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E.L.'S 4856 AND 4857

REPORT ON AREAS RELINQUISHED

IN JANUARY, 1990

VOLUME I - TEXT AND APPENDIX

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B. BERTHAULT
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I. INTRODUCTION

The two Exploration Licences, E.L. 4856 and E.L. 4857, portions of which are the subject of this report, were applied for in August, 1985 and were subsequently granted in March, 1986. They form part of the West Pine Creek Joint Venture in which TOTAL Mining Australia Pty. Limited and PNC Exploration (Australia) Pty. Ltd. are the partners.

The tenements are located in the Reynolds River, Daly River and Fish River area of the Northern Territory, being more or less centred on the Daly River settlement 150 km south of Darwin. They are contained within a block bounded by latitudes 13°15' and 14°20'S and longitudes 130°40' and 141° and are aligned in a north-south direction to cover the general strike and contacts of the Lower and Middle Proterozoic rocks. All the land covered by the licences is under a Pastoral Lease held by Tipperary Station.

The northern tenements are accessible from the main Daly River-Adelaide River road and then by established tourist and station tracks. The southern tenement is less accessible by ground, with flooding of the main waterways prohibiting traffic for 5-7 months of the year. However it is served by station roads.

Exploration activities of the subject area include ground scintillometer traversing, various airborne surveys (EM INPUT and gravity), interpretation and modelling of previously acquired data, ground EM follow-up of selected conductive zones - radon, detailed radiometric survey of EM anomalies as well as geological and structural mapping of the same areas.

The targets defined by these surveys were then tested using percussion and core drilling and the holes were logged with a radiometric probe.

Considering that the results obtained from the various surveys on certain parts of E.L.'s 4856 and 4857 are rather negative, it has been decided to relinquish those portions.

II. GEOLOGY

2.1 REGIONAL SETTING AND STRATIGRAPHY

The Joint Venture Licences are located on the western edge of the Pine Creek Geosyncline. The main rock types are sediments ranging in age from Lower Proterozoic to Adelaidean; Carpentarian granites intrude these sediments. The Litchfield Complex of ?Archaean to Lower Proterozoic age occurs to the northwest. The Cambrian Daly River Group obscures much of the Lower Proterozoic-Adelaidean rocks both west and east of the tenement area. The geology is illustrated on the Synthesis Map (Plate 1).

The stratigraphy is as follows (from N.T.G.S., 1983):

ARCHAEAN-EARLY PROTEROZOIC: Litchfield Complex comprising high grade metamorphics which appear to include sediments, basic to intermediate rocks and anatectic granites. These are located to the northwest of the project area.

EARLY PROTEROZOIC: Burrell Creek Formation comprising variably metamorphosed sandstones and siltstones. Includes pebble and conglomeratic facies, graphitic shales/schists and some carbonate rocks (Pfb).

LATE PROTEROZOIC:

(i) Carpentarian syn-orogenic to post-orogenic granites. Represented by the Mt. Litchfield, Allia Creek and Jammine granites and the Soldiers Creek granite at Collia (Pxgl, Pxga, Pxgi and Pgs).

(ii) ?Early Adelaidean Tolmer Group. Comprises four formations:

+ Depot Creek Sandstones: thickly bedded medium to coarse quartz arenite (450 m) (Ptd).

+ Stray Creek Sandstone: flaggy micaceous, ripple marked quartz arenite (300 m) (Pts).

+ Hinde Dolomite: dolomite, dolomitic shales and arenites, quartz arenites (+ 314 m) (Pth).

+ Waterbag Creek Formation: red mudstone with thin arenite layers (non-outcropping) (+ 134 m) (Ptw).

(iii) Late Adelaidean Uniya tillite (0 - 30 m) (Put).

PALAEOZOIC: Cambrian Daly River Group. Basal conglomerates, Antrim Plateau Volcanics (basalts) and the Tindall Limestone (Cla).

2.2 REGIONAL STRUCTURE

The principal structural feature of the region is the Giants Reef Fault which has caused obvious displacement to the various rock units it traverses. The zone extends some 30 km northeast of Rum Jungle where it loses its identity under alluvial cover; southwards it extends well outside the Joint Venture's area of interest. The Giants Reef Fault is considered to be the northern extension of the Hall's Creek Mobile Zone. Parallel structures, the largest being the Stapleton and Rock Candy Range Faults and many minor ones traverse both the Burrell Creek Formation and the Tolmer Group rocks.

Folding is present both on a small and large scale. The Burrell Creek sediments are tightly folded with fold axes striking generally N-S. The overlying Tolmer Group dips gently eastwards forming the extensive Daly River Basin. Folding occurs in the Tolmer adjacent to the Rock Candy Fault, forming an elongated domal structure thought to be underlain by Carpentarian granite. The Cambrian sediments are nearly flat lying.

Regional dips are moderate to steep westerly for the Burrell Creek Formation and gently eastwards for the Tolmer Group. Strikes are N-S to NW-SE.

2.3 GEOLOGY OF THE TENEMENTS

2.3.1 E.L. 4856

+ **Burrell Creek Formation**

Lower Proterozoic sediments are confined to the lower western and eastern sides of the E.L. Here they form steep sided hills abutting the Tolmer Sandstone or are present as flat soil-covered plains. Lithologically, the facies comprise fine to coarse sandstones interbedded with micaceous meta-siltstones. The former are quartzitic with, in places, a well developed lineation of the rounded quartz grains; thin conglomeratic and pebble bands occur. The silty variants are often rich in sericite and may vary in colour from pale brown to reddish; regional metamorphism has produced a phyllitic rock. The presence of higher grade andalusite schists in places could be indicative of tectonic and/or intrusive activity.

Much of the non-outcropping country covered by black soil areas and swamps is thought to be underlain by easily erodable schists and meta-siltstones.

A thin, sand-covered area near Surprise Creek, wedged between the Giants Reef Fault and outcropping Lower Proterozoic quartzites/schists has been drilled extensively in the past. Drill logs indicate the presence of chloritic mica schists, carbonaceous shales and thin dolomite bands. An informal name, the Surprise Creek Member, was applied to these rocks although they undoubtedly are part of the Burrell Creek Formation which has undergone localized intense deformation associated with activity along the Giants Reef Fault zone.

+ **Tolmer Group**

The basal Depot Creek Sandstone Member covers much of the licence area; it forms both an eastern and western contact with the Burrell Creek rocks, in part unconformable, in part faulted. Regionally, the Tabletop Range is a broad, shallow depression with observed west and east dipping strata on the respective sides, where not affected by faulting. Remnants of younger Stray Creek Sandstone were located during surface prospecting in the more northerly parts of the tenement, these not having been mapped previously. These outcrops are either erosional remnants or have been preserved in localized fault bounded zones.

The Depot Creek is typically a massive, blocky, generally fine to medium grained quartzite often reddish in colour. Bedding is obvious and, in places, is well defined by pebble bands. The Stray Creek Member comprises laminated sandstones with interbedded reddish shaley mudstones. In the field the two members can be distinguished by radiometry. Current bedding, ripple marks, slumping, autobrecciation and sand dikes are all represented in the basal Depot Creek, appearing to be a consistent feature regionally. Ripple marks were also observed in the Stray Creek Sandstone.

+ **Uniya Tillite**

At AMG grid reference 043169 (Reynolds River 1:100,000 sheet) a previously unmapped outcrop of glacially derived sediment was located during traversing. Lithologically it is a dark coloured fine grained sandstone containing "dropstones" up to 0.5 m diameter of Depot Creek Sandstone. Only a thin layer has been preserved but the coverage is fairly extensive, being several hundred metres in area. Elsewhere, unconsolidated boulder deposits are considered to be of glacial origin.

+ **Mesozoic**

Lateritized sediments thought to be of Mesozoic age form flat-topped hills overlying Depot Creek Sandstone. Most of these features are located along or adjacent to the mid-Proterozoic unconformity. Other areas of laterite which can be identified on aerial photographs are considered to be derived directly from the Tolmer Sandstone.

+ **Granite**

Two granite intrusives are present, located approximately 10 km apart. The most northerly is the Reynolds River Granite, the other has no formal name but has been termed the Alligator Creek Granite. Both are represented by very poor outcrop, the granite being obviously subject to rather quick weathering and decomposition; occasional exposures are seen in rapidly eroding creek beds. Generally the extent of the bodies has been judged by both photo signature and eluvial deposits on the ground surface. F. Lillie's (TOTAL, Paris) satellite interpretation does confirm greater known extent of the Reynolds River Granite and more or less agrees with the current interpretation. Similarly, the granitic body which underlies the Fault Wedge Zone was located accurately by Gravity methods. Drilling has proven it to be of greater extent westwards obscured under 200 m+ of Tolmer Sandstone.

Outcrop observations on the Reynolds River Granite show two variants: pink and grey. The former has been described as a "porphyritic adamellite" and occurs as isolated, rounded, boulder-like outcrops; the latter is far more widespread and poorly outcropping. It is generally a hornblende-biotite granite. Observed outcrops in the Fault Wedge indicate a similar granite type to the hornblende-biotite variety; a description grained from drill core indicates a medium grained monzonitic granite showing a distinctive chloritic-hematitic alteration near the contact.

Contact metamorphic effects are not observed around the Reynolds River Granite, however, as previously described, there is an alteration aureole adjacent to the other.

2.3.2 E.L. 4857

+ **Burrell Creek Formation**

The lithologies represented here comprise both meta-argillites and arenaceous types, the latter being more widespread than elsewhere. The structural trend is north-south with bedding vertical to steep west. Local folding occurs mainly north and northeast of March Fly, the structures being south plunging. Many photo lineations cross-cut the bedding at right angles; displacements are small scale.

Progressing south along the unconformity there is a gradual change in the facies exposed due to the combination of regional bedding strike and the trend of the contact. Lithologies, exposed to the north, gradually "disappear" under the Tolmer Group producing a continual succession of younger rocks along the traverse zone. This is illustrated by mapping (Robertson Research and Mobil) and ground traversing (T.M.A.) where coarse sandstones and conglomerates predominate adjacent to the unconformity east and north of March Fly. These coarser lithologies have been previously mapped as Noltenius Formation (BMR) and were considered older than the Burrell Creek Formation. This stratigraphic name has since been abandoned with all Lower Proterozoic rocks now being grouped within the Burrell Creek. The stratigraphy is generally as follows: coarse sandstones and grits with thin conglomeratic horizons (basal) becoming finer grained with a predominance of meta-siltstones of variable composition giving rise to sericite and quartz-muscovite schists. Interbedded with these are further sandstones of variable grainsize and some thin conglomerate beds. Locally, carbonaceous (sometimes, but rarely, graphitic) shales occur as thin bands as do isolated outcrops of black silicified greywacke. All these facies occur at the March Fly prospect.

+ **Tolmer Group**

The depot Creek Sandstone forms a prominent escarpment in places trending NNE-SSW. Outcrop of this basal unit is restricted to an average width of approximately 1.5 km due to overlying tillite and Cambrian limestone northwards (Blackfellow Creek area) and Stray Creek Sandstone elsewhere; the latter has an

unconformable relationship with the Depot Creek. East and north of Hayward Creek the unconformity surface is well preserved with little erosion of the Burrell Creek. Topographically the landform is fairly flat lying across the contact and this extends perhaps 500-800 m west to where the escarpment is developed in Burrell Creek sediments.

Regional dips taken by the NTGS and field observations show the basal sandstone member to be tilting very gently eastwards with measurements ranging from 10^{o}-20^{o} along most of the contact.

The series of parallel E-W faults in the Burrell Creek Formation also affect the Tolmer although this is not acknowledged on the NTGS maps. Minor offsets in the contact were observed during the traversing; sheeting structures in the sandstone indicated the fault trend.

Lithologically the Depot Creek Sandstone is a fine grained quartz-arenite with thin pebbly bands throughout; local conglomerate lenses were seen in places. Sedimentary features such as ripple marks and current bedding are common.

+ **Uniya Tillite**

Glacial features and sedimentation occur in a N-S trending zone from Hayward Creek north to the Reynolds River. The feature is thought to represent a glacial valley coinciding with a structural depression within the Tolmer Sandstone; this depression has been identified by geophysics and drilling at two INPUT anomaly locations.

Glacial sediments are present as both unconsolidated till (e.g. Hayward Creek area) and as a fluvioglacial shale/sandstone sequence in both outcrop and drill cuttings (INPUT anomalies 2851 and T11). The shales are red and varve-like while the sandstones are poorly sorted facies containing variously sized pebbles and large dropstones of Depot Creek Sandstone.

The most outstanding glacial feature is the striated pavement at Hayward Creek. Other pavements were found by T.M.A. geologists to the north at the Reynolds River and also near Alligator Creek (T11).

+ **Daly River Group**

The Cambrian Antrim Plateau Volcanics and Tindall Limestone unconformably overlie both the Tolmer Group and the glacial sequence. Drill holes at both T11 and 2851 INPUT anomalies intersected a thin layer of amygdaloidal basalt covering the glacial sediments; a palaeosol was identified in some holes. Muddy shale beds and some pebbly horizons might also be of Cambrian age though this is not definite.

III. EXPLORATION ACTIVITIES

3.1 INTRODUCTION

The principal aim of the exploration programmes was to carry out detailed exploration over conductive zones as defined by the aerial INPUT survey and to follow-up where necessary with drilling. Other activities were confined to the evaluation of the outcropping unconformity between the Burrell Creek and Tolmer Formations, and to some ground investigation of subtle airborne radiometric anomalies occurring within the Tolmer Sandstone.

3.2 TARGETS AND MODELS

The Tolmer Project was chosen as an exploration target by the Joint Venture because of the many geological similarities, both regionally and locally and lithologically and structurally, to the Alligator River Uranium Province some 250 km to the east.

The sequence of Lower Proterozoic sedimentation appears to have been fairly uniform across the Pine Creek Geosyncline with subsequent folding and syn-post orogenic granitic intrusive episodes. These have given rise to a series of regional synclinoriums.

Middle Proterozoic sedimentation most likely covered the entire Geosyncline; this episode comprised the Katherine River and Tolmer Groups of sandstones and associated rock types. The B.M.R. have placed the former as the oldest with an unconformity separating the two groups. The Depot Creek and Kombolgie Sandstones are considered by T.M.A. to be stratigraphical equivalents supported by near identical lithological, physiographical and botanical features. The only differences are in the facies variations reflecting the depositional environment, i.e. basic volcanism in the Kombolgie and carbonate deposition near the end of the Tolmer sedimentation.

The Burrell Creek Formation, which immediately underlies the basal Tolmer unit, the Depot Creek Sandstone, is the youngest phase of early Proterozoic sedimentation in the Pine Creek Geosyncline. Further to the northeast, at Rum Jungle, the Burrell Creek Formation is unconformably underlain by the entire sedimentary sequence which has been exposed around the margins of the Rum Jungle and Waterhouse Complexes; the sequence comprises, from oldest to youngest, the Namoona, Mt. Partridge and South Alligator Groups. The Cahill Formation, host to uranium deposits in the ARUF is stratigraphically equivalent to the Namoona Group; various sedimentary facies have been observed in the Reynolds River by T.M.A. and others which may be Namoona equivalents. These occurrences include the tracts of swampy black soil and alluvium covered country north and south of Surprise creek where bedrock drilling has confirmed the presence of various schists: chloritic and graphitic and lenses of dolomitic sediments. Near Prousts Crossing west of Surprise Creek, probably Namoona equivalents including carbonaceous shales, graphitic schists and dolomite outcrop. Folding in the region has most likely exposed these older sediments. With the intensity of prospection covering the Burrell Creek sediments it cannot be discounted that favourable lithologies could be found in these younger sediments.

Following from the above, two principal exploration targets have been outlined:

(i) the unconformity model,
(ii) the granite contact model.

Applying these to the Tolmer Project, the main points are:

(i) Unconformity Model:

- the Burrell Creek/Tolmer unconformable contact is relatively flat lying,
- the underlying sediment, i.e. BCF and ?Namoona, have suitable facies present: carbonaceous, graphitic, dolomitic,
- suitable degree of metamorphism: greenschist and minor amphibolite facies,
- possible reactivated Archaean doming during the Middle Proterozoic,
- presence of uranium in the region: the Rum Jungle field and various small occurrences in Burrell Creek sediments,
- abundant groundwater movement,
- intrusion of Proterozoic granites giving an adequate heat source to activate and maintain convection cells which may act to concentrate uranium at physically or chemically suitable sites.

(ii) Granite Contact Model:

- intrusion of upper level granites or granitoids,
- a suitable host rock: carbonaceous shale, graphitic schist, dolomite.

Exposed granites are in evidence south of the Daly River and these intrude the Burrell Creek Formation.

3.3 METHODS OF INVESTIGATION AND EQUIPMENT

At first, the reevaluation and reinterpretation of the available BMR airborne survey data was carried out. The digital data base was acquired and the various data processed to provide a regional picture of the U, Th and K and the various ratios of those elements as well as magnetic intensity and first derivative.

A regional gravity survey was performed using a helicopter to obtain a general 4 x 2 km grid pattern. The results of this survey were combined with the existing data gathered by the B.M.R.

An INPUT survey was then performed over the area covered by outcropping or subcropping basal Tolmer-Depot Creek unit.

Systematic work over the defined EM conductors involved initial location with the aid of aerial photography and 1:100,000 topographic maps. Those inaccessible by 4-WD vehicle were reached by helicopter,

a Bell Jetranger from Rotor Services, Darwin. Once the conductive zone had been identified the area was gridded, usually with 100 m spaced cross lines and 25 m intervals marked along these lines. The general sequence of activities on each grid is as follows, however not all were employed in each case:

+ initial MaxMin - Geoterrex, Sydney,
+ VLF - TOTAL staff,
+ alphaCard - TOTAL staff,
+ radiometrics - TOTAL staff,
+ geological mapping - TOTAL staff,
+ selection of drilling targets - TOTAL staff,
+ site preparation by bulldozer - North Australian Haulage, Darwin,
+ drilling: percussion and/or diamond - Rockdril, Brisbane,
+ downhole logging - Century Geophysics, Adelaide or TOTAL staff,
+ laboratory analyses of cuttings and core - Amdel, Darwin,
+ thermoluminescence studies on Tolmer Sandstone - Mark Hochman, Adelaide University.

During the campaign the MaxMin ground electromagnetic surveying was carried out by a crew from Geoterrex using a 150 m separation between receiver and transmitter along profiles either 100 m or 200 m apart. Equipment used was an Apex Parametrics MaxMin II frequency domain electromagentic system.

The MaxMin survey was performed only on the INPUT anomalies located on or immediately adjacent to the Depot Creek Member of the Tolmer Sandstone as it was ascertained that the method was unable to define a target below a thickness of overlying facies greater than that of the Depot Creek. The latter, with a maximum thickness in excess of 400 m, is already the absolute maximum through which the MaxMin can "see" even when considering the most favourable hypotheses.

The purpose of the ground EM MaxMin survey was to determine the presence and location of conductive belts, possibly corresponding to facies of graphite-chlorite schists within the Burrell Creek Formation below the overlying Depot Creek Sandstone. Our detailed survey of the Burrell Creek Formation outcropping near the Depot Creek unconformity has confirmed the presence of such favourable facies, sometimes accompanied by uranium mineralisation or anomalous radioactivity.

The radon survey was specifically applied to the conductors defined by the MaxMin readings. Radiometric surveying and geological mapping were applied to the total surface of each grid.

The MaxMin survey has provided two types of anomaly:

- some responses corresponding to wide, shallow "bad quality" conductors,

- some responses which could correspond to more deeply seated conductors.

The interpretation of the MaxMin anomalies has been done considering also the limit of mapped geological facies and/or the structural features recorded during the systematic survey of the gridded area.

VLF was run over as many lines as possible on each grid; its purpose was to define the presence of shallow conductive zones such as overburden, to help in the interpretation of the MaxMin responses, and to outline structures which affect both the Tolmer Sandstone and underlying Burrell Creek Formation. The equipment used is a Geonics EM16 unit, manually operated.

The survey was run on the Japan (NDT) and North West Cape (NWC) transmitters to obtain information on both N-S and E-W sets of faults. Unfortunately, the North West Cape Station emitted very irregularly which did not enable us to obtain values on every reading location of the grid and so get systematic information on the E-W oriented faults.

Radiometric and radon-detecting procedures were implemented concurrently, generally over selected grid lines; the surveys were limited to areas where both favourable conductive trends and suitable lithologies occurred, the latter being Tolmer Sandstone cover. Lines were rarely extended into outcropping Burrell Creek Formation.

Equipment utilised is the portable SPP-2 scintillometer and an alphaNuclear alphaCard device. A Toyota 4-WD with mounted Gemco auger drill prepared a 40 cm deep, 15 cm diameter hole in which is placed an inverted plastic flower pot with attached alphaCard. The hole was sealed with large, thick, plastic bags held in place by soil/rubble. The cards were allowed to "sit" for a minimum of 12 hours and then read using a programmed counter which gives a value in counts per minute. Scintillometer readings were taken both "down-hole" and on the surface.

Where access was not available for the auger rig, all holes had to be excavated by hand.

3.4 E.L. 4856 - INVESTIGATIONS AND RESULTS

3.4.1 Ground Radiometric Traversing

Systematic traversing of the Lower-Middle Proterozoic eastern contact was performed: scintillometric readings were taken at 25 m intervals on 50 m spaced lines. Traverse lines were designed to cover at least 800 m-1000 m of Burrell Creek Formation and extend 100-200 m onto the Tolmer Sandstone plateau. Geological observations were made at each station.

Some of the area relinquished was not explored in any detail as preliminary studies have shown its unsuitability, according to our geological methods, of having the potential for an economic uranium discovery.

No major nor sizeable anomalies were recorded. The Burrell Creek encountered along the profiles showed a much more monotonous facies (especially siltstone) than what has been observed on the western unconformity.

3.4.2 Surface Prospecting: Airborne Radiometric Anomaly Assessment - Ground Check (Plate 2)

A reassessment of the flight line data was done taking into account subtle uranium peaks which coincided with the Depot Creek Sandstone. The location of the anomaly was transferred onto colour aerial photo copies for field use.

Previously, geophysical consultants had determined thresholds for the various lithological units - this formed the basis for the initial interpretation of the radiometric data. The calculated figure arrived at for the Depot Creek Sandstone was considered too high by T.M.A. and that many subtle, yet possibly significant, anomalies were being overlooked. A reinterpretation of the data came up with new information which was then checked out in the field.

+ Photo Run 10E, No. 1728. Centred around AMG 015210. This group is located south and southwest of INPUT SV2; it comprises a N-S trend of four points, and another of three points. The former follow the edge of a low ridge, coincident with a north-south photo lineament; on the ground exposures of Stray Creek Sandstone and shaley beds occur along this line - to the east rubble and sand obscure the sandstone. No indications of any significant anomalies were found; contrast between Pts and Ptd and possibly Pts and rubble cover may have caused the anomalies. This is not conclusive however.

  The second group are all coincident with exposures in a main creek. A traverse along the creek confirmed exposures of thinly bedded sandstones and shaley siltstone horizons, background SPP2 values range from 50-80 c/s. One interesting occurrence was located on an exposed shelf of purple fine grained sandstone - this outcrop gave 140 c/s SPP2 (AMG 012211). Thin fractures with some ?bleaching occur on the anomalous outcrop. Background is 50 c/s. Dimensions of the occurrence are limited - approximately 5 x 10 metres.

3.4.3 Geochemistry and Thermoluminescence

Parts of the relinquished area, specifically that which covered the Lower-Middle Proterozoic eastern contact has been sampled for element analyses as well as for thermoluminescence study. All of these samples were of Tolmer Sandstone, collected adjacent to the unconformity where both geochemical and TL effects would be manifested. The analyses covered U and Mg, the latter of which indicates magnesium metasomatism, an important alteration feature of the ARUF deposits.

The effects of radiation are illustrated by the TL study which indicates if uraniferous fluids have circulated through the sandstone adjacent to the unconformity or if there are nearby concentrations of uranium mineralization within the favoured depositional zones.

Location of TL samples is plotted on the Synthesis Map. No major TL nor Mg anomaly was recorded on the eastern unconformity.

3.4.4 Geophysics

Several airborne geophysical surveys have covered the licence area. A widely spaced gravity survey by the B.M.R.; detailed spectrometry and magnetics by the N.T.G.S. (1983); closely spaced systematic heliborne gravity work by the Joint Venture (1986) and systematic EM INPUT in 1987 by Geoterrex Pty. Ltd. for the Joint Venture.

The two gravity surveys were integrated and reinterpreted by consulting geophysicists, TERRA GEOPHYSICS, while the N.T.G.S. data was collated and presented as stacked profiles by Geospex Associates Pty. Ltd. (Sydney) for further interpretation by T.M.A. geologist. The detailed INPUT programme provided targets for ground follow-up which was commenced on a preliminary, experimental basis in November, 1987. This was continued as an intensive 6 week programme during the 1988 dry season.

The Synthesis Map (Plate 1) shows regionally plotted data in respect of the U/Th anomalies, Gravity (Bouguer) and magnetic trends.

Details of the various surveys are set out below:

+ N.T.G.S. Data

The following data was presented to the J.V. by Geospex:

1. Flight line diagrams.

2. Stacked profiles of all flight lines covering the joint venture tenements and the area covered by the Tolmer Sandstone. These show the following parameters:

   + Total (cps)
   + U (cps)
   + U corrected (cps)
   + Thorium (ppm)
   + Potassium (%)
   + U/Th
   + U/K x 1000
   + Altimeter (m)
   + Magnetic gradient (nT/m)
   + Total magnetic (nT)

3. Stacked profiles of the Magnetic Gradient per 100,000 sheet, i.e. the Reynolds River, Daly River and Wingate Mountains sheets.

4. Stacked and shaded profiles of the U/Th.

Particular attention was paid to the radiometric data; many subtle U anomalies were outlined within the basal Tolmer Sandstone and some were verified by ground follow-up. The ground work was commenced in the latter part of 1988 with assistance from a helicopter as many of the locations were inaccessible by vehicle.

+ Summary

The aim of the anomaly check was to locate and assess various subtle anomalies supposedly associated with the basal Tolmer Sandstone. It appears that some of the areas have been incorrectly mapped as the Depot Creek Sandstone, the anomalies instead being within the Stray Creek Member and probably representing the higher radiometric background inherent in this lithology. Because the Pts outcrops are localized - probably exposed in minor fault blocks or as residuals - identification from aerial photos is impossible.

As derived from the field, the anomalous areas can be assessed broadly as follows:

- contrast anomalies; sudden variation in background between Pts and Ptd or Pts and recent cover,
- high spots within Pts (and Ptd?),
- laterite,
- radon emanations along fault/fracture zones,
- no observed cause.

