

**AGSO Record 1999/15**

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**By**

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**Transects**



**Drill Holes**



**Sections**

AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION  
DEPARTMENT OF INDUSTRY, SCIENCE & RESOURCES

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**Andrew A. Krassay<sup>1</sup>, Barry E. Bradshaw<sup>1</sup>, Jan Domagala<sup>2</sup>, Bruce A. McConachie<sup>1,3</sup>, John F. Lindsay<sup>1</sup>, Michael J. Jackson<sup>1</sup>, Peter N. Southgate<sup>1</sup>, Kurt W. Barnett<sup>1</sup> & Inge Zeilinger<sup>1</sup>**

<sup>1</sup>*Minerals Division, Australian Geological Survey Organisation,  
GPO Box 378, Canberra, ACT 2601*

<sup>2</sup>*Queensland Department of Minerals and Energy,  
GPO Box 194, Brisbane, Queensland 4001*

<sup>3</sup>*Santos Ltd.,  
Level 14 Santos House,  
60 Edward St, Brisbane Qld 4000*

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## Abstract

Palaeo- and Mesoproterozoic sedimentary rocks of northern Australia (**Figure 1**) host one of the worlds most important zinc (Zn-Pb-Ag) repositories. Despite more than fifty years of geological investigation, including the production of 1:250,000 and 1:100,000 geological maps and the drilling of countless mineral exploration holes the public domain contains comparatively little measured section and basic sedimentological information. Because these datasets are essential for understanding sediment architecture and basin shape they form a necessary stepping stone to formulating models aimed at constraining the flow of mineralising fluids in these basins.

This data record provides the mineral exploration industry, university and government geoscientists with sixty-five composite outcrop and drillhole stratigraphic sections through the upper McNamara and Fickling Groups. Over thirty four thousand metres of detailed stratigraphic/sedimentological description and interpretation are provided. Each section contains grain size, lithology, bed thickness, sedimentary structure and gamma-ray data from which facies and sequence stratigraphic surfaces are interpreted. Despite the absence of invertebrate fossils the sequence interpretations, in combination with SHRIMP zircon ages and APWP data, permit the erection of a well-constrained chronostratigraphic framework for these Palaeo- and Mesoproterozoic rocks. Previous lithostratigraphic subdivisions were diachronous and emphasised local stratigraphic successions rather than basin-wide correlations. The data contained in this record contains a chronostratigraphic sequence subdivision from which original basin shape and sediment architecture can be derived. The subdivision enables rocks deposited on the southern flanks of the Murphy Inlier to be more accurately correlated with sediments of similar age but markedly different facies in the Lawn Hill Platform to the south.



## Introduction

This CD ROM contains outcrop and drill core stratigraphic and sedimentologic data from the upper McNamara and Fickling Groups of the Isa Superbasin (Scott et al. 1998, 2000) in northern Australia. Thirty three sections and nineteen drillholes are from the upper McNamara Group, and one section and twelve drillholes are from the Fickling Group (**Table 1**). Measured sections and drillholes are provided as postscript plot files at a vertical scale of 1:1000 and 1:4000 (**Table 2**). The four Comalco deep petroleum wells are also provided at a scale of 1:2000 (**Table 2**). On-screen views can also be plotted as prints scaled to fit an A4 page).

**Table 1**

| McNAMARA GROUP            |               |                                      |
|---------------------------|---------------|--------------------------------------|
| Geographical section name | Thickness (m) | Section names marked on Location Map |
| <b>Single Sections</b>    |               |                                      |
| Silver King               | 65            | 95/BA/07                             |
| Lawn Hill Creek           | 95            | 95/BA/08                             |
| Cattle Creek              | 138           | 95/BB/10                             |
| Kamarga East              | 143           | 95/JJ/03                             |
| Twelve Mile Tank Road     | 285           | 96/AK/25                             |
| Edith Ranges North        | 135           | 96/AK/26                             |
| Widdallion Creek          | 355           | 96/AK/31                             |
| Flaggy Hill               | 35            | 96/BA/13                             |
| O'Shannassy River         | 450           | 96/BA/05                             |
| O'Shannassy River North   | 250           | 96/BA/14                             |
| Shady Gully               | 86            | 96/BA/06                             |
| Thorntonia South          | 241           | 97/AK/01                             |
| White Cliffs              | 51            | 97/AK/02                             |
| Kamarga Hill              | 75            | 97/AK/04                             |
| Brenda Creek              | 1055          | 96/BC/01                             |
| Freemans Creek Northeast  | 422           | 97/JJ/02                             |
| <b>Composite Sections</b> |               |                                      |
| Twin Hills                | 490           | 95/BA/02a-c, 96/BA/12                |
| Mended Hill South         | 227           | 95/BA/06a-b                          |
| Lilydale Spring South     | 410           | 95/BD/09a-b, 95/BB/09c               |
| Jenny Creek               | 516           | 96/AK/16-21                          |
| Mount Caroline South      | 915           | 96/AK/22-23                          |
| Widdallion Creek North    | 57            | 96/AK/27a-b                          |
| Gorge Creek               | 800           | 96/AK/28-30                          |
| Freemans Creek            | 1428          | 96/BA/15-15b                         |
| Grevillea South           | 627           | 96/BA/01-04                          |
| Victor Creek Bore         | 1088          | 96/BA/07-11                          |
| Police Creek 1            | 1403          | 96/PC/01-03                          |
| Moody Creek               | 812           | 96/BJ/01-02                          |
| Kamarga                   | 870           | 97/JJ/03, 97/AK/04-07                |
| Mount Caroline            | 1280          | 95/BB/05a,b,ar; 96/MTC/01            |
| Musselbrook Creek         | 1535          | 96/MBC/01-05                         |
| Riversleigh Tank          | 1932          | 95/BB/04b-c, 96/BJ/03, 96/GR/02      |
| Thorntonia 1              | 1130          | 97/AJ/01-03, 97/AK/03a-b             |

**Table 1 (con't)**

| <b>McNAMARA GROUP (con't)</b> |                  |                                      |
|-------------------------------|------------------|--------------------------------------|
| Geographical Section Name     | Depth (m)        | Section Names marked on Location Map |
| <b>Drillhole</b>              |                  |                                      |
| Aberfoyle PDCM000045          | 501              |                                      |
| Amoco 83-1                    | 690              | A83-01                               |
| Amoco 83-2                    | 550              | A83-02                               |
| CRA DD90LH065                 | 272              | LH065                                |
| CRA DD91LH102                 | 312              | LH102                                |
| CRA DD91LH133                 | 305              | LH133                                |
| CRA DD91LH210                 | 119              | LH210                                |
| CRA DD91LH235                 | 195              | LH235                                |
| CRA DD91LH265                 | 483              | LH265                                |
| CRA DD92LH375                 | 187              | LH375                                |
| CRA DD92LH376                 | 201              | LH376                                |
| CRA DD94LH532                 | 197              | LH532                                |
| CRA DD94LH554                 | 187              | LH554                                |
| CRA DD95CC008                 | 302              | CC008                                |
| CRA DD95CC009                 | 164              | CC009                                |
| CRA DD95FT025                 | 185              | FT025                                |
| CRA DD95FT029                 | 184              | FT029                                |
| CRA DD95IK001                 | 174              | IK001                                |
| CRA DD95RL010                 | 350              | RL010                                |
| <b>FICKLING GROUP</b>         |                  |                                      |
| Geographical Section Name     | Thickness (m)    | Section Names marked on Location Map |
| <b>Composite Sections</b>     |                  |                                      |
|                               |                  |                                      |
| Wire creek                    | 766              | 95/AW/01-05                          |
|                               |                  |                                      |
| <b>Drillholes</b>             | <b>Depth (m)</b> |                                      |
| Argyle Creek #1               | 1680             | Argyle Creek 1                       |
| Beamesbrook #1                | 1392             | Beaesbrook 1                         |
| Desert Creek #1               | 2351             | Desert Creek 1                       |
| Egilabria #1                  | 1846             | Egilabria 1                          |
| Amoco 83-4                    | 598              | A83-04                               |
| Elf-Aquitane QLG 5001         | 282              | QLG 5001                             |
| Elf-Aquitane QLG 5002         | 262              | QLG 5002                             |
| WMC HCKD01                    | 595              | HCKDO1                               |
| WFDD17                        | 640              | WFDD17                               |
| WFDD47                        | 328              | WFDD47                               |
| WFDD59                        | 602              | WFDD59                               |
| WFDD74                        | 350              | WFDD74                               |

Each section or drillhole contains primary observational data and facies and sequence stratigraphic interpretations. Primary observational data includes:

- Lithostratigraphy (Group, Formation, Member)
- Gamma Ray, Lithology, Sedimentary Structure & Bed Thickness

Interpreted data includes:

- Sequence Stratigraphy & Facies Summary (some only) including sequence boundaries, maximum flooding surfaces, and transgressive surfaces.

Eight regional cross sections are included in the data release.

- **Transect 1** correlates outcrop sections along a regional north-south corridor on the Central Lawn Hill Platform. The transect highlights facies belts, truncation and onlap within the major depocentre for the River Supersequence. The transect correlates Sequences Loretta 2.6 to River 3.1 and involves the upper part of the Lady Loretta Formation, the Shady Bore Quartzite, and the basal part of the Riversleigh Siltstone (see Krassay et al. 2000a for discussion).
- **Transect 2** correlates measured sections and drillholes from the middle part of the River Supersequence (Sequences River 3.1 to River 6.1) across the Central Lawn Hill Platform. This north-south transect extends from Mount Caroline to Thornton and encompasses the upper Shady Bore Quartzite and lower Riversleigh Siltstone (see Krassay et al. 2000a for discussion).
- **Transect 3** correlates thin successions from the upper part of the River Supersequence on the northeast side of the Termite Range Fault to thicker successions in the southwest. This transect correlates Sequences River 6.1 to Term 1.1, corresponding to the upper Riversleigh Siltstone (see Krassay et al. 2000a for discussion).
- **Transect 4** focuses on the Term Supersequence from Term 1.1 to Term 2.2. Correlations between composite measured sections on the Central Lawn Hill Platform illustrate thickness and facies variations within the Termite Range Formation and lowermost Lawn Hill Formation (see Krassay et al. 2000b for discussion).
- **Transect 5** depicts geometric relationships and facies changes of the upper Term Supersequence and lower Lawn Supersequence surrounding Century on the Central Lawn Hill Platform. The transect highlights the dramatic thickness and facies changes across the Termite Range Fault during early Lawn Hill Formation (Term 2.2-Lawn 1.2) time (see Krassay et al. 2000b for discussion).
- **Transect 6** presents regional correlations from Comalco wells on the Northern Lawn Hill Platform to sections and drillholes at Century and the area immediately north of Riversleigh Station on the Central Lawn Hill Platform. This transect encompasses the stratigraphy from the upper Term Supersequence to the Doom Supersequence (see Krassay et al. 2000b for discussion).
- **Transect 7** correlates deep petroleum wells from west to east across the Comalco seismic grid south of the Murphy Inlier on the Northern Lawn Hill Platform. The wells have been tied to seismic lines and depict progressive northward-thinning of the Loretta to Doom Supersequences through onlap and truncation onto the Murphy Inlier.
- **Transect 8** correlates 6 drillholes along a thin southwest-northeast outcrop belt of Fickling Group sediments along the southern flank of the Murphy Inlier on the Northern Lawn Hill Platform. The transect highlights important facies and thickness changes within the Loretta to Doom Supersequences in the area of the Walford Creek Prospect (see Bradshaw et al. 2000 for discussion).

The CD ROM also contains digital location information for the outcrop sections, measured\_sections.xls (sample in **Table 3**) and drill holes, drillhole\_database.xls (sample in **Table 4**) featured in this product and a similar CD ROM covering stratigraphic data in the lower McNamara, Mt Isa and Fickling Groups (Record 1999/10, Southgate et al. 1999). The location of measured sections and drill holes is shown in **Figure 2**. The chronostratigraphic Event Chart (**Figure 3**) summarises the sequence stratigraphic subdivision for the Calvert and Isa Superbasins (Southgate et al. 2000). One paper is included in the **appendix**. It is a copy of the paper by Krassay (1998) outlining the gamma ray technique and reproducibility of the data collected by NABRE.

## Datasets and Methodology

The stratigraphic data was collected from outcrop sections and publicly available drill core. The quality of outcrop provided the principal constraint in the selection of areas suitable for measuring sections. Where ever possible areas of poor outcrop were supplemented by drill core. As one aim of the project was to use the stratigraphic data to identify synsedimentary faults and determine stratigraphic architecture and basin shape it was necessary to collect both regional and locally detailed datasets. For example, comparison of sections measured at **Freemans Creek, Kamarga, Riversleigh Tank, Moody Creek** and **O'Shannassy River** provide an understanding of the timing of relative movement along the Termite Range Fault. Outcrop discontinuities prevented the collection of stratigraphic data in a line of continuous section. As a result many of the thicker sections are composited from a series of smaller sections measured within a radius of several hundred metres of each other. Individual sections were spliced together at prominent marker beds, and/or by the use of overlapping gamma-ray curves in conjunction with facies descriptions. Presentation of the data as composite sections is necessary for regional sequence stratigraphic analysis and correlation.

Sections were measured using a Jacob staff and Abney level and the rocks were marked in 1.5 m intervals of true thickness. Gamma-ray data was collected at 50 cm intervals of true thickness using a hand-held Scintrex GRS 500 spectrometer that measured total gamma ray counts. A beryllium standard was used to calibrate each spectrometer. Each machine was calibrated at intervals of two to three hours. Each gamma-ray reading is taken over a ten second count period after stabilisation of the instrument at each measuring station. Where down hole wireline logs were available for drill core they were used for correlation. However, most mineral holes lacked this dataset. In these instances gamma-ray data was acquired from drill core using an Exploranium GR 320 Envispec Geophysical-Environmental Gamma-ray Spectrometer with two horizontally mounted detectors. To avoid background contamination all gamma-ray measurements conducted on drill core were made inside a 2-cm thick, 350 kg lead shield. Krassay (1998) provides a detailed outline of the techniques used in acquiring gamma ray data and the accuracy of this method. A copy of this paper is included as **Appendix 1**.



Sedimentary facies information, including grain size, lithology, grain composition, sedimentary structures and bed thickness were collected along each stratigraphic section on field data sheets. Grain size information is recorded as a detailed, continuous graphical log. One of the major problems with facies-based sedimentological datasets involves a mechanism to cost effectively capture this continuous 'stream' of descriptive data in a digital form. Lithostratigraphic methodologies emphasise the description of rock bodies. However, sequence stratigraphic analyses require the identification of vertical facies trends and the stacking patterns of sedimentary cycles to determine key stratal surfaces. These features are difficult to identify from lithostratigraphic logs. The technique developed in this project, where outcrop-derived gamma-ray and grain size data are displayed as logs, complemented by lithology and facies information, enables these trends to be identified and stratal surfaces interpreted. Grain size curves were digitized using a fax machine scanner and subsequently loaded into a customised version of Mincom's Geolog6 software application. Lithologies were generated using customised software containing look-up tables keyed to observations made along each section.

