.2248	.8998
2	1368.5913	1346.6436	1390.8967	.0076
3	1443.8381	1422.0679	1465.9417	.0070
4	1878.3589	1878.1099	1878.6079	.9936
5	2755.2803	2754.9600	2755.6011	.9949
6	6349.7285	6349.1211	6350.3359	.9964
7	8732.3320	8545.3828	8923.3711	.0091

MCARTHUR 1979 SITE 13 C: 2 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	30.0000	30.0000	30.0000	1.0000
3	175.2192	170.7488	179.8066	.9776
4	6.7387	5.3900	8.4249	.0144
5	227.3193	225.3250	229.3314	.9886
6	108.2950	103.8897	112.8870	.9492
7	21.8618	10.9531	43.6348	.2897
8	167.0703	139.5167	200.0654	.0029

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(1)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	83.2754	120.0834	.7967
2	475.9182	216.9987	1043.7766	.3742
3	631.6517	533.5944	747.7289	.0190
4	1948.3328	1640.1284	2314.4536	.0093
5	2591.7686	2428.1055	2766.4629	.9310
6	3464.3184	2197.0249	5462.6152	.1486
7	6881.4180	4967.0059	9533.6934	.0292

MCARTHUR 1979 SITE 14 C: 2 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	8.0000	8.0000	8.0000	1.0000
2	80.0000	80.0000	80.0000	1.0000
3	1.3679	1.3673	1.3686	.8931
4	419.2980	419.2590	419.3370	.9950
5	5027.3477	5026.5264	5028.1689	.9950
6	5028.1631	5027.9590	5028.3672	.9988
7	54.3097	54.1782	54.4416	.9284
8	30.0000	30.0000	30.0000	1.0000

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	199.9998	198.3401	201.6735	.7072
2	863.8705	845.4470	882.6954	.0269
3	1002.9556	985.6116	1020.6047	.0228
4	2330.7344	2330.3848	2331.0840	.9909
5	12930.4220	12930.4220	12930.4220	1.0000
6	15359.9450	14850.7130	15886.6390	.0044
7	17359.9450	17359.9450	17359.9450	1.0000

MCARTHUR 1979 SITE # 15   C: 2 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	50.0000	50.0000	50.0000	1.0000
2	40.0000	40.0000	40.0000	1.0000
3	.5150	.5148	.5153	.9489
4	3112.5547	3111.5547	3113.5552	.9955
5	14.8326	14.8101	14.8550	.8484
6	299.9646	299.8096	300.1197	.9892
7	816.9210	816.6475	817.1947	.9938
8	526.6075	502.0873	552.3252	.2761

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	249.9999	248.2330	251.7794	.6403
2	884.0588	875.8229	892.3723	.0362
3	947.9565	939.0521	956.9454	.0322
4	6742.4414	6480.7637	7014.6855	.1881
5	8313.4414	8039.1436	8597.0996	.1335
6	10027.4650	10003.0530	10051.9360	.9535
7	11999.9770	11984.4160	12015.5590	.9761

MCARTHUR 1979 SITE # 16   C: 2 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	4.0000	4.0000	4.0000	1.0000
2	80.0000	80.0000	80.0000	1.0000
3	767.8199	760.9808	774.7205	.9833
4	537.3986	532.8558	541.9800	.9858
5	2.3365	2.2935	2.3804	.8612
6	157.5972	156.9507	158.2464	.9727
7	8.3259	8.1288	8.5277	.7202
8	160.3833	148.8936	172.7595	.0038

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	96.2296	103.9180	.8362
2	126.6776	121.3653	132.2225	.9124
3	415.0435	413.3495	416.7443	.9930
4	1062.5825	1021.3289	1105.5024	.0088
5	1274.7830	1226.9375	1324.4941	.0105
6	2863.9053	2656.3682	3087.6567	.0239
7	4164.4326	3948.7944	4391.8467	.0189

MCARTHUR 1979 SITE 17 C: 2 5.00 -2 2 1.0 .70

LAYER RESISTIVITIES
1.0000 PERCENT ERROR LEVEL

I	RO(I)	BOUND(1)	BOUND(2)	DAMPING
1	10.0000	10.0000	10.0000	1.0000
2	80.0000	80.0000	80.0000	1.0000
3	1.5399	1.3433	1.7652	.7391
4	69.9534	69.4025	70.5087	.9783
5	3.7183	3.1560	4.3809	.5773
6	112.9284	108.4408	117.6017	.8808
7	340.3916	332.1887	348.7971	.9010
8	79.3345	69.4068	90.6823	.0045

LAYER DEPTHS (TO BASE)
1.0000 PERCENT ERROR LEVEL

I	Z(I)	BOUND(1)	BOUND(2)	DAMPING
1	100.0000	98.6425	101.3761	.8158
2	731.2377	699.9086	763.9691	.0137
3	931.4073	887.6539	977.3175	.0192
4	1674.9167	1505.3555	1863.5771	.0341
5	2704.9268	2507.0015	2918.4780	.0308
6	6101.3564	5663.9824	6572.5049	.7564
7	10159.0210	7887.2793	13085.0840	.0989

TABLE 5. RANGE OF RESISTIVITIES ASSOCIATED WITH MAJOR STRUCTURAL UNITS

Unit	Composition	Common Resistivity Range (ohm-m)
Roper Group	Sandstone	10 - 50
	Subordinate siltstone	
Tawallah Group	Sandstone	50 - 500
	volcanics	
McArthur Group	Dolomite	> 10k
	Subordinate siltstone	
	some sandstone	
Basement	Granites	> 500
	metasediments	
	high grade metamorphics	
Other Rocks	Granite	10^3 - 10^5
(literature)	Metamorphics	10^2 - 10^5
	Shale	10^1 - 10^2
	Sandstone	10^2 - 10^3
	Limestone	> 10^4