In conclusion, there still remains doubt as to the origin of many of the anomalies and it is difficult to assign a definite cause for them. Where the Stray Creek Sandstone is involved, the cover thickness to any Lower Proterozoic source would be too great to have economic significance; similarly those in Depot Creek Sandstone well into the plateau zone might also have large thicknesses of sandstone to the unconformity. Nevertheless it can be considered that clusters along or within significant structurally disturbed zones represent leakages from a buried radioactive source. This is compatible with the proposed model for Tolmer.

U/Th and U anomalies are not confined to specific stratigraphic units as was initially predicted. It is obvious that there is at least some structural control exerted on the anomaly distribution, e.g. the Giants Reef Fault is anomalous in parts.

+ Gravity

This survey has outlined the outcropping Reynolds River Granite on the central east side of the E.L. and is indicating a second submerged body on the southern border of the licence. The latter is present within E.L. 4857.

Conclusions

Relating to the above gravity survey, the following general conclusions can be drawn which are relevant to the project area as a whole:

(i) There are a number of granitic intrusive bodies beneath the Tolmer Sandstone probably forming ridges and troughs. Some of these are thought to have been Archaean palaeo-topographic highs which, because they are along zones of structural weakness (deep seated faulting) were the locii of later granitic intrusion in late Lower Proterozoic or early Middle Proterozoic.

(ii) The Archaean ridges existing during the sedimentation of the Lower Proterozoic sediments have acted as near-coast islands around which back reef type facies of carbonaceous and calcareous sediments have been deposited. This is clearly seen just to the north at Rum Jungle and is interpreted to exist beneath the Tolmer Sandstone to the southwest.

(iii) The Giants Reef Fault, a very major structural element in the Pine Creek Geosyncline, has afforded extensive related faulting and structural deformation. This can be seen from the gravity, radiometry and magnetic survey results. The Giants Reef Fault appears to trifurcate west of the southern boundary of E.L. 4857. Here it runs north as the Giants Reef Fault, NE as the Stapleton Fault and ENE as the Rock Candy Range Fault. This splitting up of the main fault (feathering) occurs at or near the point where the stratigraphic trend of the Tolmer Sandstone changes from N-S to NW-SE.

\+ EM INPUT Survey

This survey was flown by Geoterrex Pty. Ltd. in July, 1987 and covered all the areas underlain by outcropping or subcropping basal Tolmer (Depot Creek). The survey was designed to cover the Tolmer Group sediments in order to locate conductive features within the Lower Proterozoic Burrell Creek Formation, specifically graphitic/carbonaceous facies which occur below the unconformity.

Many conductor anomalies were found during the survey; it was attempted to identify the source of these conductors by utilizing the geological data at hand in combination with modelling based on the EM results.

Regionally, 69 flight lines for 968 line-kilometres were flown, followed by infill lines of 80 km. The locations of all the conductors to be investigated appear on the Synthesis Plan.

Procedure - General Comments

After each flight, the tracking camera films were developed and the analog charts were sorted and annotated. As the charts are on thermal paper, which tends to fade with time, it is recommended to take a more permanent photocopy as soon as the recordings become available. After locating the charts in relation to the navigation photo strips, anomalies were selected and marked on flight-line overlays at 1:25,000 scale.

The data quality has been excellent throughout the survey; efficient work from the ground crew allowed the revision of the complete survey and the selection of infill areas one day after the end of the last flight.

During the survey, the manager of Tipperary Station was kept informed of the whereabouts and purpose of the aircraft.

Interpretation and Results

The preliminary results are based on the field evaluation of the anomalies. The plots on the 1:25,000 maps are approximate only; more accurate are the anomaly locations on the colour photographs set.

Three models were followed during the field interpretation: two indicating horizontal surface conductors (thin sheet and half-space) and one indicating a sub-vertical conductor. Only the "vertical" anomalies were plotted on colour photographs.

The symbols used on the photo set to indicate the anomalies are:

Response in channels 11 or 12: type A
Response in channels 0 or 10: type B
Response in channels 7 or 8: type C
Response in channels 1 to 6: type D
Minor anomalies.

On the overlays the ratio between channel 2 and channel 10 amplitudes and the altitude from the ground were also given.

Spatially close anomalies were grouped in "areas", generally reflecting a particular geological environment. A total of 61 areas was thus defined. Unfortunately, none of them indicates the expected occurrences of graphitic schist beneath the sandstone cover. A test flight was carried out over a known graphitic conductor in the Rum Jungle area, in order to compare the amplitude and persistency of the anomalies.

The areas fall broadly into four categories:

. Conductors in exposed Burrell Creek Formation ("basement").

. Conductors along faults.

. Conductors in Tolmer Group.

. Conductors in Cambrian Volcanics and/or the Cretaceous.

The anomalies that occur in Cretaceous are generally located near the edge of a cliff; they could indicate the presence of a thin layer of Antrim Plateau Volcanics in the pediment between Cretaceous and Proterozoic Sandstones or be a laterite response.

Some anomalies appear to line up or coincide with rivers and billabongs.

The anomalies located by the survey which fall within the relinquished blocks are listed below:

SV2	SH6
SV3	T5
SH4	T6
SH5	

Among those anomalies, some were selected for a further ground follow-up survey which included MaxMin and VLF, electromagnetic methods, alphaCard (radon), radiometric surveys, geological and structural mapping and drilling for those on which potential targets have been interpreted.

1. Anomaly SV2 (Plate 13)

Located at AMG 017522 Reynolds River Sheet, photos Run 10E 1727, 1728. The anomaly is situated on Depot Creek Sandstone, more or less in the central section of the plateau. The unconformity lies several kilometres both to the east and west; depth to Burrell Creek sediments is considered extensive.

Depot Creek Sandstone outcrops only over a limited area; extensive surficial deposits comprising soil, rubble and sand obscure much of the geology. Structural trends are vague due to the limited outcrop, however major directions are indicated as N-S and E-W; the anomaly plots at an intersection of two of these structures.

Due to the limited ground extent of the INPUT response, a 400 m N-S base line was pegged and five 1 km cross lines constructed. The only activity was a MaxMin II survey. The MaxMin response is rather weak and one cannot be certain whether the in-phase values obtained on several profiles for the 888 Hz frequency are due to general noise or to a weak response of a deep seated weakly conductive zone. A tentative, optimistic interpretation of those responses as shown in Plate 13 could indicate N-S, N20E and N10-20W "conductors". Such "conductors" could be given also by variation in the overburden.

As several radiometric anomalies occur to the west and southwest, including an SPP2 spot high of 140 c/s in Tolmer Sandstone, and as the anomaly could be located on the flank of a granite intrusion or an Archaean palaeohigh, it is worth carrying out VLF profiles and an alphaCard survey above the conductor which cannot be explained by the morphology and the lithology of the overburden.

2. Anomalies SV3, SV3a (Plates 14-16)

Located at AMG 024186 Reynolds River Sheet, photos Run 11E 2624-2625. SV3 represented a mis-plot of the anomaly; SV3a was subsequently located in the correct position. Both grids are located on Depot Creek Sandstone, centrally positioned on the plateau area. The former has abundant sandstone outcrop, principally Depot creek but with some interpreted Stray Creek on the western edge of the grid. SV3a has only minor outcrop which is concentrated on the extreme southeast corner of the grid. The remaining parts comprise Recent cover of soil, laterite and Ptd boulder rubble. The latter could be of glacial origin.

The Depot Creek Sandstone comprises a fine to medium grained quartzite; the SV3 Stray Creek facies is a more laminated quartzite with some shaley interbeds. Structures are not well defined in the region due to the masking effect of the laterite and rubble veneer. A regional NW structure traverses SV3a with several localized north to NNE trends cross-cutting this.

MaxMin was conducted over SV3 (Plate 14). Here a 500 m base line was constructed with six 1 km cross lines. The survey located an obvious anomaly on the western end of the grid which is thought to coincide with a vague but regionally extensive photolineament trending NNW. The anomaly is most obvious on the "5s" frequency showing decreasing definition with depth. On the ground the anomaly/structure may well coincide with the observed Ptd/Pts contact. As stated above, 3 is not the true INPUT position, therefore this anomaly is not considered to have significance.

SV3a was located and gridded towards the end of the field season; it was not covered by MaxMin, however a VLF survey was conducted. Four conductors can be interpreted from the profile shapes and Fraser gradient. They could possibly be displaced by a possible N120E structure (Plate 16).

Conductors "a" and "b", with a general N10E direction, could correspond to a fault (conductor "a" being of better quality than "b", could correspond to a photostructure). Conductors "c", N-S, and "d", N10E, could correspond to overburden or even a fault covered by overburden (here too, conductor "c" is better than "d"). There were no obvious indications on the ground of any faulting. Geological observations have been compiled into map form (Plate 15).

Downhole scintillometer readings within the Tolmer Sandstone appear very high, whether this is due to an inherently high background within the Tolmer or is an effect of shallow level Burrell Creek sediments is not known. Contouring shows several weak features: the contact, high zones in the NE in Burrell Creek and several anomalous areas on the Tolmer not necessarily tied to radon anomalies.

3. Anomaly SH6 (Plates 21-24)

Centred at AMG 060120 Reynolds River sheet, photos Run 12E 2543, 2544. The anomaly trends northeast covering both Depot creek Sandstone and Burrell Creek sediments. MaxMin II, VLF and Alphacard were carried out with the latter two activities being confined to the Tolmer Sandstone outcrop area only.

Structurally the area is quite complex with several major fault systems: the regional Stapleton Fault with a subsidiary structure pass along the southern side of the anomaly; complementary NW faults traverse the anomaly, one forming the contact between the Burrell Creek Formation and the Tolmer Sandstone. Various localized photostructures of N-S, E-W and NNE orientations are also evident. Geological observations were made during the VLF survey. The Tolmer Sandstone outcrop pattern is strongly controlled by the series of faults which cross-cut the area, dips are shallow westerly except where disrupted by faulting. Lithologically the sandstone is a fine grained, silicified quartzite; none of the basal facies are present. Outcrops of Burrell Creek sediments occupy approximately half the area of the anomaly; south and east of Back Creek the lithologies are primarily sandy with some interbedded meta-siltstones. To the north meta-siltstones and phyllites predominate. The Stapleton Fault truncates the outcrop eastwards - here laterite covered ?Cambrian occurs. Elsewhere much of the Burrell Creek is in unconformable contact with the Tolmer. The unconformity is not exposed. See Plate 21 for the interpretative geology of SH6.

The MaxMin survey (Plate 22) does not show any well defined conductors in the southern part of the survey where the Tolmer Formation is overlying the Burrell Creek.

The VLF survey (Plate 23) provided some conductors which are in close connection with known faults or faults inferred by geological observation and which can be explained by the existence of specific morphological patterns. It also provides, in the southeastern corner

of the grid, a N30W conductor which could indicate a fault related to the major accident present on the grid or possibly a limit between a conductive facies in the sandstone to the west and a more resistive one to the east, or a Burrell Creek conductive unit. It is important to note that the southeastern end of this conductor coincides with a definite radon anomaly open to the southeast. The INPUT survey is considered to have picked up the faults rather than lithological conductors.

Radon and downhole SPP2 show the following (see Plate 24):

+ coincident anomalies along the 1400N and 1500N lines which outline both the structural and lithological features,

+ elongate anomalies coincident with structural trends from 800N to 1250N/1200E to 1500E. The most significant is the radon/SPP2 anomaly open in the SE corner of the grid. Strong faulting is evident on ground and there is no Burrell Creek outcropping. Heavy fracturing of the sandstone has allowed the percolation of radon.

Any further work on SH6 would involve "closing off" the 800-900N/1450E anomaly and extending the VLF survey. The values present are anomalous for Tolmer but may represent only background as shown by the surveys results over the outcropping Lower Proterozoic.

Referring to Plate 24, the principal anomaly centred on 1400E/800N had an additional 20 alphaCard stations added, assuming a southwesterly trend. Included in that number, a repeat sample was taken on the maximum reading of 12 cps (1500E/1450N) as a check; the second result gave a 3 cps exhibiting the variability that can be attained by this method.

The result of the current years work shows a discrepancy in both the alphaCard and SPP2 values compared to 1988. The radon anomaly was not repeated and no extension of anomalous values was obtained. No further work at SH6 is recommended.

In view of the results obtained on the previous anomalies, no potential targets could be defined that warranted testing by drilling. It was therefore decided to relinquish these areas.

3.5 E.L. 4857 INVESTIGATIONS AND RESULTS

3.5.1 Geophysics

As with E.L. 4856, the regional airborne surveys covered this licence area in full. For an introduction to this work see page 7.

+ N.T.G.S. Data

The spectrometry and magnetics were both utilized to help in forming a local and regional interpretation of the radiometric characteristics of the various facies and the clear definition of the obscured geology.

The responses shown by the various spectrometer channels for E.L. 4857 are repeated here with much the same features apparent. There is a general lithological signature defined by the radiometrics, particularly the U/Th ratio.

No anomalies are apparent from the magnetics.

+ Gravity

No major anomaly has been interpreted in the areas which are relinquished, but one drill hole was located on the SW flank of the "Alligator Creek" granite anomaly in order to test the gravity method to have an indication of the depth of the unconformity and a lithological sequence of the basal Burrell Creek.

+ EM INPUT Survey

This survey was flown by Geoterrex Pty. Ltd. in July, 1987 and covered all tenements of the Tolmer Project. The survey was designed to cover the Tolmer Group sediments in order to locate conductive features within the Lower Proterozoic Burrell Creek Formation, specifically graphitic/carbonaceous facies which occur below the unconformity.

Many conductor anomalies were found during the survey; it was attempted to identify the source of these conductors by utilizing the geological data at hand in combination with modelling based on the EM results.

Regionally, 69 flight lines for 968 line-kilometres were flown, followed by infill lines of 80 km.

The anomalies located by the survey which fall within the relinquished blocks are listed below:

T11
T17
2881/2891

T17 being, for most of its extension, on Burrell Creek facies, no ground follow-up was carried out.

T11 and Anomaly 2881/2891 were studied in detail and surveyed by MaxMin and VLF electromagnetic methods, alphaCard (radon), radiometry, geological mapping and percussion/coring drilling.

+ **T11**

Located at AMG 030030 Daly River sheet, photos Run 1, 4928, 4929. This conductor was looked at in some detail, reaching the diamond drilling stage towards the end of the field season.

T11 is located on a wide sand and soil covered area which, based on photo studies, appears to be structurally controlled. Two major structures: the Stapleton Fault zone cuts across the northern boundary in a NW/SE direction; a regional NW lineament forms the eastern boundary of the conductor, coinciding with outcropping Depot Creek Sandstone. To the west much of the geological detail is obscured by recent cover; a possible major NW lineament occurs however, controlling the course of the Reynolds River.

The nearest outcrops of Lower Proterozoic rocks occur to the NE within 2891. Tolmer Sandstone is present as the Depot Creek Member, giving reasonable exposure. The outcrops tend to be strongly fractures with variable SW dips, principally steep, indicating the influence of faulting.

The initial INPUT anomaly comprises three principal conductors aligned in a NW direction. MaxMin generated several persistent conductive trends evident on all channels (Plate 25); partial coverage of the grid by VLF tended to illustrate a similar pattern. Based on the EM results a concentrated pattern of alphaCard stations was planned and completed prior to the final initiation of the pre-collar percussion drilling programme. Several relatively strong radon anomalies exist on the southern portion of the grid, i.e. between 1900N and 2700N (see Plate 26). They show up as two separate trends which eventually coalesce and tend to mirror the MaxMin directions. Northwards the radon anomalies lose intensity and become fragmented, however they persist in following the EM trends.

Scintillometric readings show reasonable correlation, with highest values along the eastern side of the grid. The combination of the EM/radon/SPP2 data enabled the planning of drilling targets on two profiles.

The subsurface geology of the anomaly was not known prior to deep drilling at nearby INPUT 2851 ("Radio Tower"). Here a large area of non-outcrop bordering Depot Creek Sandstone was found to be underlain by glacial sediments and some Cambrian. A similar situation was proposed for T11 and this was, in face, the case. In the meantime however some minor outcrop and rubble areas of conglomerate and laminated sandstone were found, these being assigned to the glacial sequence. The geology of T11 can best be described from the information derived from drilling and this is covered on page 25.

In conclusion, the origin of the conductor is most likely due to a red shale facies within the glacial sediment sequence. There may also be some contribution from faulting and shearing which have created the structural framework of the area. The radon and radiometric anomalies are considered also to be associated with these rocks. That being the case, no further activity will be undertaken on T11.

+ **2851 - Radio Tower**

Centred at AMG 995018 Daly River Sheet, photos 5018, 5019; the main Daly River road passes through the grid.

Like T11, 2851 reached the drilling stage with a percussion precollared diamond hole reaching 350 m. Surface activities included VLF, MaxMin II, alphaCard and scintillometer surveys. Both EM methods defined a similar conductive trend (Plates 27 and 28) which was further investigated by radon detection. Synthesis of the data enabled a target to be established and a drilling profile was chosen (Plate 26). No geological mapping was done due to outcrop absence; outside the grid Depot creek Sandstone outcrops in probable structurally controlled areas to the west and north. In addition extensive outcrops of glacial sediments occur northwards along strike

of the anomaly; facies include a poorly sorted sandstone with dropstones, conglomerates and shales. Glacial striations were seen on Tolmer Sandstone surfaces. Due to the nature of the anomalous zone and the interpreted cause the two additional holes planned for the 1988 campaign were cancelled and there is no geological reason to pursue the investigations at 2851.

IV. DRILLING

4.1 INTRODUCTION: METHODS AND STATISTICS

4.1.1 General

Table 1 summarises the 1988 drilling campaign for the relinquished areas.

All the holes in Burrell Creek were inclined 60° except one cored hole at 80°. Those drilled in the sandstone were vertical.

The drilling contractor was Rockdril Ltd. A Schramm (Rig 11) was used for all percussion holes and precollars, and a Foxmobile (Rig 4) was used for coring. Production from the Schramm was mediocre, 50 m/day average, due primarily to a badly organised crew. Depth penetration was not good (174 m) especially with water in the hole. Foxmobile production was slow (12 m/day) due primarily to the old age of the rig and hard formations. The crew of the Fox were more professional in attitude and efficient.

Access was difficult to some holes. The occasional steep grades, soft sand and heavy rigs required the use of assistance from bulldozers (twice) and a grader.

4.1.2 Gamma Logging

Most logging was performed open hole by a standby Century Geophysical logging unit, with plots produced on site. Routine gamma/gamma, SP/resistivity, ore grade, deviation and 15" combined plots were produced. A total of 1043.2 m was probed with a multifunction probe No. 9055C. Reductions at 1:200 scale of the combined logs and lithology are included in Appendix 1. Precollars TOL-P-17, 18, 19, 22-24 could only be logged to shallow depth due to caving of a clayey shale unit at the water table forming a plug.

The cored holes were planned to be surveyed by T.M.A.'s TD 400 unit. Holes TOL-PD-14 and TOL-PD-16 were successfully logged by NaI to below the unconformity, however this probe broke down before the other cored holes were completed. Polypipe was placed down the remaining holes for probing inn 1989.

4.1.3 Sampling

Core was sampled from intervals of 1, 5, 10, 15, 20 and 30 metres above and below the unconformity in holes TOL-PD-16, 18 and 19 and was analysed for U, Ni, Co, Mg, Al, and As. Thin sections were prepared from the sampled intervals.

4.1.4 Surveying

Drill collars were tied to local grids, usually 25 x 25 m or 25 x 50 m.

SPP2 readings were taken at 1 m intervals along the projection of the drill hole prior to drilling.

TABLE 1: DRILLING STATISTICS AND CHEMICAL ANALYSES

	LOCATION	TOTAL METRES	DEPTH	CHEMICAL ANALYSES									
		Perc/ Coring		U		Co		Ni		Mg		Al		As	
				Ave.	Max.	Ave.	Max.	Ave.	Max.	Ave.	Max.	Ave.	Max.	Ave.	Max.
GRAVITY ANOMALY	AMG 704855	114P 225C													
TOL-P-14	R621-5070		339												
2851															
TOL-PD-16	1400N/1100E		351	6	8	<4		<4		338	350	6400	1.4%	6	8
T11															
		497P 317.5C													
TOL-PD-17	3400N/1125E		162												
TOL-PD-18	3400N/1175E		130.6	<4		<4		<4		200		4600		2	
TOL-PD-19	3400N/1225E		136.2	4	6	<4		<4		767	950	3013	4150	7	8
TOL-P-22	2100N/1075E		90												
TOL-P-23	2100N/1125E		229.7												
TOL-P-24	2100N/1025E		66												

Analyses for holes that reached unconformity.

DDH-25 was checked for bedding orientation by use of an orientation spear.

4.2 RESULTS

Geological cross-sections at 1:200 scale were prepared for each drill hole. These summarise:

(a) lithological descriptions from cuttings and core,
(b) radiometric grade and thickness at cut-offs 300, 500 or 1000 eU ppm computed from digitized logs,
(c) SPP2 values along projection of the drill hole,
(d) water tables at time of logging.

Drill hole locations and interpreted surface geology from drill hole data has been plotted on relevant prospect maps.

15" combination electrical and gamma logs, together with detailed lithological descriptions, acid reaction and SPP2 values plotted at 1:200 scale can be found in Appendix 1.

4.2.1 2851 INPUT Anomaly (Plate 30)

+ **Summary**

This hole was percussion precollared to 150 m (50 m short of the target depth) at 1100E on the 1400N line. This was the westernmost hole of a proposed 100 m profile across a MaxMin conductor coincident with a moderate Alphacard anomaly. TOL-PD-16 was sited between the MaxMin and VLF anomaly axes (see Plates 27 and 28) in an area of no outcrop.

+ **Drilling Result**

The unconformity was cored at 319.5 m, a sharp contact was intersected. No alteration was discernible in the sandstone except for some hematitic layers and kaolinite lining some fractures. Opaque quartz grains were more common near the base of the Tolmer but these would probably be detrital, derived from the Burrell Creek Formation. The radiometric log shows no enrichment of uranium in the sandstone above the unconformity although the Burrell Creek rocks are somewhat enriched below it.

The stratigraphy of the hole is as follows:

Lower Cambrian:	Antrim Plateau Volcanics: Amygdaloidal basalt	0 - 4 m
Upper Proterozoic:	Uniya Tillite: Fluvioglacial arenites and conglomerate	4 - 38 m
Upper Proterozoic:	Uniya Tillite: Red and green ?varved shales	38 - 78 m
Middle Proterozoic:	Tolmer Group: Depot Creek Sandstone	78 - 319.5 m
Lower Proterozoic:	Burrell Creek Formation	319.5 - 351 m

The Tolmer Sandstone in this hole is generally a fine grained, pink quartzite, however to prominent pebbly bands are located at approximately 260 m; these are good consistent marker beds about 50 m above the base of the sandstone and are also widespread in outcrop. Approximately 30 m of sedimentary breccia and slumped strata were intersected above the pebbly unit.

+ **Chemical Analyses**

Chemical analyses performed on core suggests that the background for uranium may be slightly higher in this hole than regionally, however no anomalous samples occur.

A sample of Tolmer at 318 m was anomalous in aluminium for that rock type (i.e. Al - 1.4%) however Mg is only slightly high (500 ppm) therefore a clay mineral, perhaps a fracture fill, is indicated.

+ **Geological Synthesis and Conclusion**

The current thought on the geology of 2851 is a sequence of fluvioglacial sediments occupying a depression within the Depot creek Sandstone. A thin layer of Cambrian basalts overlie and have preserved the Uniya Tillite above the Depot Creek Sandstone. Ground investigation along strike at the northern end of the anomaly has confirmed the presence of outcropping fluvioglacial sediments lying directly on a striated glacial pavement. The shales, however, are absent indicating a lensing out towards the north. The sandstones consist of porous, cream and dark grey coloured quartz-lithic arenites, conglomeratic in parts. In the macro sense these sandstones are packed with pseudonodules. The glacial pavement is extensive and has significant relief and dips towards the axis of the EM anomalies.

The consolidated fluvioglacial sediments are preserved atop the glacial pavement as outliers due to their well stratified and cemented nature as opposed to the easily weathered tillite which overlies this surface at Hayward Creek. This occurrence of the glacial surface so far north has not been recognised before. Indeed other glacial deposits are now being recognised in certain areas atop the Depot Creek.

The MaxMin anomaly could therefore be explained as reflecting the contrast in conductivity between the fluvioglacial overburden (especially the shales) and the underlying resistive quartzite. The coincidence of the northern end of the anomaly with the appearance of outcrop (and lensing of the shale) seems to confirm this hypothesis. No evidence of faulting (another explanation for the EM anomaly) was found in the Tolmer outcrops east of the anomaly.

The Alphacard anomaly may represent contribution of radon from these shales.

Kewanie Oil, in their report on exploration in this area, refer to investigation of Prospect "A" on A.P. 3310M which seems to be near to 2851. They auger sampled a geobotanical anomaly and

discovered large areas with anomalous base metal values. They recognised basalt in these samples so it is suggested that the basalt was preserved in a glacial valley and itself is anomalous in lead/zinc. They abandoned a deeper hole at 25 m, due to hard formation (Tolmer Sandstone) that they drilled south of the anomalies.

4.2.2 T11 INPUT Anomaly

+ **Summary**

Six holes were drilled on two 100 m profiles where both MaxMin and Alphacard surveys outlined anomalies. All holes were drilled initially by percussion (497 m total) and three holes were extended by coring (317 m total). The results of the drilling are shown on two cross-sections, Plates 31 and 32.

All the holes intersected conductive overburden between 40-70 m, and then passed into Tolmer Sandstone. TOL-P-17, P-18 and P-19 successfully drilled through the Lower Proterozoic unconformity. No mineralisation was found, however some minor anomalies were determined from chemical analyses near the unconformity.

All the percussion precollars suffered from poor recovery and caving at and below the water table, which made interpretation of lithological units difficult from drill chips. Attempts were made by Century to log all the holes a week after drilling, however, due to caving, they were all blocked by clay plugs near the water table.

Major NNW to NW faulting is considered to have created a depression in the Tolmer in which fluvioglacial sediments have been deposited. The EM response could be a reflection of the lithology or structure or both. The Alphacard anomalies, as at 2851, could be caused by the glacial shale unit.

+ **Cross-section 3400N**

TOL-P-17, PD-18 and PD-19 were drilled from west to east 50 m apart along the 3400N profile. All three holes successfully drilled the unconformity. TOL-P-17 was percussion drilled to 162 m whilst TOL-P-18 and P-19 were precollared to 72 m and 48 m and extended by coring to 130.6 m and 136.2 m respectively.