## Sequence Stratigraphy

### Nomenclature

Whereas lithostratigraphic nomenclature is largely descriptive, sequence stratigraphic classification is interpretive and therefore subject to change as additional sequences are recognised and stratigraphic precision improved. Rather than adopt an entirely new stratigraphic terminology the 2<sup>nd</sup> to 4<sup>th</sup> order sequences identified in this study are classified in the following way. Each 2<sup>nd</sup>-order sequence (supersequence) is named after an abridged version of the lithostratigraphic unit that contains its maximum flooding surface. Because the most complete stratigraphic sections come from the McNamara Group formation names from this group have been used. In this CD ROM five Supersequences are recognised: the River, Term, Lawn, Wide, and Doom Supersequences, named after the Riversleigh Siltstone, Termite Range Formation, Lawn Hill Formation, Widdallion Sandstone Member, and Doomadgee Formation respectively. Each Supersequence name is followed by a number, the first integer identifies a 3<sup>rd</sup>-order sequence, the number following the decimal point identifies each 4<sup>th</sup>-order sequence. For example the River 1.2 sequence refers to the second 4<sup>th</sup>-order sequence in the first 3<sup>rd</sup>-order sequence of the River Supersequence. The letters 't' and 'f' refer to the type of surface, 't' denotes transgressive surface and 'f' maximum flooding surface. Qualifying text is not used to identify sequence boundaries.

### Overview

This section provides an overview of the principal terms and concepts in sequence stratigraphy. The reader is advised to refer to diagrams present in the principal references quoted in this discussion, particularly figures 1-4 in Van Wagoner et al. (1988) and Figure 2.9 of Emery & Myers (1996). Van Wagoner et al. (1988) defined sequence stratigraphy as the study of rock relationships within a chronostratigraphic framework of repetitive, genetically related strata bounded by surfaces of erosion or non-deposition or their correlative

conformities. Emery & Myers (1996) proposed an alternative and possibly simpler definition: sequence stratigraphy is the subdivision of sedimentary basin fills into genetic packages bounded by unconformities and their correlative conformities. It is used to provide a chronostratigraphic framework for the correlation and mapping of sedimentary facies and for stratigraphic prediction. Implicit in these definitions is the key distinction between lithostratigraphy and sequence stratigraphy. Whereas sequence stratigraphy is concerned with identifying chronostratigraphically significant surfaces that bound genetically related rock packages, lithostratigraphy is concerned with correlating similar rock bodies which are commonly diachronous and lack time significance. Lithostratigraphic correlation is most useful when the rock bodies are constrained by well-defined sequence stratigraphic boundaries.

Critical to an understanding of sequence stratigraphy is the concept of accommodation. Accommodation refers to the space available for sediment to accumulate and results from an interplay between tectonically-driven subsidence, oscillations in sea level, and rates of sediment supply. It is the rate of change in accommodation and its effect on rates of sediment supply that ultimately controls the migration of sedimentary facies belts, stacking patterns of sedimentary cycles and therefore architecture of sediments filling a basin. Three scenarios are possible (see Van Wagoner et al. 1988):

Accommodation rate < Rate of sediment supply - Progradational cycles

Accommodation rate > Rate of sediment supply - Retrogradational cycles  
or Backstepping

Accommodation rate = Rate of sediment supply - Aggradational cycles

Based on the examination of stratal patterns in seismic sections, wireline logs and outcrop sections the Exxon Group (Van Wagoner et al. 1988) were able to show that cycles of progradation, retrogradation and aggradation occurred in a predictable order at a variety of scales. Furthermore, the cycles could be grouped into genetic packages (systems tracts, parasequence sets and parasequences) that combined to form a depositional sequence in which each systems tract reflected a particular stage of an accommodation cycle. Each depositional sequence is bounded by a chronostratigraphic surface termed a sequence boundary across which a basinward shift in facies occurs (upwards change from deeper to shallower water facies). Van Wagoner et al. (1988) recognised Type 1 and Type 2 Sequences, each named after the character of the sequence boundary at their base. Type 1 sequences involve a significant fall in relative sea level. Type 2 sequences involve a lesser fall in relative sea level. Detailed discussions of the differences between these two sequences are found in Van Wagoner et al. (1988, 1990) and Emery & Myers (1996).

Most generalised sequence stratigraphic models are for extensional basins with a pronounced shelf break, the classic passive margin setting of many modern continental margins. For the upper McNamara Group, sequence models developed for basins with a ramp margin (Emery & Myers 1996, Fig. 9.18b; Van Wagoner et al. 1990, Figs. 20A & 20B) are more applicable. However, in this study such models require modification to include the influence of growth

faulting (Emery & Myers 1996, Fig. 9.18c) to account for significantly thicker, growth-faulted stratigraphic sections that developed on down-thrown fault blocks in both early Riversleigh Siltstone and Lawn Hill Formation time.

Importantly, the surfaces that bound sequences and internally divide them into systems tracts and parasequences are chronostratigraphic features that cut across diachronous lithofacies boundaries. For the datasets included in this CD ROM sequence interpretations are based on the vertical stacking patterns of sedimentary facies and the interpretation of gamma ray logs derived from outcrop, drill core and downhole wireline methods. The gamma-ray logs have proved particularly useful for sequence analysis of these Proterozoic sections. Whereas the previous experience of the geologist measuring the section can bias facies descriptions, gamma-ray data are objective. Gamma-ray logs simply record the K, Th and U content of the rocks displayed against depth/thickness. Gamma-ray counts are typically related to clay content and thus to grain size, and trends in these curves enable facies trends to be recognised and aid in the identification of sedimentary cycles and their stacking patterns (see Krassay 1998, Appendix 1). The curves are very useful in identifying sequence boundaries and their correlative surfaces, particularly where like facies occur above and below important stratal surfaces.

### **Well-Log Trends & Sedimentary Cycles**

Regional correlations of wireline curves, and gamma-ray logs in particular, are not based on identifying individual spikes. Instead, it is the broad, overall log trends and associated lithofacies stacking patterns that allow accurate regional correlations. A wealth of literature exists on methods for interpreting sedimentary cycles in well logs (e.g. Rider 1986; Cant 1992; Emery & Myers 1996). Most wireline logs are interpreted through the identification of five widely recognised trends (the first three being the most common), corresponding to individual sedimentary cycles (Emery & Myers 1996, Fig. 4.7):

- Cleaning-up or funnel-shaped trends show an upward decrease in gamma counts, which commonly indicates an upward increase in depositional energy, upward shallowing, and upward coarsening related to progradation of a depositional system. An example of this motif is apparent between the River 1.1f and River 1.2 surfaces in the **Kamarga** and **Freemans Creek** sections. Cleaning-up trends may occasionally result from a gradual change from clastic to carbonate deposition, or a gradual decrease in anoxia (Emery & Myers 1996).
- A dirtying-up or bell-shaped gamma trend shows a progressive upward increase in gamma readings, which commonly indicates overall fining-upward successions, typically within shale-prone intervals. In the **Freemans Creek** section this motif is apparent between the River 3.2 and River 3.2f surfaces. Dirtying up trends are common in fluvial successions, tidal channels, and estuarine fills (Emery & Myers 1996). In shallow marine settings, dirtying-up trends often indicate the retreat or abandonment of a shoreline–shelf system (Emery & Myers 1996). In deep marine settings, the

dirtying-up motif may record the waning/abandonment period of submarine fan deposition (Emery & Myers 1996).

- Boxcar or blocky gamma-ray curve segments are sharp-based low-gamma units with internally relatively consistent gamma readings set within a higher gamma background. For example, the thick sandstones in the **O'Shannassy River** section between River 4.1 and River 4.1t, and River 4.2 and River 4.2t surfaces. The sharp boundaries with overlying and underlying units imply the existence of an abrupt switching from high gamma fine-grained units to low gamma coarser units (Emery & Myers 1996). Boxcar trends are commonly found in fluvial channel sands, turbidites, aeolian sands, and occasionally within evaporites (Emery & Myers 1996). They may also occur in sequences of vertically stacked peritidal carbonate cycles.
- Bow or symmetrical trends consist of a cleaning-up trend overlain by a dirtying-up trend of similar thickness, with no significant break between the two (Emery & Myers 1996). A bow trend is usually the result of a waxing and waning of clastic sedimentation rate in a basinal setting, where the sediments are unconstrained by base level, such as during the progradation and retrogradation of a mud-rich fan system (Emery & Myers 1996).
- Irregular trends have no systematic change in either the sand base-line or shale base-line, and lack the clean character of the boxcar trend (Emery & Myers 1996). Irregular trends generally represent aggradation of a shaly or silty lithology, and are typical of shelfal or deep water settings, a lacustrine succession, or muddy alluvial overbank facies (Emery & Myers 1996).

### **Parasequences, Parasequence Sets and Systems Tracts**

Parasequences form the basic building blocks (cycles) of systems tracts and sequences. Van Wagoner et al. (1988, 1990) defined parasequences as relatively conformable successions of genetically related beds or bedsets, bounded by marine flooding surfaces and their correlative conformities. In a shallow-water, wave or storm dominated setting a siliciclastic parasequence will occur as coarsening-upwards packages tens of metres thick where beds increase in thickness upwards, bioturbation decreases upwards, and facies indicate shallowing upwards (see examples in Van Wagoner et al., 1990; Emery & Myers 1996). The best known example of a parasequence in a carbonate depositional system is the 1-10 m thick, shallowing upward, succession characteristic of peritidal environments (James 1979; Pratt et al. 1992).

Parasequences are arranged into a succession of genetically related cycles termed parasequence sets. In a parasequence set the cycles are related by their stacking patterns to form progradational, retrogradational and aggradational depositional systems. It is important to note that although a parasequence set may reflect transgression and a progressive deepening of the depositional environment, the overall deepening trend can be broken down into

a series of progradational cycles or parasequences. In such a system successive parasequences typically display an increase in deeper water facies as rates of sediment supply are unable to keep up with subsidence rates. Thus successive cycles typically thin upwards until they become condensed and eventually merge in a relatively uniform package of siltstone and shale, (e.g. Mended Hill South section, organic-matter rich, concretionary shale facies of the Lawn Hill Formation). Parasequences and parasequence sets are arranged into four depositional packages or systems tracts that together comprise a depositional sequence. The four main systems tracts are:

- Lowstand Systems Tract (LST)
- Transgressive Systems Tract (TST)
- Highstand Systems Tract (HST)
- Shelf Margin Systems Tract (SMST)

The relative positions of these systems tracts within type 1 and 2 depositional sequences are shown in Van Wagoner et al. (1988, Figs. 2-4).

The SMST is simply a version of the LST produced by a sea-level lowering that is too small to displace the lowstand shoreline below the contemporary shelf-edge break. Similarly, two recently proposed systems tracts, the forced regressive wedge systems tract (FRST, Hunt & Tucker 1992) and regressive systems tract (RST, Posamentier & James 1993), occupy theoretically different but overlapping positions on the falling and lowstand parts of an idealised sea-level curve (Carter 1998). The SMST, FRST, and RST are not common and are difficult to recognise in outcrop and well studies. In this study all parasequences and parasequence sets developed during the rapid falling and lowstand stages of an idealised sea-level curve are considered as LST's.

The LST is deposited at and around lowstand in a relative sea level cycle, typically but not necessarily when the shoreline has dropped below the shelf-break. In a basin with a shelf break the lowstand can be divided into three depositional systems, the basin floor fan, slope fan and lowstand wedge or prograding complex. The submarine fans are believed to mark the period of rapid relative sea level fall; the prograding complex with its typical progradational to aggradational geometries marks the still stand and slow rise of relative sea level (Emery & Myers 1996).

In intracratonic settings, where pronounced shelf breaks are typically absent and ramp basins develop, LST deposits typically comprise prograding wedges of sediment. Criteria for recognising the basinward shift in facies and relative fall in sea level can be quite subtle, depending on the magnitude of the fall and the position on the ramp or platform. However, during early Lawn Hill Formation time the occurrence of growth faults with significant topographical relief resulted in development of sandy lowstand fans (e.g. **Transect 5**, H1s and lower units in Jenny Creek, Edith Ranges North and Mount Caroline South sections) in the otherwise fine-grained hanging-wall sections. These sandy successions correspond to LST slope fans, and are overlain by thick, finer-grained successions corresponding to lowstand prograding wedges, or the basal part of a TST. Slope fans and lowstand prograding wedges are only recognised at this

stratigraphic level within the upper McNamara Group. At more landward positions on a ramp where shallower facies occur (e.g. Lawn Hill Formation on the SW Termite Range Fault block), an unconformity mantled by a thin sand (e.g. thin lowstand above Term 4.1 on Mended Hill South section) may provide evidence for the fall in relative sea level that initiated slope fan development in the depocentre.

The TST is deposited during the rising part of a relative sea level cycle, a period of rapid shoreline transgression. These sediments are deposited when the rate of increase in accommodation (relative sea level rise) exceeds the rate at which sediment is supplied. A backstepping set of parasequences accumulates. For example, at a third order scale backstepping parasequences are prominent between the River 3.2 and River 4.1 surfaces on Freemans Creek and Grevillea South sections (**Transect 2**). Here the upwards change from medium-grained, cross-bedded quartz arenites to wavy-bedded and hummocky cross-stratified siltstones and very fine-grained sandstones provides an example of progressive retreat of the shoreline and the drowning of siliciclastic provenance areas during a major marine transgression. At the scale of outcrop, parasequences become progressively thinner and finer-grained within the TST. Dark grey, organic-rich, tuffaceous siltstones surrounding River 3.2f mark a time of clastic starvation and high accommodation rates within the River Supersequence. In a basinward position low rates of siliciclastic deposition may result in the accumulation of authigenic sediments. These include laminated and bituminous carbonate muds, glauconite, phosphorites, manganese nodules and organic-matter rich shales of the condensed section (Loutit et al. 1988). A good example of such a condensed section is thick, dark grey to black, organic-rich shales and silty shales with concretions above Term 2.2 in the Mended Hill South section.

