Geochemical analysis of the McArthur and Tawallah Groups, McArthur Basin: Chemostratigraphy & palaeo-redox proxies using shales and carbonates

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GEOCHEMICAL ANALYSIS OF THE MCARTHUR AND TAWALLAH GROUPS, MCARTHUR BASIN: CHEMOSTRATIGRAPHY & PALAEO-REDOX PROXIES USING SHALES AND CARBONATES

CHEMOSTRATIGRAPHY OF THE MCARTHUR AND TAWALLAH GROUPS

ABSTRACT

The lower portion of the McArthur Basin includes the Palaeoproterozoic to Mesoproterozoic McArthur and Tawallah Groups that were examined in this study. During this time, Earth had comparatively less oxygen following the beginning of The Great Oxygenation Event (GOE, Palaeoproterozoic ca. 2.34 Ga) and organisms were simple. In conjunction, the Boring Billion (1800 to 800 Ma) is an acknowledged period following the GOE due to reported flat carbon and oxygen isotope trends which is evidence for a relatively stable climate and delayed organism evolution. The aim of this thesis is to gather a coupled data set using conventional geochemistry and organic geochemistry through the use of carbon/oxygen isotopes, redox sensitive trace elements (Mo, V and U), rare earth elements and organic carbon content in order to understand the oxygen conditions through palaeo-redox techniques within the lower portions of the Palaeoproterozoic McArthur Basin. Shale units of the McArthur and Tawallah groups (Mallapunyah, Wollogorang and Wuraliwuntya formations) are shown to be deposited in a stratified oxygenation and sulfidic environment. These episodes of anoxia or euxinia are shown by elevated concentrations of Rare Earth Elements (REE) and trace elements at specific drill core depth. Subtle and fluctuating cerium and europium anomalies along with trace and major elemental data were coupled by Total Organic Carbon (TOC) to show a relationship with the organic matter within the Wollogorang specifically. The trace elements seemingly concentrated within the regions of high organic content, which results in euxinia events causing elevated levels of trace metals. Potential trace metal elevations within the Wollogorang and Mallapunyah formations specifically will be compared against the reported evidence for Sedimentary Exhalative deposits (SedEX deposits). The Amelia Dolostone recorded carbon isotope values of 0 to -2‰ and oxygen isotope values of -5 to -9‰ expected carbon and oxygen isotopic concentrations for the Palaeoproterozoic to Mesoproterozoic Era.

KEYWORDS

McArthur Group, Tawallah Group, McArthur Basin, Glyde Package, Redbank Package, Chemostratigraphy, trace elements, rare earth elements, total organic carbon

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INTRODUCTION

The McArthur Basin is a Palaeo-Mesoproterozoic sedimentary basin that preserves vast mineralisation and potential ancient hydrocarbons in the Northern Territory (Ahmad et al., 2003*)*. It forms part of the unofficially labelled greater McArthur Basin which covers roughly 180,000km^2 within the Northern Territory Craton (Close, 2014) and includes the Tomkinson province to the south and Birrindudu Basin to the west. This estimation is largely due to regions of uncertainty beneath the Neoproterozoic to Early Palaeozoic Georgina Basin to the south, the Cenozoic Carpentaria Basin to the west, Murphy inlier and Arnhem Province to the north east (Jackson et al. 1987; Plumb et al. 1990; Lodwick & Lindsay 1990; Haines et al. 1993; Ahmad et al., 2003). Many studies have provided key interpretations of the depositional environments, including studies by Rawlings et al., (1999) who provided paramount interpretations of stratigraphic sequences based on physical properties. However, there are fewer studies produced on the specific units of the McArthur and Tawallah Groups within the lower potions of the McArthur Basin. This study will focus on two new drill cores retrieved last year, MCDD0003 and MCDD0005, which intersect the lower McArthur and Tawallah Groups and were kindly made available by Todd River Resources. For each drill core, palaeo-redox signals of specific shale formations will be analysed through trace element and rare earth element concentrations coupled with organic geochemistry in order to construct chemostratigraphy and decipher the specific oxygen environments and how biological productivity interacted at the time of deposition. Finally, carbon and oxygen isotope data will explain the input of organic carbon burial and biological productivity within the Palaeoproterozoic McArthur and Tawallah groups of the McArthur Basin.

The early-Paleoproterozoic was a critical era in Earth's evolution as it governed the stepwise increase of atmospheric oxygen, known as the Great Oxygenation Event. Weathering profiles of redox-sensitive trace elements, specifically iron and uranium, were paramount for the GOE discovery (Cloud, 1972; Holland, 1984 & Beukes, 1990; Holland, 1990). The redox-sensitive trace elements used in this study include molybdenum, vanadium and uranium as they are abundant within the modern ocean and their concentrations show affinities relating to specific oxic, suboxic, anoxic or euxinic conditions (Tribovillard et al., 2008). The trigger for the GOE was proposed to be an increased sedimentary burial of organic matter ca. 2.3 - 2 Ga (Karhu & Holland, 1996). These dates correspond with global scale rifting and orogeny occurrences during the initial assembly of relatively stable continental plates (Windley, 1984; Lowe, 1992). An archive for this oxidation during the early-Palaeoproterozoic is therefore reflected by pronounced positive carbon isotope excursions via the burial of organic carbon. However, this positive carbon isotope excursion dramatically flat lines throughout the late-Palaeoproterozoic (during the formation of the McArthur and Tawallah Groups of the McArthur Basin ca. 1800-1650 Ma), which coincide with the disappearance of banded iron formations ca. 1.8 Ga via oxidised bottom waters (Cloud, 1972; Holland, 1984). Contrastingly, Canfield (1998) claimed that anoxic bottom water conditions were still prevalent throughout the late-Palaeoproterozoic and only became oxic within the Neoproterozoic Oxidation Event ca. 800 Ma (Lyons et al., 2004; Canfield et al., 2007; Och et al., 2012). He further states that the disappearance of banded iron formations was due to increased sulphide production instead of oxidised bottom waters, resulting in euxinic bottom water conditions that were sulphide-rich and oxygen-poor. Thus, giving rise to the global euxinic Canfield ocean model', supported based on sulphur isotopes recording consistent increases in oceanic sulphate concentrations which coincide with the GOE, beginning ca. 2.3 Ga (Hayes et al., 1992). This increasing sulphate concentration lead to enhanced sulphide production (through the reduction of sulphate) before reaching necessary levels which surpassed the total flux of iron by ca. 1.8 Ga to allow precipitation of iron into the ocean. Additional evidence for low oxygenation within the Palaeoproterozoic (Post GOE) involved manganese-poor palaeosols as recorded by chromium isotopes (Zbinden et al., 1988; Frei et al., 2009).

Background to Trace Elements & Redox proxies

Trace elements Mo, U and V used in this study assist as palaeo redox proxies because they can exist in seawater in a soluble form or coexist with particles by adsorption. The redox conditions in which they exist ultimately governs the pathway for removal from sediments and into seawater, this can be either by abiotic or biotic processes. Biotic processes refer to the uptake of trace elements which constitute minor or micronutrients for phytoplankton. In contrast, abiotic processes occur in two ways and its effectiveness is dependent on an oxygen-rich environment. In suboxic environments, diffusion of dissolved trace elements from the seawater are incorporated through the sediment-water interface or via remobilization and repartitioning along redox gradients within the sediments (Tribovillard et al., 2006). Numerous studies include such trace elements as palaeo redox proxies and the specific methodology within Cox et al., (2016) on the Velkerri Formation of the upper McArthur Group, aswell as Spinks et al., (2016) will be followed throughout this tehsis. These elements have low detrital input characteristics, discerning primarily the authigenic signature from a dissolved aqueous source.

Vanadium (V) is the second most abundant element in modern seawater (~40 nM) (Tribovillard et al., 2006) and is enriched in sediments via adsorption to organic matter as it shares a strong relationship to organo-metallic complexes under specifically oxic conditions (Alego and Maynard, 2004), contrasting to Mo, which is enriched during euxinic conditions. Vanadium exists as V^{5+} during oxic conditions and is reduced to V^{4+} under anoxic conditions with the addition of hydrogen sulfide (Breit and Wanty, 1991). Soluble molybdate can convert to thiomolybdate under high levels of dissolved sulphide concentrations, which is then subsequently absorbed by organic matter as S complexes (Helz *et al.,* 1996). Uranium is also an effective redox sensitive element and shares similar traits to Mo and V. Specifically, it can exist as a mobile U^{6+} under oxidised conditions or as immobile U^{4+} ion under reducing anoxic conditions (Lanmuir, 1978). There is an inverse relationship with U and oxygen yet a positive relationship with TOC (McManus *et al.,* 2005). Aluminium normalisation for these trace elements is used commonly to remove the effects of authigenic minerals which interfere with the redox signal. This method will be implemented and plotted against TOC content within shale samples in order to decipher what relationship organic matter has with the redox conditions of the Palaeoproterozoic to Mesoproterozoic sweater (Calvert & Pedersen, 1993; Tribovillard et al., 2006).

Marine Carbon Cycle

Carbon isotopes are used in this study as a proxy for biological productivity during the Palaeoproterozoic. This is achieved specifically through the changing isotopic ratios composition of organic carbon ($\delta^{13}C_{org}$) and inorganic ($\delta^{13}C_{carb}$) carbonate which accumulate into a balance within carbonates (Hayes *et al*., 2006). The dissolved inorganic carbon pool of the oceans (DIC) is produced by atmospheric carbon (CO^2) entering the ocean by a diffusional process and existing in equilibrium with bioavailable HCO-3. Unaltered inorganic carbon isotopes reflect this DIC if they are precipitated in equilibrium with seawater because there is no fractionation occurring relative to the DIC pool. However, organisms cause an isotopic fractionation as they prefer to uptake light carbon isotopes ($\delta^{12}C$) against heavier carbon isotopes ($\delta^{13}C$) through fixation of CO^2 during photosynthesis. This changes the ratio of organic to inorganic carbon removed from the ocean during burial, resulting in organic material being enriched in light carbon isotope compared to the original pool of carbon. Negative carbon isotopes excursions are the result of decreased burial of organic matter from either a loss of primary productivity via organisms or lower burial efficiency (Knoll *et al.,* 1986). The DIC is altered by organic carbon burial and water column stratification (Hayes & Waldbauer, 2006; Guo et al., 2006; Halverson et al., 2010; Worden *et al.*, 2015). The isotopic signature of organic carbon has a depleted heavy carbon isotope signal relative to DIC, making it harder to acquire. Increases in the organic carbon isotope trend is largely due to raised concentrations of aqueous CO^2, which governs a greater discrimination during biological processes (Kump and Arthur, 1999). An increase in in the organic carbon isotope trend implies the burial of a higher fraction of organic carbon, or alternatively a decrease in the oxidation of organic matter relative to the weathering of carbonate rocks (Hayes *et al.* 1999). The Palaeoproterozoic to Mesoproterozoic reflects very little organism input, hence the carbon isotope excursions stay within a relatively narrow interval of between +1 and -2 ‰ (Veizer et al., 1992; Buick et al., 1995; Knoll et al., 1995b). Contrastingly, the late Mesoproterozoic and Neoproterozoic are characterised by large positive carbon values as a result of the major tectonic events and the biological evolution of eukaryotes. Specifically, the initial assembly and breakup of Rodina which reorganised the global carbon cycle and resulted in increased steady-state burial flux of organic carbon relative to inorganic carbon

(Knoll et al., 1986; Kaufman et al., 1993; Kah et al., 1999; Butterfield, 2000; Bartley et al., 2001). Additionally, carbon and oxygen isotopes will be cross plotted in this study to yield information on diagenetic behaviours within the Amelia Dolostone.

GEOLOGICAL SETTING

The McArthur Basin contains an approximate 10km archive of carbonate, un-metamorphosed sedimentary and lesser volcanic rocks ranging from the Paleoproterozoic to Mesoproterozoic (Plumb & Wellman 1987). It is widely known for substantial base metal commoities (lead, zinc, silver and copper), most notable of which is the world-class sedimentary exhalative McArthur River Mine. This specific site is hosted within the early Mesoproterozoic pyritic and carbonaceous shale, HYC member ('Heres Your Chance'). The depositional environment of this deposit suggests an area of active subsidence with an accompanied growth fault which allows for fluid flow through the metal-rich sedimentary system. The source of metal precipitation is a product of reduced anoxic conditions within organic-rich sub-basins (Large et al. 2002). Similarities are observed between the 1.64 Ga HYC member and the 1.73 Ga Wollogorang Formation as they share an extensional rift environment and carbonaceous shale composition. Studies by Spinks et al. (2016) suggest that the Wollogorang Formation was deposited under mostly euxinic conditions with periodically high concentrations of sedimentary pyrite, their work proposes that this formation is a possible chemical trap for base metals, such as copper. These similarities are one of the drivers for this research, as the extent of geochemical data for the lower McArthur and upper Tawallah Groups is are poorly constrained.