The unconformity was penetrated at a lesser depth in TOL-P-18 (73.5 m) than in TOL-P-17 (86 m) or TOL-P-19a ((1.4 m - 94.6 m). Therefore only 0.5 m of Tolmer core was recovered in TOL-P-18.

TOL-P-19 and P-18 showed that the Tolmer Sandstone near to the unconformity is steeply dipping, hematitic (or bleached in TOL-P-18) and kaolinitic in fractures; and filled with pervasive cherty silica veins and breccia in TOL-P-19. Brecciation and shearing is very strong in TOL-P-19, especially at the unconformity, which hinders the interpretation of the contact. The underlying Burrell Creek Formation (which has a more complete record in core and chips) is altered in TOL-P-18 and P-19 and relatively fresh in P-17. In TOL-P-17 the sandstones are grey and/or hematitic, and the phyllites are grey. In TOL-P-18 and P-19 the sandstones are hematitic and clayey, while the argillites are red, slatey, fissile shales and phyllites.

These shales are sericitic and quartz veined, especially within 19 m of the unconformity.

All holes were collared in amygdaloidal basalt and tuff of Lower Cambrian age, and then drilled through a regolith into red and green shales and grey/white lithic arenites and conglomerates (presumably of the fluvioglacial Uniya Formation) and into hematitic Depot Creek Sandstone before drilling through the unconformity. Excessive caving of the overburden while drilling in the thin Tolmer Sandstone caused problems in interpretation of precollar chip samples. The water table was drilled between 25 m and 30 m within the fluvioglacial sediments.

Shearing and fracturing were very common in the Lower and Middle Proterozoic rocks.

+ **Cross-section 2100N**

TOL-P-24, P-22 and P-23 were percussion precollared from west to east, 50 m apart along the 2100N profile. TOL-P-24 and P-22 were percussion drilled only, to 66 m and 90 m respectively, while TOL-P-23 was extended by diamond drill from 60 m to 229.7 m. The Lower Proterozoic unconformity was not reached in TOL-PD-23 due to an extended section of Tolmer Sandstone through faulting and steep dip and poor drilling conditions which caused the hole to be abandoned.

Plate 32 shows that all the holes were collared in chocolate coloured siltstone then passed through a red, clayey tuff and hematitic quartz-arenite and pebbly sandstones then passed into a clean red conglomerate (up to 6 m thick) before entering the purple Depot Creek Sandstone. The siltstone is similar to that overlying basalt at the magnetic anomaly and is therefore interpreted to be Lower Cambrian. The basalt is represented by a shaley tuffaceous unit which merges imperceptibly into a basal conglomerate which may be of fluvioglacial origin as suggested in profile 3400N. As mentioned earlier, caving and poor drilling conditions in deeply weathered clay strata caused contamination of percussion samples.

The Tolmer in TOL-PD-23 was the usual fine grained pink quartzite of the Depot Creek Sandstone down to 115 m, then it became increasingly coarse grained and pebbly, red to purple, occasionally hematitic clay-rich crumbly to silicified sandstone. Fracturing and brecciation were pervasive in the hole. Bleaching, chert development and hematisation were present towards the end of the hole. TOL-PD-23 was abandoned when a large cavity was intersected. Gross lithological correlation with TOL-PD-14 suggests that the pebbly bands of the middle unit of the Depot Creek were penetrated and that a further 50 m would need to be drilled to reach the unconformity.

+ **Chemical Analyses**

TOL-PD-18 and PD-19 only were sampled. Uranium values in general were low throughout the various rock types (Tolmer max. 6 ppm in TOL-PD-19). Magnesium values were not generally anomalous except perhaps for two analyses in TOL-PD-19 at 72 m and 79.5 m where Mg was 850 ppm and 950 ppm respectively (Tolmer Sandstone). Arsenic, cobalt and nickel, however, in these samples were low. No gold or aluminium analyses were anomalous.

+ **Geological Synthesis and Conclusions**

The stratigraphic sequence at T11 is: Burrell Creek, grey to mauve or red metasandstones and schists overlain unconformably or thrust faulted (TOL-PD-19 "transition zone") against steeply dipping and fractured, hematitic Depot Creek Sandstone, which is unconformably overlain by conglomerates and shales of the Uniya Tillite and then amygdaloidal basalt and chocolate coloured siltstone of the Antrim Plateau Volcanics.

Profile 3400N shows that the Phanerozoic rocks dip towards the west quite steeply. The westerly dip is confirmed by the presence of lateritized shale and conglomerate (subcropping fluvioglacials and basaltic tuffs) and a smooth westerly dipping ($35^{o}/306^{o}$) polished surface on the Depot Creek Sandstone overlain by cobbles (resembling a glacial pavement) at approximately 1250E (25 m east of TOL-PD-19). Fluvioglacial sediments are also exposed in Alligator Creek in the northeast of T11. The shale unit appears to dip back towards the east in TOL-P-17. The Carpentarian unconformity is slightly domed under TOL-PD-18, and bedding/cleavage relationships in the Burrell Creek are very steep, suggesting that it is near to the axis of a structure. However intense faulting near TOL-PD-19 must cause some undulation in this contact. No definite chemical anomalism has been found, however hematitic alteration and some enrichment of Mg, As and Al (but not Co or Ni) has occurred near to the contact in shear zones.

On profile 2100N the units above the Tolmer are apparently deeply weathered interbedded siltstone, sandstone, conglomerate and shales and therefore definite lithological boundaries are diffuse. A subdivision according to lithology and colour has been attempted. The post-Tolmer unconformity surface appears to be trough-like (as in 3400N) with the steepest grade between TOL-P-22 and TOL-PD-23. These units dip towards the east. The easterly dip is confirmed by log character (top of hole only) and a line of prominent outcrops of laterite approximately 25 m west of TOL-P-24, which probably represent outcropping basaltic and shaley sediments. TOL-P-23 was diamond drilled first because the Tolmer Sandstone was positively identified, whereas in TOL-P-22 it was coarse grained, poorly sorted and hematitic and resembled the Burrell Creek Sandstones in TOL-P-16. The presence of bleaching, chert development, hematisation, pervasive fracturing and steep dip suggests that the area is strongly faulted.

The presence of fluvioglacial sediments against Tolmer outcrop is confirmed near profile 3400N. This glacial surface trends NE, which is parallel to the main MaxMin anomaly. The difference in geology of the overburden between the two profiles causes no problem with the first hypothesis because these profiles lie on two separate anomalous trends; therefore the thickness of conductive shale may be producing the response. The presence of relief in the Lower Proterozoic unconformity, pervasive faulting, brecciation and hematitic alteration and silicification in the Tolmer also suggests a possible structural explanation. Extensive outcrops of Depot Creek Sandstone in the east of T11 are intensely faulted and fractured. Various fault trends have produced a patchwork of faulted blocks causing rapid

variation in bedding attitudes or complete destruction of bedding and hematisation/silicification of the sandstone in places. The focus of this intense faulting has not been outlined in the reconnaissance mapping to date.

The chemical analyses are not very encouraging, however some magnesium and uranium have been concentrated in this area.

Century

CGC

TOLMER ALL C P-14

COMPANY : CENTURY GEOPHYSICAL CORP.
WELL : TOLMER ALL C P-14
LOCATION/FIELD : TOLMER
STATE : N.T.

LATITUDE :

LONGITUDE :

RUN NUMBER : ONE
DEPTH DRILLER : 7665
DEPTH LOGGER : 7665
CASING THICKNESS : .25

BIT SIZE : 6 1/8"
FLUID LOSS : NIL
MUD DENSITY : 9.5
MUD VISCOSITY : 40
RESISTIVITY MATRIX : .16 @ 68°F

SOURCE : RMF & RMC @ 68°F

LOGGING SERVICES:
ENGINEER :
UNIT :

RUN TIME :
TIME LOGGER ON BOTTOM :
TIME RECORDED FROM GL :
DATE RECORDED FROM GL :

RECORDED WITNESS
RT : 14 M
GL : N A
DF :

LOGGING UNIT :
FIELD OFFICE : MEDICINE HAT
RECORDED BY : R. PETERSEN

RECORDED FROM : ORIGINAL
DF : COPY
GL : 2
ELEV. : 6166 GL
WITNESS : WORKS

ALL PRICES ARE SUBJECT TO STANDARD TERMS AND CONDITIONS

7665'

SPP2

Orthoquartzite, red-brown, medium to coarse, silicified		25
as above, pink, fine, well rounded sorted, Fe coated grains		25
as above		25
" "		25
" "		23
" "		22
" "		23
" "		22
as above, fine to coarse.		23
" "	fine	23
" "		22
" "		23
" "	fine to medium	22
" "		23
" "		22
" "	very fine	22
" "		22
" "		23
" "	light pink	22
" "		23
" "		24
" "		24
" "		24
" "		25
" "	fine	24
" "	fine to medium	23
as above, fine to medium, pink & gray.		23
" "		24
" "		25
" "	very fine	25
" "		25
" "		22
" "	fine to medium	22
" "		22
" "		20
" "		20
" "	medium, purple.	25
" "		20
" "	very fine	20
" "		22
" "	fine	23
" "		25
" "	very fine	23
" "	fine	20
" "		20
" "		23
" "		23
" "		23
" "	very fine	23
" "		22
" "		25
" "		21
" "		23
" "		23
" "		20
" "		23
" "	fine, purple.	22
" "		20
" "		20
" "		20
" "	very fine, purple	20
" "		20
" "	pink, fine.	26
" "	very fine	20
" "		25
" "		23
" "		23
" "		25
" "		25
" "		26
" "		25
" "	medium	25
" "	very fine	22
" "	fine	25
" "	fine to medium	25
" "	very fine	23
" "	fine	25
" "		20
" "		24
" "		25
" "		17
" "		17
" "		25
" "		23
" "		25
" "		27
" "	± light gray phyllite (and much white granules)	27
" "		25
" "		27
" "	fine to medium,	24
" "	fine	26
" "		28
" "		26
" "	very fine	25
" "		25
" "		24
" "		25
" "	fine	25
" "	, haematitic	27
" "	pink	29
" "		28
" "		25
" "		27

CGC **Century**

2851-TOL-PD16

COMPANY	: TOTAL MINING PTY LTD	OTHER SERVICES:	O-GRADE, DEV, ELECTRIC
WELL	: 2851-TOL-PD16		
LOCATION/FIELD	: TOLMER		
STATE	: N. T.		
LATITUDE	: 1100	LONGITUDE	: 1400
DATE	: 08-12 88	PERMANENT DATUM	: N/A
DEPTH DRILLER	: 150	ELEV. PERM. DATUM	: N/A
LOG BOTTOM	: 149.00	LOG MEASURED FROM	: GL
LOG TOP	: 0.00	DRL MEASURED FROM	: GL
CASING DRILLER	: 2	LOGGING UNIT	: 7662
CASING TYPE	: PVC	FIELD OFFICE	: ADELAIDE
CASING THICKNESS	: 0.5	RECORDED BY	: ROGERS
BIT SIZE	: 14	BOREHOLE FLUID	: WATER
MAGNETIC DECL.	: 5.600	RM	: 0
MATRIX DENSITY	: 2.65	RM TEMPERATURE	: 0
FLUID DENSITY	: 1.12	MATRIX DELTA T	: 182
NEUTRON MATRIX	: SANDSTONE		

ELEVATIONS
KB : N/A
DF : N/A
GL : N/A

FILE : PROCESSED
TYPE : 9067C
LOG : 5
PLOT : 9055C 1
THRESH: 999999

REMARKS :
ELECTRIC LOGS POSSIBLY AFFECTED BY THICK POLYMER (DESIEL ?) MUD

Description	SPP2	HCL
Basalt, amygdular, (weathered), purple with chlorite vesicles	65	×
Sandstone, red, fine grained	60	×
" green & grey, fine grained	65	×
" grey/brown and fawn, silty	75	×
Arenite, med grained, grey/brown, well rounded & sorted	68	×
as above	50	×
as above	60	×
" "	60	×
" "	60	×
Quartz-wacke, med grained grey & brown	70	×
as above	65	×
Quartz arenite, med to csc, brown	55	×
as above	57	×
as above, red, fine grained	55	×
as above, med to cse, well rounded, moderately sorted	50	×
as above, red, fine to very fine	40	×
Conglomerate, granule to pebble, red, [illegible]	40	×
as above	45	×
Sandstone, red med grained, well sorted & rounded	45	×
Sandstone, gritty	43	×
as above	35	×
Quartzite, dark grey banded	40	×
Sandstone, white	37	×
Conglomerate, red, pebbly (of quartzite)	40	×
as above with schist pebbles	37	×
Quartzite, dark red and schist clasts	40	×
Sandstone, red as above	39	×
Sandstone and shale, red.	50	✓
No recovery	—	—
Conglomerate, granulestone of quartzite and quartz	40	×
as above, pebbles of pink quartzite, white subrounded quartz	39	×
as above	40	×
as above	39	×
as above, of quartzite, and quartz lithic med grained granule [illegible]	37	✓
Shale, red, sandy with quartz granules	60	✓
Siltstone, red, sandy with quartzite and granule chips	75	✓
Shale, gritty, with subrounded quartz	50	✓
as above	50	✓
as above with grey quartzite	70	✓
as above	65	✓
as above	65	✓
as above	50	✓
as above	65	✓
" "	65	✓
" "	60	✓
" "	65	✓
" " with arkose (hidden quartz [illegible])	60	✓
Shale, red with thin arkose.	60	✓
as above (no arkose present)	55	✓
" "	55	✓
" "	55	✓
" "	40	✓
" "	60	✓
" "	70	✓
" "	75	✓
" "	70	✓
" "	65	✓
No recovery	—	—
"	—	✓
Shale red	58	✓
as above	65	✓
" "	67	✓
" "	60	✓
" "	55	✓
Shale, as above, green	62	✓
as above	65	✓
Shale, red	67	✓
as above	60	✓
" "	63	✓
" "	63	✓
" "	45	✓
Sandstone, fine grained, white, soft	55	×
Shale, red	70	×
	68	×
	60	×
Quartzite, red, very fine grained	45	✓
" orange, fine grained	37	✓
" , red, very fine grained	37	✓
as above	32	✓
" "	37	✓
" "	40	✓
" "	37	✓
No recovery	—	✓
Quartzite, as above	35	✓
as above	33	✓
" "	40	✓
" "	45	✓
" "	40	✓
" "	35	✓
Quartzite, dark red, fine grained	37	✓
as above	35	✓
" "	32	✓
" "	32	✓
" "	35	✓
" "	32	✓
" "	32	✓
" "	35	✓
Quartzite, light pink, fine grained	27	×
as above	27	×
" "	27	×
" "	27	×
" "	27	×
" "	27	×
Quartzite, purple and very fine	32	×
" , red, very fine	40	×
as above	33	×
" " dark pink	30	×
" "	40	×
Quartzite, fine grained	32	×
as above	30	×
" "	27	×
" "	32	×
" very fine grained, pink	32	×
as above	32	×
" "	30	×
" "	30	×
" "	30	×
" "	33	×
" "	33	×
" "	30	×
" "	28	×
Quartzite, dark red, fine to medium	32	×
as above	27	×
" "	29	×
" "	30	×
" "	30	×
Quartzite, pink, fine	30	×
as above	30	×
" "	28	×
" "	30	×
" "	30	×
" "	30	×
Quartzite, red, fine grained	30	×
as above	30	×
" "	27	×
" "	27	×
" "	33	×
" "	32	×
" "	30	×
" "	32	×
" "	29	×
" "	30	×
" "	27	×
" "	32	×
" "	29	×
No sample	—	×

TOTAL Mining Australia Pty. Limited

DRILL HOLE Nº TOL P17

VERTICAL SCALE : 100

DRILL HOLE Nº

GEOLOGY REFERENCE

DEVIATION SURVEY

DEPTH	MAGN. AZIMUTH	DIP
(collar)		

CO-ORDINATES 11256 E 3900N

COLLAR RL

MAG AZIMUTH

DIP VERTICAL

DRILLED DEPTH 162.0m

HOLE DIAMETER

FROM	TO	mm
0	162	150

AIR DRILLING from 0 to 162

MUD DRILLING from ... to ...

CORING from ... to ...

from ... to ...

LITHOLOGY M VERY SOFTISH

WATER LEVELS metres

WATER TABLE (first rest strikings) ?

WHEN? LOGGED ...

HYDROSTATIC ...

STRING/CASING (other ... legend)

TYPE	FROM	TO	THICKNESS mm

FLUID IN HOLE ... density ...

CASING LEFT IN THE HOLE

TYPE	FROM	TO	THICKNESS mm

NOTE: IN CORE HOLES ALL DEPTHS ARE RADIOMETRIC LOG DEPTHS

DEPTH LOGGED ... m

DATE ...

LOGGING EQUIPMENT

	PROBE Nº	LOGGING SPEED m/min
FUNCTION 1		
FUNCTION 2		
FUNCTION 3		
FUNCTION 4		

GAMMA LOGGING

	BY 24 FT
TEST BEFORE	
TEST AFTER	
BACKGROUND	
K FACTOR	
DEAD TIME CORR	

NATURAL γ (RAE)

BY 22 : BY 1.04

BOREHOLE ELECT. REC.

S.P. 1.04

LATEROLOG (type, Rxo)

NEUTRON NEUTRON

DIGITIZED LINE

RAYDATA

STS 22

CALIPER

DEVIATION SURVEY

TOTAL RAC HOLE

CUMULATED WIDTH ... m

NUMBER OF INTERSECTIONS ...

NOTE: K DETERMINED AT THRESHOLD

OPERATOR C R Evans - Canberra

PROJECT TOLMER

PROSPECT UPPER TOL EL 4887

T.R. ... ASUP Nº ... ELA EL 4887

DRILLING CONTRACTOR ROCKDRILL

DRILL RIG SCHRAMM

START OF OPERATION 24 7 88

END OF OPERATION 26 7 88

HOLE INTERSECTIONS	FROM	TO	m

CHECKED BY P McGuire (Project Manager)

REMARKS

Attempted & logging by Century Geophysics Hole blocked at 22 m

CUTTINGS RECOVERY	CORE RECOVERY
DUST / CHIPS / MEDIUM / COARSE	%
Dr AC AU Au Ag	

PARAMETERS RECORDED SYSTEMATICALLY

R.L.

GRAPHIC LOG

COMPONENT PERCENT or SEQUENCE

LITHOLOGICAL DESCRIPTION MINERALIZATION

CHRONOSTRATIGRAPHIC UNIT

LITHOSTRATIGRAPHIC UNIT

SYMBOLIZED LOG

DEPTH

FUNCTION 1 — Main Scale: cm — Reading on left hand side — UNITS

FUNCTION 2 — Main Scale: cm — Reading on left hand side — UNITS

FUNCTION 3 — Main Scale: cps — Reading on left hand side — UNITS

FUNCTION 4 — Main Scale: cps — Reading on left hand side — UNITS

LEFT HAND LINE TO BE SHOWN ON GRAPH FOR EACH FUNCTION - SCALE OF DETAILS TO BE SHOWN NEAR INDIVIDUAL TRACES

LOG RECORDED

SAMPLE No.

ASSAYS (ppm)

0-6m Soil, Laterite and weathered basalt fragments

6-19m BASALT Weathered, reddish grey in colour Vesicular structure noted

20.0m Basalt Vesicular fragments Some
21.0m ? prehnite
to
23.0m Reddish grey basalt

23-24m Kaolinitic Clay, Quartzite & basalt pebbles
24-25m Red Shale
25-26m Pink Quartzite

26.0 - 37.0m Shale sequence Generally very soft and clayey Red and green colouration

37.0 - 39.0m Red shale with minor quartzite

39.0 - 40.0m Shale with pebbles of sandstone
40.0 - 41.0m Ps Above
41.0 - 42.0m "

42.0 - 53.0m Generally a coarse pebbly horizon with contamination from above Appears to be a sand/quartzite matrix with fragments of various lithologies Abundant clay Contaminant fragments of shale and basalt
Becoming finer grained from 50m

53.0 - 54.0m Hematitic quartzite + quartz fragments
54.0 - 55.0m Claystone and shale
55.0 - 57.0m Chertlike dark grey to reddish - hematitic, minor shale fragments

57.0 - 61.0m Various fragments with a clayey shale band

61.0 - 64.0m
Medium grained pink quartz arenite & quartzite

65.0m Red shale + quartz arenite fragments
65.0 - 67.0m Quartzite and quartz arenite, medium grained compact

67.0 - 69.0m Red Shale

70.0 - 72.0m Massive quartzite with shale fragments (contaminant)
72.0 - 74.0m Quartzite - pink to greenish colour Contaminant fragments, minor quartz
75.0m to 80m+ Pebbly at 76.0m with some shale fragments

80.0 - 87.0m Quartzite Some pebbles

87.0 - 88.0m Grey micaceous phyllite
88.0 - 89.0m Grey meta sandstone and phyllite
89.0 - 90.0m Grey meta sandstone

90.0 - 96.0m Interbedded meta - sandstone and grey to reddish phyllitic meta - siltstone

96.0 - 99.0m Grey meta - siltstone Phyllitic

99.0-100.0m Grey quartz - lithic meta - sandstone
100-102.0m Fine grained, dark grey quartz arenite - slightly hematitic matrix Minor phyllite
102-104.0m Quartz - lithic meta sandstone Medium grained Minor phyllite

104.0 - 113.0m Principally quartz arenite and quartz - lithic arenite Variable but minor hematization Grey colour poorly sorted Siliceous sections - phyllitic

113.0 - 119.0m Dark grey to reddish hematitic meta - siltstone Sericitic Silicified in part Minor meta - arenite

119.0 - 120.0m Coarse grained meta - arenite Poorly sorted, hematitic matrix

CANBRIAN - ANTRIM PLATEAU VOLCANICS - BASALT

LATE PROTEROZOIC FLUVIO GLACIAL SEQUENCE UNIT A TILLITE SANDSTONES & CONGLOMERATES

MIDDLE PROTEROZOIC DEPOT CREEK SANDSTONE - TOLMER GROUP

LOWER PROTEROZOIC MICA - SILTSTONE - META - SILTSTONE @ BURKETT CREEK FORMATION

TOTAL Mining Australia Pty. Limited

DRILL HOLE Nº TOL PD18

VERTICAL SCALE - 1:100

DRILL HOLE Nº

GEOLOGY REFERENCE

DEVIATION SURVEY

CO-ORDINATES 11186 E 24002 N

COLLAR RL 486.16m

DRILLED DEPTH 136.6m

HOLE DIAMETER

FROM	TO	mm
0	72	180
72	136.6	HQ

AIR DRILLING from 0 to 72

MUD DRILLING from to

CORING from 72 to 136.6

LITHOLOGY M. VAN STEENVEN P. MELVILLE

WATER LEVELS metres

WATER TABLE (Static non-pumping) Not Recorded

DIVERT LOSSES

HYDROSTATIC

STRING/CASING 136m HQ

TYPE	FROM	TO	THICKNESS mm

FLUID IN HOLE

CASING LEFT IN THE HOLE

TYPE	FROM	TO	THICKNESS mm

NOTE IN CORE HOLES ALL DEPTHS ARE RADIOMETRIC LOG DEPTHS

DEPTH LOGGED

DATE

LOGGING EQUIPMENT

	PROBE Nº	LOGGING SPEED m/min
FUNCTION 1		
FUNCTION 2		
FUNCTION 3		
FUNCTION 4		

GAMMA LOGGING

	ST 22	ST
TEST BEFORE		
TEST AFTER		
BACKGROUND		
K FACTOR		
HEAD TUBE CORR		

NATURAL Γ (RAT)

ST 22 - ST 10L

SINGLE ELECT RES

SP LOG

LATEROLOG 7 (7m Res)

NEUTRON - NEUTRON

DIGITIZED LOGS

RADIOMETRIC

STS 22

CALIPER

DEVIATION SURVEY

TOTAL RAC NO CORE

CUMULATIVE WIDTH (B)

NUMBER OF INTERSECTIONS

NOTE: K DETERMINED AT THREE SHOULDS

OPERATOR C. Rogers

PROJECT TOLMER

PROSPECT INPUT TILL

T.R. AMPM of ELs EL 4857

DRILLING CONTRACTOR ROCKDRILL

DRILL RIG Schramm 820

START OF OPERATION 24/7/96 (H)

END OF OPERATION 11/11/96 (P)

FROM	TO	%

CHECKED BY P Melville (Project Manager)

REMARKS

Attempted logging of precollar by Century Geophysics - blocked at 22m.

Extension of hole by diamond drilling.

Poly-pipe placed down hole for future logging

LITHOLOGICAL DESCRIPTION - MINERALIZATION

0 - 10.0m Zone of Weathering
Mainly clay and sand at first becoming more clayey with increase of lithic fragments

Interpreted as weathered basalts and some sediments

10.0 - 11.0m Weathered basalt with a green mineral - ? chlorite or a vesicle filling. Minor quartz fragments

11.0 - 14.0m Clay - Kaolinitic

14.0 - 18.0m Weathered basalt - sandy, hematitic

18.0 - 19.0m Red sandy clay

19.0 - 23.0m Weathered basalt. Decomposed feldspars observed

24.0m Red clay

24.0 - 27.0m Coarse conglomeratic facies. Sandy matrix with clasts of pink Tolmer quartzite

27.0 - 37.0m Shale, essentially soft and clayey. Red with some green bands

37.0 - 40.0m As above but with some arenaceous bands

Interpreted Unya/Tolmer contact at 40.0m

40.0 - 73.5m

Red silicified Sandstone throughout

Ex contact white bleached fine grained sandstone with haematite veinlets. Very strong contact - no evidence of fracture

73.5 - 74.0m Grey sericitized fine grained ss

74.0 - 75.0 Mauve, f.gr. tuffaceous ss. Very fractured & clay & sericite stained with basal red, purple & slaty siltstone

76 - 80.0m Finer grained, red, platey argillaceous phyllite
76.0m B. 83°, 11.0m B. 353° Oxidized clayey joint
77.2 to 77.9m

Thin sandstone beds at 77.9 - 79.0m Latter soft and broken with kaolin veinlets

80.0 - 81.0m Shear zone first 30cm → fine to med gr sandstone with clay on fracture - minor ironstone

81.0 - 83.0m Mauve, f.gr. meta-siltstone/mudstone. Very fine fractures B. 0-8°, 10°

83.0 - 87.0m Interlayed meta-sandstone and platey phyllite. Shear and fracture zones though out 5° to 10°, 20° Quartz veins at 84.3m

87.0 - 87.5m Fine grained silicified ss with quartz vein sheared with associated clay to 88m

88.0 - 89.0m Very crushed broken, clayey phyllite and sandstone

89.0 - 90.0m Minor Sandstone Sheared - very clayey. Quartz veining 89.7m

90.0 - 91.0m Very soft clay 30° to core axis. Minor phyllite at 90.8m

91.0 - 93.0m Interlayed sandstone & phyllite. Broken & fractured throughout B. 0-8°

93.0 - 94.7m Red, platey phyllite. Vertical S.