The HST is deposited during and shortly after the peak of a relative sea level cycle, and is the youngest and uppermost systems tract of a sequence. These sediments accumulate during a time of decelerating rate of relative sea level rise, enabling the rate of sediment supply to exceed the rate of accommodation. In HST deposits parasequence stacking patterns will depend upon cycle position in the HST as well as facies position on the shelf or ramp. During the early to mid parts of HST's, sites in close proximity to the siliciclastic provenance or shallow water carbonate factory will receive relatively high rates of sediment supply and a progradational set of parasequences will form (e.g. **Transect 1**, Freemans Creek, Kamarga, and Brenda Creek sections between River 1.1f and River 1.2 surfaces).

In the late or terminal parts of HST's, when accommodation rates are in significant decline shallow subtidal to supratidal facies will dominate the shallowing upward cycles. This will result in an aggradational package of parasequences as like facies belts are superimposed (e.g. **Transect 1**, Kamarga and Kamarga Hill sections between River 1.2f and River 2.1 surfaces). In basinward positions, where rates of sediment supply are comparatively low, aggradational stacking patterns may occur in early highstand deposits (e.g. **Transect 5**, Mended Hill South and Amoco 83-2 sections between Term 4.1f and Term 5.1 surfaces).



## Stratal Surfaces

Each of the systems tracts discussed above is bounded by a chronostratigraphic stratal surface. Three surfaces are defined:

1. Sequence Boundary (SB)
2. Transgressive Surface (TS)
3. Maximum Flooding Surface (MFS)

The sequence boundary occurs at the base of the LST, or where absent at the base of the TST. Sequence boundaries are unconformities and correlative conformities associated with subaerial erosion and in some places correlative marine erosion surfaces (Van Wagoner et al. 1990). A basinward shift in lithofacies is usually found above sequence boundaries. Sequence boundaries are typically interpreted in well logs where evidence exists for an abrupt fall in gamma-ray counts related to a sharp lithological change. A common example of an SB in the upper McNamara Group is shallow-marine sandstones abruptly overlying shales and siltstones. In many cases, the gamma-ray log trend immediately beneath a sequence boundary is progradational, indicating an underlying shoaling and coarsening-upwards event within a HST. The gamma-ray trend above a sequence boundary is progradational–aggradational if a LST is present, or retrogradational if immediately overlain by a TST. Seismic sequence boundaries are identified by terminations of seismic reflectors through either onlap and/or truncation.

The transgressive surface defines the top of the LST and marks the time of initial significant marine flooding across the shelf, platform or ramp (Van Wagoner et al. 1990). The TS passes shorewards into the lowest ravinement surface, which is commonly superimposed on the SB over much of the transgressed shelf. The ravinement surface is only preserved as a discrete surface at the base of the TST above the fill of incised fluvial and estuarine channels. Transgressive surfaces are indicated in gamma-ray logs by a change from overall aggradation or progradation to retrogradation, typically accompanied by a change to finer-grained facies. In seismic profiles, the transgressive surface is identified as the major onlap surface. A marine flooding surface shows evidence of an abrupt increase in water depth, commonly accompanied by minor submarine erosion or non-deposition (Van Wagoner et al. 1990). Marine flooding surfaces are usually interpreted where gamma-ray values suddenly increase above a cleaning-up trend.

The maximum flooding surface marks the time of maximum rate of increase in accommodation. On seismic sections it coincides with the downlap surface which marks the switch from retrogradational trends to aggradational and progradational trends. In well logs, where higher resolution is possible, the MFS occurs within the condensed section (Loutit et al. 1988). The condensed section is usually identified as a shale-prone, organic-rich interval with elevated gamma-ray counts. High gamma-ray readings are commonly due to anomalously high uranium and thorium contents associated with organic matter or mineralised hardgrounds containing authigenic manganese and phosphate. In outcrops the exact position of an MFS is commonly difficult to pick, but it is

interpreted where the deepest-water facies occur (often in conjunction with a peak in the gamma-ray log at the top of a retrogradational trend).

### **Scales of Observation and Orders of Cyclicity**

Because tectonic cycles of subsidence and uplift, and eustatic cycles of sea level change operate over different time periods, sequences can be classified in terms of their order of duration (Vail et al. 1977; Emery & Myers 1996). Each depositional sequence is bounded top and bottom by an unconformity surface or correlative conformity and the age differences between these surfaces provide a maximum duration for the event (tectonic or eustatic) controlling the creation or destruction of space. A number of authors (e.g. Van Wagoner et al. 1990; Emery & Myers 1996) have classified sequences into a number of orders depending on their duration. The largest is the long-term continental encroachment cycle with duration in excess of 50 Ma; this is called a first-order cycle. There are probably two of these "supercontinent cycles" in the Phanerozoic. The next scale down is the second-order cycle (supersequence) of 3-50 Ma in duration. This is the scale at which we are proposing the new, supersequence subdivisions of the Proterozoic succession in the NABRE area. The next scale down is the third-order cycle (sequence) of 1-5 Ma in duration. Cycles of this scale are well resolved in seismic data, can be recognised in outcrop sections, and are considered as the foundation units of sequence stratigraphy (Emery & Myers 1996).

Most NABRE supersequences are able to be subdivided into third-order sequences. In areas of good control, third-order sequences can be further subdivided into fourth-order cycles (0.1-1 Ma duration) and even fifth-order cycles (less than 100,000 years duration). Such high-order, small-scale cycles comprise the parasequences/parasequence sets described above. There is no consensus regarding the principal driving mechanism behind all the cycles of different orders. At the larger scales (1st and 2nd order) tectonism is usually regarded as the principal driving mechanism (Emery & Myers 1996). However, Vail et al. (1991) consider glacio-eustatic fluctuations as the principal driving force behind 3rd to 5th order cycles. Whereas others (e.g. Cloetingh 1988; Cloetingh et al. 1985) believe that tectonism may still be a significant driving mechanism. In the Isa Superbasin there is apparently a close relationship between inflections on the APWP (which represent significant changes in the direction of movement of the craton) and Supersequence boundaries. It is tempting, therefore, to see tectonic events indicated on the APWP as having a causal relationship to at least second-order sequence stratigraphic surfaces. The role of tectonism at 3rd and 4th order sequence boundaries within the NABRE area appears to be variable, and will be discussed in forthcoming papers.

The principal datasets for identifying stratigraphic sequences are seismic sections, wireline logs, core and outcrop. Seismic images are able to resolve strata to a minimum thickness of 25-50 m, depending on the velocities of the intersected strata and acquisition parameters for the survey. Wireline logs are able to identify bed thicknesses at the metre scale. Observations on drill core

and outcrop sections can be made at the centimetre scale thereby providing increased resolution of stratigraphic detail. Determining the order of stratigraphic sequences requires access to the appropriate dataset. Seismic datasets are used for the identification of 1st to 3rd order sequences. Outcrop, drill core and wireline logs are necessary for the identification of 4th and 5th order sequences, and are also important for identification of 3rd order cycles.

## Event Chart

The event chart (Southgate et al. 2000), (**Figure 3**) summarises the sequence nomenclature for the Isa Superbasin across the McArthur, Murphy, Lawn Hill, Gunpowder and Mt Isa regions. Rocks belonging to the upper McNamara Group (Shady Bore Quartzite to Lawn Hill Formation) and upper Fickling Group (Mt Les Siltstone and Doomadgee Formation) are combined to form the River, Term, Lawn, Wide and Doom Supersequences, each separated by an unconformity surface. In each Supersequence we identify third- and fourth-order sequences. Regional correlations for this stratigraphic interval are at the second- to fourth-order scales of precision; fifth-order cycles are recognised, but are not used for correlation. Second-order sequences (supersequences) have a duration of approximately 15 Ma (Page et al. 2000). Third-order sequences (e.g. River 1 and River 2) have a duration of several million years, and fourth-order sequences (e.g. River 1.1-River 1.3) have a probable duration less than 1 million years. Using this method of classification, supersequences are typically in excess of a thousand metres thick, third-order sequences in excess several hundred metres thick, and fourth-order sequences typically 50-100 m thick.