The McArthur Basin stratigraphy is grouped into five divisions, which has been commonly termed ‘packages’ (Rawlings, 1999). These packages occur throughout the entire northern and southern regions of the basin and are organised based on their stratigraphic position, maximum depositional age, similarities in lithological composition, volcanism composition and basin-fill geometry. This paper will focus on the Glyde and Redbank packages, which are the two lowest packages within the southern portion of the McArthur Basin. Accompanying Rawlings, three intracontinental Superbasins were identified by sequence stratigraphy (Jackson & Southgate, 2000). These are the 1800 to 1750 Ma Leichhardt Superbasin, the 1730 to 1670 Ma Calvert Superbasin, and the 1668 to 1590 Ma Isa Superbasin. In terms of Superbasin evolution, the Redbank Package formed during the Leichhardt Superbasin successions, which are characterised as bimodal magmatism, fluvial and shallow marine sedimentation whilst the Glyde package formed coeval with the Isa Superbasin and possibly the Calvert Superbasin. The environment for this evolution occurred throughout a period of subsidence that was evenly distributed throughout the basin, with local unconformities giving additional evidence for a syn-depositional tectonic system (Betts & Giles, 2006). This produced thickening of successions overlying the half-grabens and large-scale erosion of the younger previous unit. Both the approaches validate the concept of large-scale stratigraphic packages initially being continuous or contiguous with other Proterozoic depocentres and that the cyclical depositional environment was governed by episodic tectonism over a period of ~600 million years. This repetitive tectonism formed a sag in the basin morphology and allowed for increased mantle presence which was followed by amalgamation of the supercontinent (Walter et al.., 1995; Lindsay, 2001).

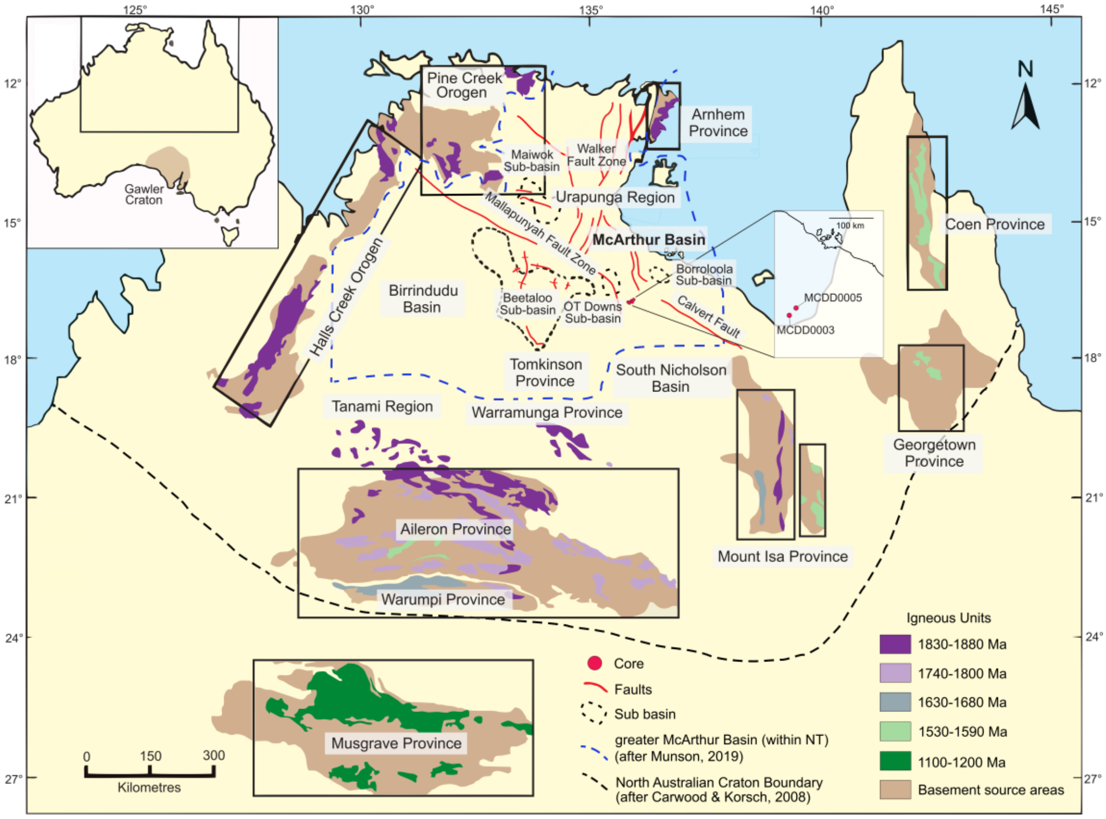

Figure 1. Digitised study map of the Northern Australian Craton Boundary which includes the Greater McArthur Basin and its accompanying basins (modified after Yang et al., 2018), most important for this thesis being the McArthur Basin, highlighting the study area and location of drill cores MCDD0003 and MCDD0005.

The region of this study is shown in figure 1, it is located within the southern McArthur Basin, focused in the south-western extent of the Batten Fault Zone. The Batten Fault Zone consists of the Mallapunyah Fault and Tawallah Fault which both orientate NNW-SSE, intersect the stratigraphy within the McArthur and Tawallah Groups and provide majority of the deformation within this region (Ahmad, et al. 2013). The two diamond drill cores investigated in this study are MCDD0003 and MCDD0005 which were both recovered in late 2018 by Todd River Resources. They intersect the lower McArthur Group and upper Tawallah Group within the Glyde and Redbank packages respectively, which is complimentary for chemostratigraphic purposes of this study. The McArthur and Tawallah Groups are classified as being thinner when compared to the overlying Roper Group. Their thin sequence formation is a result of basin-controlled underlying rift elements, whereas the Roper Group governs a more widespread evolution which allows for thicker sequences (Leaman, 1998).

Redbank Package

The Redbank package represents the basement of the McArthur Basin stratigraphy and is defined as being equivalent to the basal sandstone succession of the Tomkinson Province and Birrindudu Basin (Ahmad et al. 2015). It comprises up to 6km of siliclastic sedimentary rocks during, conglomerate, dolostone, organic-rich siltstone/shale and bi-modal volcanic rocks. It is proposed to be deposited in a shallow-marine environment during approximately 1815-1710 Ma, governed by the U-Pb SHRIMP zircon ages of the bi-modal volcanic rocks. The Tawallah Group has well defined minimum ages of 1710 Ma (Ahmad et al. 2015). The Wollogorang Formation is a laterally extensive intracontinental shallow marine to near-shore clastic sedimentary unit with carbonaceous shale and siltstone with up to 350m thickness (Jackson, 1985, Ahmad et al., 2013), it is a key focus for this study and 142 samples were taken throughout both drill cores (figure 2). It is both underlain and overlain by extrusive and intrusive volcanic units which yield a depositional age of 1729±4 to 1730±3 Ma from the observed tuffaceous green clays, which were also noted in the drill cores in this study (Page et al., 2000). The central to lower portions of the Wollogorang Formation has gained attention within the literature as being a potential mineralisation and petroleum source. Its composition has dolomitic ovoid beds within highly bituminous black shale and displays trace heavy metal mineralisation of zinc and sulphide-bearing fine-grained sphalerite and fine-grained stratiform pyrite and galena.

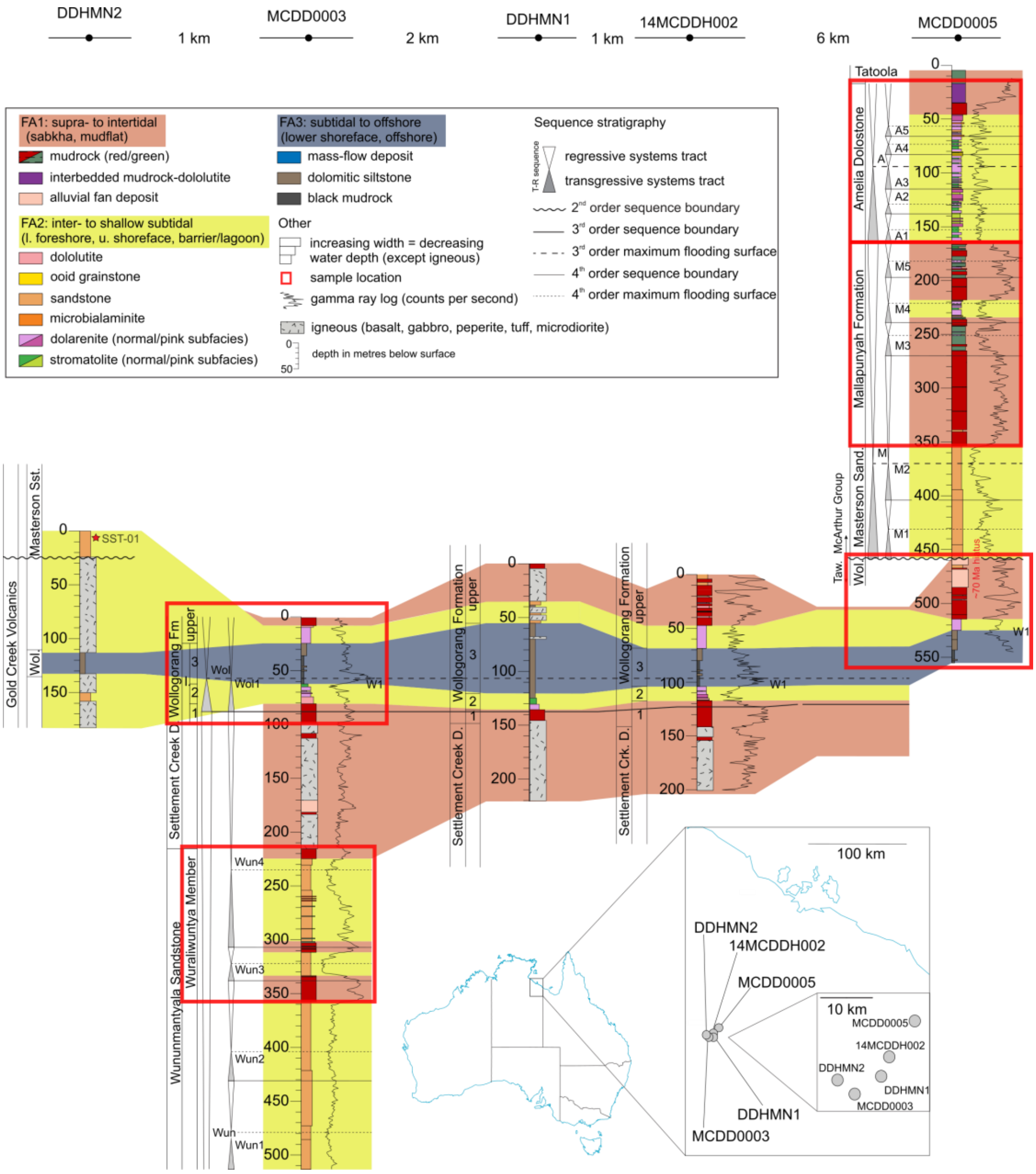

Figure 2. Detailed sequence stratigraphy cross section (Created by Cruz, C., modified after M Kunzmann, personal communication, June 26, 2019) of McArthur and Tawallah Groups over five separate drill cores. Most relevant to this study being MCDD0003 and MCDD0005 and specifically the highlighted formations where samples were taken. Individual colours represent different depositional environments and the blow out shows an accurate spatial positioning of all five drill cores within the McArthur Basin.

Glyde Package

The Glyde package is the second lowest stratigraphy and unconformably overlies the Redbank Package. It comprises up to 5km of stromatolitic-evaporitic dolostone, siliclastic sedimentary rocks, carbonaceous siltstone and minor tuffaceous rocks. It is proposed to have been deposited in a shallow to moderately deep water and locally emergent environment during approximately 1640-1600 Ma, governed by U-Pb SHRIMP zircon ages of the tuffaceous rocks (Haines et al., 1999; Rawlings et al., 1997, 1999). It is restricted to the Batten, Walker and Urapunga fault zones within the southern regions of the McArthur Basin. Two separate formations within the McArthur Group were sampled from this package, including 83 from the Amelia Dolostone and 130 from the Mallapunyah formation (figure 2).

METHODS

Sample Collection

Samples were collected from drill cores: MCDD0003, MCDD0005 (Northern Territory Government Core Library, Darwin). These samples were all situated within the southern McArthur Basin, in the south-western portion of the Batten Fault Zone and are situated approximately 5-10km apart. The carbonate samples were taken approximately every 2 metres, whilst the shale samples were restricted to every 1 metre. This was done to achieve a high-resolution data set.

Crushing

All 287 shales were crushed using a Rocklabs jaw crusher/hammer to produce sizable chunks in preparation for the Rocklabs tungsten carbide ring mill which homogenised the chunks into fine powder. The cleaning process involved high pressure air and ethanol after each sample was loaded into the jaw crusher and ring mill. The use of a quartz blank was also implemented after each sample ran through the ring mill; these steps were taken in order to reduce cross contamination between samples.

Drilling

Carbonate-rich areas were targeted within samples and drilled using a tungsten carbide dermal tool to extract powder that was collected in cleaned 14 ml Sarstedt PVC centrifuge tubes. These samples were carefully drilled instead of crushed into a homogenised powder in order to capture the true un-diagenetic d13C and d18O signal.