94.7 - 96.5m Mauve fine grained, fairly compact meta-ss. Fractured on planes (0-15°)

96.5 - 99.3m Thin alternating bands of meta-ss and phyllite occasionally fractured 10° at 45°

98.3 - 102.1m Fairly to fairly compact red, purple red platey phyllite throughout. Minor S.; fractures through clay seams

102.1 - 103.0m Red, fine grained sandstone, compact, few fractures

103.0 - 108.5m Mainly red platey phyllite with some beds of sericitic meta-ss. Fairly compact though. Rarely few fractures. Minor shearing with quartz veining 103.5 - 104.5 5° (core), 0-15° (intact)

108.5 - 113.0m Interbedded red, sericitic meta-siltstone minor platey phyllite and some mauve meta-ss beds.

Quartz veining 110.0 - 112.8m
Fragments of siltstone incorporated in veining

113.0 - 115.8m Intensely quartz veined, red, medium grained ss Breccia zones. Fractured throughout

115.8 - 116.0m Sheared meta-siltstone on contact

116.0 - 119.0m Fairly massive, red. Fine to medium grained ss (Compatible only a few fractures) - Some thin bands of hard phyllite
116.0 - 116.5 @ 5-15° 118.1 - 119.0m Sheared ss with quartz veining the massive quartz

119 - 200m Massive quartz vein

CAMBRIAN ANTRIM PLATEAU VOLCANICS (Basalt)

UNYA SILTSTONE Neoproterozoic sediments

TOLMER GROUP MIDDLE PROTEROZOIC DEPOT CREEK SANDSTONE - QUARTZITE

SUBBELLI CREEK FORMATION Mainly Neoproterozoic siltstone and shale phyllite

TOTAL Mining Australia Pty. Limited

DRILL HOLE Nº TOL PD19

VERTICAL SCALE 1:100

PLATE

Co-ordinates	12256 / 3960N
Inclination	VERTICAL
Drilled depth	136.2 m
Water table	20 m
Hole diameter	0 – 48: HQ5 (?); 48 – 136.2: HQ
Cored	from 48 to 136.2
Deviation survey	No Survey
Logged by	M. Van Schaik / Melville
Project	TOLMER
Prospect	Tolmer Prospect (?)
Title	EL 4857
Drilling contractor	Rocksearch (?) / Schramm (?)
Drill rig	Fox (?)
Start of operation	27.7.88 / 7.11.88
End of operation	29.7.88 / 10.11.88
Total RAC	NIL
Checked by	P. Melville (Project Manager)

Remarks: Hole blocked when logging attempted. Later reopened by diamond drill. Poly pipe placed down hole for future logging.

Lithological description / mineralization

0 – 4 m: Soil, clays and laterite gravels (?)

4 – 15 m: Clayey and strongly weathered Cambrian Basalt

15 – 19 m: ? Conglomeratic facies. [illegible] fragments [illegible] with [illegible] clayey sand. Fine grained conglomerate [illegible]

19 – 21 m: Red shale [illegible], sandy – part

21 – 36 m: Probably interbedded shales, sandstones and conglomeratic sandstone

(No sample returned [illegible])

36 – 48 m: Fine grained variably coloured Quartzite

47 – [illegible] m: Reddish [illegible] [illegible] Some [illegible] fractures @ 70°

48 – 50 m: Red to pink [illegible] Clay [illegible] in places. Some kaolin on fractures [illegible] banded [illegible] @ 60°

50 – 59 m: Variably coloured fine to medium grained sandstone, pink and white – colour [illegible], circular patterns [illegible] Created by [illegible] [illegible] oxide [illegible] Brecciated in places with replacement / infilling by clay [illegible] Intense fracturing in places [illegible] @ 60° at 52 m

59.4 m: Thin, coarser grained bands. Very broken

60 – 62 m: Fine grained [illegible] sandstone. Some coarser layers [illegible] Very fractured in places

62 – 66 m: More compact [illegible] fractured pink fine grained [illegible] coarser sand layers abundant [illegible]

66 – 68.0 m: Darker red hematized fine grained [illegible] sandstone. Strong fracturing in places. Minor [illegible]

68.0 – 70 m: Reddish fine grained [illegible] Some coarser [illegible] layers [illegible] 69 – 70 m [illegible] @ 70°

70 – 79 m: Reddish fine grained, generally compact sandstone. [illegible] Few [illegible] clay zones [illegible] 73, 79 m. Minor [illegible] at 75 m. Local [illegible] 72 – 72.[illegible], 73.4

[illegible] @ [illegible] at 76 m

79 – 83.0 m: Reddish fine grained hematised [illegible] Brecciated throughout [illegible] infilling [illegible] zones. Some small scale faulting [illegible] at 80 m

83 – 84 m: Fine grained, red, compact Ss. [illegible] @ 70°

84 – 85 m: [illegible] very fractured [illegible] clay

85 – 89 m: [illegible] banded (laminated) fine grained, brecciated [illegible] Abundant clay [illegible] replacement [illegible] small scale faulting [illegible]

89 – 90 m: Fine grained red [illegible] Few pebbles [illegible] Dark grey [illegible] laminated

90 – 91 m: Very fractured Dark grey [illegible] Minor kaolin [illegible]

91 – 92 m: Dark grey [illegible] strongly fractured [illegible] clay [illegible] [illegible] hematite clays

92 – 93 m: [illegible] soft clayey [illegible]

93 – 93.6 m: [illegible] soft clayey [illegible] [illegible] [illegible] 94 – 96 m [illegible] fine grained [illegible] quartz [illegible]

96 m: Becoming less sheared, soft and clayey. More – well fine to medium grained Ss. Some minor zones of [illegible] [illegible] throughout. Becoming gradually less [illegible] to 99 m

99 – 102 m: Medium to coarse grained [illegible] Compact only a few fractures [illegible]

102 – 108 m: Shear – fracture zone. Abundant quartz veining, clayey fracture zones [illegible] medium to coarse grained Ss.

Continuation of shear – fracture zone with abundant quartz veining [illegible]

109 – 110 m: Compact, grey medium grained Ss. Only few fractures

111 – 112 m: Red, medium gr. Ss. with bands of interbedded red [illegible] phyllite. Ss. [illegible] cleavage @ 50°

113 m: [illegible] medium gr. Ss. [illegible] few fractures

[illegible] as above but with abundant quartz veining [illegible] @ 45°

115 m: [illegible] gr. Ss. Sheared at 115.9 m with clay

116 – 119 m: Red slatey phyllite with minor [illegible] of Ss. [illegible] fractured [illegible] quartz veining [illegible]

119 – 121.0 m: Fine grained red Ss. Sheared at 121 m with quartz veining. [illegible] of [illegible]

121 – 126 m: Red, medium to coarse grained Ss. Compact at first but becoming more sheared from 124 m. [illegible] with soft [illegible] zones, hematitic clay. Minor kaolin [illegible] on shear / fracture surfaces

126 → Red fine to med gr Ss. Very sheared from 126 m – clayey, soft and [illegible]

127 → Sheared soft and clayey to 127.5 m [illegible]

[illegible] band and siltstone [illegible] Ss. [illegible]

128 → [illegible] fine to coarse gr. [illegible] fairly compact, [illegible] fractures

129 → Fine gr. red Ss. Coarse pebble band [illegible] 129.5 – 130 m

130 → Red coarse, med to [illegible] Ss. Fractures [illegible] @ 45° [illegible] with hematitic clay [illegible]

131.0 → Fine to medium gr. Ss. Sheared at 131.6 m

132.0 → [illegible] [illegible] slatey phyllite

133.0 → 134 m Red medium gr. [illegible] Minor [illegible] at 133.5 [illegible] contact [illegible] Ss.

134 → 135.6 m: Red sheared slatey phyllite. Becoming [illegible] [illegible] @ 30°

135.6 → 135.8 m: [illegible] medium gr. [illegible] Ss.

135.8 → 136.2 m: Red slatey phyllite. S. @ 30°

E O H 136.2 m

Stratigraphic unit

CAMBRIAN – Antrim Plateau Volcanics (?) [illegible] Basalt

LATE PROTEROZOIC – [illegible] shale, [illegible] conglomerate

TOLMER GROUP

[illegible] – [illegible] SANDSTONE

[illegible] FORMATION – Fine to medium grained sandstone, minor siltstone and slatey phyllite

Graphic log notes

DRILL CUTTINGS ↑

CORE ↓

Assays (ppm)

Sample No	U	Co/Ni	As	Au	V	Mg/Al (?)
46375	<4	<4/<4	8	–	<500	420/960 (?)
46374	4	<4/<4	6	–	<500	880/2750 (?)
46378	6	<4/<4	5	–	<500	600/3000 (?)
46372	<4	<4/<4	7	–	<500	400/2150 (?)
46364	6	<4/<4	2	0.01	<500	2150/7.49 (?)
46363	4	<4/<4	22	–	<500	2500/7.52 (?)
46362	<4	<4/<4	10	0.01	<500	2600/8.47 (?)
46361	8	<4/<4	34	–	<500	2100/4.52 (?)
46360	<4	<4/<4	22	–	<500	1700/4.62 (?)
46359	<4	<4/<4	9	–	<500	1850/6.48 (?)

TOTAL Mining Australia Pty. Limited

DRILL HOLE N° TOL P22

VERTICAL SCALE : 100

PLATE No 06

DRILL HOLE N°

GEOLOGY REFERENCE

DEVIATION SURVEY

DEPTH	MAG AZIMUTH	DIP
Meters	V	V
10	329	
10	101	
284	192	

CO ORDINATES 10756E 2100N

COLLAR { MAG AZIMUTH VERTICAL DIP

DRILLED DEPTH 90m

HOLE DIAMETER

FROM	TO	mm
0	90	150

AIR DRILLING from 0 to 90

MUD DRILLING from ___ to ___

CORING from ___ to ___

from ___ to ___

from ___ to ___

LITHOLOGY M Van Schaten

WATER LEVELS metres

WATER TABLE (First met / Settled) Dump at 26m

WHEN? LOGGED ___

HYDROSTATIC ___

STRING/CASING (when ___ logged)

TYPE	FROM	TO	THICKNESS m/m

FLUID IN HOLE ___ density ___

CASING LEFT IN THE HOLE

TYPE	FROM	TO	THICKNESS m/m
16	0	37	5

NOTE: IN CORE HOLES, ALL DEPTHS ARE GAMMA/METRIC LOG DEPTHS

DEPTH LOGGED 28.4 m

DATE 5.10.86

LOGGING EQUIPMENT Century 7442

	PROBE No	LOGGING SPEED m/min
FUNCTION 1		
FUNCTION 2		
FUNCTION 3		
FUNCTION 4		

GAMMA LOGGING

		m/m SS-ST
TEST BEFORE		
TEST AFTER		
BACKGROUND		
K FACTOR		
DEAD TIME CORR		

NATURAL γ (RAD)	✓
SYES-ST LOG	
SINGLE ELECT RES	✓
SP LOG	✓
LATEROLOG 7 (Pilot Res.)	
NEUTRON - NEUTRON	
SHOTHOLE LOG	
GAMMA	
RTS 22	
CALIPER	
DEVIATION SURVEY	✓

TOTAL RAC —

CUMULATED WIDTH m/m ___

NUMBER OF INTERSECTIONS ___

HOPE 'A' RETE REACHED AT THRESHOLD ___

BEST INTERSECTIONS	FROM	TO	%	

OPERATOR Century Geophysics

PROJECT TOLMER

PROSPECT Tol

T.R. AUTHORITY & No. EL 4857

DRILLING CONTRACTOR ROCKDRILL

DRILL RIG SCHRAMM

START OF OPERATION 30.7.86

END OF OPERATION 31.7.86

REMARKS

Hole stacked at 28 m

Lithological boundaries questionable due to excessive contamination & vague lithological descriptions

CHECKED BY P Michelis (Project Manager)

CUTTINGS RECOVERY: NO REC / POOR / MEDIUM / GOOD / SAMPLE

CORE RECOVERY: 20 40 60 80 100 %

PARAMETERS RECORDED SYSTEMATICALLY

R/C

COMPONENT PERCENT OF SEQUENCES

ARSEN / MINERALIZ

LITHOLOGICAL DESCRIPTION / MINERALIZATION

STRATIGRAPHIC UNIT

SYMBOLIZED LOG

DEPTH

FUNCTION 1 — Main Scale-1cm= ___ Units ___ Reading on left-hand line ___

FUNCTION 2 — Alternate/Main Scale-1cm= ___ Units ___ Reading on left-hand line ___

FUNCTION 3 — Main Scale-1cm= ___ Units ___ Reading on left-hand line ___

FUNCTION 4 — Main Scale-1cm= ___ Units ___ Reading on left-hand line ___

LEFT-HAND LINE TO BE SHOWN ON JOURNAL WITH EACH FUNCTION — SCALE OF DETAILS TO BE SHOWN NEAR INDIVIDUAL TRACES

SAMPLE READINGS LAND LOG

BAS

CHEMICAL No.

ASSAYS (ppm)

0 – 2 m : No recovery

2 – 6 m : Clay, ironstone (laterite) gravel

6 – 13 m : Chocolate coloured siltstone (? red glacial shales) Very soft.

13 – 14 m : Chocolate siltstone with minor sandstone fragments. Some coarser silty bands.

14 – 19 m : Chocolate-coloured siltstone.

19 – 20 m : silty shale with sandstone fragments

Daly River Group — siltstone and minor plateau volcanics

20 – 25 m : Clay - reddish, silty with areas of grey colouration.

(Probable volcanic component) ? contamination.

25 – 30 m : Clay

UNCONFORMITY

30 – 35 m : No recovery

35 – 36 m : Clay with quartz fragments.

36 – 37 m : No recovery

37 – 42 m : Clay with fragments of sandstone quartz and shale/siltstone.

42 – 43 m : Tuffaceous clay.

43 – 44 m : Hematitic Sandstone & clay

44 – 45 m : Pebbly sandstone & minor siltstone

45 – 46 m : Hematitic quartz-arenite

46 – 60 m : Quartzite

50 – 51 m : siltstone and clay

Redbank Sandstone (Carved) arenites and conglomerates.

51 – 59 m : Contamination throughout. Probably Quartzite / Quartz-arenite

59 – 60 m : Conglomeratic arenite

? ? Contaminated

60 – 67 m : Quartzite, Quartz-arenite; conglomeratic siltstone/shale and clay.

TOMKINSON GROUP — BASAL PROTEROZOIC

67 – 70 m : Red, coarse grained Quartzite.; pebbly

70 – 90 m : Red, hematitic quartzite throughout Contamination

Casing 79-81m.

EOH

SP Full scale 2mV

R log Full scale 2000 ohm

Rxo Full Scale 2000 ohm

TOTAL Mining Australia Pty. Limited

DRILL HOLE N° TOL PD23

VERTICAL SCALE 1:100

PLATE 78

DRILL HOLE N°

GEOGRAPHIC REFERENCE	
DEVIATION SURVEY	
10 MINUTES	11259 E 8100 N
1 DEGREE	11000 E 8000 N
DRILLED DEPTH	249.3m

HOLE DIAMETER

FROM	TO	DIAMETER
0m	24.1m	165
24.1m	249.3m	85

CASING LEFT IN THE HOLE

TYPE	FROM	TO	THICKNESS

WATER LEVELS MARSH

WATER TABLE	20m
ARTESIAN FLOW	
OVERFLOW	

STRONG FLOW(S) (over 1000 l/h)

TYPE	FROM	TO	CAPACITY
Fis.	0	3	

DEPTH LOGGED 27 m

DATE 8 / 6 / 84

LOGGING EQUIPMENT Mt Isa Mines

	FROM	TO	LOGGING UNIT
FUNCTION 1			
FUNCTION 2			
FUNCTION 3			
FUNCTION 4			

BOREHOLE LOGGING

TOTAL DEPTH	
CASING LEFT (DEPTH)	
DEPTH OF LOGGER	
DEPTH OF DRILLER	
BOTTOM HOLE TEMP.	

NATURAL γ (API)
SCALE AT 1 MM
SINGLE GLASS TUBE
AT 1 MM
LITHOLOGY (TPN Files)
DRILLING / BOREHOLE
CASING
GTD 22
DIP/DIR
DRILLING SURVEY

TOTAL GAS
CHROMATOGRAPHY WITH γ
NUMBER OF INTERVALS
DATE OF DETERMINATION
AT INTERVALS

PROJECT TOLMER
PROSPECT EIL
I.R. GRANT or REG. No. 4851

DRILLING CONTRACTOR BOYDRILL
RIG No. TOL
START OF DRILLING AT 21:15
END OF DRILLING AT 21:15

REMARKS
Hole blocked at 27m. Water 20 approx. Dry diamond drill. Further collapse at 99. Drilling rods. Stuck pulley to 180m

LITHOLOGY M. Van Schaijk / P. Wright

OPERATOR Century Drilling

DRILLER

CHECKED BY P. Mabbutt

Project Manager

LITHOLOGICAL DESCRIPTION / MINERALISATION

0 - 3m No Recovery
collar pipe placement

3 - 10m Chocolate to orange coloured clay - ? sediments basalt

10 - 23m Chocolate coloured silty cuttings ? sediment basalt as ambient

23 - 24m Red medium ground quartz schist

24 - 28m Sandy siltstone, brownish

28 - 34m No recovery.

34 - 39m Finely laminated poorly sorted sandstones with clasts of Tolmer - Sept Oak sandstone

39 - 40m Interbedded sandstone and shale

40 - 60m Pink, fine ground Arkosite

FRACTURATION AND FISSURE ZONES

60 - 74 m generally fine grained, pink colorized sandstone - Strongly fractured in places
So @ 70°
+ cross bedding
66 m broken m. 2 / fracture surfaces
67 m laminated / bandable + beds
69 m Cross bedding
72 m laminated

74 - 80m Silicified sandstone, medium to coarse grained. Pink to red, bandable. Cross bedded textures

80 - 87 m Fine grained, massive pink colorized sandstone So @ 35°-36°

87 - 88 m Light pink, medium to coarse grained colorized sandstone.
88 - 89 m Fine pink colorized to very bandable fine Cross bedded sandstone

89 - 92 m Fine grained pink to Salmon coloration
92 m Fault
92 - 93 m Medium coarse grained pink, colorized
93 - 94m Colorized, pink fine grained to
94 - 96m Bandable, very coarse grained, finely bedded pink colorized sandstone

96 - 97m Fine to medium grained sandstone, pink colorized + 20% milkey hedgehog quartz
98 - 100m Reddish bandable medium to coarse grained colorized sandstone Host grained textures

100 - 102m Generally fine to medium grained, red bandable colorized to Cross bedd So @ 0°

102 - 108 m Generally red bandable medium to coarse grained colorized to Colorized in places Coarse grained medium Pebbly

108 - 116.5m Fine grained, massive colorized to loose sediment fluidizing in places Medium coloring to white at 112m

116 - 123 m Purple, very coarse to coarse grained colorized to Clastic type colorized sandstone, cross bedding to 45° to 60° Colorized breccia zone at 117.5m Laminated bedding at 119 - 121m

123 - 126m Highly fine red coloured quartz pebble sub - Rounded bandable colorized to So @ 0°-5°
124 - 125m Red, bandable mud to coarse grained to
126 - 127m Red, bandable mud to coarse grained to Silt.
127 - 129m Fine to medium grained Silt, Red to purple clay Finely bedded
129 - 131m Purple medium to coarse grained colorized bandable clay containing fine host Medium fractures
131 - 132m As above bed with pebbly bands
132 - 133m Fine grained pink silts to very fine host bandable + beds at fine host medium + to 30°

133 - 137m Fine grained + pebbly bearing coarse pink bandable? fractured fine + bandable mud
137 - 138m Fine grained + pebbly bearing coarse pink bandable? fractured fine + bandable mud
138 - 139m Fine grained medium to pebble, silicified pink to grey Cross bedded medium to coarse grained
139 - 140.5 m Pink to reddish bandable fine grained fractured grains Pebbly bands

140 - 142 m Pink, colorized fine grained to Generally massive host rock bandable + beds Clay bodies throughout with beds + bandable clay beds silicification 141.5 - 142m
142 - 143m Fine grained pink silts to fine pebbly host Very fractured fractured beds + m

143 - 154m Pink colorized fine grained to Clastic bedded sediment fractures pebble bearing coarse grained at 148.5m So @ 0° to 5°
147 - 151m Generally grained fine to medium pink pebbly host fractured with bandable + beds + m fractures
151 - 152m Silicified fine host grained rock to host coarse grained + bandable + beds
152 - 154m Mainly fine grained silts to host coarse sediment with bandable + beds + m fractures
154 - 156m Medium to coarse grained red to fractured with soft coloured grains
157m Thin pebbly layers
157 - 158m Reddish colorized, fine to coarse grained host

158 - 172m Fine to coarse grained, to Generally Pink colour generally brought on planes Mainly pebbly bearing fractured grains with bandable + clay coloring
168 Minor mud seal beds So @ 5° to 10°
Fractures coloured grains

172 - 176m Pink fine grained colorized to loose bandable grains Reddish fractured grains

176 - 182m Fine grained, red, bandable, pebble bearing coarse grained colorized fractured grains Bandable
178 - 182m Fine grained, red, bandable, pebble bearing coarse grained colorized fractured grains Bandable

182 - 184m Pink colorized fine grained to Clastic bedded sediment fractures pebble bearing coarse grained at 183.5m So @ 0° to 5°
184 - 185m Generally grained fine to medium pink pebbly host fractured with bandable + beds + m fractures
185 - 186m Fine to med grained red coarse host Pink to reddish colorized + bandable pebbly + m beds
186 - 188m Mainly fine grained clay to host coarse coloring and pebbly bandable red clay bodies + beds
188 - 194m Medium to coarse grained red to fractured with soft coloured grains
193m Thin pebbly layers
193 - 195m Reddish colorized, fine to med gr. Host rock

195 - 196m Fine to coarse grained, to Generally Pink colour generally brought on planes Mainly pebbly bearing fractured grains with bandable + clay coloring
196 - 197m Minor mud seal beds So @ 5° to 10°
Fractures coloured grains

197 - 202m Pink fine grained colorized to loose bandable grains Reddish fractured grains

202 - 204m Fine grained, coarse to pebble Coloured pebble grains fractured grains bandable Hardness 4.5 - 5.5m

204 - 214m Fine to medium grained rocks Weathering

214 - 218m Fine to med gr. Fractured rocks 214.5m

218 - 224m Zone of core loss Generally fine grained, red, bandable pebble bearing to Colorized mud bandable + beds grains

224 - 228m Pink fine grained fissile, extensive colorized to Generally mud bandable + beds Pebble bearing coarse grains

Medium to fine host medium
So @ 25° to 30°

228 - 230m very fine grained silty bands

230 - 232.5m No returns lost mud compact

232 - 233m Pink very fine grained silts to Very finely fractured with bandable + bandable clay as colour

233 - 234m Mudstone compact

234 - 235m Fine grained, medium bands + pebble

235 - 237m Reddish mixed fine gr silts to Very broken Rock Chalky silts + bandable fractured grains broken at fracture surfaces to 0 to 5°

237 - 239m Medium grained with broken Slightly coarser grained

239 - 249.3m Becoming less fractured at 239m Very red host from 239m Very bandable Seams of soft red coloured Chalky silts Drilling abandoned due to continuous loss of circulation

E O H 249.3m

TOTAL Mining Australia Pty. Limited

DRILL HOLE N° TOL P24

VERTICAL SCALE 1:100

PLATE No.

DRILL HOLE N°

GEOLOGY REFERENCE

DEVIATION SURVEY

DEPTH	MAG AZIMUTH	DIP
Collar		

CO-ORDINATES 10256 E 2160 N

COLLAR MAG AZIMUTH —

DIP VERTICAL

DRILLED DEPTH 66m

HOLE DIAMETER

FROM	TO	Ø mm
0	4	150
4	66	105

AIR DRILLING from 0 to 66

ROD DRILLING from — to —

CORING from — to —

from — to —

from — to —

WATER LEVELS during drilling

WATER TABLE (First encountered) 16m

WATER LEVEL (Final) —

HYDROSTATIC —

STRING/CASING taken — mm

TYPE	FROM	TO	THICKNESS/mm

PLUGS IN HOLE — depth —

CASING LEFT IN THE HOLE

TYPE	FROM	TO	THICKNESS/mm
PVC	0	4	5"

NOTE: IN ZONE HOLES, ALL DEPTHS ARE MAGNETIC AND ADOPTED

DEPTH LOGGED —

DATE —

LOGGING EQUIPMENT —

	PROBE N°	LOGGING SPEED m/min
FUNCTION 1		
FUNCTION 2		
FUNCTION 3		
FUNCTION 4		

GAMMA LOGGING

	ST 30-37
TRUE RESPONSE	
TEST AFTER	
CALIBRATION	
K FACTOR	
DRILL TYPE CODE	

GENERAL REMARKS

CALIPER

DEVIATION SURVEY

TOTAL RAC

NOTE: —

AT —

PROJECT Tolmer

PROSPECT Tol

T.R. SHEET No. & ALL EL 4485

DRILLING CONTRACTOR Rockdrill

DRILL RIG Scorpion

START OF OPERATIONS 31.7.85

FINISH OF OPERATIONS 31.7.85

DEPTH	TO		

REMARKS

Hole blocked. Not logged

OPERATOR —

CHECKED BY P. Michelle (Project Manager)

CUTTINGS RECOVERY: DRY / WET — NO PICK / POOR / MEDIUM / GOOD / CAVED

PARAMETERS RECORDED SYSTEMATICALLY: PENETR. / HOLE DIAM.

A/D

COMPONENT PERCENT OF SEQUENCES

LITHOLOGICAL DESCRIPTION / MINERALIZATION

0 - 4 : No Recovery.

4 - 7 m : Soil cover, alluvium & rock fragments

7 - 13 m : Chocolate coloured clay, silky. Greenish chloritic mineral in clay. ? Weathered Basalt.

13 - 50 m ? : Continuous caving around collar pipe produced much contamination throughout hole

Abundant clay throughout with weathered basalt component

Chips of red silicified sandstone/quartzite presumably representing the Proterozoic glacial sequence. Also fragments of quartz.