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**NABRE  
project  
area**

**McARTHUR  
BASIN**

***Northern  
Lawn Hill  
Platform***

**MT ISA  
INLIER**

WA

SA

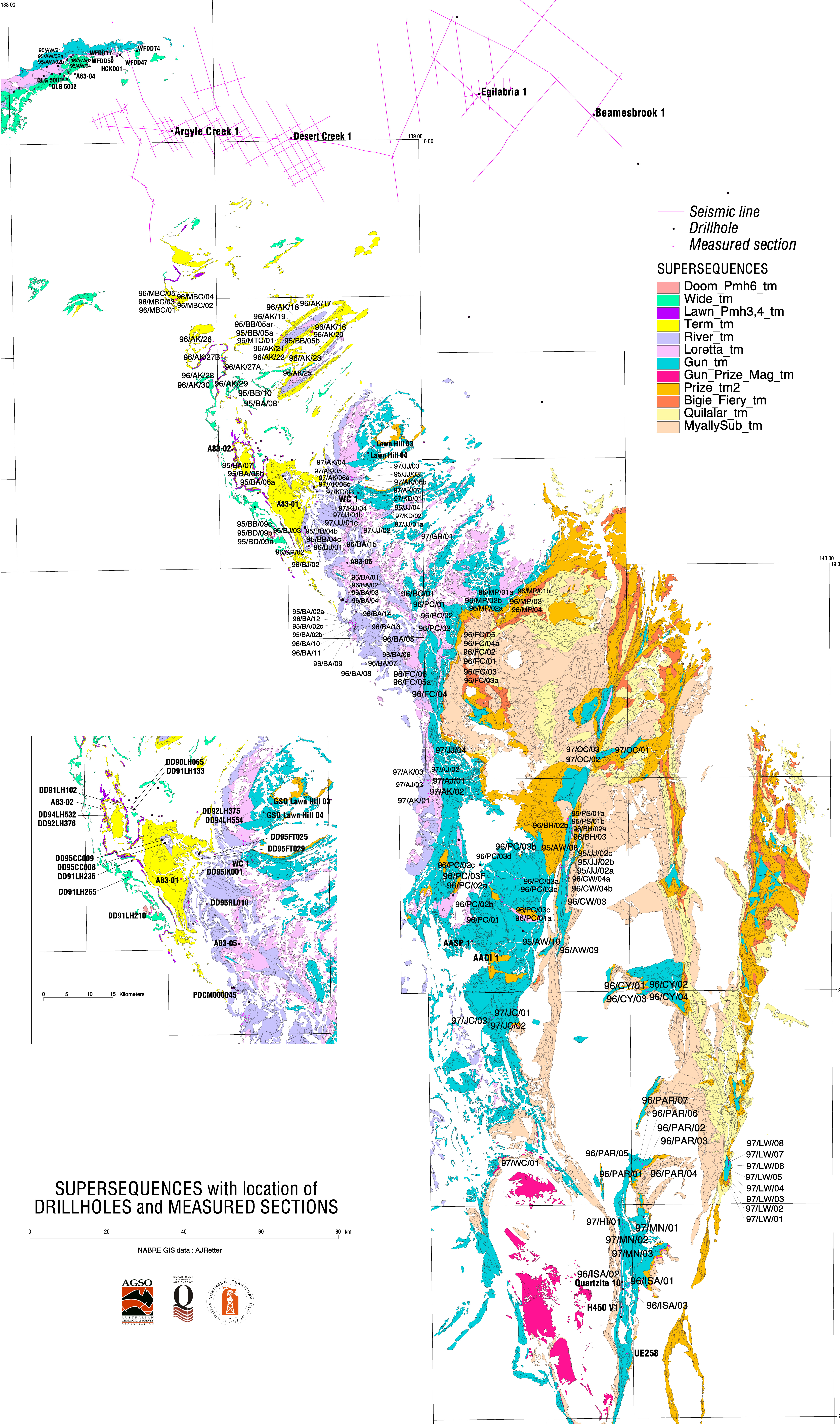
QLD

NSW

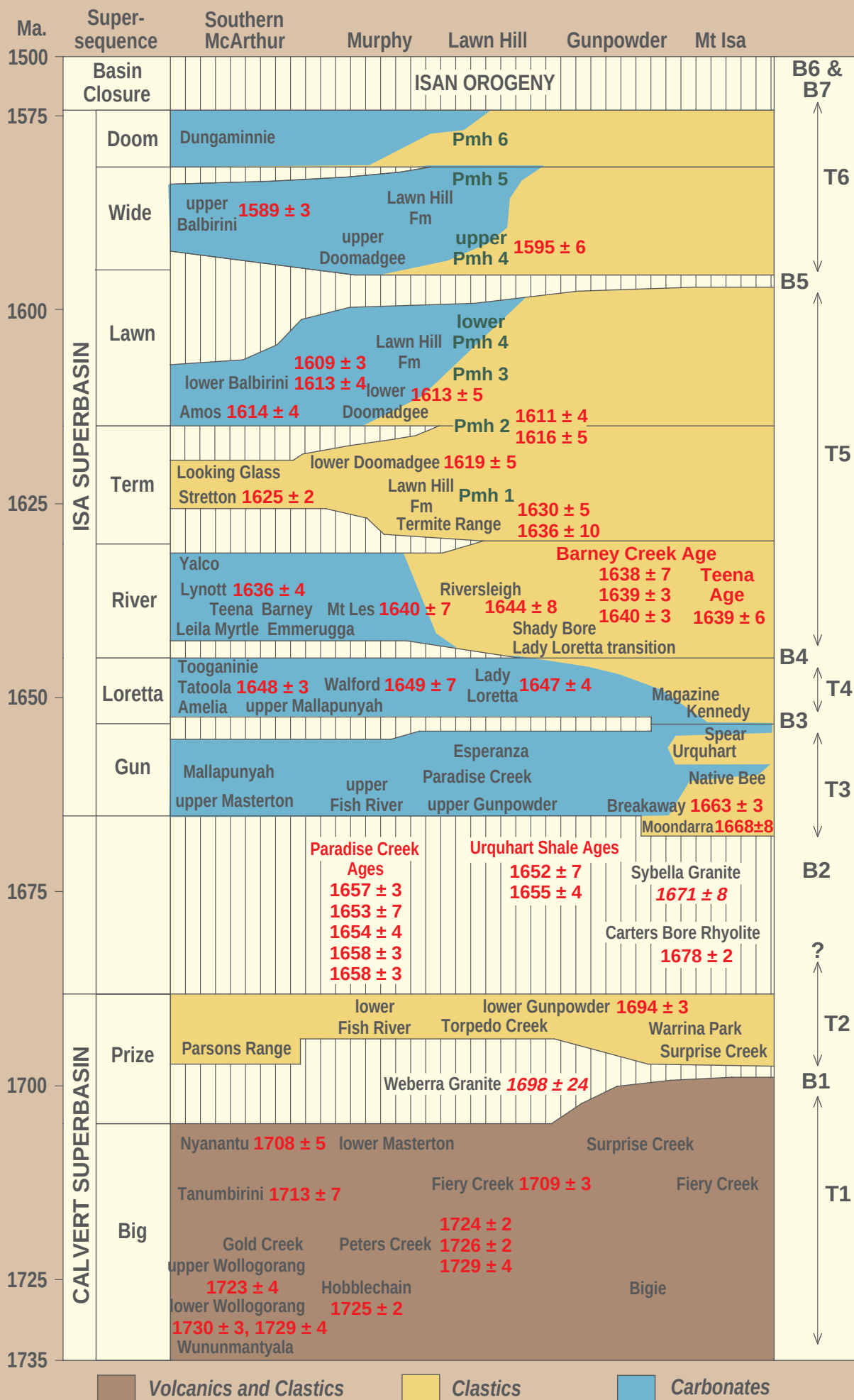
ACT

**Location Map**









| Table 2 - GEOLOG FILES and POSTSCRIPT FILES FOR OUTCROP SECTIONS and DRILL HOLES |          |                          |                          |                 |                          |
|----------------------------------------------------------------------------------|----------|--------------------------|--------------------------|-----------------|--------------------------|
| GROUP                                                                            | Thick(m) | Files for viewing with   | Files for Plotting       |                 |                          |
| McNamara                                                                         |          | Report AGSO 1999/15      | Report AGSO 1999/15      |                 |                          |
| Single Section                                                                   |          | 1:1000                   | 1:1000                   | 1:2000          | 1:4000                   |
| Silver King                                                                      | 65       | Silver King              | Silver King              | No              | Silver King              |
| Lawn Hill Creek                                                                  | 95       | Lawn Hill Creek          | Lawn Hill Creek          | No              | Lawn Hill Creek          |
| Cattle Creek                                                                     | 138      | Cattle Creek             | Cattle Creek             | No              | Cattle Creek             |
| Kamarga East                                                                     | 143      | Kamarga East             | Kamarga East             | No              | Kamarga East             |
| Twelve Mile Tank Road                                                            | 285      | Twelve Mile Tank Road    | Twelve Mile Tank Road    | No              | Twelve Mile Tank Road    |
| Edith Ranges North                                                               | 135      | Edith Ranges North       | Edith Ranges North       | No              | Edith Ranges North       |
| Widdallion Creek                                                                 | 355      | Widdallion Creek         | Widdallion Creek         | No              | Widdallion Creek         |
| Flaggy Hill                                                                      | 35       | Flaggy Hill              | Flaggy Hill              | No              | Flaggy Hill              |
| O'Shannassy River                                                                | 450      | O'Shannassy River        | O'Shannassy River        | No              | O'Shannassy River        |
| O'Shannassy River North                                                          | 250      | O'Shannassy River North  | O'Shannassy River North  | No              | O'Shannassy River North  |
| Shady Gully                                                                      | 86       | Shady Gully              | Shady Gully              | No              | Shady Gully              |
| Thorntonia South                                                                 | 241      | Thorntonia South         | Thorntonia South         | No              | Thorntonia South         |
| White Cliffs                                                                     | 51       | White Cliffs             | White Cliffs             | No              | White Cliffs             |
| Kamarga Hill                                                                     | 75       | Kamarga Hill             | Kamarga Hill             | No              | Kamarga Hill             |
| Brenda Creek                                                                     | 1055     | Brenda Creek             | Brenda Creek             | No              | Brenda Creek             |
| Freemans Creek Northeast                                                         | 422      | Freemans Creek Northeast | Freemans Creek Northeast | No              | Freemans Creek Northeast |
| Composite Section                                                                | Thick(m) | 1:1000                   | 1:1000                   | 1:2000          | 1:4000                   |
| Twin Hills                                                                       | 490      | Twin Hills               | Twin Hills               | No              | Twin Hills               |
| Mended Hill South                                                                | 227      | Mended Hill South        | Mended Hill South        | No              | Mended Hill South        |
| Lilydale Spring South                                                            | 410      | Lilydale Spring South    | Lilydale Spring South    | No              | Lilydale Spring South    |
| Jenny Creek                                                                      | 516      | Jenny Creek              | Jenny Creek              | No              | Jenny Creek              |
| Mount Caroline South                                                             | 915      | Mount Caroline South     | Mount Caroline South     | No              | Mount Caroline South     |
| Widdallion Creek North                                                           | 57       | Widdallion Creek North   | Widdallion Creek North   | No              | Widdallion Creek North   |
| Gorge Creek                                                                      | 800      | Gorge Creek              | Gorge Creek              | No              | Gorge Creek              |
| Freemans Creek                                                                   | 1428     | Freemans Creek           | Freemans Creek           | No              | Freemans Creek           |
| Grevillea South                                                                  | 627      | Grevillea South          | Grevillea South          | No              | Grevillea South          |
| Victor Creek Bore                                                                | 1088     | Victor Creek Bore        | Victor Creek Bore        | No              | Victor Creek Bore        |
| Police Creek 1                                                                   | 1403     | Police Creek 1           | Police Creek 1           | No              | Police Creek 1           |
| Moody Creek                                                                      | 812      | Moody Creek              | Moody Creek              | No              | Moody Creek              |
| Kamarga                                                                          | 870      | Kamarga                  | Kamarga                  | No              | Kamarga                  |
| Mount Caroline                                                                   | 1280     | Mount Caroline           | Mount Caroline           | No              | Mount Caroline           |
| Musselbrook Creek                                                                | 1535     | Musselbrook Creek        | Musselbrook Creek        | No              | Musselbrook Creek        |
| Riversleigh Tank                                                                 | 1932     | Riversleigh Tank         | Riversleigh Tank         | No              | Riversleigh Tank         |
| Thorntonia 1                                                                     | 1130     | Thorntonia 1             | Thorntonia 1             | No              | Thorntonia 1             |
| Drillhole                                                                        | Thick(m) | 1:1000                   | 1:1000                   | 1:2000          | 1:4000                   |
| Aberfoyle PDCM000045                                                             | 501      | Aberfoyle PDCM000045     | Aberfoyle PDCM000045     | No              | Aberfoyle PDCM000045     |
| Amoco 83-1                                                                       | 690      | Amoco 83-1               | Amoco 83-1               | No              | Amoco 83-1               |
| Amoco 83-2                                                                       | 550      | Amoco 83-2               | Amoco 83-2               | No              | Amoco 83-2               |
| CRA DD90LH065                                                                    | 272      | CRA DD90LH065            | CRA DD90LH065            | No              | CRA DD90LH065            |
| CRA DD91LH102                                                                    | 312      | CRA DD91LH102            | CRA DD91LH102            | No              | CRA DD91LH102            |
| CRA DD91LH133                                                                    | 305      | CRA DD91LH133            | CRA DD91LH133            | No              | CRA DD91LH133            |
| CRA DD91LH210                                                                    | 119      | CRA DD91LH210            | CRA DD91LH210            | No              | CRA DD91LH210            |
| CRA DD91LH235                                                                    | 195      | CRA DD91LH235            | CRA DD91LH235            | No              | CRA DD91LH235            |
| CRA DD91LH265                                                                    | 483      | CRA DD91LH265            | CRA DD91LH265            | No              | CRA DD91LH265            |
| CRA DD92LH375                                                                    | 187      | CRA DD92LH375            | CRA DD92LH375            | No              | CRA DD92LH375            |
| CRA DD92LH376                                                                    | 201      | CRA DD92LH376            | CRA DD92LH376            | No              | CRA DD92LH376            |
| CRA DD94LH532                                                                    | 197      | CRA DD94LH532            | CRA DD94LH532            | No              | CRA DD94LH532            |
| CRA DD94LH554                                                                    | 187      | CRA DD94LH554            | CRA DD94LH554            | No              | CRA DD94LH554            |
| CRA DD95CC008                                                                    | 302      | CRA DD95CC008            | CRA DD95CC008            | No              | CRA DD95CC008            |
| CRA DD95CC009                                                                    | 164      | CRA DD95CC009            | CRA DD95CC009            | No              | CRA DD95CC009            |
| CRA DD95FT025                                                                    | 185      | CRA DD95FT025            | CRA DD95FT025            | No              | CRA DD95FT025            |
| CRA DD95FT029                                                                    | 184      | CRA DD95FT029            | CRA DD95FT029            | No              | CRA DD95FT029            |
| CRA DD95IK001                                                                    | 174      | CRA DD95IK001            | CRA DD95IK001            | No              | CRA DD95IK001            |
| CRA DD95RL010                                                                    | 350      | CRA DD95RL010            | CRA DD95RL010            | No              | CRA DD95RL010            |
| GROUP                                                                            | Thick(m) | Files for viewing with   | Files for Plotting       |                 |                          |
| Fickling                                                                         |          | Report AGSO 1999/15      | Report AGSO 1999/15      |                 |                          |
| Compositee Section                                                               |          | 1:1000                   | 1:1000                   | 1:2000          | 1:4000                   |
| Wire Creek                                                                       | 765      | Wire Creek               | Wire Creek               | No              | Wire Creek               |
| Drillhole                                                                        | Thick(m) | 1:1000                   | 1:1000                   | 1:2000          | 1:4000                   |
| Argyle Creek #1                                                                  | 1680     | Argyle Creek #1          | Argyle Creek #1          | Argyle Creek #1 | Argyle Creek #1          |
| Beamesbrook #1                                                                   | 1392     | Beamesbrook #1           | Beamesbrook #1           | Beamesbrook #1  | No                       |
| Desert Creek #1                                                                  | 2351     | Desert Creek #1          | Desert Creek #1          | Desert Creek #1 | Desert Creek #1          |
| Egilabria #1                                                                     | 1846     | Egilabria #1             | Egilabria #1             | Egilabria #1    | Egilabria #1             |
| Amoco 83-4                                                                       | 598      | Amoco 83-4               | Amoco 83-4               | No              | Amoco 83-4               |
| Elf-Aquitane QLG 5001                                                            | 282      | Elf-Aquitane QLG 5001    | Elf-Aquitane QLG 5001    | No              | Elf-Aquitane QLG 5001    |
| Elf-Aquitane QLG 5002                                                            | 262      | Elf-Aquitane QLG 5002    | Elf-Aquitane QLG 5002    | No              | Elf-Aquitane QLG 5002    |
| WMC HCKD01                                                                       | 595      | WMC HCKD01               | WMC HCKD01               | No              | WMC HCKD01               |
| WFDD17                                                                           | 640      | WFDD17                   | WFDD17                   | No              | WFDD17                   |
| WFDD47                                                                           | 328      | WFDD47                   | WFDD47                   | No              | WFDD47                   |
| WFDD59                                                                           | 602      | WFDD59                   | WFDD59                   | No              | WFDD59                   |
| WFDD74                                                                           | 350      | WFDD74                   | WFDD74                   | No              | WFDD74                   |

| Table 2 - GEOLOG FILES and POSTSCRIPT FILES FOR OUTCROP SECTIONS and DRILL HOLES (con't) |                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section Number                                                                           | Transects                                                                                                                                                                                                      |
| Transect 1                                                                               | 1:2000 Scale    transect1_2000.ps                                                                                                                                                                              |
|                                                                                          | Mount Caroline, Kamarga Hill, Kamarga, Freemans Creek Northeast, Freemans Creek, Brenda Creek, Police Creek 1, Thornton 1, Thornton South                                                                      |
| Transect 2                                                                               | 1:2000 Scale    transect2_2000.ps                                                                                                                                                                              |
|                                                                                          | Mount Caroline, Kamarga, Freemans Creek, DDR010, Grevillea South, DDCM45, Twin Hills, O'Shannassy River North, O'Shannassy River, Victor Creek Bore, Police Creek 1, Thornton 1                                |
| Transect 3                                                                               | 1:2500 Scale    transect3_2500.ps                                                                                                                                                                              |
|                                                                                          | DD95FT25, DD95FT29, IK001, DD95CC009, DD95CC008, Amoco 83-1, Riversleigh Tank, Moody Creek, Victor Creek Bore                                                                                                  |
| Transect 4                                                                               | 1:2000 Scale    transect4_2000.ps                                                                                                                                                                              |
|                                                                                          | Musselbrook Creek, Mount Caroline, Riversleigh Tank                                                                                                                                                            |
| Transect 5                                                                               | 1:2500 Scale    transect5_2500.ps                                                                                                                                                                              |
|                                                                                          | Jenny Creek, Mount Caroline South, Twelve Mile Tank Road, DD94LH554, Widdallion Creek North, Widdallion Creek, Cattle Creek, Lawn Hill Creek, Silver King, DD92LH376, Mended Hill South, Amoco 83-2, DD91LH235 |
| Transect 6                                                                               | 1:2000 Scale    transect6_2000.ps                                                                                                                                                                              |
|                                                                                          | Desert Creek 1, Beamesbrook 1, Gorge Creek, DD90LH065, DD91LH133, DD91LH102, DD92LH375, DD94LH532, DD92LH376, DD91LH235, DD91LH265, Lilydale Springs South, DD91LH210                                          |
| Transect 7                                                                               | 1:5000 Scale    transect7_5000.ps                                                                                                                                                                              |
|                                                                                          | Argyle Creek 1, Desert Creek 1, Egilabria 1, Beamesbrook 1                                                                                                                                                     |
| Transect 8                                                                               | 1:5000 Scale    transect8_5000.ps                                                                                                                                                                              |
|                                                                                          | GLQ 5002, GLQ 5001, Amoco 83-4, WFDD17, WFDD47, WFDD74                                                                                                                                                         |