Elemental Analysis

The 287 powdered shale samples were sent to the Bureau Veritas for whole rock geochemical analysis and underwent two separate methods based on the element in order to recover elemental concentrations including trace, major and rare earth elements. The first method involved a specific set of samples being digested and refluxed with a mixture of Acids, including: Hydrofluoric, Nitric, Hydrochloric and Perchloric Acids. The second method involved an aliquot of sample being accurately weighed and fused with lithium metaborate at high temperature in a Pt crucible. The fused glass is then digested in nitric acid.

Table 1. Elemental suite analysed by Bureau Veritas, 2/35 Cormack Rd, Wingfield SA 5013, with the corresponding instrument and scheme used with reported units of elemental concentrations (ICP-OES : Coupled Plasma (ICP) Optical Emission Spectrometry, ICP-MS : Inductively Coupled Plasma (ICP) Mass Spectrometry)

Elements	Method	Scheme	Unit
Cu, Li, Ni, S, Sc, Zn	ICP-OES	MA101	ppm
Ag, As, Be, Bi, Cd, Ce, Co, Cs, Dy, Er, Eu, Ga, Gd, Hf, Ho, In, La, Lu, Mo, Nb, Nd, Pb, Pr, Sb, Se, Sm, Sr, Ta, Tb, Te, Th, TI, Tm, Yb, Zr,	ICP-MS	MA102	ppm
Ai, Ba, Ca, Cr, Fe, K, Mg, Mn, Na, P, Si, Ti, V	ICP-OES	LB101	% (Cr:ppm)
Rb, Re, U, W, Y	ICP-MS	LB102	ppm

Organic Geochemistry Analysis

Pyrolysis measurements were undertaken using a Weatherfords Source Rock Analyser™ at The University of Adelaide. Shale powders were weighed at 80-120 mg (dependent on the amount of organic carbon) into crucibles and were loaded into the carousel and heated under inert Helium in both the pyrolysis (to obtain S1, S2, Tmax and S3 peaks) and oxidation modes (to obtain the S4 peak). The pyrolysis oven was first held at 300°C for 5 minutes and ramped at 25°C per minute from 300°C to 650°C. Subsequently the oven was reduced to 220°C and held for 5 minutes with the carrier gas converted to inert air (CO & CO^2 free) and purged, ramped at maximum heating to 580°C and held for 20 minutes. The flame ionisation detector (FID) was calibrated by running Weatherford Laboratories Instruments Division Standard 533. The IR Analysers were calibrated against standard gas with known concentration of CO^2 and CO. An analysis blank was run as 'blank' mode with the sample batch and the blank data was automatically subtracted from all analyses. An external check standard was also run first with each batch to ensure the instrument status with additional check standards every 10 samples. The results were processed where peak areas and geochemical indices including Total organic carbon (TOC), Oxygen Index (OI), Hydrogen Index (HI) and Production Index (PI) are automatically calculated.

Isotope Ratio Mass Spectrometry (IRMS)

The 83 carbonate-rich extracted powder were weighed at ~4mg before being placed into cleaned individual glass vials with septum's and caps (this weight was based on the sample calcium carbonate content and achieved during test runs). Powders were purged with eight drops of concentrated 1M phosphoric acid in order to dissolve the calcium carbonate and helium injected. The resultant fumes were measured via the dual inlet element in the IRMS in order to produce $\delta^{13}C$ and $\delta^{18}O$ values. The calibration method was determined against standards ANU P3, UAC and NCM with the use of 1 blank (for a total run, 28 standards were used per 72 samples).

OBSERVATIONS AND RESULTS

AMELIA DOLOSTONE

From the 83 samples run for carbon and oxygen analysis, the specific values for $\delta^{13}C$ ranged from -3.10 to +0.47‰, with a mean value of -0.93 and errors between 0.01 to 0.13. For the analysis on $\delta^{18}O$, values ranged from -9.60 to -2.34, with a mean value of -6.86 and errors between 0.00 to 0.33.

WOLLOGORANG FORMATION

For the 143 samples analysed over the two separate drill cores, the specific redox-sensitive elemental concentrations for Mo, V and U are given: Mo concentrations ranged from 1 to 43.5 ppm, maximum value correlated to a depth of 57.4 metres within drill core MCDD000, with a mean of 10.20 ppm. A total of 15 samples failed to detect any trace of Mo (0.5 ppm). V concentrations ranged from 20 to 500 ppm, maximum value correlated to a depth of 541.5 metres within drill core MCDD0005, with a mean of 105.7 ppm. A total of 3 samples fell under the detection limit of V (20 ppm). U concentrations ranged from 1 to 36.5ppm, maximum value correlated to a depth of 541.5 metres within drill core MCDD0005, with a mean of 7.18 ppm. No samples fell under the detection limit of U (0.5 ppm).

Al concentrations ranged from 1.7 to 10.4%, maximum value correlated to a depth of 499 metres within drill core MCDD0005, with a mean of 5.75%. No samples fell under the detection limit of Al (0.005%). S concentrations ranged from 0 to 72200 ppm, maximum value correlated to a depth of 52.45 metres within drill core MCDD0003, with a mean of 9340.2 ppm. 43 samples fell under the detection limit of S (50 ppm). Zn concentrations ranged from 10 to 2500, maximum value correlated to a depth of 550.90 metres within drill core MCDD0005, with a mean of 161.7. No samples fell under the detection limit of Zn (2 ppm). Pb concentrations ranged from 0 to 1450, maximum value correlated to a depth of 56.3 metres within drill core MCDD0003, with a mean of 46.4 1 sample fell under the detection limit of Pb (1 ppm). Tl concentrations ranged from 0 to 10.7 ppm, maximum value correlated to a depth of 544.63 metres, with a mean of 2.3. 1 sample fell under the detection limit of Tl (0.1 ppm).

MALLAPUNYAH FORMATION

For the 130 samples within drill core MCDD0005, the specific redox-sensitive elemental concentrations for Mo, V and U are comparatively less enriched than the Wollogorang, they are as follows: Mo values range from 1 to 4.5ppm, maximum value correlated at a depth of 188 metres, with a mean of 1.38. A total of 95 samples fell under the detection limit of Mo (0.5ppm). V values ranged from 20 to 400, maximum value correlated at a depth of 273.4 metres, with a mean of 63.42. A total of 13 samples fell under the detection limit of V (20ppm). U values ranged from 1 to 7.5ppm, maximum value correlated at a depth of 273.4 metres, with a mean of 3.10. A total of 2 samples fell under the detection limit of U (0.5ppm).

Al concentrations ranged from 0.075 to 8.64 %, maximum value correlated to a depth of 165.2 metres, with a mean of 5.2. No samples fell under the detection limit of Al (0.005%). S concentrations ranged from 0 to 24700 ppm, maximum value correlated to a depth of 274.6 metres, with a mean of 1238.5. 61 samples fell under the detection limit of S (50 ppm). Zn concentrations ranged from 4 to 104 ppm, maximum value correlated to a depth of 277.3 metres, with a mean of 35.6. No samples fell under the detection limit of Zn (2 ppm). Pb concentrations ranged from 0 to 126, maximum value correlated to a depth of 181.6 metres, with a mean of 11.5. 1 sample fell below the detection limit for Pb (1 ppm). Tl concentrations ranged from 0 and 4.1 ppm, maximum value correlated to a depth of 182.8 metres, with a mean of 0.5. 8 samples fell under the detection limit of Tl (0.1 ppm).

WURALIWUNTYA FORMATION

For the 56 samples within drill core MCDD0003, the specific redox-sensitive concentrations for Mo, V and U are comparatively less enriched than the Wollogorang, they are as follows: Mo concentrations range from 0 to 40.5ppm, maximum value correlated at a depth of 266.75 metres and was highly outside the range of other values as the mean was just 3.26 ppm. A total of 7 samples fell under the detection limit of Mo (0.5ppm). V concentrations range from 40 to 300ppm, maximum value correlated at a depth of 225.10 metres, with a mean of 145.45. No samples fell under the detection limit of V (20ppm). U concentrations range from 2.7 to 32.3ppm, maximum value correlated to a depth of 266.75 metres, with a mean of 5.73. No samples fell under the detection limit of U (0.1ppm).

Al concentrations ranged from 4.76 to 13.6 ppm, maximum value correlated to a depth of 271.21 metres, with a mean of 9.2. No samples fell under the detection limit of Al

(0.005%). S concentrations ranged from 0 to 4600 ppm, maximum value correlated to a depth of 298.33 metres, with a mean of 419.6. 32 samples fell under the detection limit of S (50 ppm). Zn concentrations ranged from 4 to 54 ppm, maximum value correlated to a depth of 341.56 metres, with a mean of 28.2. No samples fell under the detection limit of Zn (2 ppm). Pb concentrations ranged from 5 to 46, maximum value correlated to a depth of 266.75 metres, with a mean of 12.7. No samples fell under the detection limit of Pb (1 ppm). Tl concentrations ranged from 0.4 to 2.7 ppm, maximum value correlated to a depth of 299.38 metres, with a mean of 1.05. No samples fell under the detection limit of Tl (0.1 ppm).

TOC

A total of 154 samples over all three formations were analysed for TOC. High resolution was not required for this technique as the focus was only on darker coloured powders, this restricted majority of the sampling to the Wollogorang Formation. TOC values ranged from 0.01 to 8.31 wt.%, maximum value correlated to a depth of 57.4 metres within the Wollogorang Formation of drill core MCDD0003 with a mean of 0.85.

DISCUSSION

REDOX ANALYSIS: TRACE ELEMENTS AND REE BEHAVIOUR

Cerium (Ce) is the only REE which can convert from a soluble 3+ state to an insoluble 4+ state in the presence of oxidised seawater. During the conversion of Ce 3+ to Ce 4+, Ce’s insoluble state allows it to become enriched into ferromanganese sediments (iron and manganese rich sediments), resulting in a depleted signature from residual seawater

(Elderfield et al., 1988). This discriminates its behaviour from other neighbouring REEs which remain in a soluble trivalent state under oxidised seawater and hence do not become enriched in sediments (German et al., 1991). This process is the key factor that enables the interpretation of palaeo redox conditions of seawater and is sensitive on a metre scale (Carlo and Green, 2002). Ce anomalies are weakened (more positive) in sub-oxic and anoxic seawater due to the reductive dissolution of ferromanganese sediments, causing a limitation on the amount of Ce able to become enriched (German et al., 1991). This depleted Ce anomaly is commonly calculated as $Ce*_{SN}$ as: $Ce*_{SN}=(2*Ce_{SN})/(La_{SN}+Pr_{SN})$, which incorporates neighbouring REEs of La and Pr, all of which are normalised to specific Post Archean Australian Shale (PAAS) values by Nance & Taylor (1976).

The trace element concentrations of Mo, V and U show noticeable contrasts within the three sampled formations within a somewhat Ce* fluctuating environment (figure 3). The Wollogorang formation (within both studied cores) shows the highest concentrations of these trace elements and additionally, the most negative Ce anomalies, indicating the most oxic conditions amongst the formations. Interestingly, trace element spikes closely mirror each other to show and are restricted within negative Ce* anomalies produced at the time of deposition, indicating that these relatively oxygen-rich conditions share an affinity with elevated Mo and U concentrations. However, this relationship cannot be justified purely based on Ce* anomalies as Mo is soluble during oxic conditions and only converts to thiomolybdate to be subsequently absorbed by organic matter as S complexes under high levels of dissolved sulphide (euxinic conditions) (Helz et al., 1996). Additionally, uranium is in a soluble U^{6+} form during oxidised conditions and is only immobile and absorbed into sediments under similar anoxic conditions (Lanmuir, 1978). Further analysis of how organic matter with respect to such trace element concentrations and corresponding Ce* anomalies will be investigated below.