50 - E.O.H. Red to mauve, fine grained silicified sandstone.

Contamination from above with much clay, quartz fragments, etc.

E.O.H. 66m

PROTEROZOIC sediments, sandstone, shales

TOLMER GROUP, DEPT CREEK SANDSTONE

BASALT

FUNCTION 1 — Main Deviation — units — Reading on left-hand line —

FUNCTION 2 — Main Deviation — Units — Reading on left-hand line —

FUNCTION 3 — Main Deviation — Reading on left-hand line —

FUNCTION 4 — Main Deviation — units — Reading on left-hand line —

ASSAYS (type)

SAMPLE No.

ANY USEFUL LOGS TO BE SHOWN ON GRAPH FOR EACH FUNCTION — SCALE OF DETAILS/TRANSPARENCY VARIATIONS, ETC.

30m

40m

70m

130° 45'

13° 30'

14° 00'

Mistake Creek

Eccles

Dozer

March Fly

E.L. 4856

E.L. 4857

SV2

SV3

SH4

T4

SH5

T6

SH6

SH7

T3

T5

T7

T8

T12

T13

T16

T1

T19

T20

T21

T22

T24

T25

T26

T27

T28

T29

T30

T31

T32

T36

T38

T37

T40

T35

T41

T39

T23

T11

SV7a

T47

T49

SV8

U/Th Anomaly

Gravity - Bouguer Anomaly

Thermoluminescence Sample Point

Anomalous

Radiometric Anomaly

Magnetic Trend

Surveyed Baseline

Magnesium Sample Location & Value

INPUT SURVEY

SV4 Vertical Conductor

SH2 Horizontal Conductor

T10 Both Vertical & Horizontal Conductors

Input Survey Conductor Location

CRETACEOUS

K Sandstone, conglomerate, siltstone

PERMIAN

P Sandstone, siltstone

CAMBRIAN-ORDOVICIAN

Daly River Group — €-O Limestone, siltstone, sandstone, conglomerate; C Limestone, siltstone, sandstone

Antrim Plateau Volcanics — Cla Basalt

LATE PROTEROZOIC

Uniya Formation — Eu Dolomite, sandstone, siltstone

MIDDLE PROTEROZOIC

Murrenja Dolerite — Dolerite

Tu Tree Granophyre — Pgi Granophyre

Auvergne Group — Pa Sandstone, siltstone, minor carbonate

Fitzmaurice Group — Pz Sandstone, siltstone, shale, conglomerate

Tolmer Group — Pt Sandstone, siltstone, dolomite

EARLY PROTEROZOIC

Undivided Granite — Pg Granite, adamellite, granodiorite, tonalite

Wangi Basics — Metagabbro, dolerite, anorthosite, ultrabasic rocks, diorite

Zamu Dolerite — Pdr Dolerite and differentiates

Welltree Metamorphics — Pw Biotite gneiss, marble, para amphibolite, calcsilicate gneiss

Fog Bay Metamorphics — Pg Biotite gneiss

Finniss River Group — Pf Shale, siltstone, sandstone, greywacke, schist and gneiss, acid extrusive rocks

South Alligator Group — Ps Carbonaceous and ferruginous shale with chert bands, carbonate, bift banded iron formation

Mount Partridge Group — Pp Sandstone, siltstone, shale, marble, quartzite, conglomerate

Namoona Group — Pn Shale, sandstone, arkose, conglomerate, dolomite

Hermit Creek Metamorphics — Ph Gneiss, metabasite, schist

ARCHAEAN

Rum Jungle Complex — Ar Granite, gneiss, schist, metasediments

Waterhouse Complex — Aw Granite, gneiss, amphibolite, metasediments

PLATE 1

WA NT QLD SA N.S.W

N

0 1 2 3 4 SCALE 8 12 km

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.

SYNTHESIS MAP

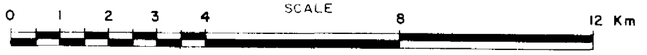
CR90/367B

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		D.H.	G.R.		

OFFICE | SCALE 1 : 100000 | SHEET OF | DRG Nº 547-046

PLATE 2

■ Location of Investigated Airborne Anomalies



TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
E.L. 4856
Location of Airborne Radiometric Anomalies CR90/367B

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		P M	G R		FEB 89

OFFICE	SCALE 1 : 100000	SHEET OF	DRG No 547-210

130°45'0"
130°50'0"
130°55'0"
13°10'0"
13°15'0"
13°20'0"
13°25'0"
13°30'0"
8540000
8530000
8520000
8510000
690000
700000
N
L 6462
L 6404
L 6611
L 6703
L 6754
L 6402
L 6412
L 6422
L 6433
L 6441
L 6451
L 6461
L 6471
L 6481
L 6491
L 6501
L 6511
L 6659
L 6681
L 6692
L 6702
L 6732
L 6742
L 6762
L 6771
Base Level = Line Average
Vertical Scale = 0.075 nT/m/cm
Plate 3
SCALE
1:50000
0 1 2 3 4 km
TOTAL MINING AUSTRALIA PTY. LTD.
CR90/367B
REYNOLDS RIVER - N.T.
Magnetic and Spectrometer Survey
Magnetic Vertical Gradient
Compiled by
Drawn by. Geospex
Date. 04-JUL-86
Drawing No. 547-050

130°30'
130°40'
130°50'
131°0'
13°0'
13°10'
13°20'
13°30'
13°40'
8560000
8550000
8540000
8530000
8520000
8510000
8500000
8490000
560000
570000
580000
590000
600000
610000
620000
630000
N

LEGEND

Instrument : WORDEN No 274

Bouguer density : 2.67 g/cc

Contour interval: 2 gu (0.2 mGal)

Gravity datum : IGSN71 (Isogal84)

Base station : N.T. Geological Survey gravity station N.8555-2037 located at Daly River opposite the Police station, with observed gravity value of 9783241.18 gu

No topographic correction applied

Plate 4

▲ Gravity station: BMR gravity data base
• Gravity station: TMA survey 1986
• Gravity station: NTGS survey 1985

SCALE

1:100000

0 1 2 3 4 5 6 7 8 9 km

CR90/367B

TOTAL MINING AUSTRALIA PTY. LTD.

TOLMER PROJECT - N.T.
1986 Gravity Helicopter Survey
RESIDUAL ANOMALY CONTOUR MAP
Filter wavelength = 10 km
Northern Area
Prepared by TERRA GEOPHYSICS

Compiled by:	Date: 01-SEP-86
Drawn by: Geospex	Drawing No.: 547 - 019

130°30' 130°40' 130°50' 131°0' 13°0' 13°10' 13°20' 13°30' 13°40'

8650000 8640000 8630000 8620000 8610000 8600000 8590000

6600000 6700000 6800000 6900000 7000000 7100000 7200000 7300000

N

LEGEND

Instrument : WORDEN No 274

Bouguer density : 2.67 g/cc

Contour interval: 10 gu (1 mGal)

Gravity datum : IGSN71 (Isogal84)

Base station : N.T. Geological Survey gravity station N.8555-2037 located at Daly River opposite the Police station, with observed gravity value of 9783241.18 gu

No topographic correction applied

▲ Gravity station: BMR gravity data base
• Gravity station: TMA survey 1986
• Gravity station: MTGS survey 1985

Plate 5

SCALE

1: 100000

0 1 2 3 4 5 6 7 8 9 km

CR 90/367B

TOTAL MINING AUSTRALIA PTY. LTD.

TOLMER PROJECT - N.T.
1986 Gravity Helicopter Survey
REGIONAL ANOMALY CONTOUR MAP
Filter wavelength = 10 km
Northern Area
Prepared by TERRA GEOPHYSICS

Compiled by:	Date: 19-AUG-86
Drawn by: Geospex	Drawing No.: 547-021

130°30' 130°40' 130°50' 131°0' 13°0'

8860000 8850000 8840000 8830000 8820000 8810000 8800000 8790000

13°10' 13°20' 13°30' 13°40'

B A D

N

OUTLINE OF TOLMER SANDSTONE

GRAVITY HIGH

J GRAVITY LOW

FAULT (MAPPED)

POSSIBLE TECTONIC FEATURE FROM HYDROGRAPHIC NETWORK INTERPRETATION

GRANITE OUTCROP

LEGEND

Instrument : WORDEN No 274

Bouguer density : 2.67 g/cc

Contour interval: 10 gu (1 mGal)

Gravity datum : IGSN71 (Isoga184)

Base station : N.T. Geological Survey gravity station N.8555-2037 located at Daly River opposite the Police station, with observed gravity value of 9783241.18 gu

No topographic correction applied

+ Gravity station: BMR gravity data base
+ Gravity station: TNA survey 1986
+ Gravity station: NTGS survey 1985

Plate 6

SCALE

1:100000

0 1 2 3 4 5 6 7 8 9 km

CR 90/367B

TOTAL MINING AUSTRALIA PTY. LTD.

TOLMER PROJECT - N.T.

1986 Gravity Helicopter Survey

BOUGUER ANOMALY INTERPRETATION

Northern Area

Compiled by:	Date: APRIL 87
Drawn by: Geospex	Drawing No.: 547 - 083

E660000 E670000 E680000 E690000 E700000 E710000 E720000 E730000

I

IIn

A

γ

C

γ

IVn

C

III

C

B

IVs

I'

B'

B'

II'

A'

A'

γ

III'

C

C'

C'

IV'

D'

E'

E'

V'w

V'e

γ

E'

OUTCROPPING GRANITE

OUTSIDE LIMIT OF TOLMER SANDSTONE

RESIDUAL GRAVITY LOW

RESIDUAL GRAVITY HIGH

PROFILE SHOWING GRAVITY RESIDUAL OUTLINE FROM THE RESIDUAL GRAVITY CONTOUR MAP

MAPPED EARLY

POSSIBLE GRANITE BELOW TOLMER SANDSTONE

PLATE 7

N.T. QLD W.A. S.A. N.S.W.

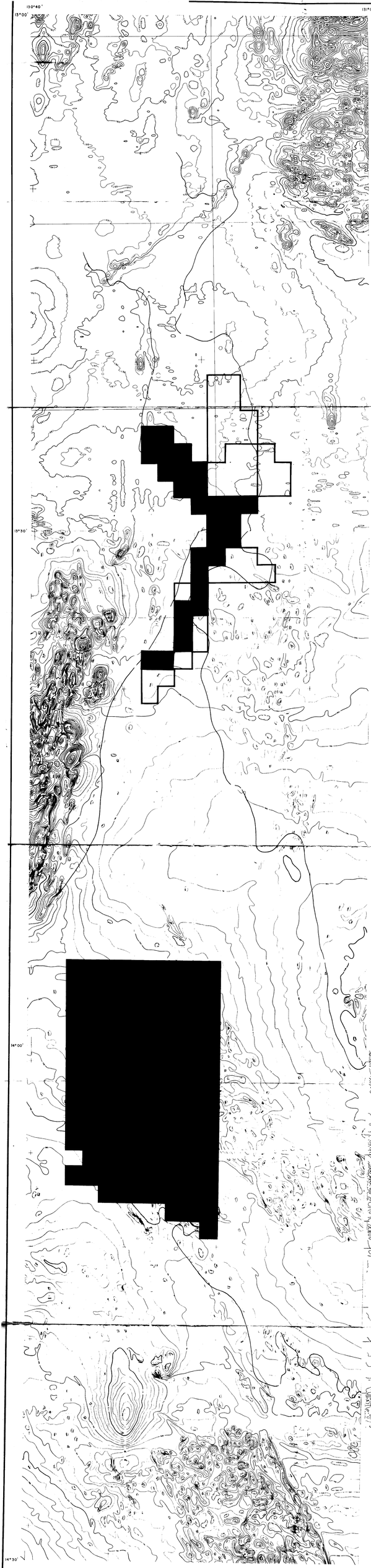
SCALE 0 1 2 3 4 0 10 KM

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T
CR 90/3678
GRAVIMETRIC INTERPRETATION
FROM RESIDUAL GRAVITY ANOMALY PROFILE

REV	DESCRIPTION	PREP	GRAVS	CHECKED	DATE
		B.B	G.R		APR. 87

OFFICE | SCALE 1 : 100 000 | SHEET OF | DRG Nº 547 - 062

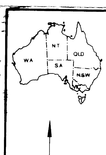


MAGNETIC CONTOUR MAP

AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT	
MAGNETOMETER	
SPECTROMETER	
DATA ACQUISITION	
FLIGHT LINE SPACING	
FLIGHT LINE DIRECTION	
SURVEY HEIGHT	
NAVIGATION	
FLIGHT PATH RECOVERY	

PLATE 9



N

SCALE 0 1 2 3 4 8 12 KM

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
CR 90 13678
TOTAL MAGNETIC INTENSITY CONTOURS

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		S.H	C.R		JAN. 91

OFFICE	SCALE	SHEET	DRG Nº
	1 : 100 000	OF	547 - 057

130°50'0"
130°55'0"
131°0'0"
13°30'0"
13°35'0"
13°40'0"
13°45'0"
13°50'0"
13°55'0"
8500000
8490000
8480000
8470000
8460000
L 10780
L 10980
L 11112
N
Base Level = Line Average
Vertical Scale = 0.075 nT/m/cm
Plate 9
SCALE
1:50000
0 1 2 3 4 km
TOTAL MINING AUSTRALIA PTY. LTD.
CR90/367B
DALY RIVER - N.T.
Magnetic and Spectrometer Survey
Magnetic Vertical Gradient
Sheet 2
Compiled by:
Date. 08-JUL-86
Drawn by. Geospex
Drawing No. 547-033

130°35'0" 130°40'0" 130°45'0"

13°30'0" 13°35'0" 13°40'0" 13°45'0" 13°50'0" 13°55'0" 14°0'0"

8500000 8490000 8480000 8470000 8460000

8670000 8680000 8690000

L 10021 L 10030 L 10040 L 10050 L 10061 L 10070 L 10080 L 10090 L 10100 L 10110 L 10120 L 10130 L 10132 L 10140 L 10150 L 10160 L 10170 L 10181 L 10190 L 10200 L 10210 L 10220 L 10230 L 10240 L 10250 L 10253 L 10260 L 10270 L 10281 L 10290 L 10300 L 10310 L 10321 L 10322 L 10330 L 10340 L 10350 L 10360 L 10370 L 10381 L 10390 L 10400 L 10410 L 10421 L 10430 L 10440 L 10451 L 10460 L 10470 L 10481 L 10490 L 10500 L 10510 L 10521 L 10530 L 10531 L 10541 L 10550 L 10560 L 10571 L 10581 L 10590 L 10600 L 10610 L 10620 L 10630 L 10631 L 10640 L 10650 L 10661 L 10670 L 10680 L 10690 L 10700 L 10710 L 10720 L 10721 L 10730 L 10740 L 10750 L 10760 L 10770 L 10771 L 10781 L 10790 L 10800 L 10810 L 10820 L 10821 L 10830 L 10840 L 10850 L 10851 L 10860 L 10870 L 10880 L 10890 L 10891 L 10900 L 10911 L 10920 L 10930 L 10940 L 10950 L 10960 L 10970 L 10990 L 10991 L 11000 L 11010 L 11021 L 11030 L 11040 L 11052 L 11062 L 11071 L 11081 L 11091 L 11101 L 11111 L 11121 L 11131

Base Level = Line Average
Vertical Scale = 0.075 nT/m/cm

Plate 10

SCALE
1:50000
0 1 2 3 4 km

TOTAL MINING AUSTRALIA PTY. LTD.

CR 90 13678

DALY RIVER - N.T.

Magnetic and Spectrometer Survey

Magnetic Vertical Gradient

Sheet 1

Compiled by:	Date: 08-JUL-86
Drawn by: Geospex	Drawing No. 547-032

692000E 694000E 696000E 698000E 700000E 702000E 704000E 706000E 708000E

13 8 0S
13 10 0S
13 12 30S
13 15 0S
13 17 30S
13 18 0S

8546000N
8544000N
8542000N
8540000N
8538000N
8536000N
8534000N
8532000N
8530000N

130 46 0E 130 47 30E 130 50 0E 130 52 30E 130 55 0E 130 57 0E

Pfb
Ptd
T-1

3431 3424 3413 3401 3391

AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM :	INPUT MARK V/12 Channel centres:280.380.480.580.680 780.930.1080.1280.1480.1780. and 2080 microseconds after transmitter turn off
RECORDING INTERVAL :	0.2 sec (approx 13 metres at 220 kph)
MAGNETOMETER :	Cesium Vapour optical absorption. Sensitivity 0.1 nT
RECORDING INTERVAL :	1.0 sec (approx 60 metres at 220 kph)
DATA RECORDING :	Geoterrex MADACS acquisition system. Digital to magnetic tape.
NOMINAL TERRAIN CLEARANCE :	Magnetometer sensor in aircraft at 120 m EM transmitter in aircraft at 120 m EM receiver in towed bird at 60 m
NOMINAL LINE SPACING :	Traverse lines 500 metres No Tie lines
FLIGHT PATH RECORD :	Geocam 35mm continuous tracking camera.
FLIGHT PATH RECOVERY :	Visually to 1:25,000 black and white enlargements of low level photography.

SELECTED INPUT CONDUCTOR MAP

Grid notation refers to Australian Map Grid Zone 52
Digitised from 1:25,000 black and white
enlargements of low level photography

Anomaly Peak Position
Anomaly Width [ ]
Terrain Clearance (metres) [120]
Channel Response [7]
Selected Conductor Outline
Zone Identification number (T-3)
Weak zones in resistive areas
- Vertical source (SV-3)
- Flat-lying source (SH-3)
Fault
Conductive areas
Areas of increased conductivity

13 08 00S
14 28 00S
130 40 30E
131 02 00E

1 2 3 4 5 6 7 8 9 10 11

Plate 11

N

0 1 2 3 Km
SCALE 1:25000

JOB NO : 2-597
Flown by GEOTERREX PTY LTD : JULY 1987
Compiled by GEOTERREX PTY LTD, Sydney, NSW.
Processed using the ECS GEONET system

CR90 1878 TOTAL MINING AUSTRAILA PTY LIMITED.

TOLMER N.T.
SELECTED INPUT CONDUCTOR MAP
SHEET 1 OF 11

DATE: 15-OCT-87 547 - 094

AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM :	INPUT MARK V/12 Channel centres:280.380.480.580.680 780.930.1080.1280.1480.1780. and 2080 microseconds after transmitter turn off
RECORDING INTERVAL :	0.2 sec (approx 13 metres at 220 kph)
MAGNETOMETER :	Caesium Vapour optical absorption. Sensitivity 0.1 nT
RECORDING INTERVAL :	1.0 sec (approx 80 metres at 220 kph)
DATA RECORDING :	Geoterrex MADACS acquisition system. Digital to magnetic tape.
NOMINAL TERRAIN CLEARANCE :	Magnetometer sensor in aircraft at 120 m EM transmitter in aircraft at 120 m EM receiver in towed bird at 60 m
NOMINAL LINE SPACING :	Traverse lines:500 metres No Tie lines
FLIGHT PATH RECORD :	Geoterrex 35mm continuous tracking camera.
FLIGHT PATH RECOVERY :	Visually to 1:25,000 black and white enlargements of low level photography.

SELECTED INPUT CONDUCTOR MAP

Grid coordinates refer to Australian Map Grid Zone 53
Digitised from 1:25,000 black and white
enlargements of low level photography

Plate 12

Anomaly Peak Position

Anomaly Width

Terrain Clearance (metres)

Channel Response

Selected Conductor Outline

Zone Identification number

Weak zones in resistive areas
- Vertical sources
- Flat-lying sources

Fault

Conductive areas

Areas of increased conductivity

Pfb

Ptd

T-9 T-12 T-13 T-14 T-15 T-16 T-17 T-18 T-19 T-20 T-21 T-22 T-23 T-W SW-1 SW-2 SW-3

13 00 000

14 00 000

130 40 00E

131 00 00E

0 1 2 3 Km

JOB NO : 2-597
Flown by GEOTERREX PTY LTD : JULY 1987
Compiled by GEOTERREX PTY LTD. Sydney, NSW.
Processed using the EGS GEOMET system

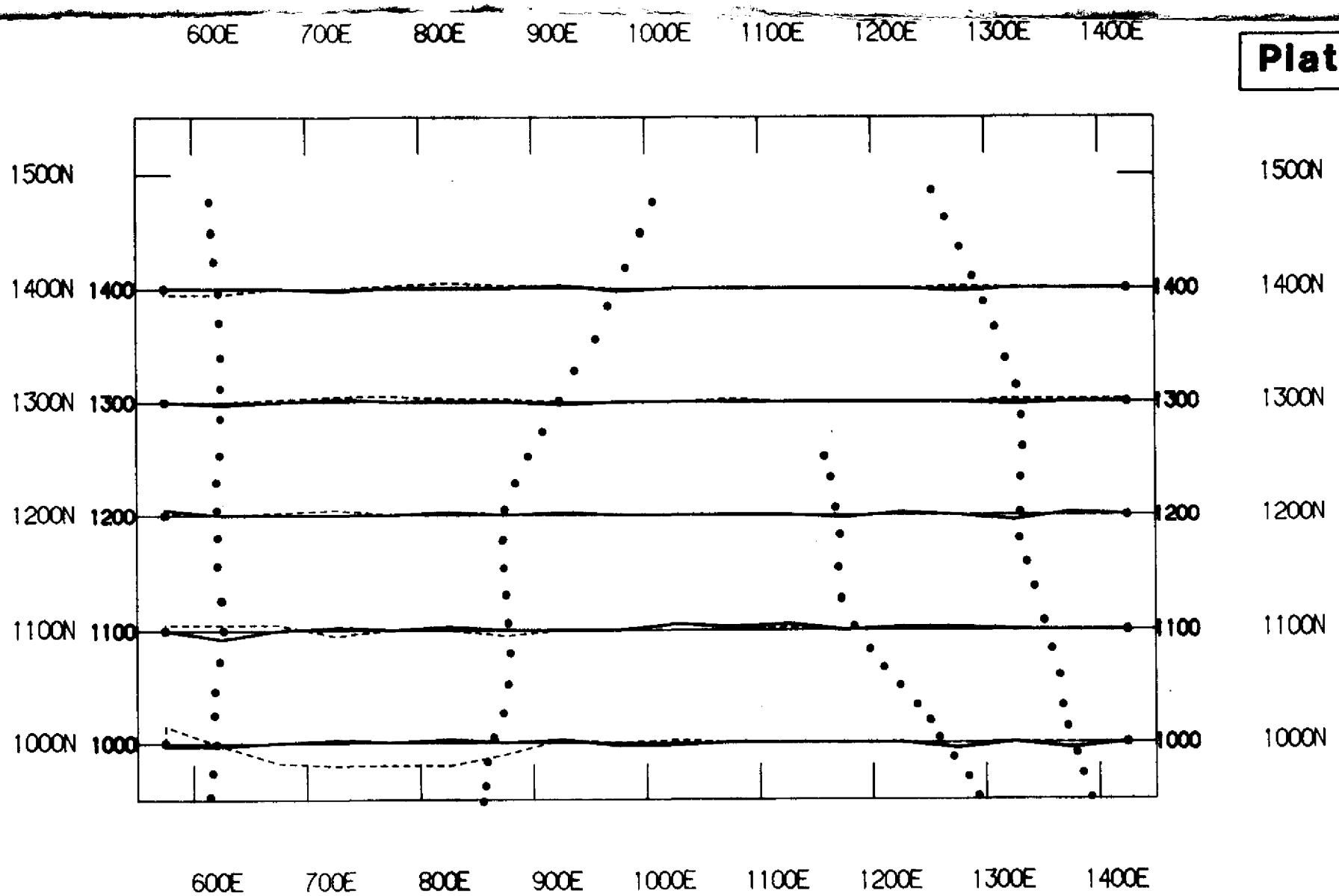
TOTAL MINING AUSTRAILA
PTY LIMITED.