| JANUOE     | LENGTH | ORIGIN | MEASURED     | B                   | SECT | LOC                | PROVNO | PROVINCE       | GROUPNO | GROUP              | STRATO | FORMATION                                    | GEOL    | 100KM     | LONG    | LAT       | EASTING | NORTHING | MAG | ZONE | BASE    | TOR     |
|------------|--------|--------|--------------|---------------------|------|--------------------|--------|----------------|---------|--------------------|--------|----------------------------------------------|---------|-----------|---------|-----------|---------|----------|-----|------|---------|---------|
| 5 95AWJ01  | 324.5  | 324.5  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.133 | -17.7834  | 138.133 | -17.7834  | 958300  | 803400   | 54  | S    | 958300  | 803400  |
| 5 95AWJ01  | 324.5  | 325    | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.134 | -17.7849  | 138.134 | -17.7849  | 958260  | 803000   | 54  | S    | 958260  | 803000  |
| 5 95AWJ01  | 324.5  | 325    | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.135 | -17.7974  | 138.135 | -17.7974  | 958170  | 802450   | 54  | S    | 958170  | 802450  |
| 5 95AWJ01  | 324.5  | 325    | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.136 | -17.7996  | 138.136 | -17.7996  | 958160  | 802050   | 54  | S    | 958160  | 802050  |
| 6 95AWJ02  | 226.4  | 226.4  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.137 | -17.7978  | 138.137 | -17.7978  | 958050  | 802850   | 54  | S    | 958050  | 802850  |
| 6 95AWJ02  | 226.4  | 226.4  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.138 | -17.8079  | 138.138 | -17.8079  | 957950  | 802850   | 54  | S    | 957950  | 802850  |
| 9 95AWJ02  | 240    | 240    | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.137 | -17.8072  | 138.137 | -17.8072  | 958050  | 802850   | 54  | S    | 958050  | 802850  |
| 9 95AWJ02  | 124.6  | 124.6  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.136 | -17.8145  | 138.136 | -17.8145  | 958050  | 802850   | 54  | S    | 958050  | 802850  |
| 10 95AWJ03 | 124.6  | 124.6  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.140 | -17.8061  | 138.140 | -17.8061  | 957750  | 802850   | 54  | S    | 957750  | 802850  |
| 11 95AWJ03 | 124.6  | 124.6  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.152 | -17.81029 | 138.152 | -17.81029 | 958100  | 802850   | 54  | S    | 958100  | 802850  |
| 12 95AWJ03 | 130.8  | 130.8  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.149 | -17.81158 | 138.149 | -17.81158 | 958100  | 802850   | 54  | S    | 958100  | 802850  |
| 13 95AWJ04 | 130.8  | 130.8  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.148 | -17.81385 | 138.148 | -17.81385 | 957700  | 8028100  | 54  | S    | 957700  | 8028100 |
| 14 95AWJ04 | 130.8  | 130.8  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.149 | -17.81035 | 138.149 | -17.81035 | 957800  | 8027800  | 54  | S    | 957800  | 8027800 |
| 15 95AWJ05 | 153.8  | 153.8  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.140 | -17.82056 | 138.140 | -17.82056 | 958100  | 8026350  | 54  | S    | 958100  | 8026350 |
| 17 95AWJ05 | 153.8  | 153.8  | ATW          | Wire Creek          | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Fickling Group                               | 138.140 | -17.83730 | 138.140 | -17.83730 | 957920  | 8025600  | 54  | S    | 957920  | 8025600 |
| 18 95AWJ06 | 174.0  | 174.0  | ATW          | Triple T Creek      | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Peters Creek Volcanics, Fish River Formation | 138.204 | -17.7830  | 138.204 | -17.7830  | 9582100 | 8031650  | 54  | S    | 9582100 | 8031650 |
| 19 95AWJ06 | 174.0  | 174.0  | ATW          | Triple T Creek      | 54   | Mount Isa Inferior | 6631   | Fickling Group | 54      | Mount Isa Inferior | 6631   | Peters Creek Volcanics, Fish River Formation | 138.203 | -17.7826  | 138.203 | -17.7826  | 9582000 | 8030650  | 54  | S    | 9582000 | 8030650 |
| 21 95AWJ07 | 268.5  | 268.5  | ATW          | Esperanza Waterhole | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.334 | -18.70730 | 139.334 | -18.70730 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 21 95AWJ07 | 268.5  | 268.5  | ATW          | Esperanza Waterhole | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.351 | -18.70184 | 139.351 | -18.70184 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 22 95AWJ08 | 170.0  | 170.0  | ATW          | Esperanza Waterhole | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.330 | -18.70812 | 139.330 | -18.70812 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 22 95AWJ08 | 170.0  | 170.0  | ATW          | Esperanza Waterhole | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.341 | -18.70770 | 139.341 | -18.70770 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 24 95AWJ09 | 412.5  | 325    | ATW          | Crocodile Creek     | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.328 | -18.89196 | 139.328 | -18.89196 | 9580000 | 7996000  | 54  | S    | 9580000 | 7996000 |
| 25 95AWJ10 | 93.0   | 93.0   | ATW          | Crocodile Creek     | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.345 | -18.99427 | 139.345 | -18.99427 | 9580000 | 7996000  | 54  | S    | 9580000 | 7996000 |
| 26 95AWJ10 | 93.0   | 93.0   | ATW          | Crocodile Creek     | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.328 | -18.88789 | 139.328 | -18.88789 | 9580000 | 7996000  | 54  | S    | 9580000 | 7996000 |
| 27 95AWJ10 | 93.0   | 93.0   | ATW          | Crocodile Creek     | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.341 | -18.89019 | 139.341 | -18.89019 | 9580000 | 7996000  | 54  | S    | 9580000 | 7996000 |
| 28 95AWJ11 | 225.8  | 225.8  | ATW          | Bar Hole            | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.349 | -19.59173 | 139.349 | -19.59173 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 29 95AWJ11 | 225.8  | 225.8  | ATW          | Bar Hole            | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.351 | -19.59176 | 139.351 | -19.59176 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 30 95AWJ12 | 50.0   | 50.0   | ATW          | Bar Hole            | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.348 | -19.59491 | 139.348 | -19.59491 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 31 95BA02A | 22.5   | 324    | BB & AK      | Riversleigh         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.825 | -19.66493 | 138.825 | -19.66493 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 32 95BA02A | 22.5   | 324    | BB & AK      | Riversleigh         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.828 | -18.12597 | 138.828 | -18.12597 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 34 95BA02A | 16.6   | 324    | BB & AK      | Riversleigh         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.818 | -19.13026 | 138.818 | -19.13026 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 34 95BA02B | 16.6   | 324    | BB & AK      | Riversleigh         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.819 | -19.13026 | 138.819 | -19.13026 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 35 95BA02B | 16.6   | 324    | BB & AK      | Riversleigh         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.816 | -19.12568 | 138.816 | -19.12568 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 35 95BA02C | 16.6   | 324    | BB & AK      | Riversleigh         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.819 | -19.13026 | 138.819 | -19.13026 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 37 95BA02C | 73.5   | 324    | BB & AK      | Riversleigh         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.816 | -19.13026 | 138.816 | -19.13026 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 38 95BA02A | 52.5   | 324    | BB & AK & JD | Mended Hill         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.615 | -18.78149 | 138.615 | -18.78149 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 39 95BA02A | 52.5   | 324    | BB & AK & JD | Mended Hill         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.617 | -18.78084 | 138.617 | -18.78084 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 40 95BA02B | 20.0   | 324    | BB & AK & JD | Mended Hill         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.615 | -18.77907 | 138.615 | -18.77907 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 40 95BA02B | 20.0   | 324    | BB & AK & JD | Mended Hill         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.617 | -18.77907 | 138.617 | -18.77907 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 42 95BA07  | 64.5   | 324    | BB & AK & JD | Silver King         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.625 | -18.74668 | 139.625 | -18.74668 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 43 95BA07  | 64.5   | 324    | BB & AK & JD | Silver King         | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.625 | -18.74668 | 139.625 | -18.74668 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 45 95BA08  | 34.0   | 324    | BB & AK & JD | Lawn Hill Creek     | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.569 | -18.60455 | 139.569 | -18.60455 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 45 95BA08  | 34.0   | 324    | BB & AK & JD | Lawn Hill Creek     | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 139.569 | -18.60455 | 139.569 | -18.60455 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 46 95BB04  | 98.0   | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 46 95BB04  | 98.0   | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 46 95BB04  | 117.0  | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 46 95BB04  | 117.0  | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 50 95BB04  | 117.0  | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 51 95BB04  | 117.0  | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 51 95BB04  | 117.0  | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 53 95BB04C | 53.0   | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 53 95BB04C | 53.0   | 324    | BB & B       | Temple Range South  | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.569 | -18.90556 | 138.569 | -18.90556 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 55 95BB05A | 54.0   | 324    | BB & B       | McCarline           | 54   | Mount Isa Inferior | 15175  | McNamara Group | 54      | Mount Isa Inferior | 15175  | McNamara Group                               | 138.615 | -18.45454 | 138.615 | -18.45454 | 9580000 | 7952000  | 54  | S    | 9580000 | 7952000 |
| 55 95BB05A | 54     |        |              |                     |      |                    |        |                |         |                    |        |                                              |         |           |         |           |         |          |     |      |         |         |

|              |        |                  |                     |                     |                      |                                                                           |                        |          |           |         |         |      |
|--------------|--------|------------------|---------------------|---------------------|----------------------|---------------------------------------------------------------------------|------------------------|----------|-----------|---------|---------|------|
| 144 96/AK/30 | 169.5  | 195 AK           | Gorge Creek         | 54 Mount Isa Inlier | 11575 McNamara Group | 10261 Lawn Hill Formation                                                 | Constance Range Region | 138.4818 | -18.56092 | 0234203 | 7945887 | 54 B |
| 145 96/AK/30 | 169.5  | 195 AK           | Gorge Creek         | 54 Mount Isa Inlier | 11575 McNamara Group | 10261 Lawn Hill Formation                                                 | Constance Range Region | 138.4795 | -18.56076 | 022964  | 7945902 | 54 T |
| 146 96/AK/31 | 355.5  | 195 AK           | Widdall Creek       | 54 Mount Isa Inlier | 11575 McNamara Group | 10261 Lawn Hill Formation                                                 | Lawn Hill Region       | 138.5016 | -18.57522 | 0226320 | 7943890 | 54 B |
| 147 96/AK/31 | 355.5  | 195 AK           | Widdall Creek       | 54 Mount Isa Inlier | 11575 McNamara Group | 10261 Lawn Hill Formation                                                 | Lawn Hill Region       | 138.4980 | -18.58127 | 0225943 | 7943658 | 54 T |
| 148 96/A/01  | 132.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Shady Bore Quartzite, Riversleigh siltstone                         | Lawn Hill Region       | 138.8119 | -19.07567 | 0269766 | 7889595 | 54 B |
| 149 96/A/01  | 132.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Shady Bore Quartzite, Riversleigh siltstone                         | Lawn Hill Region       | 138.8103 | -19.07872 | 0269956 | 7889015 | 54 T |
| 150 96/A/02  | 238.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8115 | -19.07975 | 0269726 | 7888903 | 54 B |
| 151 96/A/02  | 238.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8094 | -19.08234 | 0269925 | 7888613 | 54 T |
| 152 96/A/03  | 348.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8118 | -19.08131 | 0269761 | 7888731 | 54 B |
| 153 96/A/03  | 348.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8087 | -19.08627 | 0269439 | 7888178 | 54 T |
| 154 96/A/04  | 123.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8098 | -19.08655 | 0269560 | 7888148 | 54 B |
| 155 96/A/04  | 123.0  | 324 BB & AK      | Sweet Bee Valley    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8090 | -19.08828 | 0269470 | 7887955 | 54 T |
| 156 96/A/05  | 450.0  | 324 BB & AK      | Shady Bore Dome     | 54 Mount Isa Inlier | 11575 McNamara Group | 11575 Shady Bore Quartzite, Riversleigh siltstone                         | Lawn Hill Region       | 138.8216 | -19.12955 | 0271910 | 7883416 | 54 B |
| 157 96/A/05  | 450.0  | 324 BB & AK      | Shady Bore Dome     | 54 Mount Isa Inlier | 11575 McNamara Group | 11575 Shady Bore Quartzite, Riversleigh siltstone                         | Lawn Hill Region       | 138.8242 | -19.13582 | 0271141 | 7882712 | 54 T |
| 158 96/A/06  | 87.0   | 324 BB & AK      | Boulder Roll Valley | 54 Mount Isa Inlier | 11575 McNamara Group | 16787 Shady Bore Quartzite                                                | Lawn Hill Region       | 138.8310 | -19.13380 | 0271856 | 7882945 | 54 B |
| 159 96/A/06  | 87.0   | 324 BB & AK      | Boulder Roll Valley | 54 Mount Isa Inlier | 11575 McNamara Group | 16787 Shady Bore Quartzite                                                | Lawn Hill Region       | 138.8315 | -19.13350 | 0271855 | 7882978 | 54 T |
| 160 96/A/07  | 85.5   | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8316 | -19.13669 | 0271916 | 7882625 | 54 B |
| 161 96/A/07  | 85.5   | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8322 | -19.13796 | 0272088 | 7882498 | 54 T |
| 162 96/A/08  | 229.5  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8290 | -19.14057 | 0271649 | 7882192 | 54 B |
| 163 96/A/08  | 229.5  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8285 | -19.14168 | 0271595 | 7882069 | 54 T |
| 164 96/A/09  | 385.0  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8241 | -19.13946 | 0271137 | 7882309 | 54 B |
| 165 96/A/09  | 385.0  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8176 | -19.14220 | 0270452 | 7881997 | 54 T |
| 166 96/A/10  | 202.5  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8189 | -19.14466 | 0270595 | 7881726 | 54 B |
| 167 96/A/10  | 202.5  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8160 | -19.14455 | 0270286 | 7881735 | 54 T |
| 168 96/A/11  | 312.0  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8159 | -19.14703 | 0270285 | 7881460 | 54 B |
| 169 96/A/11  | 312.0  | 324 BB & AK      | Victor Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8114 | -19.14795 | 0269906 | 7881352 | 54 T |
| 170 96/A/12  | 220.5  | 324 BB & AK      | Dead Horse Gully    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8196 | -19.12658 | 0270642 | 7883507 | 54 B |
| 171 96/A/12  | 220.5  | 324 BB & AK      | Dead Horse Gully    | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8152 | -19.13087 | 0270185 | 7883248 | 54 T |
| 172 96/A/13  | 36.0   | 324 BB & AK      | Shady Bore Dome     | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8237 | -19.13300 | 0271078 | 7883024 | 54 B |
| 173 96/A/13  | 36.0   | 324 BB & AK      | Shady Bore Dome     | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8242 | -19.13384 | 0271138 | 7882931 | 54 T |
| 174 96/A/14  | 250.5  | 324 BB & AK      | The Knobs           | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8235 | -19.13034 | 0271062 | 7883318 | 54 B |
| 175 96/A/14  | 250.5  | 324 BB & AK      | The Knobs           | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.8215 | -19.13208 | 0270849 | 7882780 | 54 T |
| 176 96/A/15  | 1428.0 | 195 BB & AK & JJ | Freemans Creek      | 54 Mount Isa Inlier | 11575 McNamara Group | 11575 Lady Loretta Formation, Riversleigh Siltstone, Shady Bore Quartzite | Lawn Hill Region       | 138.8108 | -18.93790 | 0269459 | 7904607 | 54 B |
| 177 96/A/15  | 1428.0 | 195 BB & AK & JJ | Freemans Creek      | 54 Mount Isa Inlier | 11575 McNamara Group | 11575 Lady Loretta Formation, Riversleigh Siltstone, Shady Bore Quartzite | Lawn Hill Region       | 138.8270 | -18.94049 | 0271170 | 7904551 | 54 T |
| 178 96/B/101 | 380.8  | 324 BB & JD      | Little Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.7285 | -18.94496 | 0260798 | 7903715 | 54 B |
| 179 96/B/101 | 380.8  | 324 BB & JD      | Little Creek        | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.7258 | -18.94629 | 0260510 | 7903565 | 54 T |
| 180 96/B/102 | 552.0  | 324 BB & JD      | North Little Creek  | 54 Mount Isa Inlier | 11575 McNamara Group | 24472 Riversleigh Siltstone                                               | Lawn Hill Region       | 138.7257 | -18.94236 | 0260550 | 7904000 | 54 B |