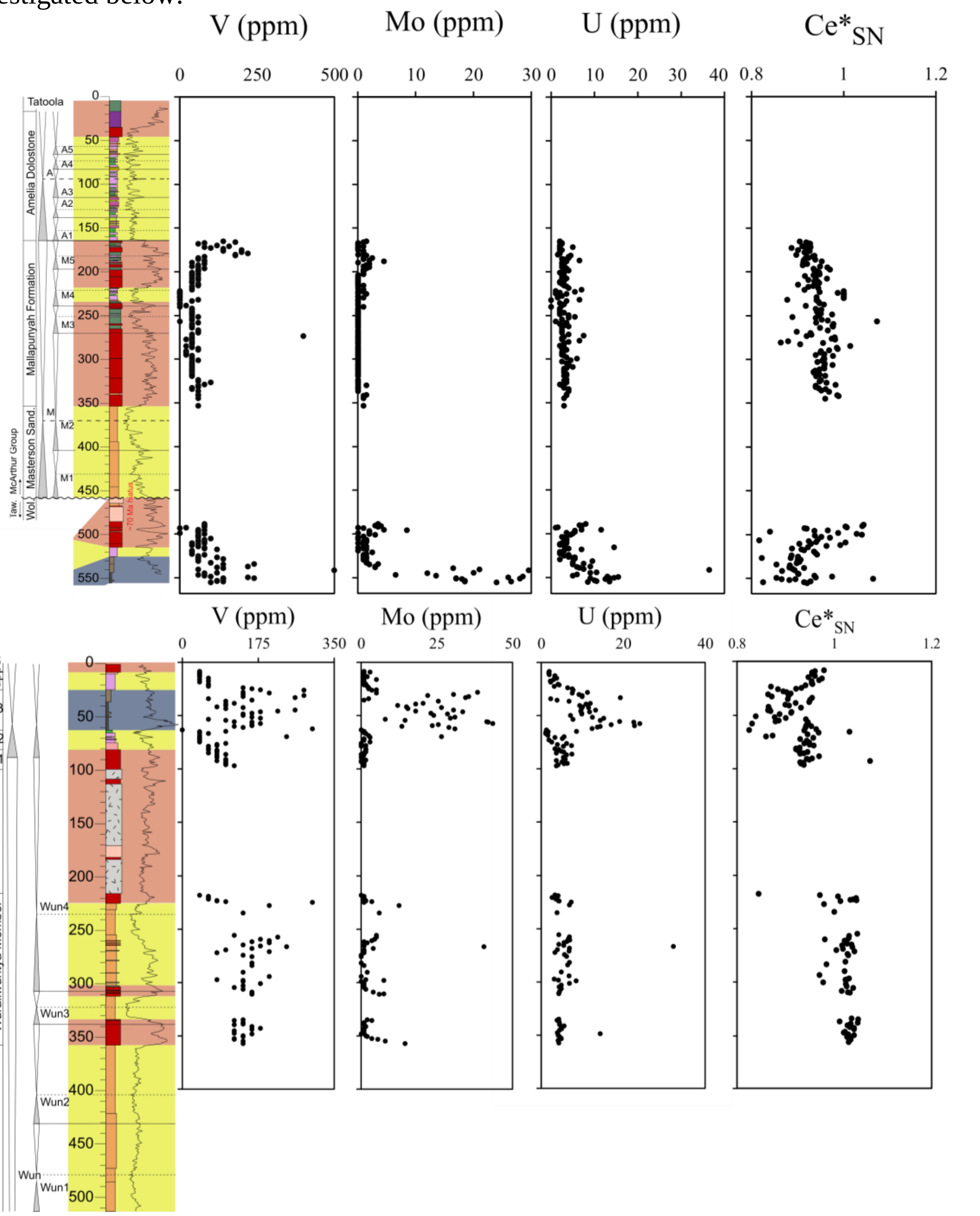

Figure 3. Top: high resolution stratigraphic log of drill core MCDD0005, bottom: high resolution stratigraphic log of drill core MCDD0003 (created by Cris Cruz, modified after Kunzmann, 2019). Redox-sensitive trace element concentrations of Mo, V and U correlated to stratigraphic depths within the Wollogorang, Mallapunyah and Wuraliwuntya with shale-normalised (SN) Ce anomalies to PAAS alongside.

The Ce* anomalies reflect a fluctuating pattern from positive to negative throughout the two studied drill cores. Specially within the Wollogorang formation of drill core MCDD0005, increasing oxic conditions occur with depth as Ce anomalies become more negative. The opposite pattern is true for the higher stratigraphy of the Mallapunyah formation within the same drill core, as it becomes more anoxic with depth as Ce anomalies become more positive. Contrastingly, the Wuraliawuntya is restricted within the anoxic region whilst the Wollogorang of the higher stratigraphy in drill core

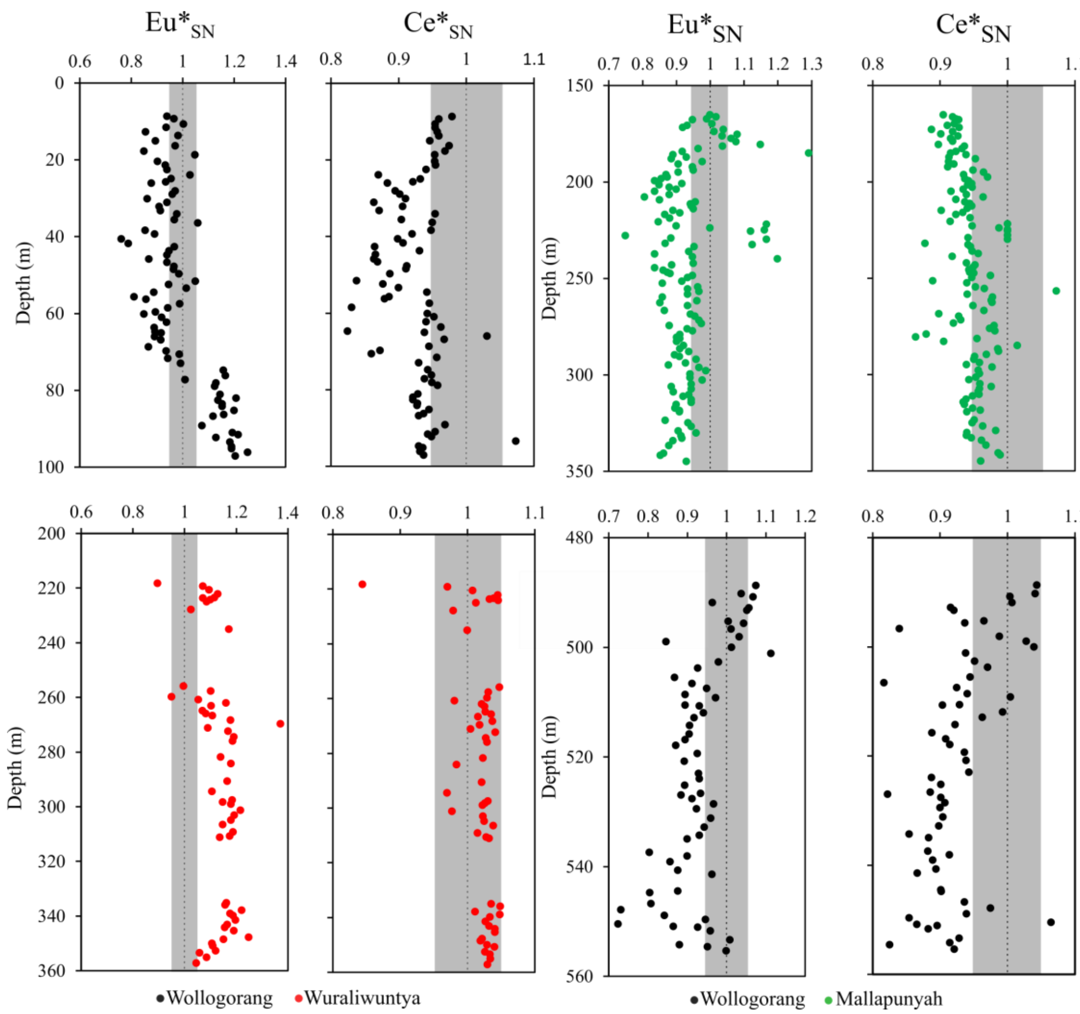

Figure 4. Left: drill core MCDD0003, right: drill core MCDD0005. Shale-normalised (SN) Ce and Eu anomalies to normalised to PAAS (Post Archean Australian Shale) (Nance and Taylor, 1976) against depth for three separate formations. Anomalies calculated as: Ce*SN= (2*CeSN)/(LaSN+PrSN), Eu*SN=(2*EuSN)/(SmSN+GdSN).

MCDD0003 shows a middle spike in negative Ce anomalies (figure 4). These negative Ce* anomalies reach up to 0.80, which is interpreted as sub-oxic by conditions after Bau & Dulski (1996). By comparison, negative Ce* anomalies for strongly oxidised modern oceans are 0.4-0.7 (Elderfield & Greaves, 1982). Eu anomalies are attained in seawater as it can reduce from Eu^{3+} to Eu^{2+} in anoxic environments. Large positive Eu anomalies (>1.5) are indicative of hydrothermal fluid mixing with sweater (Meyer et al., 2015). The Eu* anomaly is calculated in a similar fashion as Ce*, through the relationship of its respective neighbouring REEs using the following equation: Eu*SN=(2*EuSN)/(SmSN+GdSN). Slight positive Eu* anomalies are evident within the bottom of the Wollogorang of drill core MCDD0003, throughout the Wuraliwuntya formation and partly within the top of the Mallapunyah formation. This may be slight evidence for a hydrothermal exhaust within the basin, yet these values are all <1.5 and negligible for this thesis.

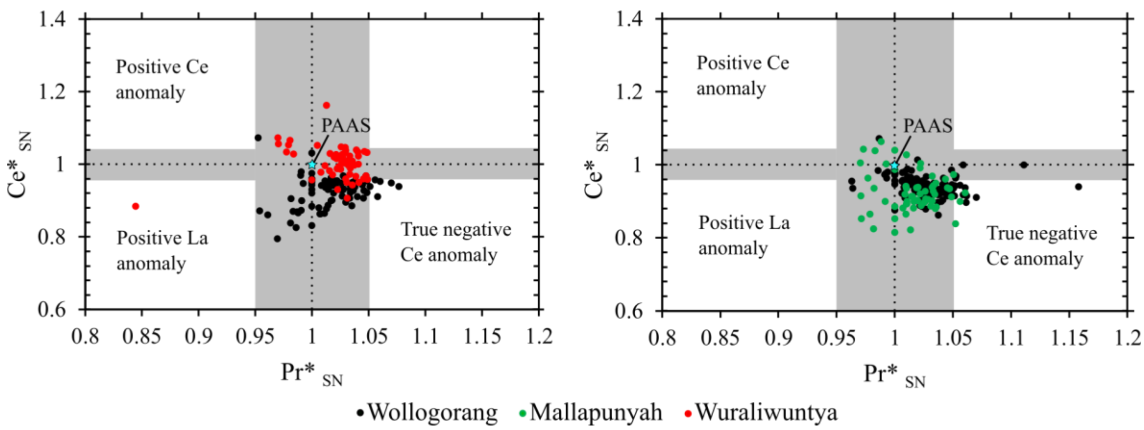

Figure 5. Left: drill core MCDD0003, right: drill core MCDD0005. Shale-normalised (SN) Ce and Pr anomalies cross plot after Bau & Dulski, (1996). Normalisation was to PAAS (Post Archean Australian Shale) (Nance and Taylor, 1976). Pr*SN=(2*PrSN)/(CeSN+NdSN).

Cross plotting Ce* and Pr* after Bau and Dulski, (1996) removes the effects of positive La anomalies in order to interpret a true negative Ce anomaly. The plot is split up into three specific bounds of positive Ce anomalies, true negative Ce anomalies and positive

La anomalies. The results in figure 5 are predominately Ce <1 and are observed in a scattered pattern restricted within the middle-bounded section of PAAS. However, the Wollogorang and Mallapunyah formations record limited true negative Ce anomalies, which is indicative of no La anomaly contamination within the signal (as stated above).

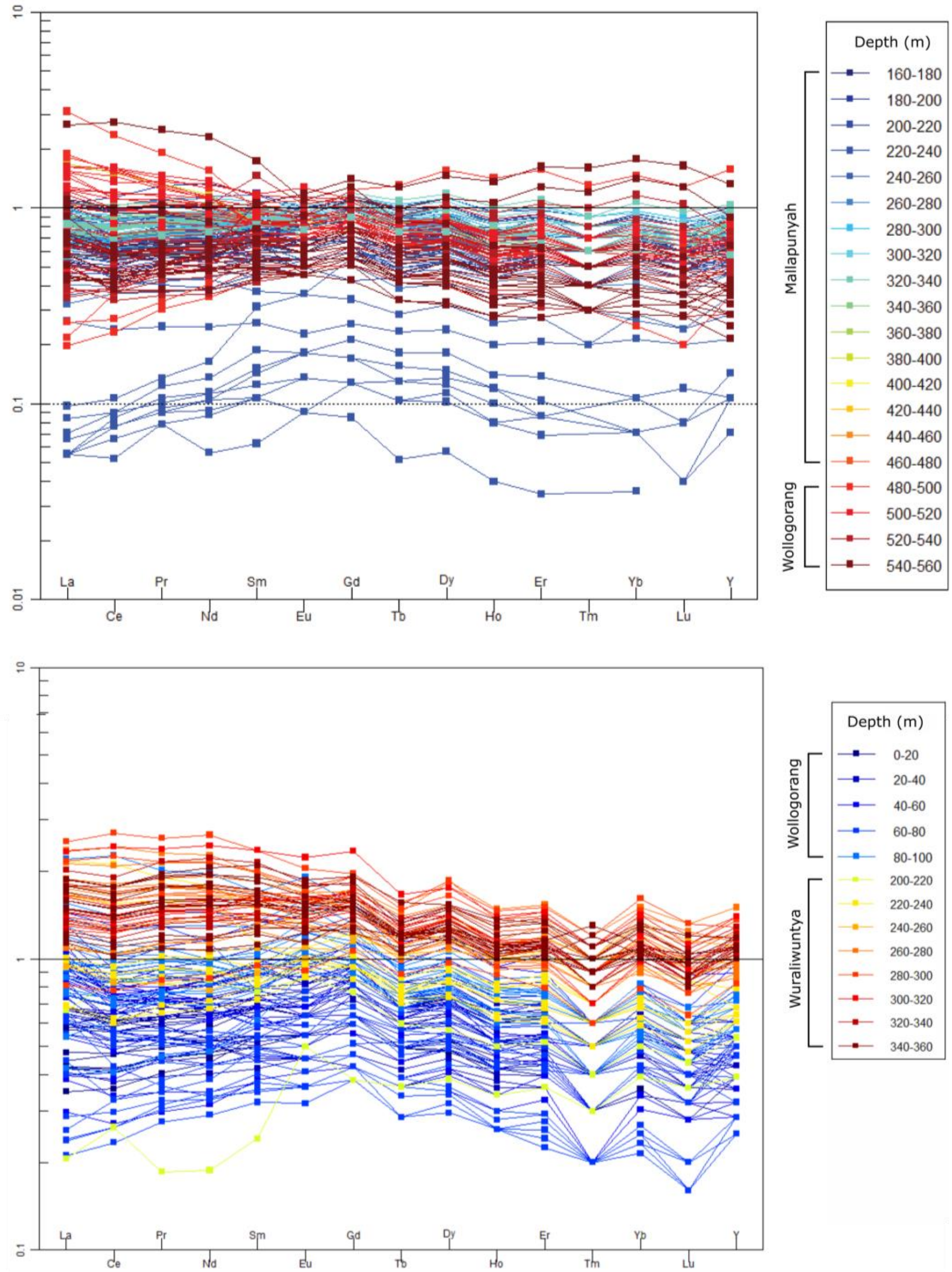

Figure 6. Top: drill core MCDD0005, bottom: drill core MCDD0003. REE spiderplot normalised to PAAS values from Nance and Taylor (1976) with depth intervals (including correlated formations) colour coded and the y-axis representing REE concentration in ppm. Created in GCD kit using R-Studio software.