TOLMER N.T.
SELECTED INPUT CONDUCTOR MAP
SHEET 3 OF 11

DATE: 15-OCT-87 547-096

CR90/367B

Plate13



• • • • • Max Min Conductor

GROUND SURVEY SPECIFICATIONS

EM SYSTEM :	Apex MAXMIN II
	3555 Hz
	1777 Hz
	888 Hz
	444 Hz
COIL SEPARATION :	150 metres
STATION SPACING :	25 and 50 metres

MAXMIN 888 HZ PROFILES

Grid notation refers to Local Grid
Vertical scale :10 percent per cm
Base value :0 percent
Out of phase :- - - - - -

JOB NO : 4-984
Surveyed by GEOTERREX PTY LTD. MAY-JUNE 1988
Compiled by GEOTERREX PTY LTD. Sydney. NSW.
Processed using the ECS GEONET system

0.0 0.1 0.2 0.3 0.4 0.5 Km

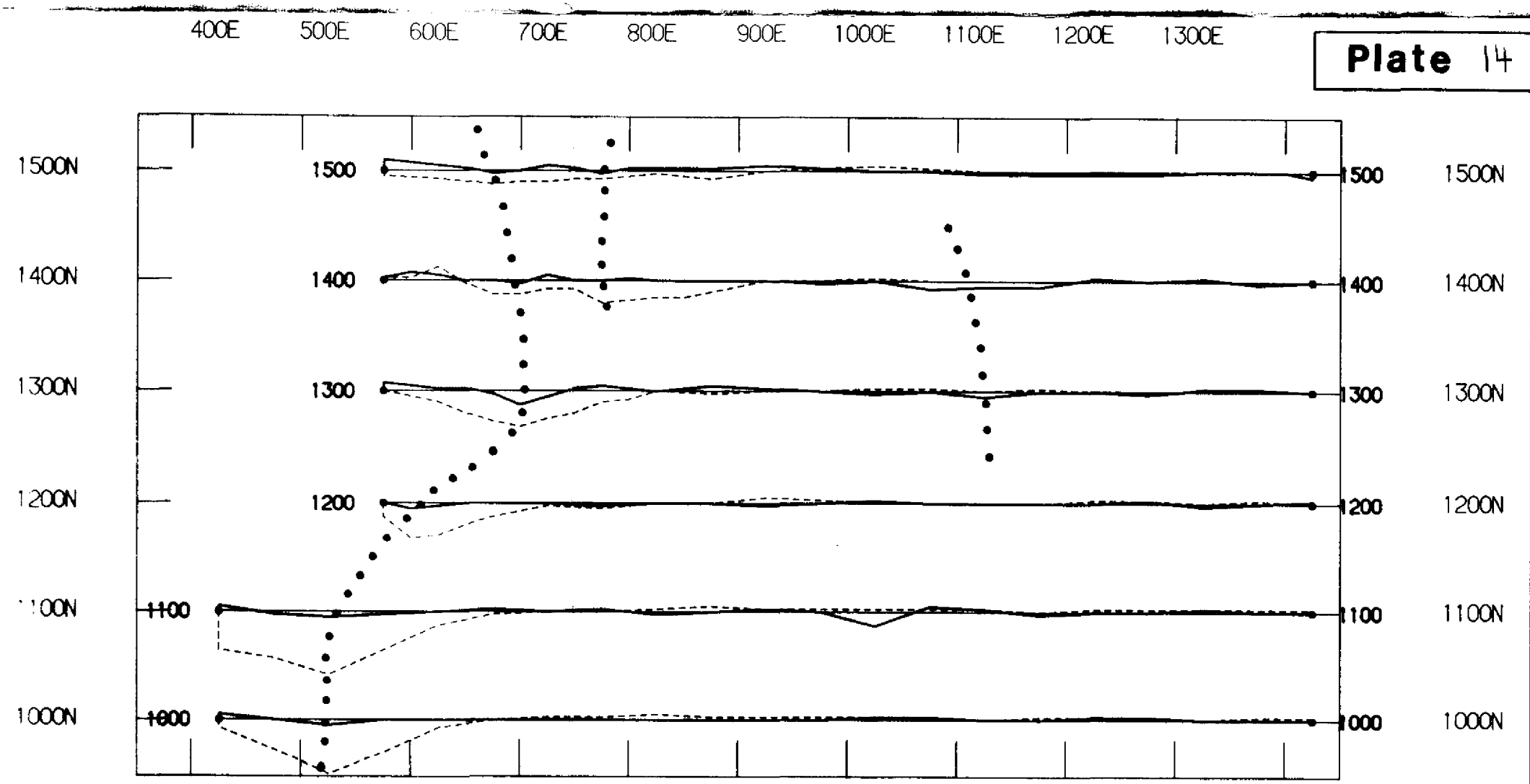
SCALE 1:5000

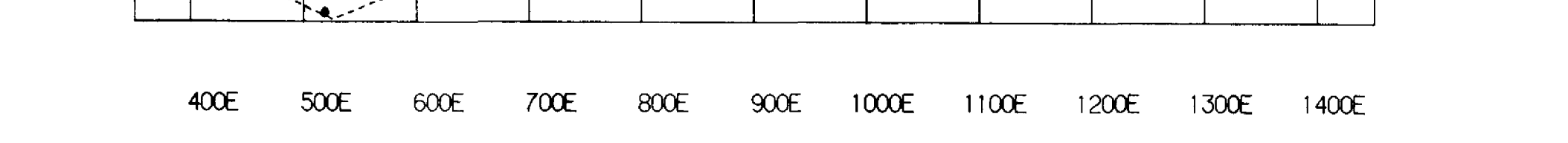
TOTAL MINING AUSTRALIA PTY LTD

CR90/367B TOLMER NT
MAXMIN 888HZ PROFILES
SV2 PROSPECT

547-213 | DATE: 14-MAR-89

Plate 14





•••••• **Max Min Conductor**

GROUND SURVEY SPECIFICATIONS

EM SYSTEM : Apex MAXMIN II
3555 Hz
1777 Hz
888 Hz
444 Hz

COIL SEPARATION : 150 metres

STATION SPACING : 25 and 50 metres

MAXMIN 888 HZ PROFILES

Grid notation refers to Local Grid
Vertical scale : 10 percent per cm
Base value : 0 percent
Out of phase : - - - - - -

JOB NO : 4-984
Surveyed by GEOTERREX PTY LTD. MAY-JUNE 1988
Compiled by GEOTERREX PTY LTD. Sydney. NSW.
Processed using the ECS GEONET system

0.0 0.1 0.2 0.3 0.4 0.5

SCALE 1:5000

TOTAL MINING AUSTRALIA PTY LTD

CR90367B TOLMER NT
MAXMIN 888HZ PROFILES
SV3 PROSPECT

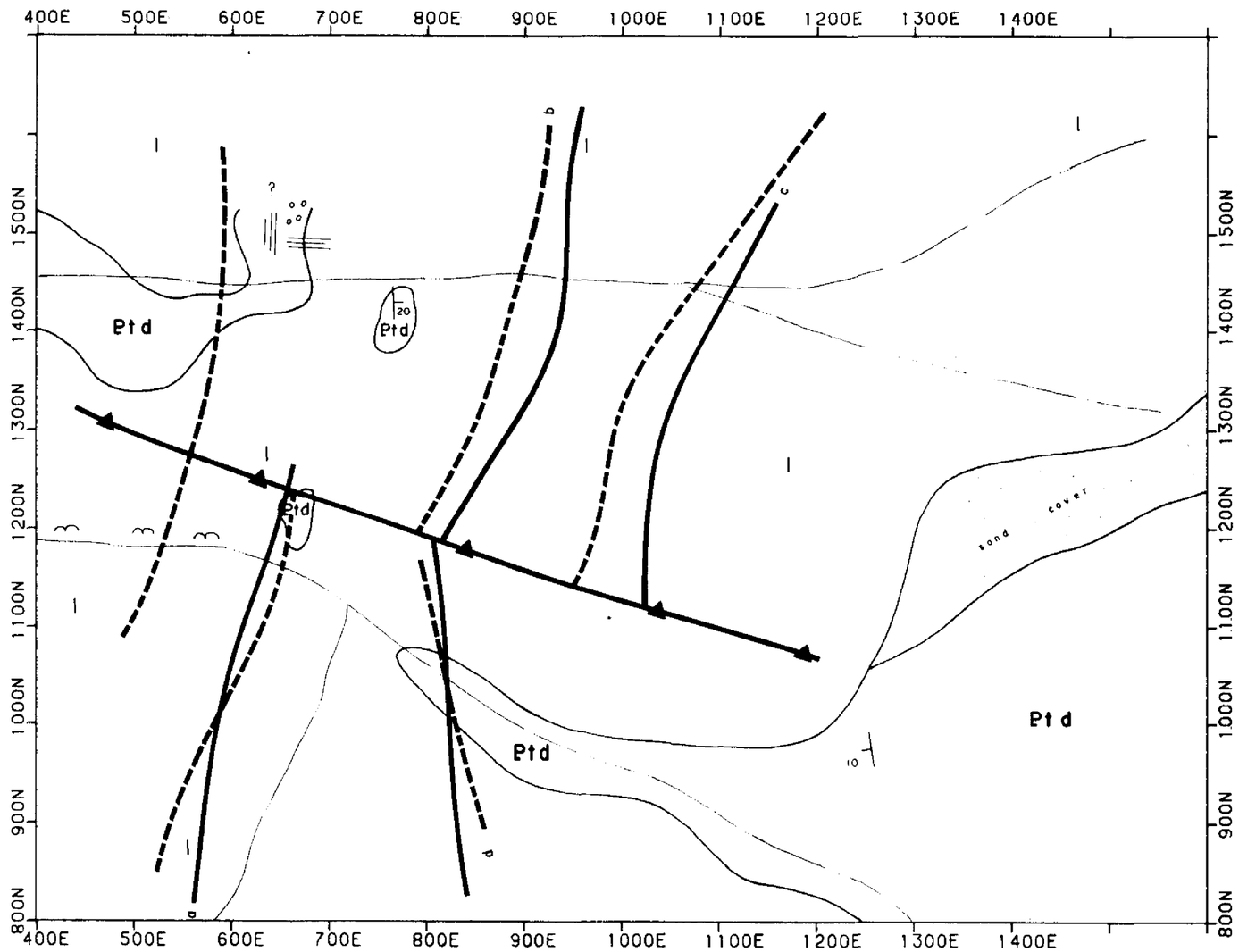
547-201

DATE: 13-FEB-89

	⊥	Strike and dip of bedding
	\\\\	Strike of fracture sets
Recent		Alluvium
Cretaceous?		Laterite
Middle Proterozoic Tolmer Sandstone	Ptd	Depot Creek Sandstone Massive, poorly bedded quartzite. Local pebble bands.

- INTERPRETATED TRANSVERSE FAULT
- INTERPRETATED GEOLOGICAL FAULT
- V.L.F. CONDUCTOR (Cross Over Interpretation)
- V.L.F. CONDUCTOR (Fraser Gradient Interpretation)
- MAX - MIN INTERPRETATED CONDUCTOR
- RADON ANOMALY

PLATE 15



MN

SCALE m

250 200 150 100 50 0 250 500

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.

INPUT ANOMALY - SV3A

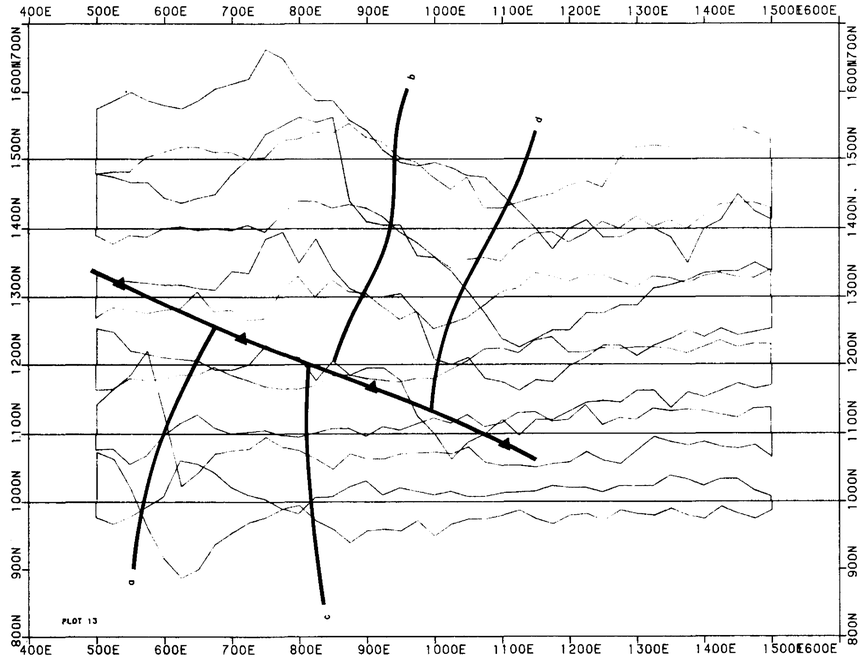
CR90/367B

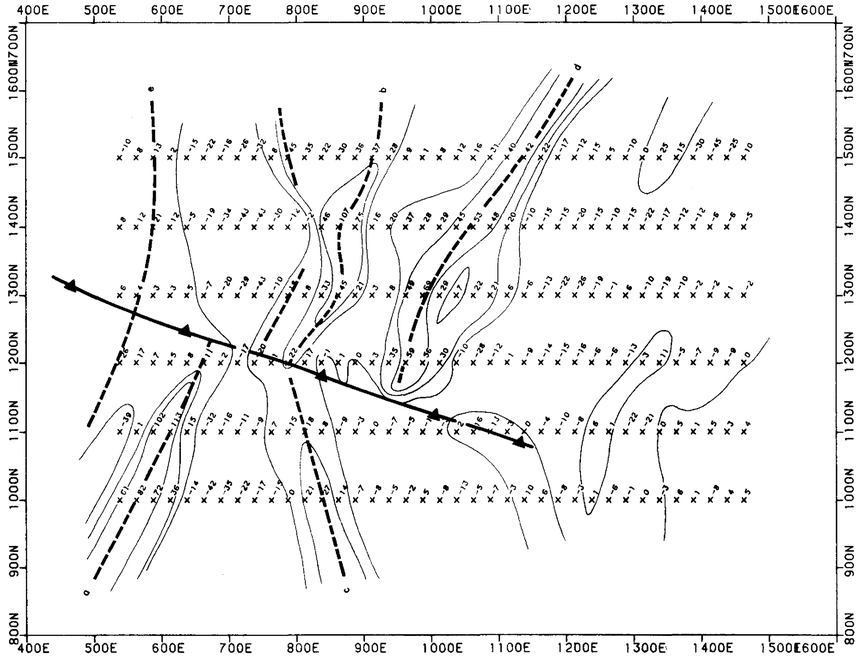
GEOLOGY

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXX	XXXXXXXXXXXXXXXXXXXXX		FOR.		12/12/88

OFFICE: SYD | SCALE 1/5000 | SHEET 1 OF 1 | DRG. No 547-168

PLATE 16





INTERPRETATED TRANSVERSE FAULT
INTERPRETATED GEOLOGICAL FAULT
V.L.F. CONDUCTOR (Cross Over Interpretation)
V.L.F. CONDUCTOR (Fraser Gradient Interpretation)
MAX - MIN INTERPRETATED CONDUCTOR
RADON ANOMALY

MN

SCALE m
250 200 150 100 50 0 250 500

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - NT.
CR90/367B
INPUT ANOMALY - SV3A
V.L.F. SURVEY
(NDT Transmitter)

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXX	XXXXXXXXXXXXXXXXXXXX		FOR.		12/12/88

OFFICE: SYD | SCALE 1/5000 | SHEET 1 OF 1 | DRG. No. 547-17.0

NOTE: Refer to text for Tolmer facies description.

Middle Proterozoic Tolmer Sandstone	Ptd	Depot Creek Sandstone.
	Q	Quartzite.
Lower Proterozoic Burrell Creek Formation	Ptb	Meta-sandstone and slatey phyllites

- INTERPRETATED TRANSVERSE FAULT
- INTERPRETATED GEOLOGICAL FAULT
- V.L.F. CONDUCTOR (Cross Over Interpretation)
- V.L.F. CONDUCTOR (Fraser Gradient Interpretation)
- MAX - MIN INTERPRETATED CONDUCTOR
- RADON ANOMALY

PLATE 17

MN

SCALE m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.

INPUT ANOMALY - SH4-5

CR 90/367B

GEOLOGY

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXX	XXXXXXXXXXXXXXXXXXXX		FOR.		18/12/90

OFFICE: SYD | SCALE 1/5000 | SHEET 1 OF 1 | DRG. No 547-170

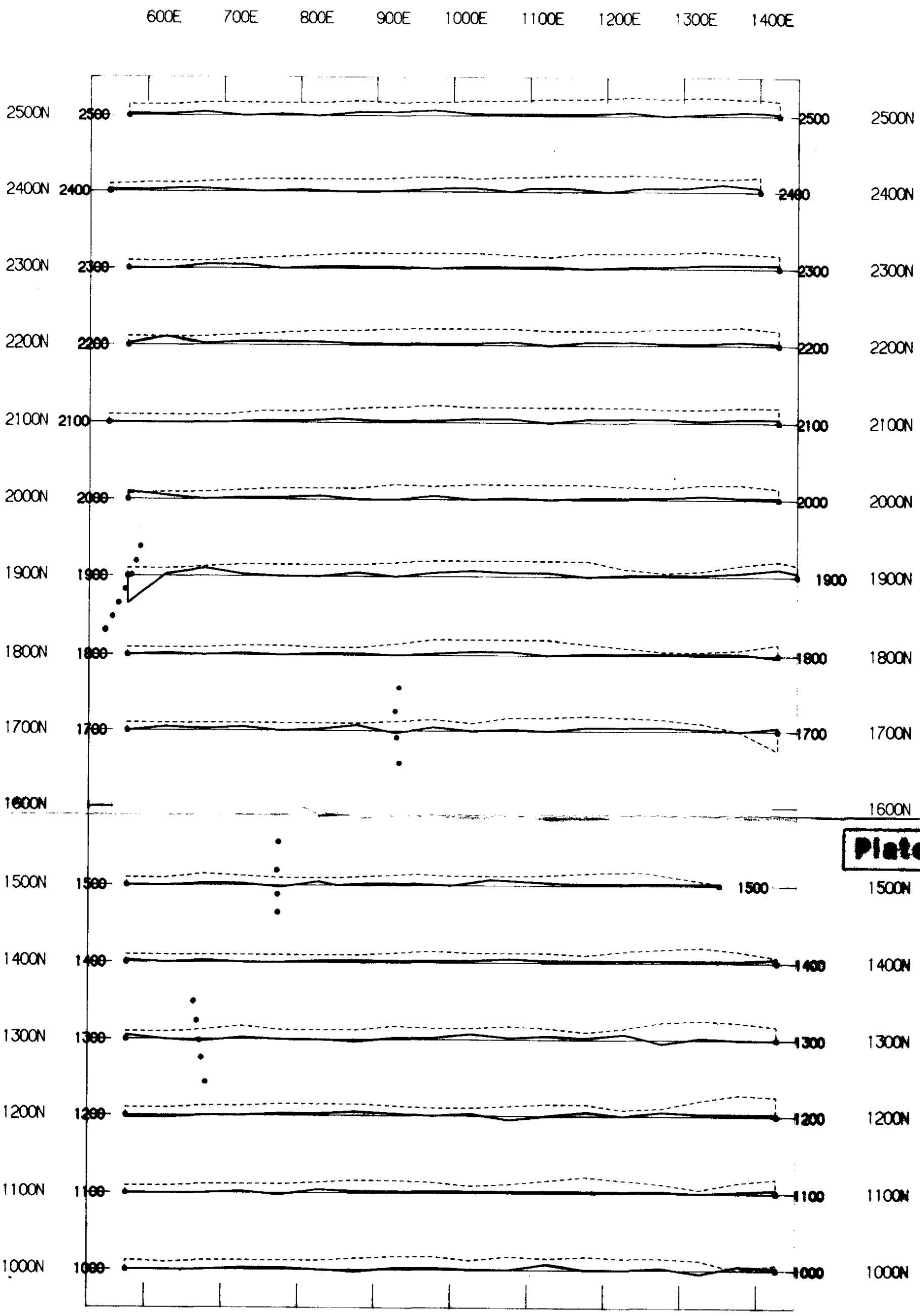


Plate 18

600E 700E 800E 900E 1000E 1100E 1200E 1300E 1400E

• • • • • Max Min Conductor

GROUND SURVEY SPECIFICATIONS

EM SYSTEM : Apex MAXMIN II
3555 Hz
1777 Hz
888 Hz
444 Hz

COIL SEPARATION : 150 metres

STATION SPACING : 25 and 50 metres

MAXMIN 888 HZ PROFILES

Grid notation refers to Local Grid
Vertical scale :10 percent per cm
Base value :0 percent
Out of phase :- - - - - -

0.0 0.1 0.2 0.3 0.4 0.5 Km

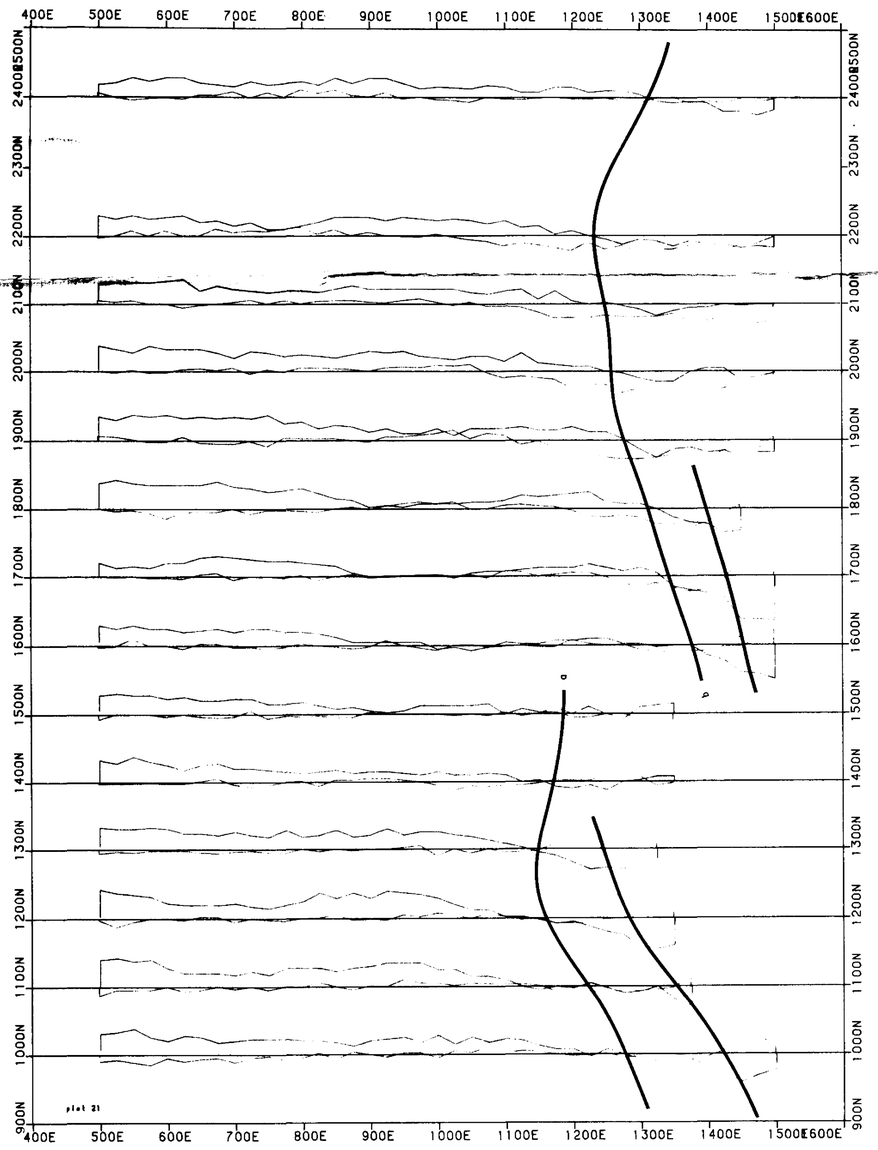
SCALE 1:5000

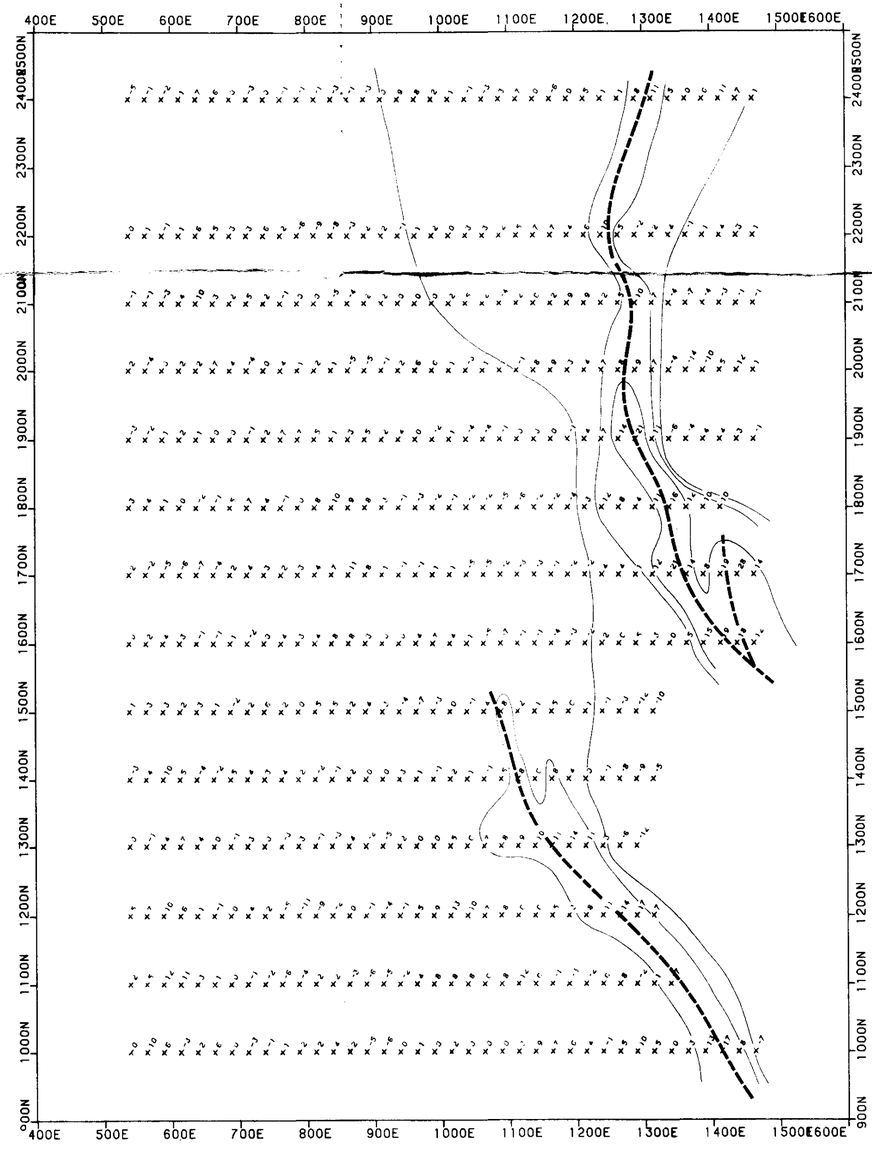
JOB NO : 4-984
Surveyed by GEOTERREX PTY LTD. MAY-JUNE 1988
Compiled by GEOTERREX PTY LTD. Sydney, NSW.
Processed using the ECS GEOMET system

TOTAL MINING AUSTRALIA PTY LTD

CR 90/3678 TOLMER NT
MAXMIN 888HZ PROFILES
SH4 PROSPECT

547-216 | DATE: 14-MAR-89





INTERPRETATED TRANSVERSE FAULT
INTERPRETATED GEOLOGICAL FAULT
V.L.F. CONDUCTOR (Cross Over Interpretation)
V.L.F. CONDUCTOR (Fraser Gradient Interpretation)
MAX - MIN INTERPRETATED CONDUCTOR
RADON ANOMALY

PLATE 19

MN

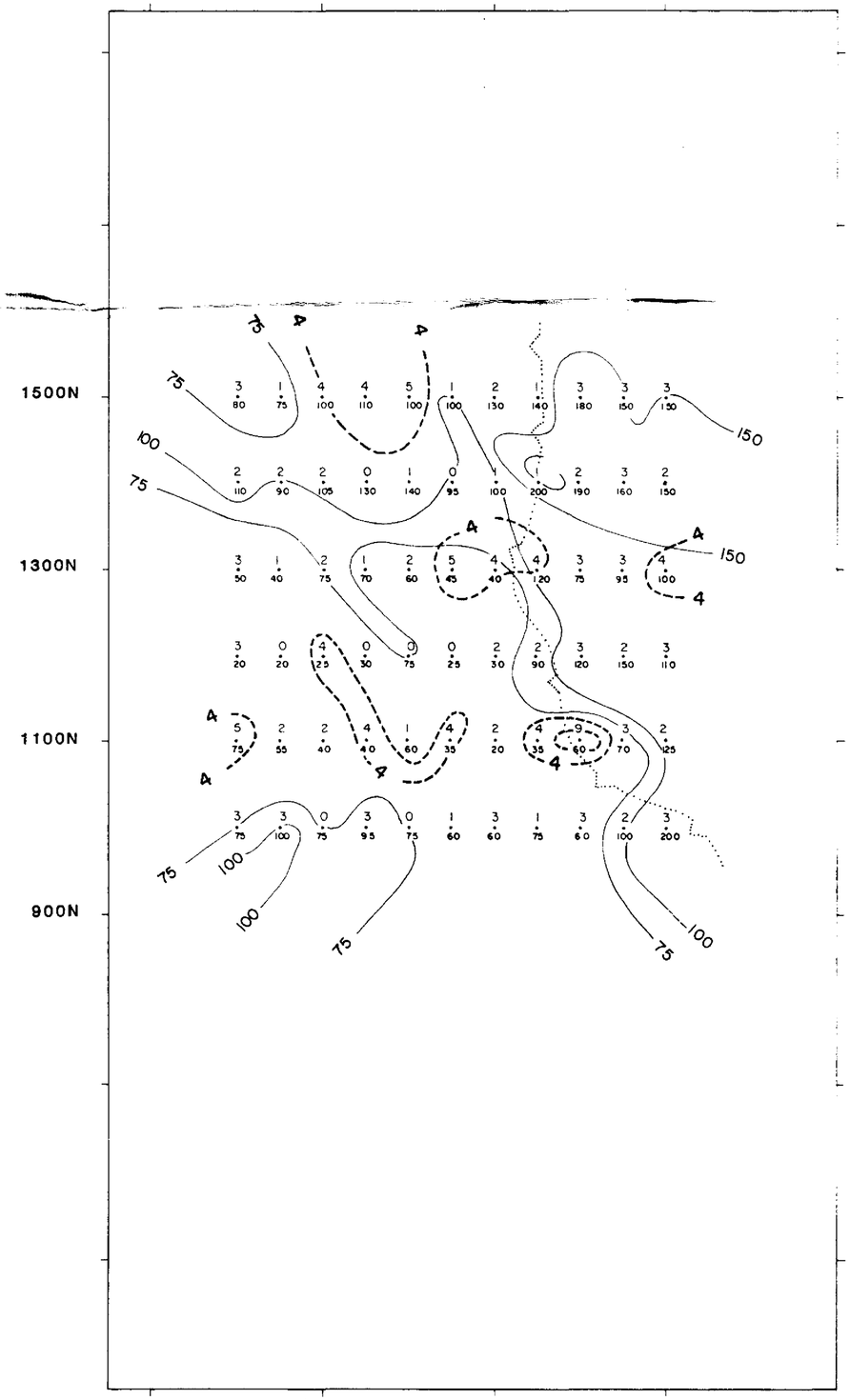
SCALE m
250 200 150 100 50 0 250 500

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
CR90/367B
INPUT ANOMALY - SH4-5
V.L.F. SURVEY
(NDT Transmitter)

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXX	XXXXXXXXXXXXXXXXXXXX		FOR.		12/12/88

OFFICE: SYD | SCALE 1/5000 | SHEET 1 OF 1 | DRG. No 547-181



ALPHA CARD CONTOUR(c.p.m.)