| dh_id                | dh_company        | info | year | tot_metres | core_size  | av. az | dip | core_a | core_v | core_from | core_to | easting | northing | lat       | long      | loc_method    | 100k_map | group                                                                         | stratum                                                    | formation         | member                                                                                                                         | event                 | accom_package    |         |
|----------------------|-------------------|------|------|------------|------------|--------|-----|--------|--------|-----------|---------|---------|----------|-----------|-----------|---------------|----------|-------------------------------------------------------------------------------|------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------|---------|
| Amoco DDH 8214       | Amoco             | n    | 1982 | 541.00     |            |        |     |        |        |           |         | 513000  | 828670   | -15.46964 | 135.12121 |               | 93       | Towns                                                                         | Nathan Group                                               | 26072             | Bathini Dolomite, Smythe Sandstone, Maltapanyah Formation                                                                      |                       |                  |         |
| Amoco DDH 8215       | Amoco             | n    | 1982 | 455.50     |            |        |     |        |        |           |         | 603700  | 820600   | -16.22251 | 135.97027 |               | 93       | Batten                                                                        | McArthur Group                                             | 10891             | Lynott Formation                                                                                                               |                       |                  |         |
| Amoco DDH 8216       | Amoco             | n    | 1982 | 301.10     |            |        |     |        |        |           |         | 613170  | 815170   | -16.71770 | 136.23721 |               | 93       | Lynott Formation, Sireton Sandstone, Yalco Formation, Looking Glass Formation | McArthur Group                                             | 11512             |                                                                                                                                |                       |                  |         |
| Amoco DDH 8217       | Amoco             | n    | 1982 | 498.60     |            |        |     |        |        |           |         | 606400  | 814450   | -16.78007 | 135.98639 |               | 93       | Maltapanyah                                                                   | McArthur Group                                             | 11512             | Lynott Formation, Sireton Sandstone, Yalco Formation, Looking Glass Formation                                                  |                       |                  |         |
| Amoco DDH 8311       | Amoco             | n    | 1983 | 665.00     | HQ, NO     |        |     |        |        |           |         | 257200  | 791300   | -18.86070 | 138.09550 |               | 93       | Lawn Hill Region                                                              | McArthur Group                                             | 11512             | Termite Range Formation, Riversleigh Silstone                                                                                  |                       |                  |         |
| Amoco DDH 8312       | Amoco             | n    | 1983 | 350.00     | HQ, NO     |        |     |        |        |           |         | 239800  | 792810   | -18.72220 | 138.52550 |               | 93       | Lawn Hill Region                                                              | McArthur Group                                             | 11512             | Lawn Hill Formation, Termite Range Formation                                                                                   |                       |                  |         |
| Amoco DDH 8313       | Amoco             | n    | 1984 | 547.20     | HQ, NO, BQ |        |     |        |        |           |         | 214901  | 797407   | -18.32918 | 138.29703 |               | 93       | Lawn Hill Region                                                              | McArthur Group                                             | 11512             |                                                                                                                                |                       |                  |         |
| Amoco DDH 8314       | Amoco             | n    | 1983 | 597.60     | HQ, NO     |        |     |        |        |           |         | 199100  | 802570   | -17.83570 | 138.16122 | 7             | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | Walford Dolomite, Mount Les Silstone, Doonagade Formation                                                                      | E.F                   | 4, 5, 7          |         |
| Amoco DDH 8315       | Amoco             | n    | 1983 | 362.20     | HQ, NO     |        |     |        |        |           |         | 209800  | 798800   | -18.98848 | 138.61339 |               | 93       | Lawn Hill Region                                                              | McArthur Group                                             | 11512             | Lady Lorella Formation                                                                                                         |                       |                  |         |
| AAO 1                | Anacondra         | n    | 1976 | 345.00     | HQ, NO, BQ |        |     |        |        |           |         | 300900  | 798200   | -19.80312 | 139.17831 | co-report map | 93       | Mannmoth Mines                                                                | McManama Group                                             | 11512             | Paradise Creek Formation, Gunpowder Creek Formation                                                                            |                       |                  |         |
| AARC 1               | Anacondra         | n    | 1976 | 900.00     | HQ, NO, BQ |        |     |        |        |           |         | 315400  | 780340   | -19.85670 | 139.23710 | co-report map | 93       | Mannmoth Mines                                                                | McManama Group                                             | 11512             | Paradise Creek Formation, Gunpowder Creek Formation                                                                            |                       |                  |         |
| AASP 1               | Anacondra         | n    | 1976 | 325.50     | BQ         |        |     |        |        |           |         | 302100  | 790900   | -19.87800 | 139.10980 | co-report map | 93       | Mannmoth Mines                                                                | McManama Group                                             | 11512             | Paradise Creek Formation, Gunpowder Creek Formation                                                                            |                       |                  |         |
| Amelia 31            | Amelia            | n    | 1982 | 249.00     | HQ         |        |     |        |        |           |         | 625800  | 815900   | -16.64460 | 136.16990 |               | 93       | Glyde                                                                         | McArthur Group                                             | 1130              |                                                                                                                                |                       |                  |         |
| Amelia Basin 2       | AO (AUST) Pty Ltd | n    | 1978 |            |            |        |     |        |        |           |         | 621137  | 816280   | -16.61570 | 136.13570 |               | 93       | Glyde                                                                         | McArthur Group                                             | 1130              |                                                                                                                                |                       |                  |         |
| Amelia Basin 4       | MM                | n    | 1980 | 298.00     | NO         |        |     |        |        |           |         | 621700  | 816100   | -16.63830 | 136.14110 |               | 93       | Glyde                                                                         | McArthur Group                                             | 1130              | Tenna Dolomite, Barney Creek Formation, Reward Dolomite, Lynott Formation                                                      |                       |                  |         |
| Amelia Basin 5       | MM                | n    | 1980 | 402.00     | NO, BQ     |        |     |        |        |           |         | 622100  | 815720   | -16.65890 | 136.14590 |               | 93       | Glyde                                                                         | McArthur Group                                             | 1130              | Barney Creek Formation, Reward Dolomite, Lynott Formation                                                                      |                       |                  |         |
| Amelia Basin 6       | MM                | n    | 1980 | 334.00     | NO, BQ     |        |     |        |        |           |         | 620340  | 815850   | -16.65290 | 136.12840 |               | 93       | Glyde                                                                         | McArthur Group                                             | 1130              | Barney Creek Formation, Reward Dolomite, Lynott Formation                                                                      |                       |                  |         |
| Argyle Creek 1       | Comatco           | n    | 1992 | 1680.10    | RVC        |        |     |        |        |           |         | 212288  | 8010819  | -17.97338 | 138.39671 | 7             | 93       | Heideley Creek                                                                | Fickling Group, South Nicholson Group                      | 6631, 17123       | Walford Dolomite, Mount Les Silstone, Doonagade Formation, Constance Sandstone                                                 |                       |                  |         |
| Bachy Creek 3        | MM                | n    | 1977 | 352.70     | NO, BQ     |        |     |        |        |           |         | 603453  | 817480   | -16.50740 | 135.95940 |               | 93       | Maltapanyah                                                                   | Nathan Group                                               | 11512             | Barney Creek Formation, Reward Dolomite, Lynott Formation                                                                      | D, E, F, G, H         | 4, 5, 6, 7, 8    |         |
| BMR Bauphina Downs 3 | BMR               | n    | 1979 | 153.50     | HQ         |        |     |        |        |           |         | 586800  | 815040   | -16.63720 | 135.81390 | 16            | 93       | Maltapanyah                                                                   | Nathan Group                                               | 11512             | uppermost Bathini Dolomite                                                                                                     |                       |                  |         |
| BMR Bauphina Downs 4 | BMR               | n    | 1979 | 36.50      | HQ         |        |     |        |        |           |         | 605000  | 814570   | -16.76930 | 135.96990 | 16            | 93       | Maltapanyah                                                                   | Nathan Group                                               | 11512             | Bathini Dolomite                                                                                                               |                       |                  |         |
| BBIO 1               | WWC               | n    | 1982 | 472.30     | HQ         |        |     |        |        |           |         | 320550  | 794090   | -18.61790 | 139.28620 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 11512             | Lady Lorella Formation                                                                                                         |                       |                  |         |
| BCCLDQ589            | MM                | n    | 1988 | 11384.00   | RVC        |        |     |        |        |           |         | 303889  | 7811034  | -19.78725 | 139.18525 |               | 93       | Mannmoth Mines                                                                | McManama Group                                             | 10002             | Doonagade Formation, Narramatta Formation, Allaru Mudstone, Toolibuc Formation, Wallumbilla Formation, Gilbert River Formation |                       |                  |         |
| Beamsbrook 1         | Comatco           | n    | 1988 | 11384.00   | RVC        |        |     |        |        |           |         | 303889  | 7811034  | -19.78725 | 139.18525 |               | 93       | Westmoreland                                                                  | Fickling Group, Rolling Downs Group, Eulo Queen Group      | 6631, 16267, 6356 | Doonagade Formation, Narramatta Formation, Allaru Mudstone, Toolibuc Formation, Wallumbilla Formation, Gilbert River Formation |                       |                  |         |
| Ben Basin 2          | AO (AUST) Pty Ltd | n    | 1978 | 442.90     | NO, BQ     |        |     |        |        |           |         | 623900  | 815270   | -16.72310 | 136.98820 |               | 93       | Glyde                                                                         | McArthur Group                                             | 1130              | upper Teena Dolomite, Barney Creek Formation, Reward Dolomite, lower Lynott Formation                                          | Caaco Dolomite Member | H, I             | 7, 8, 9 |
| CA 4                 | Aberfyle          | n    | 1983 | 739.00     | HQ, NO     |        |     |        |        |           |         | 614433  | 8198303  | -18.29340 | 136.07110 |               | 93       | Bonboldia                                                                     | McArthur Group                                             | 1130              |                                                                                                                                |                       |                  |         |
| DDPSRC2008           | Rio Tinto         | n    | 1995 | 302.90     | NO         |        | 135 | 60     | 80     | 83.50     | 302.90  | 253719  | 7920608  | -18.79080 | 138.65350 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 24472             | Riversleigh Silstone                                                                                                           |                       | 5                |         |
| DDPSRC2009           | Rio Tinto         | n    | 1995 | 302.90     | NO         |        | 135 | 60     | 80     | 83.50     | 302.90  | 253719  | 7920608  | -18.79080 | 138.65350 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 24472             | Riversleigh Silstone                                                                                                           |                       | 5                |         |
| CEC10                | MM                | n    | 1970 | 359.60     |            |        |     |        |        |           |         | 184570  | 787470   | -17.89710 | 138.02370 |               | 93       | Bonboldia                                                                     | McArthur Group                                             | 1130              | Walford Dolomite, Mt Les Silstone                                                                                              | E                     | 4, 5             |         |
| DDDLH055             | CRA Century       | n    | 1990 | 394.00     | HQ, NO     |        |     |        |        |           |         | 247451  | 7930453  | -18.70130 | 138.60530 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 11575             | Termite Range Formation, Thornton Limestone                                                                                    |                       |                  |         |
| DDDLH065             | CRA Century       | n    | 1990 | 394.00     | HQ, NO     |        |     |        |        |           |         | 247451  | 7930453  | -18.70130 | 138.60530 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 11575             | Termite Range Formation, Thornton Limestone                                                                                    |                       |                  |         |
| DDDLH120             | CRA Century       | n    | 1991 | 127.00     | HQ         |        |     |        |        |           |         | 250350  | 7905350  | -18.92900 | 138.62960 | 22            | 93       | Lawn Hill Region                                                              | McManama Group                                             | 11575             | Lawn Hill Formation                                                                                                            |                       |                  |         |
| DDDLH265             | CRA Century       | n    | 1991 | 589.00     | HQ         |        |     |        |        |           |         | 250350  | 7905350  | -18.92900 | 138.62960 | 22            | 93       | Lawn Hill Region                                                              | McManama Group                                             | 11575             | Lawn Hill Formation                                                                                                            |                       |                  |         |
| DDDLH476             | CRA Century       | n    | 1992 | 228.00     | HQ         |        |     |        |        |           |         | 249978  | 7925653  | -18.74547 | 138.62010 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 11575             | Lawn Hill Formation                                                                                                            |                       |                  |         |
| DDDLH453             | CRA Century       | n    | 1992 | 275.00     | HQ         |        |     |        |        |           |         | 249978  | 7925653  | -18.74547 | 138.62010 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 11575             | Lawn Hill Formation                                                                                                            |                       |                  |         |
| Desert Creek 1       | Comatco           | n    | 1992 | 2352.00    | RVC        |        |     |        |        |           |         | 255108  | 8009036  | -17.99317 | 138.68731 | 7             | 93       | Westmoreland                                                                  | Fickling Group, Rolling Downs Group                        | 6631, 16267       | Doonagade Formation, Constance Sandstone, Allaru Mudstone, Toolibuc Formation, Wallumbilla Formation                           | E, F, G, H, I         | 4, 5, 6, 7, 8, 9 |         |
| Eglabur 1            | Comatco           | n    | 1992 | 1847.00    | RVC        |        |     |        |        |           |         | 303906  | 8020391  | -17.89554 | 139.14901 | 7             | 93       | Westmoreland                                                                  | Fickling Group, Rolling Downs Group, South Nicholson Group | 6631, 16267       | Doonagade Formation, Constance Sandstone, Allaru Mudstone, Toolibuc Formation, Wallumbilla Formation                           |                       |                  |         |
| Emu 1                | MM                | n    | 1975 | 208.00     | NO, BQ     |        |     |        |        |           |         | 617253  | 8186425  | -16.40060 | 136.09250 |               | 93       | Bonboldia                                                                     | McArthur Group                                             | 1130              | Barney Creek Formation                                                                                                         |                       |                  |         |
| Emu 11               | MM                | n    | 1975 | 729.50     | NO, BQ     |        |     |        |        |           |         | 613910  | 8186492  | -16.40060 | 136.09250 |               | 93       | Bonboldia                                                                     | McArthur Group                                             | 1130              | Barney Creek Formation, Reward Dolomite, Lynott Formation                                                                      |                       |                  |         |
| Emu 13               | MM                | n    | 1977 | 1255.00    | NO, BQ     |        |     |        |        |           |         | 616673  | 8186140  | -16.40140 | 136.09170 |               | 93       | Bonboldia                                                                     | McArthur Group                                             | 1130              | Barney Creek Formation, Reward Dolomite                                                                                        |                       |                  |         |
| Emu 4                | MM                | n    | 1978 | 709.00     | NO, BQ     |        |     |        |        |           |         | 613961  | 8186162  | -16.40110 | 136.08220 |               | 93       | Bonboldia                                                                     | McArthur Group                                             | 1130              | upper Emmungulla Dolomite, Teena Dolomite, Barney Creek Formation, Reward Dolomite                                             |                       |                  |         |
| DDPSF7025            | CRA               | n    | 1995 | 259.70     | NO         |        | 42  | 55     | 40     | 84.00     | 259.70  | 244588  | 7918228  | -18.81435 | 138.76620 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 24472             | Riversleigh Silstone                                                                                                           |                       | 5                |         |
| DDPSF7029            | CRA               | n    | 1995 | 196.50     | NO         |        | 25  | 60     | 70     | 84.00     | 196.50  | 201840  | 7917345  | -18.82139 | 138.74010 |               | 93       | Lawn Hill Region                                                              | McManama Group                                             | 24472             | Riversleigh Silstone                                                                                                           |                       | 5                |         |
| GC1                  | MM                | n    | 1990 | 300.00     |            |        |     |        |        |           |         | 191620  | 8027000  | -17.84440 | 138.09200 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              |                                                                                                                                |                       |                  |         |
| GC101                | Passmore          | n    | 1995 | 313.30     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC102                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC104                | Passmore          | n    | 1995 | 313.30     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC105                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC106                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC107                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC108                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC109                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC110                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC111                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC112                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC113                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC114                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC115                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC116                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC117                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC118                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC119                | Passmore          | n    | 1995 | 300.00     | NO         |        |     |        |        |           |         | 197200  | 8029450  | -17.80160 | 138.14380 |               | 93       | Westmoreland                                                                  | Fickling Group                                             | 6631              | MI Les Silstone, Walford Dolomite                                                                                              | E                     | 4, 5             |         |
| GC120                | Passmore          | n    | 1995 | 300.00     | NO</       |        |     |        |        |           |         |         |          |           |           |               |          |                                                                               |                                                            |                   |                                                                                                                                |                       |                  |         |