The distribution of rare earth elements and yttrium (REY) within the oceans has several possible pathways including rivers, aeolian input and hydrothermal vents. The concentrations of REY accumulate via erosion and sedimentation and are carried by suspension rather than dissolution and reflect their source (Taylor & McLennan, 1985). These carried accumulations also undergo removal of specific REEs (such as Ce depletions) during sedimentation via particle scavenging which give identifiable characteristic REY signatures based on different environments (Byrne and Kim, 1990; Douville et al., 1999; Elderfield et al., 1990). For modern seawater, depleted Ce signatures and heavy rare earth (HREE) enrichments are evident (James et al., 1995). These depleted Ce anomalies are slightly pronounced within the Wollogorang formation in both studied cores, yet HREEs are comparatively depleted against light and medium rare earths in drill core MCDD0003. Indicating less heavy mineral and zircon (Nesbitt, 1979) concentrations over drill core MCDD0005 that represents a flatter overall pattern. Supporting evidence for HREE depletion is given through chemical analysis studies (Gromet et al., 1984; Schokovitz, 1990; Chen et al., 1990), their results indicate deficient heavy mineral dissolution within the seawater. Additionally, hydrothermal activity reflects REY patterns which have flat or depletions in HREEs and excess in Eu (Bau & Dulski, 1996; Douville et al., 1999). This could be a result of mantle influences within drill core MCDD0003. However, as represented above (figure 4), Eu* anomalies are negligible throughout all studied formations. Therefore, the REY pattern observed in drill core MCDD0003 is more likely representative of riverine waters from Soyol-Erdene & Huh (2013).

BIGOCHEMICAL INFLUENCE ON REDOX

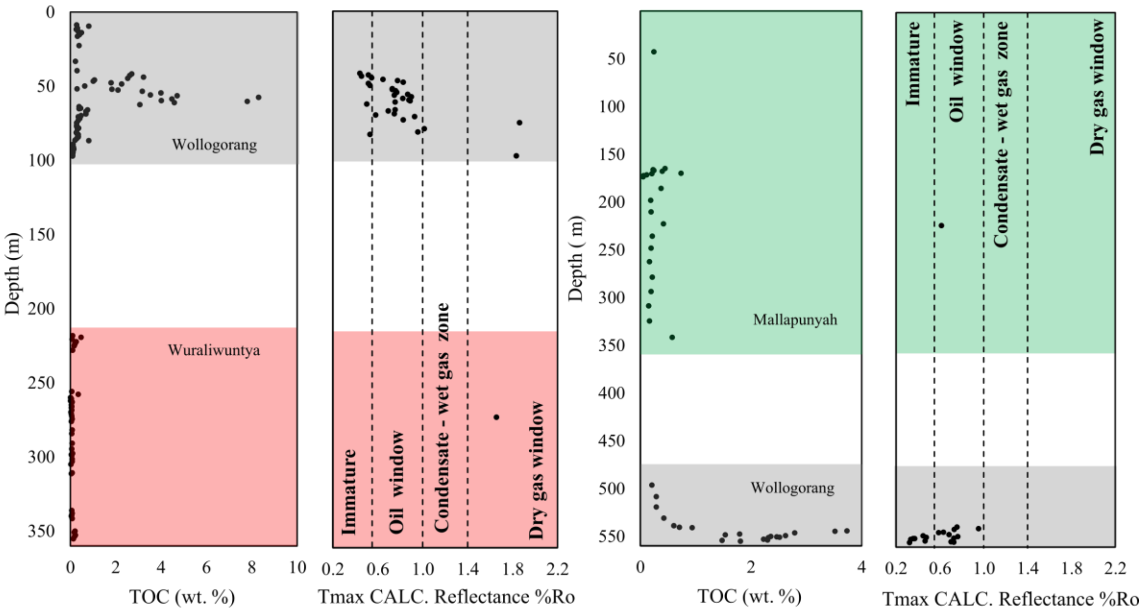

Figure 7. Left: drill core MCDD0003, Right: MCDD0005. TOC variations with depth based on pyrolysis data between 3 separate formations, showing a pronounced enrichment in the Wollogorang Formation and a slight enrichment in the Mallapunyah Formation. Thermal maturity index based on Tmax and vitrinite reflectance (Calculated %Ro = 0.0180 x Tmax -7.16, Jarvie et al., 2001) indicating different stages of TOC maturity based on increasing Tmax.

The variations in TOC content throughout all formations is observed in figure 7, with highest TOC enrichments being primarily within the black shale bearing Wollogorang Formation with a slight enrichment in the Mallapunyah Formation. Thermal maturity index based on vitrinite reflectance and Tmax disregard Tmax values below 400 °C within the calculations, as these falls below the immature window, hence it is a more accurate representation of TOC maturity. Majority of the high TOC values from Wollogorang Formation fall within the oil window, with a few samples reaching the condensate-wet gas zone and Tmax values of above 400 °C. This shows the potential for the hydrocarbon exploration of this specific formation and is analogous to findings from Cox et al., (2016) within the Velkerri formation.

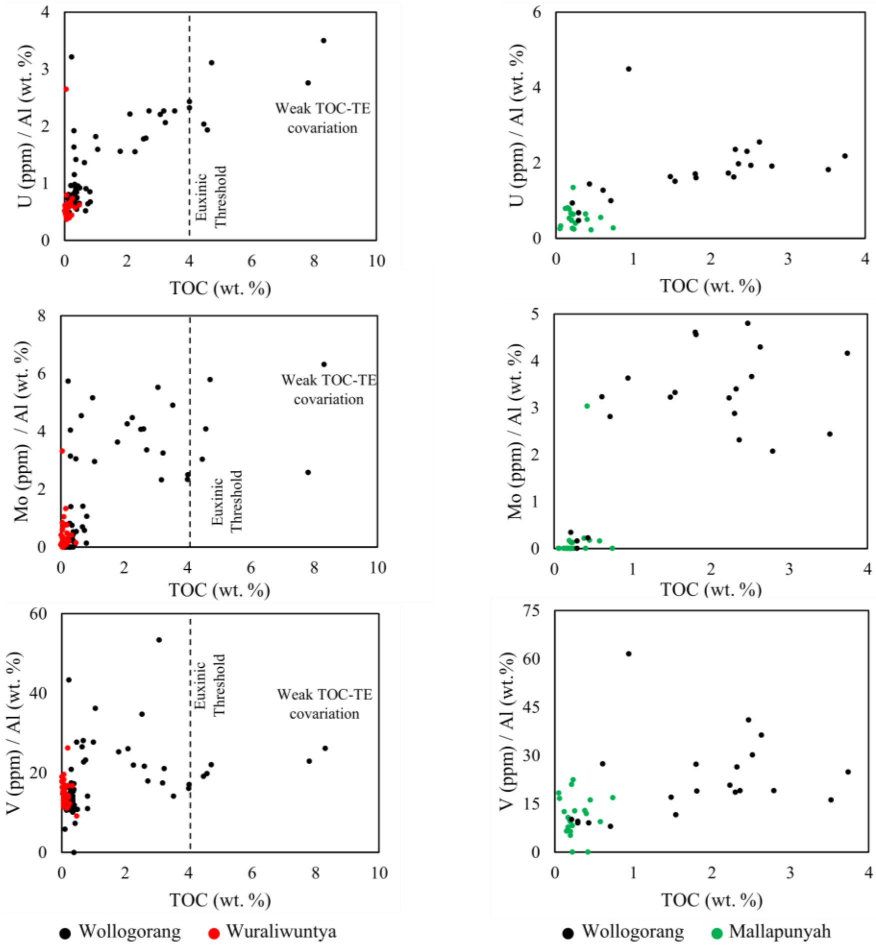

Figure 8. Left: drill core MCDD0003, Right: drill core MCDD0005. Cross-plots of total organic carbon (TOC) against redox-sensitive trace elements (Mo, V and U) normalised to aluminium, showing the euxinic threshold at 4% TOC and contrasting relationships over 3 formations.

Increasing TOC content highlights key redox conditions and shares a co-variance with redox-sensitive trace elements of Mo, V and U (figure 8). These results were compared with similar reports by Cox et al., (2016) within the 1.4 Ga Velkerri Formation of the McArthur Basin which show strong TOC and Trace Element co-variance from ~0.5 - 4% TOC. Based on the results in this study however, trace elements from the Wollogorang and Mallapunyah showed a weaker co-variance between 0.5 and 4% TOC, with U showing the strongest co variance. This region interprets the sub-oxic and anoxic conditions within a closed system. For this specific redox condition, trace element concentrations are enriched via productivity of organo-metallic complexes within somewhat closed system (Algeo & Maynard, 2004; Scott & Lyons, 2012). Outside these TOC parameters (<0.5% and >4% TOC), euxinic redox conditions prevail, resulting in the co-variation relationship between trace elements and TOC becoming less pronounced by scattering of data values. Notably, this relationship and decoupling of trace elements only persists within Wollogorang as it is the only formation which surpasses the 4% TOC euxinic threshold. Trace element concentrations which exist in euxinic conditions are succumb to an open system rather than a sub-oxic to anoxic closed system. Concentrations for Mo are increased to due water column sulphides (H^2S) becoming the primary sink, whereas concentrations of U and V are elevated due to further reduction of V and U species, (Algeo & Maynard, 2004; Scott & Lyons, 2012). This evidence of trace element enrichment with respect to TOC highlights dominant sub-oxic to anoxic redox conditions with episodes of euxinia within the Palaeoproterozoic seawater which allows organic compounds to accumulate. Supporting evidence for this result is governed by studies from Spinks et al., (2006) whom use Mo, V, Re and TOC to show that the Wollogorang Formation plots within the anoxic and euxinic region within a normal marine environment.

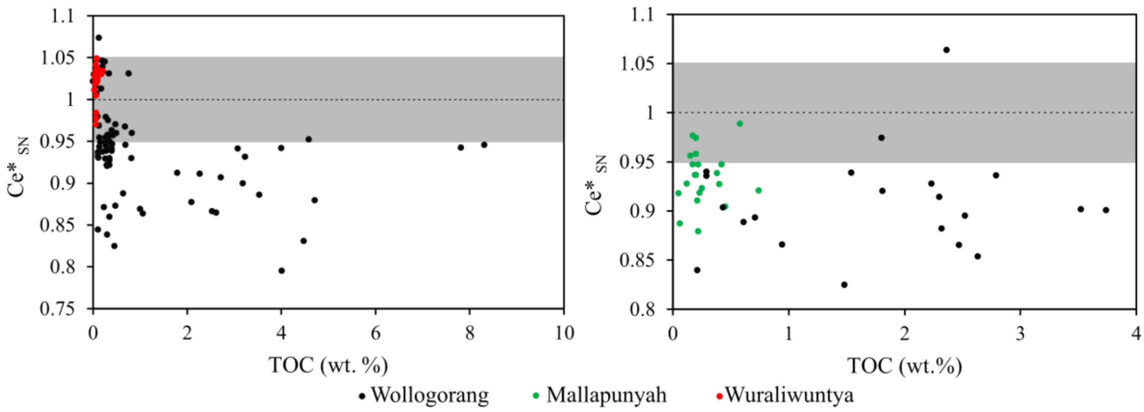

Figure 9. Left: drill core MCDD0003, right: drill core MCDD0005. Shale-normalised (SN) Ce anomalies to PAAS plotted against TOC, highlighting each formation and showing increasing TOC content is restricted within primarily negative Ce anomaly regions. The shaded regions represent areas of anoxia, with cerium not being oxidised.