4

25

DOWN HOLE CONTOUR(c.p.s.)

UNCONFORMITY

PLATE 20

0 50 100 150 200 SCALE 400 600m

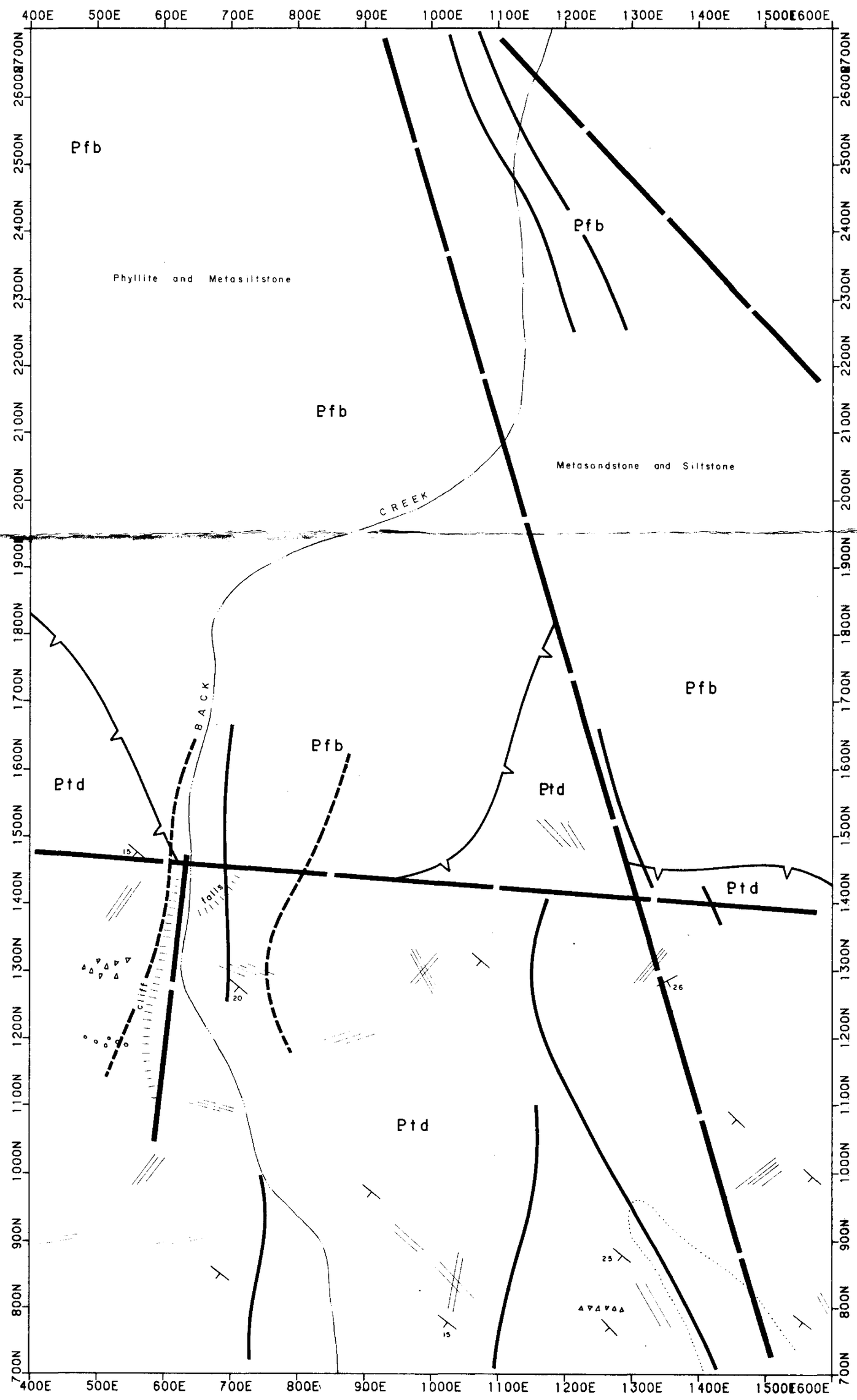
TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
INPUT ANOMALY - SH4-SH5
ALPHA CARD & DOWN HOLE SPP2
CONTOURS

CR 90/367B

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		P. M.	G. R.		OCT 88

OFFICE	SCALE 1 : 5000	SHEET OF	DRG Nº 547-158



INTERPRETATED TRANSVERSE FAULT

INTERPRETATED GEOLOGICAL FAULT

V.L.F. CONDUCTOR (Cross Over Interpretation)

V.L.F. CONDUCTOR (Fraser Gradient Interpretation)

MAX - MIN INTERPRETATED CONDUCTOR

RADON ANOMALY

Strike and dip direction of bedding

Strike of fracture sets

Brecciation

Middle Proterozoic Tolmer Sandstone	Ptd	Depot Creek Sandstone White-reddish bedded quartzite. Some pebble lenses.
Lower Proterozoic Burrell Creek Formation	Pfb	Interbedded meta-sandstone, siltstone and slatey phyllites

PLATE 21

MN

SCALE m

250 200 150 100 50 0 250 500

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.

INPUT ANOMALY - SH6

GEOLOGY

CR90/367B

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXX	XXXXXXXXXXXXXXXXXXX		FOR.		12/12/88

OFFICE: SYD | SCALE 1/5000 | SHEET 1 OF 1 | DRG. No 547-166

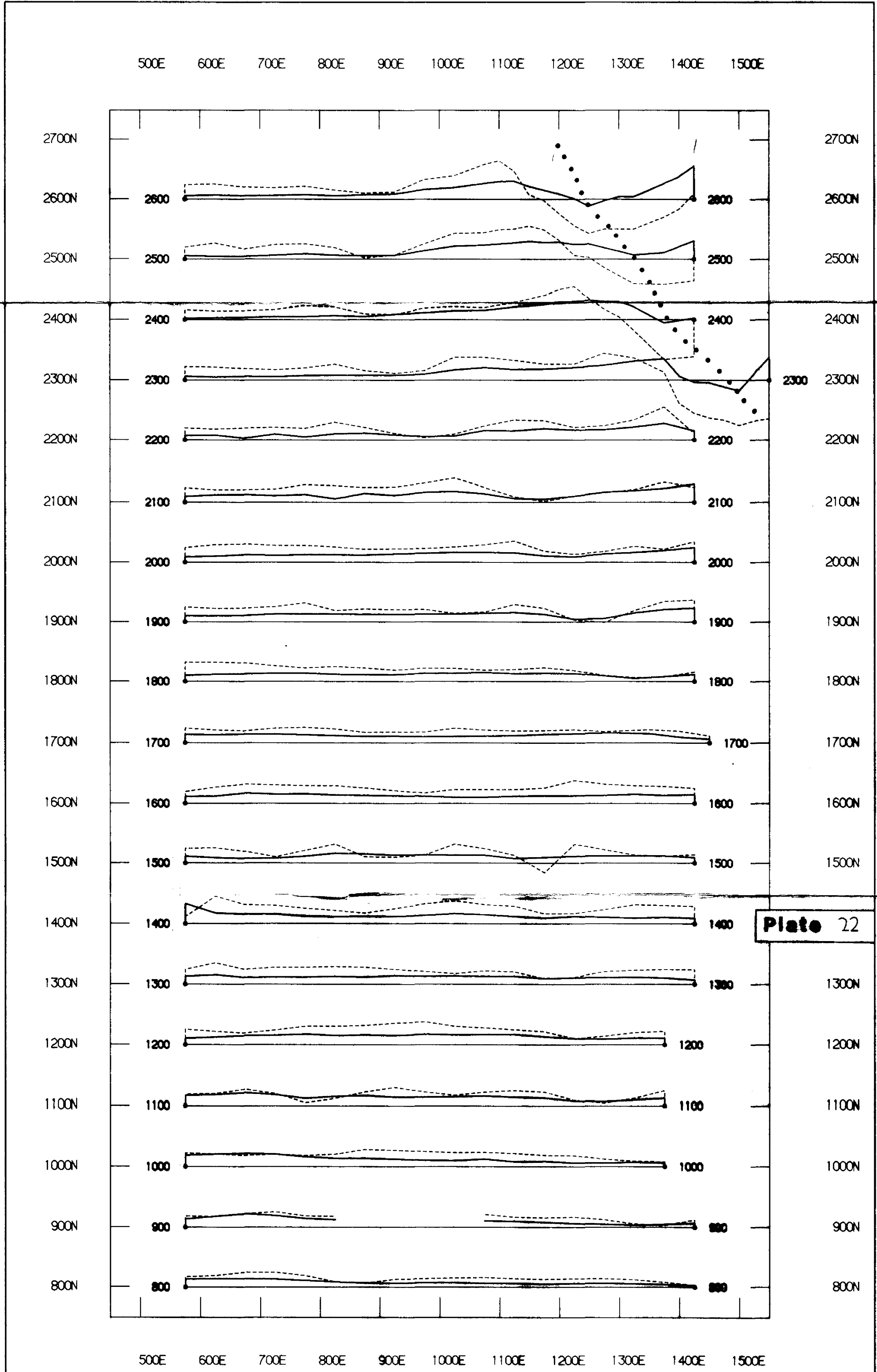


Plate 22

•••••• **Max Min Conductor**

GROUND SURVEY SPECIFICATIONS

EM SYSTEM : Apex MAXMIN II
3555 Hz
1777 Hz
888 Hz
444 Hz

COIL SEPARATION : 150 metres

STATION SPACING : 25 and 50 metres

MAXMIN 3555 HZ PROFILES

Grid notation refers to Local Grid
Vertical scale :40 percent per cm
Base value :0 percent
Out of phase :- - - - - -

JOB NO : 4-984
Surveyed by GEOTERREX PTY LTD. MAY-JUNE 1988
Compiled by GEOTERREX PTY LTD. Sydney. NSW.
Processed using the ECS GEONET system

0.0 0.1 0.2 0.3 0.4 0.5 Km

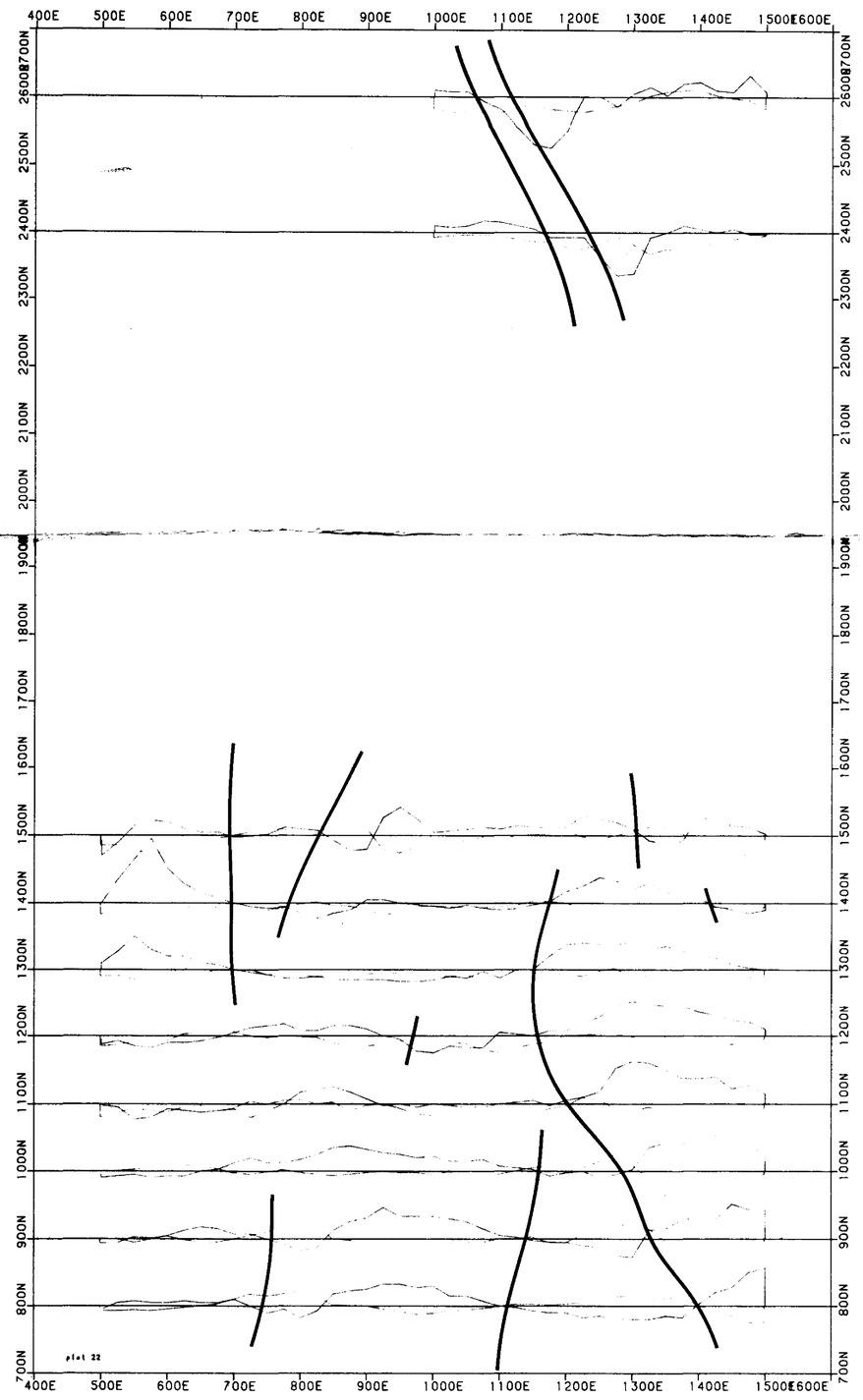
SCALE 1:5000

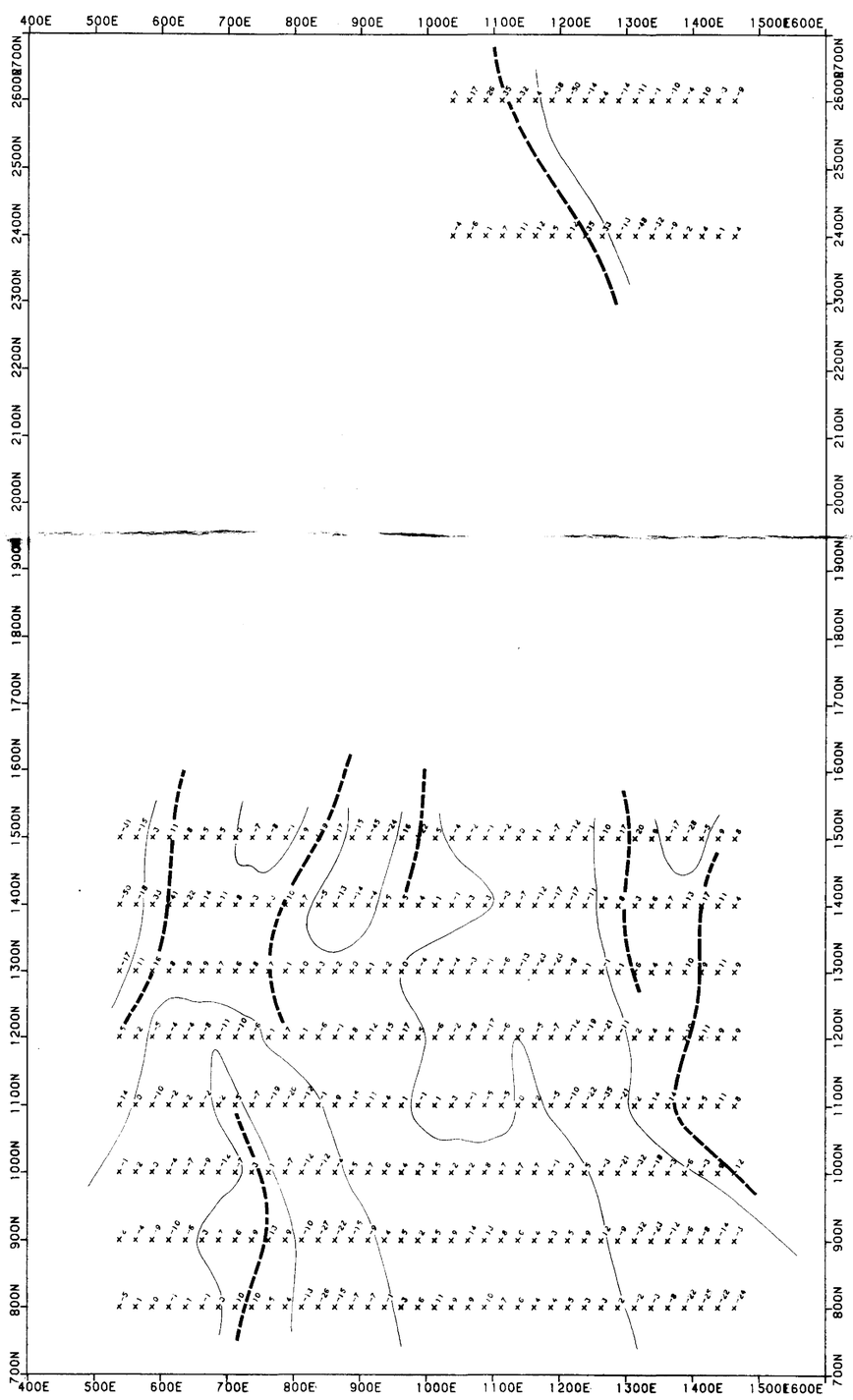
CR90/367B

TOTAL MINING AUSTRALIA PTY LTD

TOLMER NT
MAXMIN 3555HZ PROFILES
SH6 PROSPECT

547-205 | DATE: 13-FEB-89





INTERPRETATED TRANSVERSE FAULT
INTERPRETATED GEOLOGICAL FAULT
V.L.F. CONDUCTOR (Cross Over Interpretation)
V.L.F. CONDUCTOR (Fraser Gradient Interpretation)
MAX - MIN INTERPRETATED CONDUCTOR
RADON ANOMALY

PLATE 23

MN

SCALE m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
CR90/367 B
INPUT ANOMALY - SH6
V.L.F. SURVEY
(NDT Transmitter)

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXX	XXXXXXXXXXXXXXXXXXXX		FOR.		12/12/90

OFFICE: SYD | SCALE 1/5000 | SHEET 1 OF 1 | DRG. No. 647-182

ALPHA CARD CONTOUR (c.p.m.)

5

20

DOWN HOLE CONTOUR (c.p.s.)

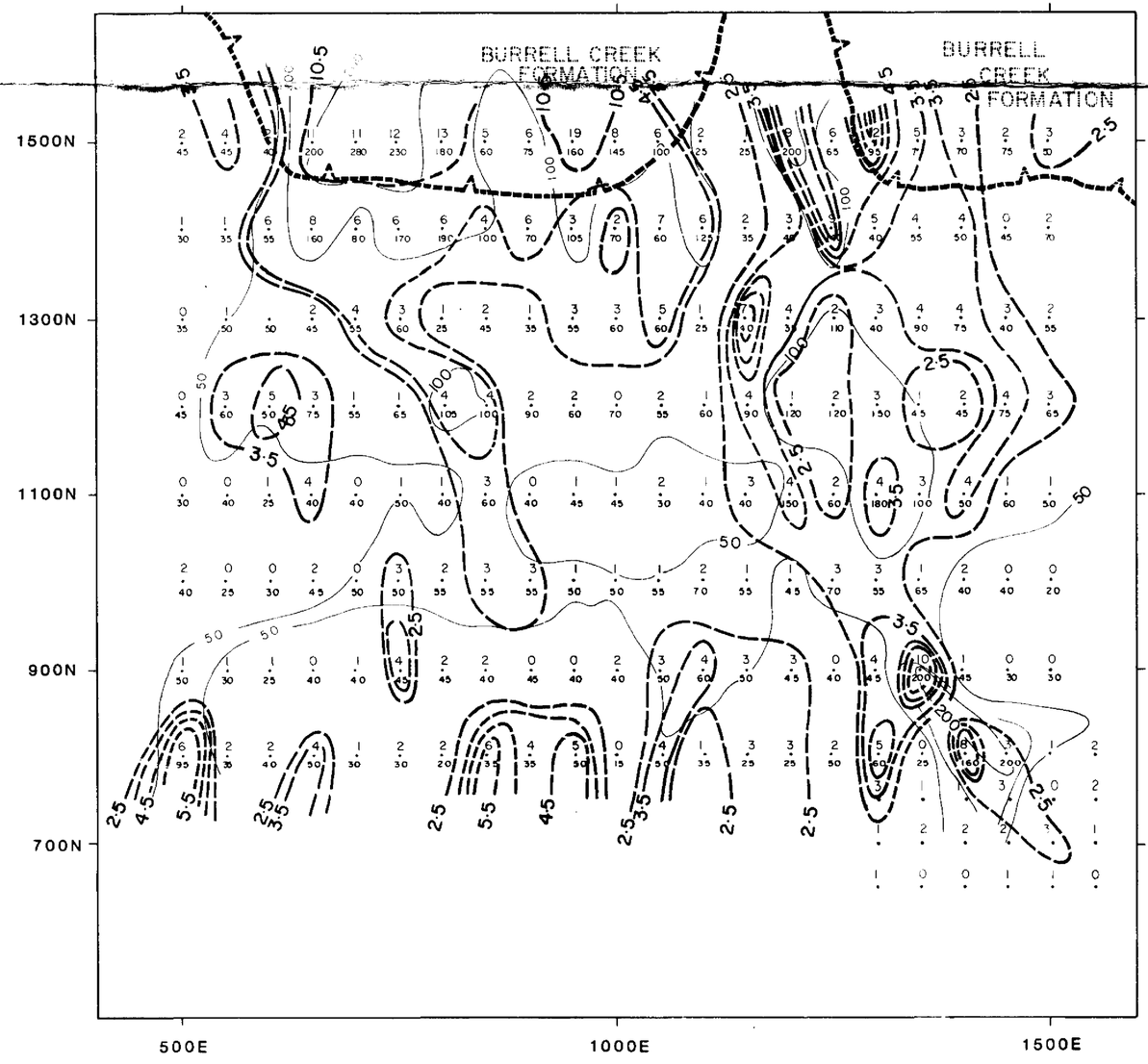
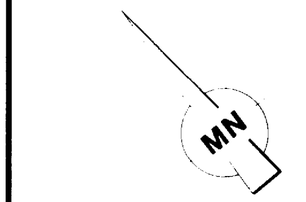


PLATE 24



0 50 100 150 200 400 600m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
INPUT ANOMALY - SH6
ALPHA CARD & DOWN HOLE SPP2 CONTOURS