| dh_id         | dh_company   | rfid | year | tot_metres | core_size | av.azi | core_a | core_from | core_to | easting | northing | lat_apd66 | long_apd66 | loc_method | o | n  | 100k_map     | group                                                 | stratno      | formation                                                                                                | member | event | surface | accom_package |
|---------------|--------------|------|------|------------|-----------|--------|--------|-----------|---------|---------|----------|-----------|------------|------------|---|----|--------------|-------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------|--------|-------|---------|---------------|
| OLG 5002      | Auriferne    | n    | 1983 | 261.88     | NO        |        | 90     | 175.00    | 261.80  | 192580  | 802280   | -17.86040 | 138.09950  | 7          |   | 54 | Westmoreland | Fickling Group                                        | 6031         | Doomadgee Formation, Mt Les Silstone, Walkford Dolomite                                                  |        |       | E, F, G | 4, 5, 7       |
| Burketown 1   | MIU East Oil | n    | 1964 | 975.00     | ?         |        | 90     | 100.00    | 975.00  | 345237  | 8002336  | -18.06200 | 139.53770  | ?          |   | 54 | Wernadanga   | McNamara Group, Eulo Queen Group, Rolling Downs Group | 11575, 6356, | Normanton Formation, Allaru Mudstone, Toolebuc Formation, Wullumbilla Formation, Gilbert River Formation |        |       |         |               |
| Arrinyahald 1 | Comalco      | n    | 1988 | 638.00     | R/C       |        | 90     |           |         | 368720  | 7994550  | -18.13391 | 139.75905  | 7          |   | 54 | Wernadanga   | McNamara Group, Eulo Queen Group, Rolling Downs Group | 11575, 6356, | Normanton Formation, Allaru Mudstone, Toolebuc Formation, Wullumbilla Formation, Gilbert River Formation |        |       |         |               |
| GRQ B1-2      | Alnico       | n    | 1981 | 417.50     | NO, BQ    |        | 90     | 206.00    | 417.50  | 296200  | 8040450  | -17.71380 | 139.09710  | 7          |   | 54 | Westmoreland | Rolling Downs Group                                   | 16289        | Normanton Formation, Allaru Mudstone, Toolebuc Formation, Wullumbilla Formation                          |        |       |         |               |
| FB8           | MM           | n    |      | 535.00     |           |        |        |           |         | 341360  | 7718600  | -20.69729 | 139.47667  |            |   | 54 | Mount Isa    | Mount Isa Group                                       | 19001        | Unsuheri Shale                                                                                           |        |       |         |               |

location method

| LOCMETHNO | LOCMETHOD                                                  | Accuracy (m) | Preferences |
|-----------|------------------------------------------------------------|--------------|-------------|
| 0         | unknown                                                    |              |             |
| 1         | GPS observation (WGS84 - World Geodetic System 1984)       | 100          |             |
| 2         | GPS observation (AGD66 - Australian Geodetic Datum 1966)   | 100          |             |
| 3         | GPS observation (AGD84 - Australian Geodetic Datum 1984)   | 100          |             |
| 4         | GPS observation (GDA94 - Geocentric Datum Australian 1994) | 100          |             |
| 5         | astronomical observation                                   |              |             |
| 6         | surveyed from ground control                               |              |             |
| 7         | published report                                           |              |             |
| 8         | unpublished report                                         |              |             |
| 10        | non-standard topographic map                               |              |             |
| 11        | 1:25 000 topographic map                                   | 25           |             |
| 12        | 1:50 000 topographic map                                   | 50           |             |
| 13        | 1:100 000 topographic map (AMG66)                          | 100          |             |
| 14        | 1:250 000 topographic map                                  | 250          |             |
| 15        | 1:500 000 topographic map                                  | 500          |             |
| 16        | 1:1 000 000 topographic map                                | 1000         |             |
| 20        | non-standard geological map                                |              |             |
| 21        | 1:25 000 geological map                                    | 25           |             |
| 22        | 1:50 000 geological map                                    | 50           |             |
| 23        | 1:100 000 geological map (AMG66)                           | 100          |             |
| 24        | 1:250 000 geological map                                   | 250          |             |
| 25        | 1:500 000 geological map                                   | 500          |             |
| 26        | 1:1 000 000 geological map                                 | 1000         |             |
| 30        | Differential GPS - Survey quality (WGS84)                  | 1            |             |

| dh_id                | zone |
|----------------------|------|
| A82-04               | 53   |
| A82-05               | 53   |
| A82-06               | 53   |
| A82-07               | 53   |
| A83-01               | 54   |
| A83-02               | 54   |
| A83-04               | 54   |
| A83-05               | 54   |
| AADI 1               | 54   |
| AARC 1               | 54   |
| AASP 1               | 54   |
| Amelia 33            | 53   |
| Amelia Basin 2       | 53   |
| Amelia Basin 4       | 53   |
| Amelia Basin 5       | 53   |
| Amelia Basin 6       | 53   |
| Argyle Creek 1       | 54   |
| Barney 3             | 53   |
| BCK3                 | 53   |
| Bauhinia 3           | 53   |
| Bauhinia 4           | 53   |
| BBRD 1               | 54   |
| BCC1DQ5869           | 54   |
| Beamesbrook 1        | 54   |
| Bing Bong 2          | 53   |
| CA 4                 | 53   |
| DD95CC008            | 54   |
| DD95CC009            | 54   |
| CEC10                | 54   |
| DD90LH055            | 54   |
| DD90LH065            | 54   |
| DD91LH210            | 54   |
| DD91LH265            | 54   |
| DD92LH376            | 54   |
| DD94LH532            | 54   |
| Desert Creek 1       | 54   |
| Egjabria 1           | 54   |
| Emu 1                | 53   |
| Emu 11               | 53   |
| Emu 13               | 53   |
| Emu 9                | 53   |
| Emu 4                | 53   |
| DD95FT025            | 54   |
| DD95FT029            | 54   |
| GC1                  | 54   |
| GC101                | 54   |
| GC102                | 54   |
| GC104                | 54   |
| GC105                | 54   |
| GC41                 | 54   |
| GC47                 | 54   |
| GC56                 | 54   |
| GC57                 | 54   |
| GC58                 | 54   |
| GC95A                | 54   |
| GC99A                | 54   |
| GCD1                 | 54   |
| GCD2A                | 54   |
| GCD3                 | 54   |
| GCD4                 | 54   |
| Gilligans 001        | 54   |
| GRDD 1               | 54   |
| H450 V1              | 54   |
| H19/79S              | 53   |
| HCKD01               | 54   |
| I20-32s              | 53   |
| I22/55               | 53   |
| I203 ED1             | 54   |
| DD95IK001            | 54   |
| Lawn Hill 03         | 54   |
| Lawn Hill 04         | 54   |
| Lella Yard 1         | 53   |
| DD91LH235            | 54   |
| DD92LH355            | 54   |
| DD92LH375            | 54   |
| DD94LH508            | 54   |
| DD94LH539            | 54   |
| DD91LH102            | 54   |
| DD91LH133            | 54   |
| DD93LH421            | 54   |
| DD93LH432            | 54   |
| DD94LH554            | 54   |
| DD94LH556            | 54   |
| LHYD 1               | 54   |
| Lynott West 3        | 53   |
| Lynott West 4        | 53   |
| Lynott West 5        | 53   |
| McA1                 | 53   |
| McA10                | 53   |
| McA3                 | 53   |
| McA5                 | 53   |
| McA9                 | 53   |
| BMR Bauhinia Downs 1 | 53   |
| BMR McArthur River 2 | 53   |
| BMR Mt Young 2       | 53   |
| P142                 | 54   |
| P148                 | 54   |
| POLA 64              | 54   |
| Quartzite 010        | 54   |
| DD95RL010            | 54   |
| RVCRO12              | 54   |
| RVCRO13              | 54   |
| RVCRO14              | 54   |
| RVCRO19              | 54   |
| RVD 17               | 54   |
| RVD 47               | 54   |
| RVD 5                | 54   |
| Stone Axe 130        | 54   |
| Stony Creek 3        | 54   |
| UE 258               | 54   |
| Urapunga 1           | 53   |
| Urapunga 2           | 53   |
| Urapunga 3           | 53   |
| Urapunga 4           | 53   |
| Urapunga 5           | 53   |
| Urapunga 6           | 53   |
| Wearyan 1            | 53   |
| WFDD17               | 54   |
| WFDD39               | 54   |
| WFDD47               | 54   |
| WFDD59               | 54   |
| WFDD74               | 54   |
| PDCM000009           | 54   |
| PDCM000017           | 54   |
| PDCM000024           | 54   |
| PDCM000026           | 54   |
| PDCM000035           | 54   |
| PDCM000045           | 54   |
| QLG 5001             | 54   |
| QLG 5002             | 54   |
| Burketown 1          | 54   |
| Armraynald 1         | 54   |
| GRQ 81-2             | 54   |