In order to evaluate the specific redox environment in which the organic matter accumulated, TOC contents from all three formations were plotted against Ce* anomalies, again normalised to PAAS (figure 9). The Wollogorang Formation and Mallapunyah Formations both plot within a negative Ce* anomaly against TOC, with the Wollogorang showing a more pronounced negative Ce* anomaly and increase in TOC content. Samples with limited TOC (<1%) show very slight to no negative anomaly and fall within the anoxic shaded zone, providing further evidence that the negative Ce anomalies share an affinity to increasing TOC content. This negative Ce* anomaly relationship with organic matter is are interpreted to be representative of authigenic mineral precipitation within oxygenated seawater (Dumoulin et al., 2011; Pi et al., 2013; Slack et al., 2015). This evidence is similar to findings by Cox et al., (2016) and further infers that the oxidised waters during the deposition of the Wollogorang and Mallapunyah Formations within the study is influenced by organic matter. These results indicate the Wollogorang Formation and Mallapunyah Formations being formed within highly productive sub-oxic to oxic surface mixed layers of the Palaeoproterzoic seawater.

POTENTIAL SEDEX MINERALISATION OF THE TAWALLAH GROUP

Trace element and metal concentrations of S, Al, Zn, Pb, Tl within the Wollogorang and Mallapunyah are comparatively elevated against the Wuraliwuntya (figure 10). These specific metals are seemingly sequestered into sediments within a sub-oxic to anoxic conditions based on Ce* anomalies. This trace metal mineralisation is analogous to findings from Spinks et al. (2016) whom describes evidence for sedimentary exhalative (SEDEX) ore deposit style mineralisation within the Tawallah Group of the McArthur Basin. There are two simplified conditions required for a SEDEX deposit, firstly: base metal sulfide precipitation is governed by metallic basinal brines from proximal active faulting within synsedimentary depositional conditions (Large et al.,1998; Large and McGoldrick, 2000; Large et al., 2005), secondly via syndiagenetic replacement of carbonate (Large et al., 1998; Ireland et al., 2004). Two major categories were brought forward by Cooke et al., (2004), characterised by mineralising brines, sedimentary basin and lithology type: McArthur type (oxidising brines) and Selwyn type (reduced brines). The formation of the major McArthur River Mine SEDEX deposit, within the Barney Creek Formation of the upper McArthur Group, has underlying volcanic lithologies, which is argued to have been essential for governing oxidized metallic-rich brines that are deposited along faults zones into anoxic/euxinic basin floor or shallow marine surface waters (Cook et al., 2000). This scenario is somewhat analogous for the Wollogorang and Mallapunyah Formations as the proximal Batten Fault Zone could potentially produce an interesting target as a base metal trap due to underlying Settlement Creek Volcanics, overlying Gold Creek Volcanics and sub-oxic to anoxic conditions as discussed above.

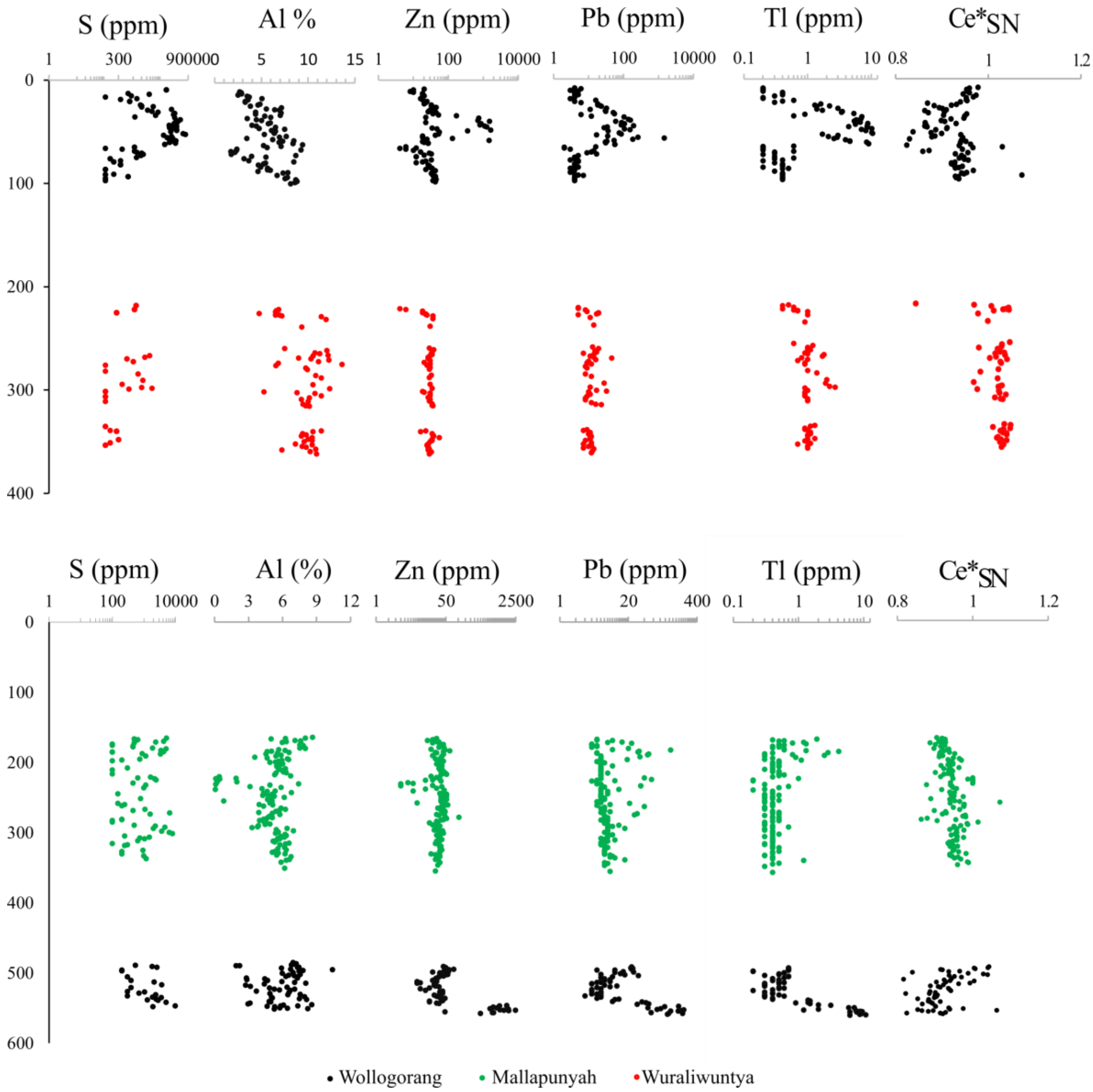

Figure 10. Top: drill core MCDD0003, Bottom: drill core MCDD0005. Trace element and metals (S, Al, Zn, Pb and Tl) concentrations alongside Ce*$_{SN}$ evidence for sedimentary exhalative ore deposit (SEDEX) related mineralisation.

CARBON AND OXYGEN

The $\delta^{13}C$ values range between +0.47 and -3.10 ‰, whilst $\delta^{18}O$ values range from -2.34 and -9.57 ‰ (figure 11). There is no evidence for large scale shifts in positive carbon isotopes via enhanced organic carbon burial or high levels of biological activity fixating CO^2 that result in enrichments of lighter carbon (^{12}C) (Braiser & Lindsay, 1998). Interestingly, the trend for $\delta^{13}C$ does demonstrate a systematic variation from <-1 ‰ at the bottom of the formation, with a bulge to >-1 ‰ in the middle section and increasing again to >-2 ‰ at the top of the formation. This indicates decreased burial of organic matter which could be a result of decreasing biological productivity or lower burial efficiency. Additionally, the trend for $\delta^{18}O$ stays low which makes sense for the oxygen-poor Palaeoproterozoic. Both trends are relatively flat, with isotope values within a narrow band, these findings are similar studies by Des Marais et al. (1992) for the mid-Palaeoproterozoic to late Mesoproterozoic (Des Marais et al., 1992). The low negative excursions also suppourts the reported delay of biological activity during this period, termed 'the boring billion' (Buick et al., 1995). This restriction on biological activity was mainly due to insufficient bioavailable nutrients such as phosphates and nitrate (Lindsay & Braiser, 1999).

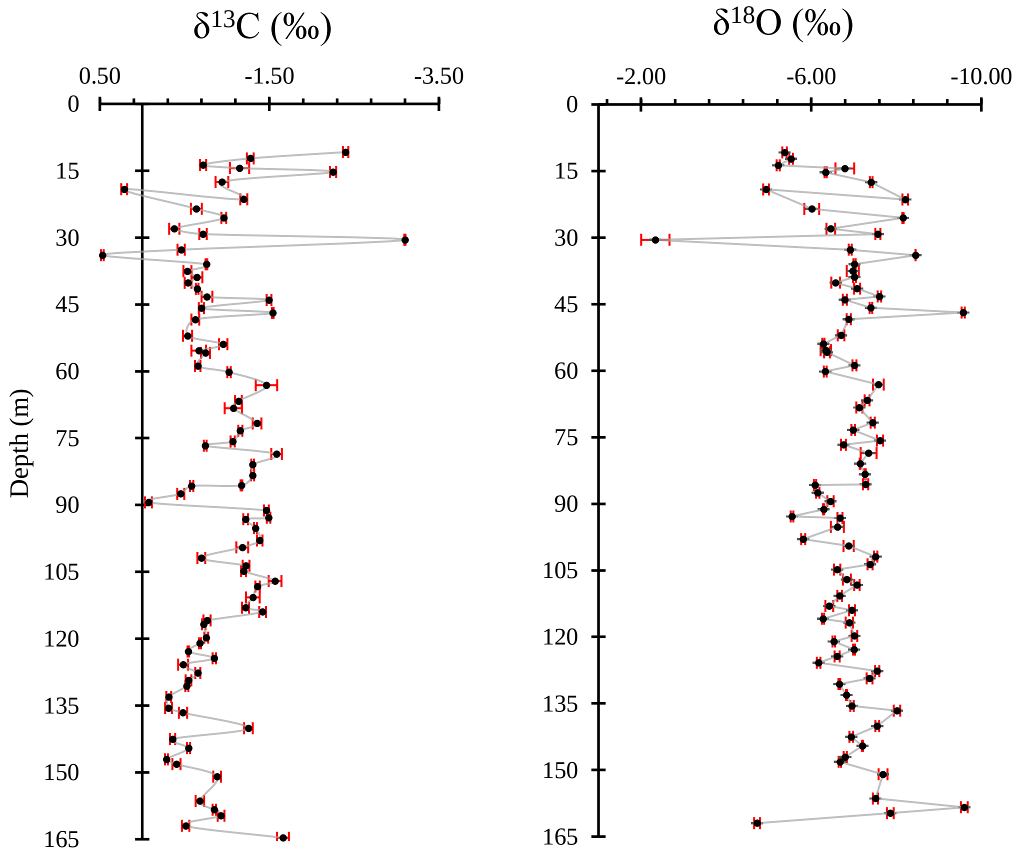

Figure 11. Carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotope data with depth for the Amelia Dolostone within the McArthur Group, fractionation in isotopic values represented in permil (‰) and error bars for each value given in red.

Cross-plotting carbon and oxygen isotopes is a method after Banner & Gilbert (1990) for checking diagenetic overprint on carbonate samples. The scattered pattern for the Amelia Dolostone seem to share no covariance relationship between carbon and oxygen isotopes, which indicates they are not influenced by diagenetic overprint. However, whether it is safe to assume these isotope systems are recording a primary signal is ambiguous due to lack of trace element data.

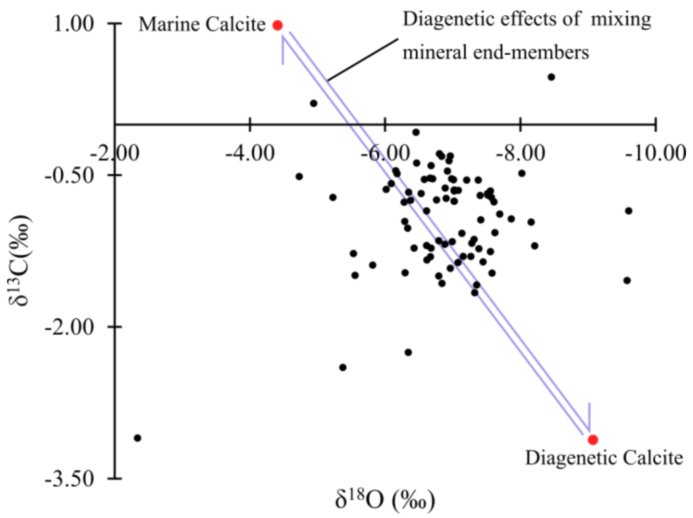

Figure 12. Carbon and oxygen isotope cross-plot from the Amelia Dolostone within the McArthur Group in order to decipher diagenetic behaviour after Banner and Gilbert, (1990). Demonstrating a modelled diagenetic relationship indicated via covariation of carbon and oxygen isotopes (blue arrows) from a theorised marine calcite and diagenetic calcite.