CR90/367B

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		P M	G R		OCT 88

OFFICE	SCALE 1 : 5000	SHEET OF	DRG Nº 547-159

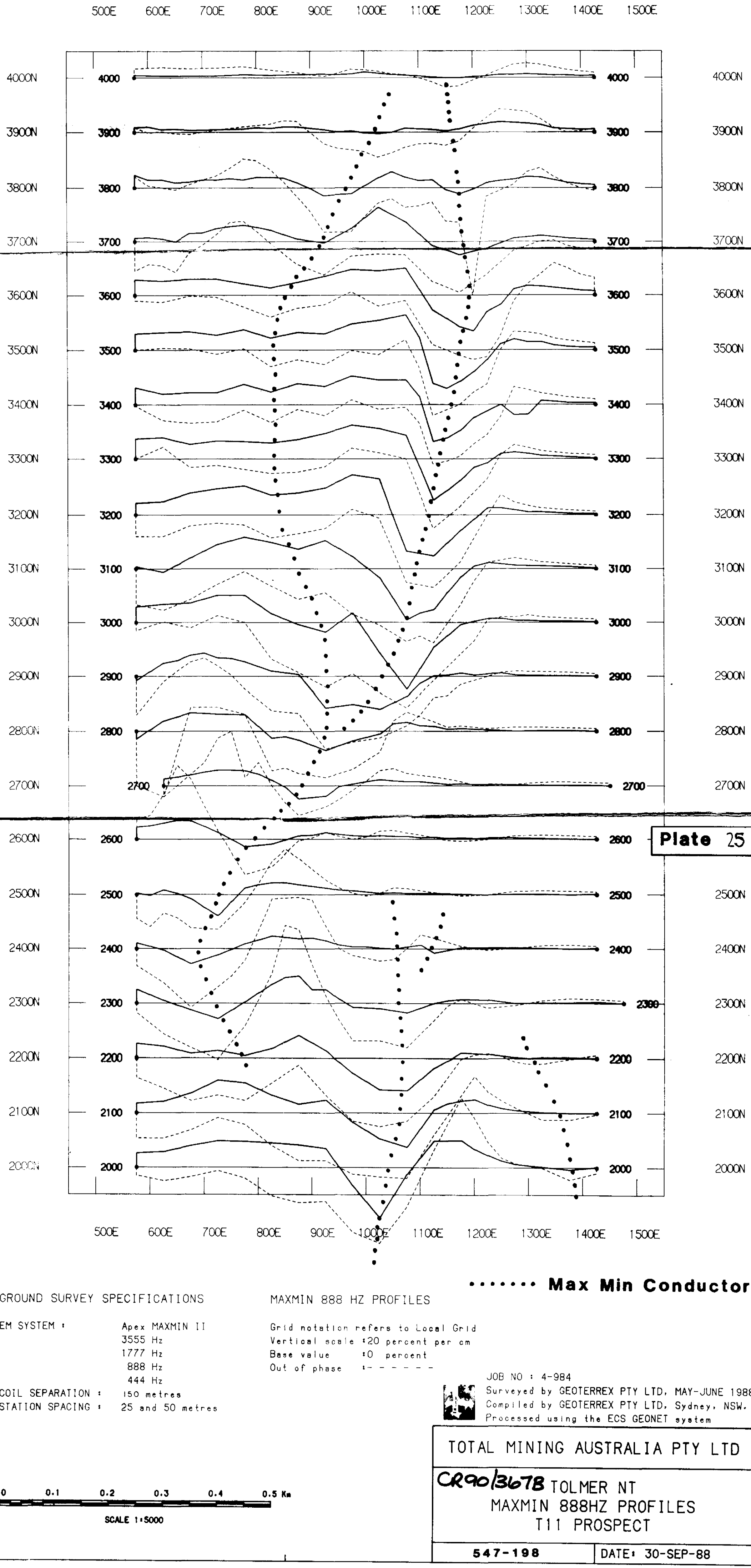


Plate 25

•••••• Max Min Conductor

GROUND SURVEY SPECIFICATIONS

EM SYSTEM : Apex MAXMIN II
3555 Hz
1777 Hz
888 Hz
444 Hz

COIL SEPARATION : 150 metres

STATION SPACING : 25 and 50 metres

MAXMIN 888 HZ PROFILES

Grid notation refers to Local Grid
Vertical scale : 20 percent per cm
Base value : 0 percent
Out of phase : - - - - - -

JOB NO : 4-984
Surveyed by GEOTERREX PTY LTD. MAY-JUNE 1988
Compiled by GEOTERREX PTY LTD. Sydney, NSW.
Processed using the ECS GEONET system

0.0 0.1 0.2 0.3 0.4 0.5 Km

SCALE 1:5000

TOTAL MINING AUSTRALIA PTY LTD

CR90/3678 TOLMER NT
MAXMIN 888HZ PROFILES
T11 PROSPECT

547-198

DATE: 30-SEP-88

400 E 600 E 800 E 1000 E 1200 E 1400 E

4100 N 3800 N 3600 N 3400 N 3200 N 3000 N 2800 N 2600 N 2400 N 2200 N 2000 N 1800 N 1600 N

PD 17 PD 18 PD 19

P 22 P 24 P 23

ALPHACARD CONTOURS in c.p.m.

DOWNHOLE SPP2 CONTOURS in c.p.s.

MAXMIN II CONDUCTORS (888 Hz)

1988 DRILLING

PLATE 26

N

0 50 100 150 200 SCALE 400 600m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
INPUT ANOMALY T11
ALPHACARD & DOWNHOLE SPP2 CONTOURS

CR 90/367B

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		P.M.	G.R.		NOV 88

OFFICE	SCALE 1 : 5000	SHEET OF	ORG Nº 547-146

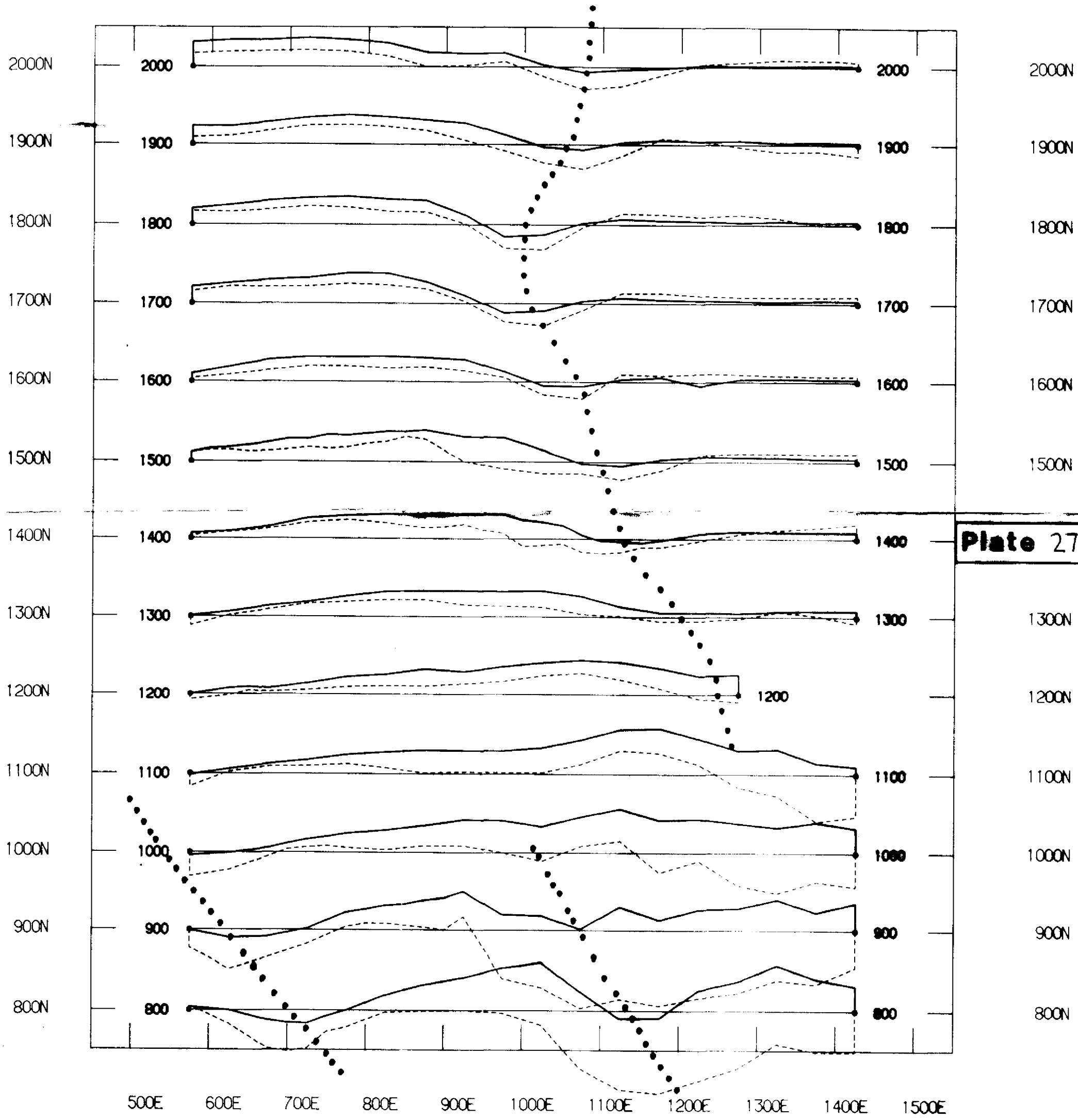


Plate 27

•••••• Max Min Conductor

GROUND SURVEY SPECIFICATIONS

EM SYSTEM : Apex MAXMIN II
3555 Hz
1777 Hz
888 Hz
444 Hz
COIL SEPARATION : 150 metres
STATION SPACING : 25 and 50 metres

MAXMIN 1777 HZ PROFILES

Grid notation refers to Local Grid
Vertical scale :30 percent per cm
Base value :0 percent
Out of phase :- - - - - -

0.0 0.1 0.2 0.3 0.4 0.5 Km

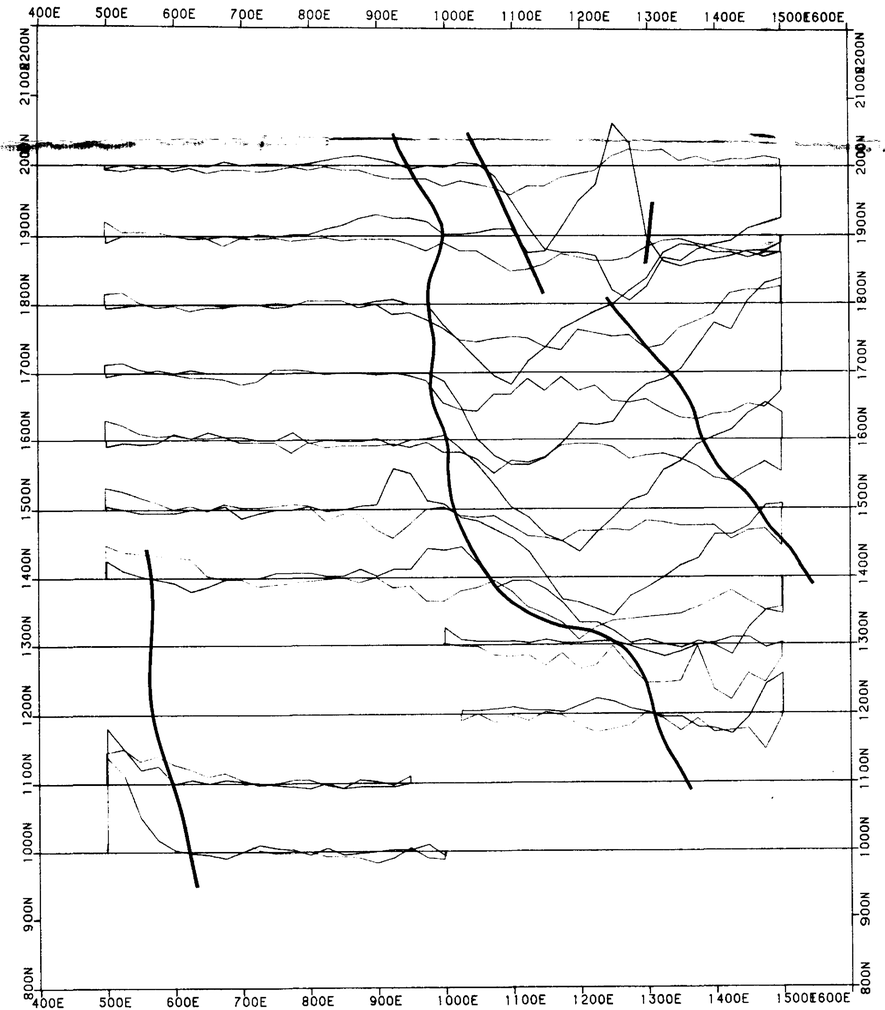
SCALE 1:5000

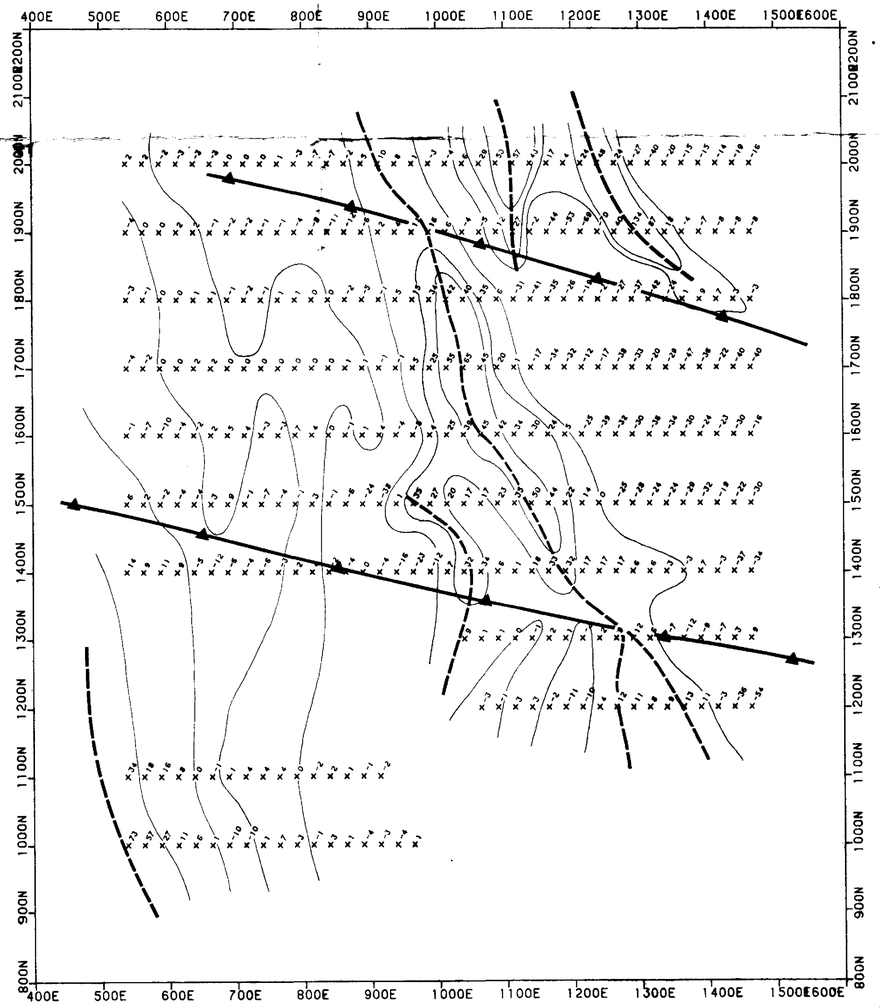
JOB NO : 4-984
Surveyed by GEOTERREX PTY LTD. MAY-JUNE 1988
Compiled by GEOTERREX PTY LTD. Sydney. NSW.
Processed using the ECS GEONET system

TOTAL MINING AUSTRALIA PTY LTD

CR90/367B TOLMER NT
MAXMIN 1777HZ PROFILES
2851 PROSPECT

547-197 | DATE: 11-OCT-88





INTERPRETATED TRANSVERSE FAULT
INTERPRETATED GEOLOGICAL FAULT
V.L.F. CONDUCTOR (Cross Over Interpretation)
V.L.F. CONDUCTOR (Fraser Gradient Interpretation)
MAX - MIN INTERPRETATED CONDUCTOR
RADON ANOMALY

PLATE 28

MN

SCALE =

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
INPUT ANOMALY 2851

V.L.F. SURVEY

CR90/367B (NDT Transmitter)

REV.	DESCRIPTION	PREP.	DRAWN	CHECKED	DATE
XXXXXXXXXXXXXXXXXXXX			FOR.		12/12/90

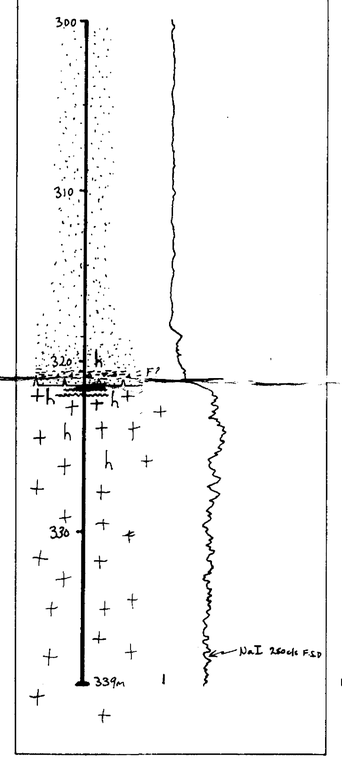
OFFICE: SYD | SCALE 1/5000 | SHEET 1 OF 1 | DRG. No. 849-108

West

PD-14

East

INSET



(€la) LOWER CAMBRIAN
- Siltstone, chocolate brown
- ANTRIM VOLCANICS: Tuff, basaltic
- Basalt/dolerite

(Puu) UPPER PROTEROZOIC
- UNIYA TILLITE: Tillite and fluvio-glacials
- Pebbly shale
- Varved shales

(Ptw) - MIDDLE PROTEROZOIC: Shale and siltstone

(Ptd) - TOLMER GROUP: Silicified sandstone

(Ptd) - Pebbly sandstone

GRANITE

(Pfb) LOWER PROTEROZOIC
- BURRELL CREEK: Siltstone, phyllitic to schistose
- Interbedded siltstone + sandstone
- Metasandstone
- Conglomerate/granulestone

h Haematisation

chl Chloritisation

s Sericitisation

py Pyrite

Fault

Fracturing

PLATE 29

0 10 20 30 40 SCALE 80 120 m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.

CR90/367B GRAVITY ANOMALY

GEOLOGICAL CROSS SECTION

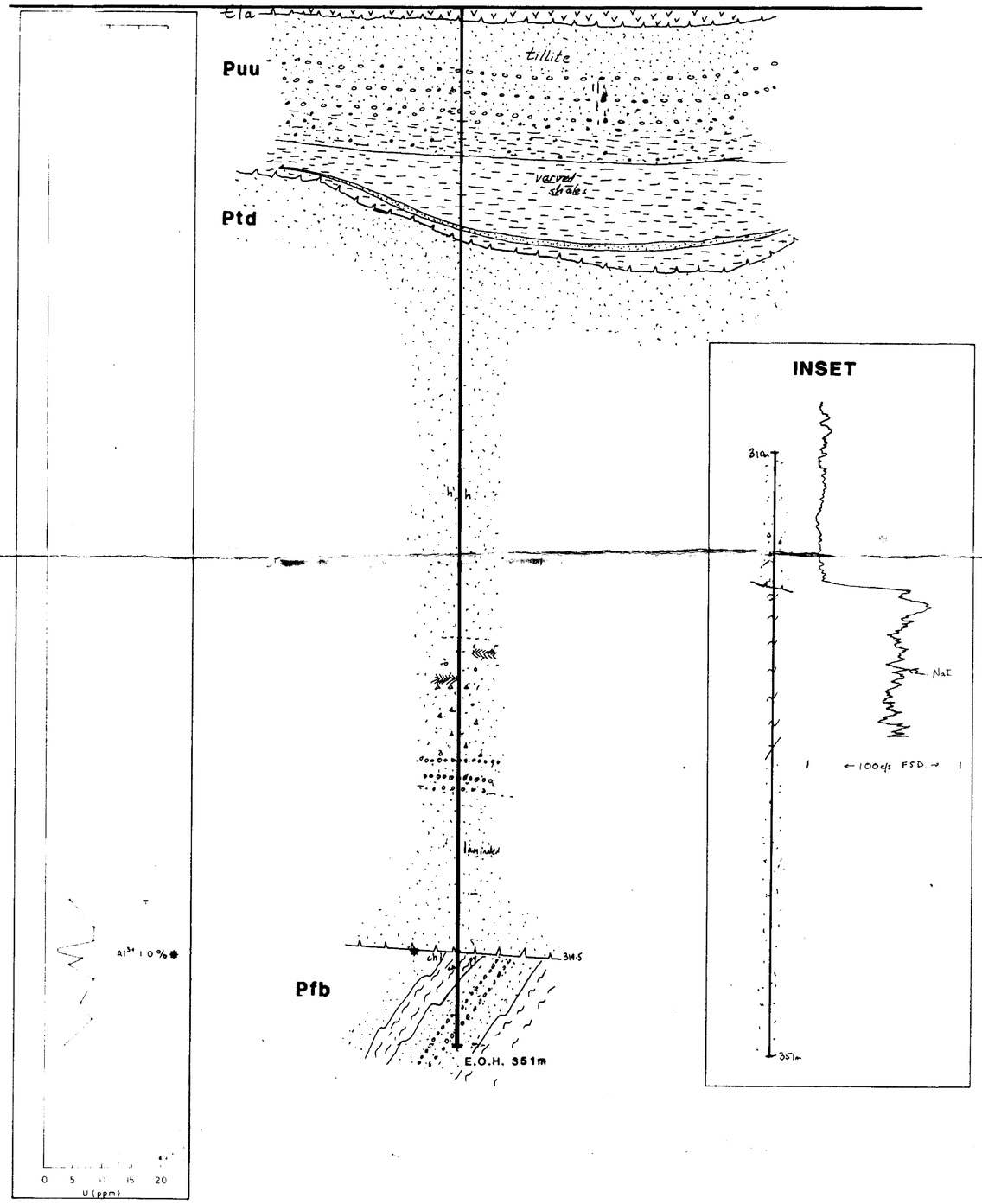
REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		M.V.S.	G.R.		NOV 88

OFFICE | SCALE 1 : 1000 | SHEET OF | DRG Nº 547 - 123

PD-16

West

East



(Ela) — LOWER CAMBRIAN — Siltstone, chocolate brown
ANTRIM VOLCANICS — Tuff, basaltic
Basalt/dolerite

(Puu) — UPPER PROTEROZOIC — Tillite and fluvio-glacials
UNIYA TILLITE — Pebbly shale
Varved shales

(Ptw) — MIDDLE PROTEROZOIC — Shale and siltstone
(Ptd) — TOLMER GROUP — Silicified sandstone
(Ptd) — Pebbly sandstone

(Pfb) — LOWER PROTEROZOIC — Siltstone, phyllitic to schistose
BURRELL CREEK — Interbedded siltstone + sandstone
Metasandstone
Conglomerate/granulestone

h — Haematisation
chl — Chloritisation
s — Sericitisation
py — Pyrite
Fault
Fracturing
CROSS BEDDING

PLATE 30

0 10 20 30 40 SCALE 80 120m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.

CR90/3678 2851 INPUT ANOMALY

GEOLOGICAL CROSS SECTION - 1400 N

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		M.V.S.	G.R.		NOV 88

OFFICE | SCALE 1 : 1000 | SHEET OF | DRG Nº 547 - 125

West

East

P 17

PD 18

PD 19

1125 E

1175 E

1225 E

Cla

Puu

Ptd

Pfb

base of precollar

72.6 m

mud

Mg 960ppm
U 8ppm

Mg 850ppm

As 34 ppm

shear zone

Mg 215ppm

dark grey Ptd fractured abundant clay

Mg 2150ppm

Transitional Zone Ptd / Pfb fragments, fractured, clayey, sheared

As 34ppm
Mg 2800ppm

E.O.H. 130.6 m

E.O.H. 136.2 m

E.O.H. 162 m

(Cla) LOWER CAMBRIAN / ANTRIM VOLCANICS
- Siltstone, chocolate brown
- Tuff, basaltic
- Basalt/dolerite

(Puu) UPPER PROTEROZOIC / UNIYA TILLITE
- Tillite and fluvio-glacials
- Pebbly shale
- Varved shales

(Ptw) - MIDDLE PROTEROZOIC
- Shale and siltstone

(Ptd) - TOLMER GROUP
- Silicified sandstone

(Ptd) -
- Pebbly sandstone

(Pfb) LOWER PROTEROZOIC / BURRELL CREEK
- Siltstone, phyllitic to schistose
- Interbedded siltstone + sandstone
- Metasandstone
- Conglomerate/granulestone

- Hematization, kaolinization
- chl Chloritization
- s Sericitization
- py Pyrite
- Fault
- Fracturing
- qv Quartz veining
- ch Cherty silicification
- Shearing
- Brecciation
- S_0 or S_1 dip
- Unconformable contact

PLATE 31

N.T
QLD
W.A
S.A
N.S.W

SCALE
0 2 4 6 8 16 24 m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
CR90/367B INPUT ANOMALY T11
CROSS SECTION - 3400N

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		M.V.S.	G.R.		DEC 88

OFFICE | SCALE 1 : 200 | SHEET OF | DRG Nº 547-162

W

E

1025 E

1075 E

1125 E

P-24

P22

PD-23

0m

20

40

60

80

100

CONTAMINATED HOLE - NOT LOGGED

brown

red

E.O.H. 60 m

collapse (not logged)

E.O.H. 90 m

collapse (not logged)

Pfd

precollar limit 60 m

136 m

INSET (P23)

136 m

140m

160m

180m

200m

220m

230m

(Ela) LOWER CAMBRIAN / ANTRIM VOLCANICS — Siltstone, chocolate brown; Tuff, basaltic; Basalt/dolerite

(Puu) UPPER PROTEROZOIC / UNIYA TILLITE — Tillite and fluvio-glacials; Pebbly shale; Varved shales

(Ptw) - MIDDLE PROTEROZOIC — Shale and siltstone

(Ptd) - TOLMER GROUP — Silicified sandstone

(Ptd) - Pebbly sandstone

(Pfb) LOWER PROTEROZOIC / BURRELL CREEK — Siltstone, phyllitic to schistose; Interbedded siltstone + sandstone; Metasandstone; Conglomerate/granulestone

Hematization, kaolinization

ch Chloritisation

s Sericitisation

py Pyrite

Fault

Fracturing

qv Quartz veining

ch Cherty silicification

Shearing

Brecciation

S_0 or S_1 dip

Unconformable contact

No Recovery

PLATE 32

W.A

N.T

QLD

S.A

N.S.W

0 40 80 120 160 SCALE 320 480m

TOTAL Mining Australia Pty. Limited

TOLMER PROJECT - N.T.
INPUT ANOMALY T11
SCHEMATIC CROSS SECTION 2100N

CR 90/367B P22, P23, P24

REV	DESCRIPTION	PREP	DRAWN	CHECKED	DATE
		M V S	G R		AUG 88

OFFICE | SCALE 1 : 4000 | SHEET OF | DRG No 547 - 111