# DRILLHOLES



McNamara Group



Fickling Group



AGSO Record 1999/15



Transects



Drill Holes



Sections



# SECTIONS

## McNAMARA GROUP



Single Sections



Composite Sections

## FICKLING GROUP



Composite Section



AGSO Record 1999/15



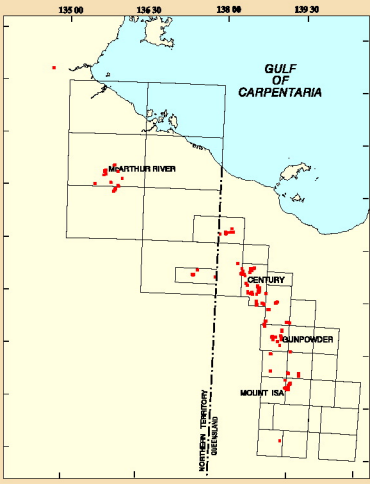
Transects



Drill Holes



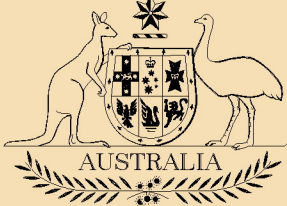
Sections



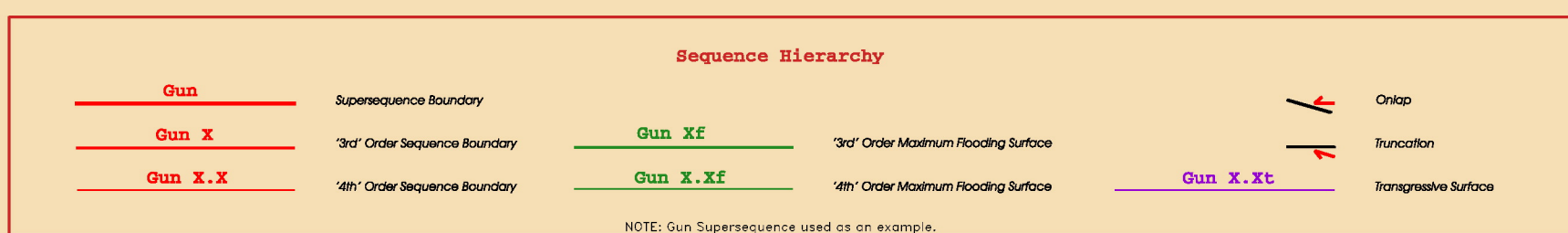
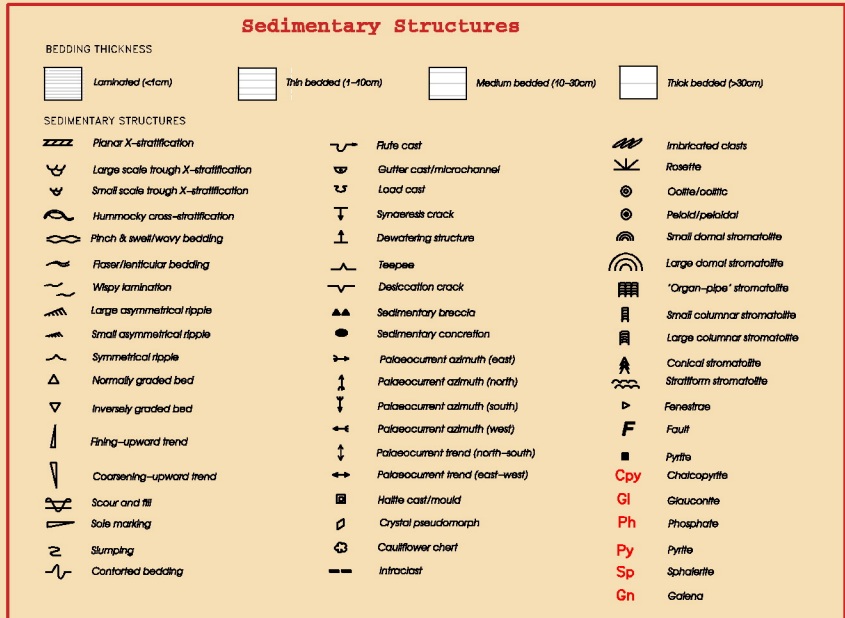
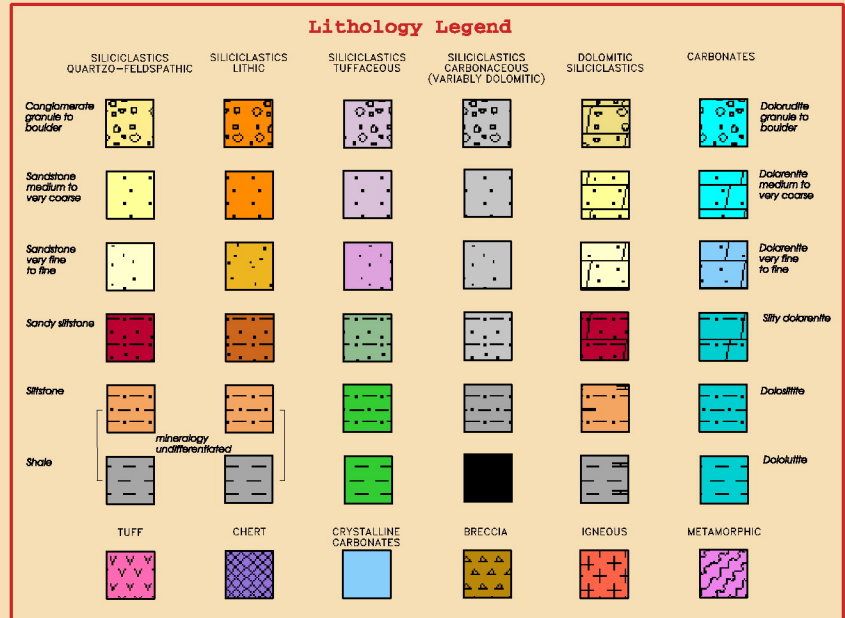
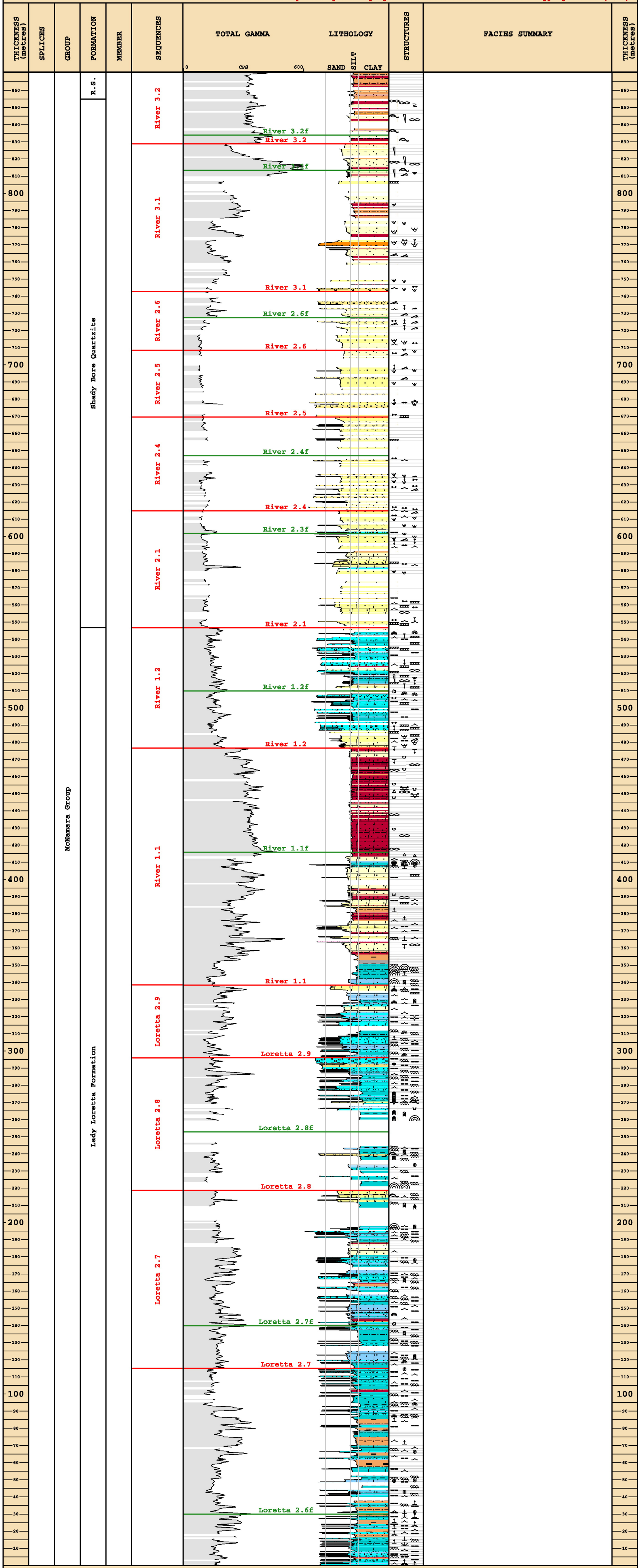
# Kamarga

97JJ-03, 97AK-04, 97AK-05, 97AK-06A, 97AK-06B, 97AK-07  
SCALE 1:1000

Easting: 270320  
Northing: 7922439  
Data type: Measured Section  
Map sheet: Lawn Hill Region 100000  
Geology: A Krassay, J Jackson, P Southgate  
Geolog compilation: K Barnett & A Krassay



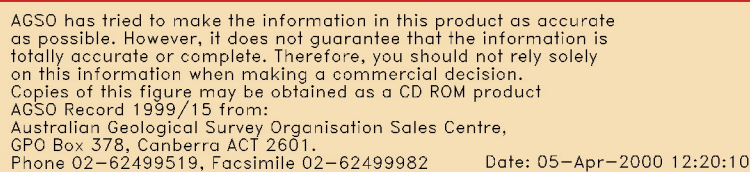
Data collected and interpreted by NABRE project for the National Geoscience Mapping Accord (NGMA)



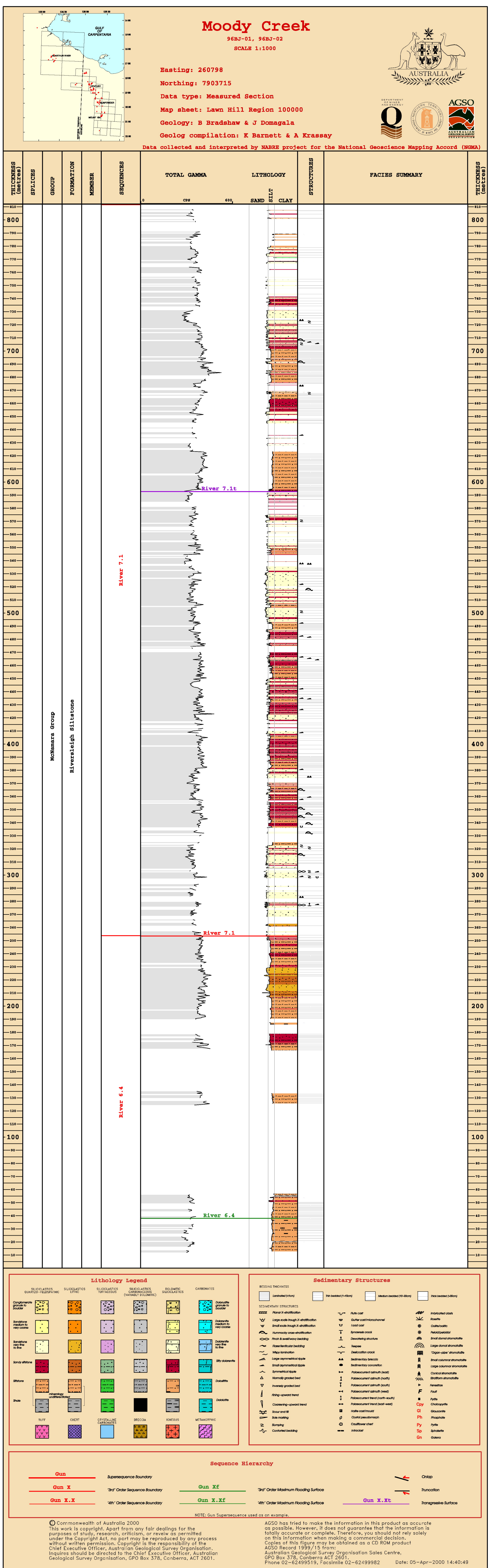
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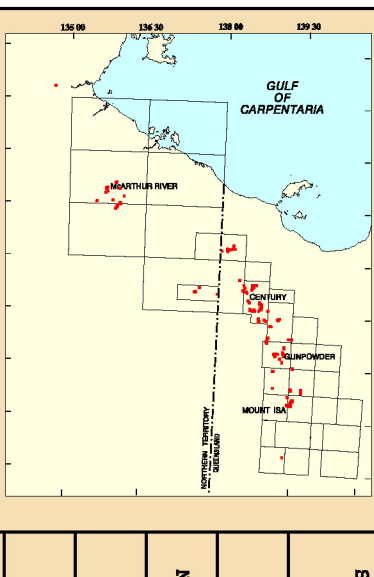












# Riversleigh Tank

95BB-04B, 95BB-04C, 96BJ-03, 96GR-03

SCALE 1:1000

Easting: 258836

Northing: 7906703

Data type: Measured Section

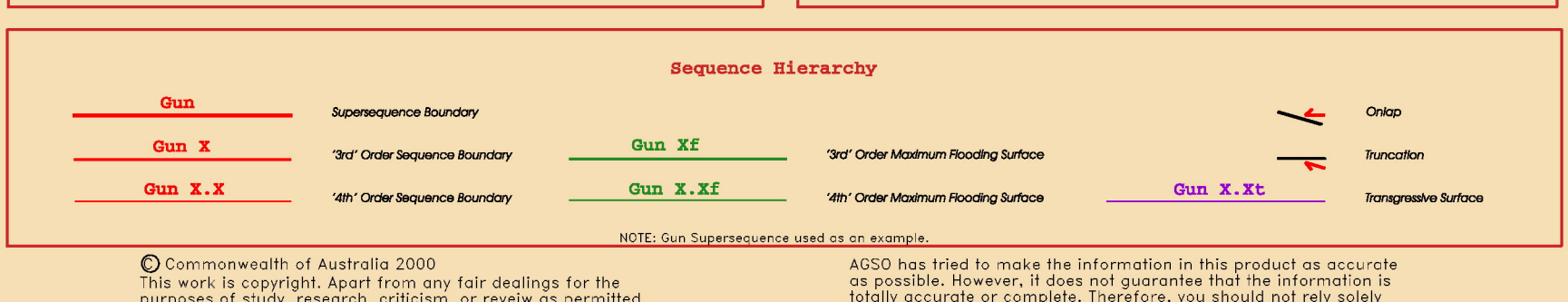
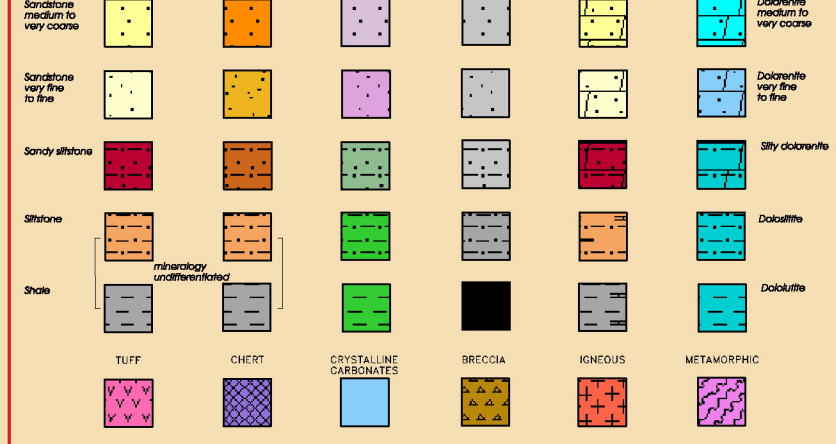
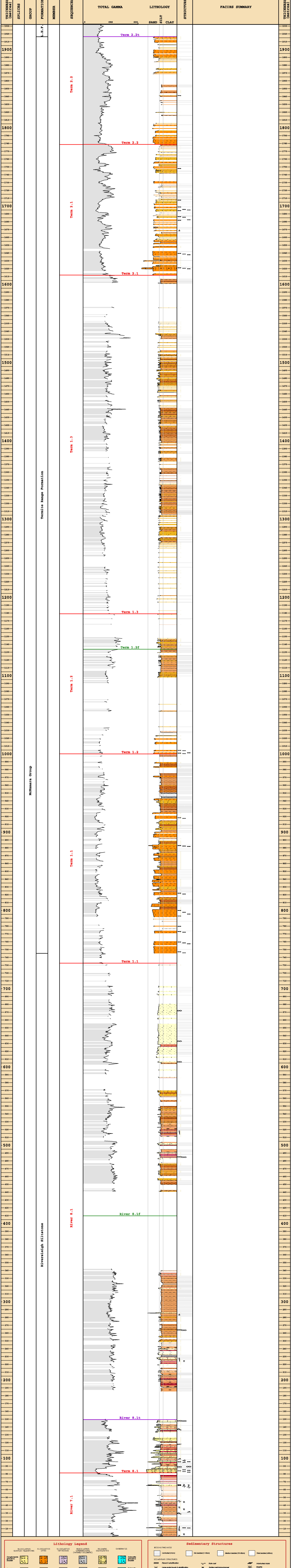
Map sheet: Lawn Hill Region 100000

Geology: B Bradshaw, J Domagala, A Krassay

Geolog compilation: K Barnett & A Krassay



Data collected and interpreted by NABRE project for the National Geoscience Mapping Accord (NGMA)



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Date: 05-Apr-2000 16:38:10