CONCLUSIONS

Using a new high resolution coupled dataset of conventional and organic geochemistry, the palaeoredox conditions of the units within the McArthur and Tawallah groups have been inferred.

- Cerium anomalies indicate fluctuations within the palaeoredox history of the lower McArthur Basin from suboxic to anoxic during the deposition of the Mallapunyah and Wollogorang formations. Similar suboxic signals were reported by 1.74-1.74 Ga chert and iron formation within the Jerome mining district Arizona (Slack et al., 2007). Depositional environments for the Wollogorang formation were due to episodic euxinic conditions as evident by redox-sensitive trace element enrichments sharing a covariance with increasing organic matter content, with additional large influxes of sulphur concentrations within (>70,000 ppm). This supports evidence of euxinia within the Palaeoproterozoic given by Canfield (1998), however suboxic conditions are contrasting. These findings are analogous to other studies (Spinks et al., 2016; Shen et al., 2002; Kendall et al., 2009) and share a resemblance to the depositional conditions for the 1.4Ga Velkerri formation (Cox et al., 2016).
- The Wollogorang shows evidence for sedimentary exhalative deposit style mineralisation, evident by spikes in trace metals which is supported by Spinks et al. (2016).
- Flat carbon isotope trends and slight increasing negative excursions indicate limited organic carbon burial and biological productivity. The narrow range of values are analogous to The Boring Billion period (Veizer et al., 1992; Buick et al., 1995; Knoll et al., 1995b).

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REFERENCES

AHMAD, M., & MUNSON, T. J. (2013). Geology and mineral resources of the Northern Territory: Northern Territory Geological Survey.

ALGEO, T., & LYONS, T. (2006). Mo–total organic carbon covariation in modern anoxic marine environments: Implications for analysis of paleoredox and paleohydrographic conditions. *Paleoceanography, 21*(1)

ANBAR, A.D., & KNOLL, A.H. (2002). Proterozoic Ocean Chemistry and Evolution: A Bioinorganic Bridge?, *Science, 297(5584),* 1137-1142. doi: 10.1126/science.1069651

BANNER, J.L., & HANSON, G.N. (1990). Calculations of simultaneous isotopic and trace element variations during water-rock interaction with applications to carbonate diagenesis, *Geochimica et Cosmochimica Acta, 54(11),* 3123-3137.

BAU, M., & DULSKI, P. (1996). Distribution of yttrium and rare-earth elements in the Penge and Kuruman iron-formations, Transvaal Supergroup, South Africa, *Precambrian Research, 79(1-2),* 37-55. doi:10.1016/0301-9268(95)00087-9

BETTS, P. G., & GILES, D. (2006). The 1800–1100 Ma tectonic evolution of Australia. *Precambrian Research, 144(1),* 92-125. doi:10.1016/j.precamres.2005.11.006

BLAIKIE, T. N., BETTS, P. G., ARMIT, R. J., & AILLERES, L. (2017). The ca. 1740–1710 Ma Leichhardt Event: Inversion of a continental rift and revision of the tectonic evolution of the North Australian Craton. Precambrian Research, 292, 75-92. doi:10.1016/j.precamres.2017.02.003

BRAISER, M.D., & LINDSAY, J.F. (1998). A billion years of environmental stability and the emergence of eukaryotes: New data from Northern Australia. *Geology, 26(6),* 555-558. doi:10.1130/0091-7613(1998)026<0555:ABYOES>2.3.CO;2

CANFIELD, D.E. (1998). A new model for Proterozoic ocean chemistry, *Nature, 396*(6710), 450-453. doi: 10.1038/24839

CLOSE, D. (2014). The McArthur Basin: NTGS' approach to a frontier petroleum basin with known base metal prospectivity. Paper presented at the Annual Geoscience Exploration Seminar (AGES) Proceedings, Alice Springs, Northern Territory

CONDIE, K.C. (1991). Another look at rare earth elements in shales, *Geochemica et Cosmochinica Acta, 55(9),* 2527-2531

COX, G.M., JARRET, A., EDWARDS, D., CROCKFORD, P.W., HALVERSON, G.P., COLLINS, A.S., POIRIER, A., & LI, Z. (2016). Basin redox and primary productivity within the Mesoproterozoic Roper Seaway, *Chemical Geology, 440,* 101-114, doi:10.1016/j.chemgeo.2016.06.025

CULLERS, R.L. (2002). Implications of elemental concentrations for provenance, redox conditions, and metamorphic studies of shales and limestones near Pueblo, CO, USA, *Chemical Geology, 191(4),* 305-327. doi: 10.1016/S0009-2541(02)00133-X

DONNELLY, T.H. & JACKSON, M.J. (1987). Sedimentology and geochemistry of a mid-Proterozoic lacustrine unit from northern Autralia, *58,* 159-169.

ELDERFIELD, H., & GREAVES, J.H. (1982). The rare earth elements in seawater, *Nature, 296(5845),* 214-219.

German, C.R., Hollidat, B.P., & Elderfield, H. (1991). Redox cycling of rare earth elements in the suboxic zone of the Black Sea, *Geochimica et Cosmochimica Acta, 55(12),* 3553-3558. doi:10.1016/0016-7037(91)90055-A

GREY, K. (2018). McArthur river project: 2018 stratigraphic diamond drilling program EL 27711 and EL 30085. Todd River Resources Limited

JACKSON, M. J., SCOTT, D. L., & RAWLINGS, D. J. (2000). Stratigraphic framework for the Leichhardt and Calvert Superbasins: Review and correlations of the pre- 1700 Ma successions between Mt Isa and McArthur River. *Australian Journal of Earth Sciences, 47(3),* 381-403. doi:10.1046/j.14400952.2000.00789.x

KUMP, L.R., & ARTHUR, M.A. (1999). Interpreting carbon-isoptope excursions: carbonates and organic matter, *Chemical Geology, 161(1-3),* 181-198. doi: 10.1016/S0009-2541(99)00086-8

KUNZMANN, M., SCHMID, S., BLAIKIE, T. N., & HALVERSON, G. P. (2019). Facies analysis, sequence stratigraphy, and carbon isotope chemostratigraphy of a classic Zn-Pb host succession: The Proterozoic middle McArthur Group, McArthur Basin, Australia. *Ore Geology Reviews, 106,* 150-175. doi:10.1016/j.oregeorev.2019.01.011

LANGMUIR, D. (1978). Uranium solution-mineral equilibria at low temperatures with applications to sedimentary ore deposits, *Geochimica et Cosmochimica Acta, 42,* 547-569

LINDSAY, J.F. (2010). Basin dynamics and mineralization McArthur Basin northern Australia, *Australian Journal of Earth Sciences, 48(5),* 703-720. doi: 10.1046/j.1440-0952.2001.485892.x

LINDSAY, J.F., & BRAISER, M.D. (2000). A carbon isotope reference curve for ca. 1700-1575 Ma, McArthur and Mount Isa Basins, Northern Australia, *99(3),* 271-308. doi:10.1016/S0301-9268(99)00062-5

LYONS, W.T., REINHARD, T.C. & PLANAVSKY, J.N. (2014). The rise of oxygen in Earth's early ocean and atmosphere, *Nature,* (506), 307-315. doi:10.1038/nature13068

MUKHERJEE, I., LARGE, R. R., CORKREY, R., & DANYUSHEVSKY, L.V. (2018). The Boring Billion, a slingshot for Complex Life on Earth, *Nature, 8,* 1-7. doi:10.1038/s41598-018-22695-x

MYERS, J. S., SHAW, R. D., & TYLER, I. M. (1996). *Tectonic evolution of Proterozoic Australia. Tectonics, 15(6),* 1431.

NANCE, W.B., & TAYLOR, S.R. (1976). Rare earth element patterns and crustal evolution-I. Australia post-Archean sedimentary rocks, *Geochimica et Cosmochimica Acta, 40,* 1539-1551. doi:10.1016/0016-7037(76)90093-4

NESBITT, H., & YOUNG, G. (1996). Petrogenesis of sediments in the absence of chemical weathering: Effects of abrasion and sorting on bulk composition and mineralogy. *Sedimentology, 43*(2), 341-358.

PIPER, D.Z., & CALVERT, S.E. (2009). A marine biogeochemical perspective on black shale deposition, *Earth Science Reviews, 95,* 63-96. doi:10.1016/j.earscirev.2009.03.001

POULTON, S.W., FRALICK, P.W., & CANFIELD, D.E. Spatial variability in oceanic redox structure 1.8 billion years ago, *Natural Geoscience, 3(7),* 486-490. doi: 10.1038/ngeo889

RAWLINGS, D. J. (1999). Stratigraphic resolution of a multiphase intracratonic basin system: the McArthur Basin, northern Australia. *Australian Journal of Earth Sciences, 46(5),* 703-723. doi:10.1046/j.1440-0952.1999.00739.x

RAWLINGS, D. J. (2002). Sedimentology, volcanology and geodynamics of the Redbank package, Northern Australia. (PhD). University of Tasmania, Hobart, Tasmania

SCHRAG, D.P., HIGGINS, J.A., MACDONALD, F.A., & JOHNSTON D.T. (2013). Authigenic Carbonate and the History of the Global Carbon Cycle, *Science, 339(6119),* 540-543. doi: 10.1126/science.1229578

SLACK, J.F., GRENNE, T., BEKKER, A., ROUXEL, O.J., & LINDBERG, P.A. (2007). Suboxic deep seawater in the late Paleoproterozoic: Evidence from hematitic chert and iron formation related to seafloor-hydrothermal sulfide deposits, central Arizona, USA, *Earth and Planetary Science Letters, 255(1-2),* 243-256. doi: 10.1016/j.epsl.2006.12.018

SPINKS, S.C., SCHIMD, S., PAGÉS, A., & BLUETT, J. (2016). Evidence for SEDEX-style mineralization in the 1.7 Ga Tawallah Group, McArthur Basin, Australia, *Ore Geology Reviews, 76(C),* 122-139. doi:10.1016/j.oregeorev.2016.01.007

SPINKS, S.C., SCHMID, S., PAGÉS, A., & BLUETT, J. (2016). Delated euxinia in Paleoproterozoic intracontinental seas: Vital havens for the evolution of eukaryotes?, *Precambrian Research, 287,* 108-114. Doi: 10.1016/j.precamres.2016.11.0020301-9268/

TOSTEVIN, R., SHIELDS, G., TARBUCK, G., He, T., CLARKSON, M., & WOOD, R. (2016). Effective use of cerium anomalies as a redox proxy in carbonate-dominated marine settings. *Chemical Geology, 438*(C), 146-162.

TRIBOVILLARD, N., ALGEO, T.J., LYONS, T., & RIBOULLEAU, A. (2006). Trace metals as paleoredox and paleproductivity proxies: An update, *Chemical geology, 232(1-2),* 12-32. doi: 10.1016/j.chemgeo.2006.02.012

APPENDIX:

Carbon and oxygen isotope data

Depth (m)	sample #	δ13C	δ13Cerr	δ18O	δ18Oerr
10.81	1	-2.40	0.03	-5.37	0.05
12.24	2	-1.27	0.04	-5.53	0.04
13.71	3	-0.72	0.04	-5.22	0.04
14.41	4	-1.15	0.11	-6.79	0.22
15.27	5	-2.25	0.04	-6.34	0.03
17.51	6	-0.94	0.07	-7.41	0.03
21.41	7	-1.20	0.04	-8.21	0.07
19.15	8	0.21	0.03	-4.94	0.07
23.54	9	-0.64	0.06	-6.01	0.17
25.57	10	-0.96	0.03	-8.16	0.02
28.02	11	-0.38	0.06	-6.46	0.10
29.21	12	-0.72	0.04	-7.57	0.06
30.49	13	-3.10	0.01	-2.34	0.33
32.72	14	-0.46	0.04	-6.92	0.04
33.95	15	0.47	0.02	-8.45	0.00
36	16	-0.76	0.01	-7.02	0.03
37.54	17	-0.53	0.05	-6.98	0.14
38.9	18	-0.65	0.06	-7.02	0.03
40.15	19	-0.54	0.04	-6.58	0.10
41.5	20	-0.65	0.02	-7.08	0.07
43.27	21	-0.76	0.06	-7.60	0.04
44	22	-1.50	0.03	-6.79	0.05
45.84	23	-0.70	0.03	-7.40	0.03
46.9	24	-1.54	0.01	-9.57	0.04
48.4	25	-0.63	0.05	-6.88	0.05
52.03	26	-0.53	0.05	-6.70	0.08
53.93	27	-0.96	0.05	-6.29	0.03
55.37	28	-0.67	0.09	-6.34	0.12
55.87	29	-0.75	0.05	-6.37	0.07
58.8	30	-0.65	0.03	-7.02	0.05
60.2	31	-1.02	0.02	-6.33	0.03
63.13	32	-1.47	0.13	-7.58	0.13
66.69	33	-1.13	0.04	-7.31	0.06
68.29	34	-1.07	0.10	-7.13	0.07
71.7	35	-1.35	0.05	-7.45	0.05
73.35	36	-1.16	0.02	-6.99	0.04
75.75	37	-1.07	0.02	-7.62	0.07
76.7	38	-0.74	0.02	-6.76	0.06
78.57	39	-1.58	0.06	-7.35	0.19
80.95	40	-1.30	0.02	-7.15	0.01
83.35	41	-1.30	0.02	-7.26	0.02
85.6	42	-1.17	0.01	-7.28	0.06
85.75	43	-0.58	0.02	-6.09	0.03
87.5	44	-0.45	0.04	-6.15	0.04
89.42	45	-0.07	0.04	-6.45	0.07
91.23	46	-1.46	0.03	-6.29	0.02
92.86	47	-1.49	0.02	-5.55	0.03
93.2	48	-1.22	0.03	-6.68	0.06
95.19	49	-1.34	0.02	-6.62	0.15
97.97	50	-1.39	0.03	-5.81	0.05
99.5	51	-1.18	0.07	-6.88	0.12
101.9	52	-0.70	0.05	-7.52	0.04
103.63	53	-1.22	0.04	-7.38	0.06
104.83	54	-1.20	0.03	-6.61	0.07

107.07	55	-1.57	0.08	-6.84	0.09
108.3	56	-1.36	0.03	-7.08	0.06
110.75	57	-1.30	0.08	-6.67	0.05
113.05	58	-1.22	0.04	-6.43	0.09
114	59	-1.42	0.04	-6.96	0.07
115.9	60	-0.76	0.04	-6.28	0.03
116.77	61	-0.73	0.02	-6.90	0.09
119.77	62	-0.76	0.02	-7.02	0.07
121.03	63	-0.68	0.01	-6.53	0.03
122.86	64	-0.54	0.01	-7.01	0.02
124.4	63	-0.85	0.02	-6.61	0.06
125.83	66	-0.48	0.06	-6.17	0.04
127.71	67	-0.66	0.03	-7.55	0.05
129.35	68	-0.55	0.03	-7.37	0.07
130.63	69	-0.53	0.02	-6.66	0.02
133.09	70	-0.31	0.03	-6.83	0.01
135.55	71	-0.31	0.04	-6.96	0.04
136.62	72	-0.48	0.05	-8.02	0.08
140.1	73	-1.25	0.05	-7.55	0.04
142.52	74	-0.36	0.03	-6.94	0.04
144.55	75	-0.55	0.02	-7.20	0.01
147.07	76	-0.29	0.02	-6.80	0.04
148.15	77	-0.40	0.05	-6.67	0.03
150.96	78	-0.88	0.05	-7.69	0.10
156.42	80	-0.68	0.05	-7.51	0.06
158.38	81	-0.85	0.02	-9.6	0.08
159.73	82	-0.93	0.04	-7.86	0.08
161.98	83	-0.51	0.04	-4.73	0.07
164.68	84	-1.66	0.07	-7.32	0.07

Drill core MCDD0005 – Mallapunyah formation

IDENT	Depth	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga
UNITS		ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm
SCHEME		MA102	LB101	MA102	LB101	MA102	MA102	LB101	MA102	MA102	LB101	MA102	MA101	LB101	MA102
LOD		0.2	0.005	1	20	0.5	0.1	0.01	0.5	1	20	0.1	2	0.01	0.2
1	165.2	0.6	8.64	17	220	6.5	0.8	0.35	<0.5	39	100	15	86	3.11	25.6
2	166.3	<0.2	7.99	4	140	6	<0.1	0.24	<0.5	38	100	10.9	102	6.92	23.8
3	167.3	<0.2	6.25	5	200	6	<0.1	4.61	<0.5	27	60	17.8	8	3.42	21.4
4	167.9	<0.2	4.99	6	220	2.5	0.6	6.64	<0.5	20	60	7.1	50	2.32	14.8
5	169.9	0.4	7.09	17	200	6	0.3	2.88	<0.5	85	80	15.1	350	3.36	24.2
6	170.7	0.4	7.59	9	160	6.5	0.3	1.33	<0.5	65	100	12.7	148	4.25	24.4
7	171.8	<0.2	6.32	4	220	4	0.5	0.66	<0.5	19	80	12.4	12	2.39	19.8
8	172.8	<0.2	5.98	2	160	3.5	<0.1	4.15	<0.5	20	60	16	4	4.2	20.4
9	173.9	<0.2	7.63	2	200	3	<0.1	0.22	<0.5	16	100	15.5	6	5.56	23.4
10	175.3	<0.2	7.6	4	140	3	<0.1	0.29	<0.5	16	100	13.8	6	5.66	23.4
11	176.3	<0.2	7.5	3	180	3.5	<0.1	0.23	<0.5	32	100	15.5	<2	7.34	23.8
12	177.5	<0.2	7.83	2	140	3.5	<0.1	0.18	<0.5	20	100	13	338	6.58	25.2
13	179.1	<0.2	7.82	19	180	3.5	0.4	1.26	<0.5	33	100	11.6	80	3.2	27
14	180.6	<0.2	7.5	16	560	1	0.2	0.06	<0.5	62	80	3.1	6	2.46	21
15	181.6	1	8	57	760	2.5	0.4	1.18	<0.5	101	100	10.9	194	2.73	31.8
16	182.8	0.4	5.66	16	220	2.5	0.6	5.59	<0.5	35	60	9.6	384	2.11	20.2
17	184.2	0.4	6.21	20	260	3.5	0.3	4.07	<0.5	24	40	13.6	24	3.03	19.8
18	185.1	<0.2	5.02	5	300	2.5	<0.1	5.46	<0.5	16	60	11.5	10	3.71	13.8
19	185.9	<0.2	4.64	3	320	2.5	<0.1	7.45	<0.5	16	60	11.1	6	2.77	13.8
20	187.2	<0.2	6.56	10	740	2	0.6	0.88	<0.5	32	60	10.5	24	1.77	18
21	188	1.6	5.54	44	260	3	1.3	4.01	<0.5	81	60	15.8	100	2.86	19.4
22	189.6	<0.2	4.54	3	900	1.5	<0.1	5.18	<0.5	24	40	8.3	10	2.94	11.4
23	190.8	0.6	5.86	18	360	2.5	0.8	5	<0.5	33	60	12.8	34	2.69	18.6
24	192.3	<0.2	5.42	6	840	2.5	<0.1	4.55	<0.5	18	40	12.8	26	4.78	15.2
25	194	<0.2	3.54	4	420	1.5	<0.1	10.8	<0.5	15	40	7.8	10	1.91	10.8
26	195	0.4	4.64	13	360	3	0.5	7.9	<0.5	23	60	10.4	22	2.96	14.6
27	196.3	<0.2	6.43	8	340	3.5	0.3	2.78	<0.5	22	60	15.6	12	6.76	19.6
28	197.6	<0.2	6.52	4	560	3	<0.1	3.26	<0.5	21	60	14.7	40	4.46	21
29	198.4	<0.2	5.93	8	420	3	0.3	3.96	<0.5	20	60	11.2	10	4.36	18
30	199.5	0.4	5.66	9	480	3	0.3	4.41	<0.5	19	60	14	8	5.42	19.4
31	200.9	<0.2	5.37	9	680	2	0.3	5.39	<0.5	19	60	11.1	8	4.85	16
32	201.6	<0.2	4.86	7	300	3	0.3	5.78	<0.5	31	40	9.8	6	3.42	14.4

33	202.8	<0.2	5.52	7	220	3	0.2	5.46	<0.5	18	60	12.1	4	4.66	16.6
34	203.9	<0.2	6.01	8	520	2.5	0.3	5.3	<0.5	17	60	12.2	6	5.01	17.4
35	204.9	<0.2	5.67	10	400	2.5	0.3	5.01	<0.5	20	60	11.9	6	4.87	16.2
36	206.6	<0.2	5.46	6	440	2	0.2	5.24	<0.5	18	40	10.6	6	4.56	14.8
37	207.9	<0.2	5.51	4	2280	2	0.2	5.81	<0.5	20	40	6.8	4	2.53	13.6
38	209.3	<0.2	5.67	6	480	3	0.3	5.03	<0.5	18	40	12.7	6	3.84	16.8
39	210.5	<0.2	6.25	8	700	3	0.4	3.91	<0.5	23	60	12	8	4.32	16.8
40	211.4	<0.2	5.64	7	420	3	0.3	4.56	<0.5	25	40	11.3	10	3.69	14.8
41	212.6	<0.2	5.95	9	480	2.5	0.4	4.19	<0.5	18	60	11.8	6	5.11	17
42	213.9	<0.2	6.17	9	540	3	0.4	3.49	<0.5	16	40	12.2	10	4.93	17.4
43	214.9	<0.2	6.08	8	340	3	0.4	3.64	<0.5	16	40	11.8	6	4.17	16.2
44	216	<0.2	6.33	8	480	3.5	0.4	4.04	<0.5	18	40	10.8	16	4.47	19.2
45	217	<0.2	5.41	8	380	3.5	0.5	5.2	<0.5	17	40	11	14	3.98	15.8
46	218.8	<0.2	5.31	3	680	2	0.3	6.35	<0.5	13	60	6.6	<2	1.45	14
47	220.7	0.6	6.7	26	760	3	5.5	2.92	<0.5	36	60	8.3	16	1	19.4
48	221.9	<0.2	0.405	4	4900	<0.5	0.2	14.6	<0.5	16	<20	0.3	10	0.89	0.8
49	222.9	<0.2	0.33	29	1480	<0.5	1.1	19.4	<0.5	16	<20	0.2	10	1.68	0.4
50	224	<0.2	1.89	2	60	1	<0.1	13.2	<0.5	12	20	2.9	8	1.18	5.4
51	224.9	<0.2	0.115	6	17400	<0.5	<0.1	19	<0.5	8	<20	<0.1	416	1.24	0.2
52	225.5	<0.2	0.445	10	160	<0.5	0.2	16.4	<0.5	19	<20	0.3	6	0.84	0.8
53	227.8	<0.2	0.285	13	120	<0.5	<0.1	16.3	<0.5	22	<20	0.2	6	0.86	0.6
54	229.1	<0.2	1.97	4	120	0.5	<0.1	10.6	<0.5	13	20	1.8	118	0.84	5.4
55	229.9	<0.2	0.215	6	300	<0.5	<0.1	16.6	<0.5	8	<20	<0.1	8	1.06	0.4
56	232	0.4	7.4	9	200	5	2.7	1.42	<0.5	23	40	12.1	10	1.18	24.4
57	232.6	<0.2	0.1	<1	340	<0.5	<0.1	16	<0.5	10	<20	<0.1	6	0.76	0.2
58	233.7	<0.2	4.87	2	320	2.5	<0.1	2.69	<0.5	16	20	14.4	22	2.44	15.4
59	236.1	<0.2	3.13	2	3000	1.5	<0.1	5.25	<0.5	27	20	6.9	18	1.18	9.8
60	237.3	<0.2	5.85	3	80	4.5	0.4	0.08	<0.5	7	<20	6.1	4	2.98	20.6
61	238.8	<0.2	4.16	6	160	2.5	0.2	2.64	<0.5	16	<20	14.9	8	2.72	17
62	240	<0.2	0.075	3	980	<0.5	0.4	10.2	<0.5	29	<20	0.2	10	0.17	<0.2
63	242.2	<0.2	5.34	2	240	2	<0.1	3.68	<0.5	16	40	17	12	3.92	13.2
64	243.1	<0.2	4.64	2	260	1	<0.1	6.76	<0.5	14	40	12.5	34	1.74	11.6
65	244.5	<0.2	6.78	2	280	3	<0.1	0.39	<0.5	16	40	20.6	8	2.04	16
66	245.8	<0.2	4.33	3	140	1.5	0.2	5.95	<0.5	15	40	15.5	40	2.46	10.2
67	246.9	<0.2	5.09	3	200	2	0.3	4.12	<0.5	14	40	20.4	26	2.42	12.2
68	247.5	<0.2	4.66	3	200	2	0.2	1.68	<0.5	18	40	19.5	22	3.87	13.8
69	248.6	<0.2	4.24	2	180	2	0.3	4.26	<0.5	21	40	15.6	56	2.88	11.2
70	249.7	<0.2	5.26	4	260	2.5	0.2	0.96	<0.5	17	40	17.3	44	2.29	14
71	251.5	<0.2	6.15	13	600	3	1.2	0.43	<0.5	30	60	16	16	2.51	15.8

72	252.5	<0.2	4.8	2	640	2	<0.1	4.57	<0.5	22	40	12.7	12	1.99	11.6
73	254.5	<0.2	4.68	2	580	2	0.2	5.01	<0.5	20	40	12.3	18	2.07	12.2
74	255.5	<0.2	5.05	3	220	1.5	0.2	3.46	<0.5	20	40	16.3	14	3.66	13.2
75	256.8	<0.2	0.785	2	200	<0.5	0.7	19.3	<0.5	11	<20	1.4	176	0.52	1.6
76	258.3	<0.2	5.04	4	640	3	0.3	0.46	<0.5	32	40	16.1	12	5.48	13.2
77	259.8	<0.2	4.86	3	220	2	0.2	2.56	<0.5	36	40	18.7	74	2.5	13.2
78	261.6	<0.2	3.92	4	460	1.5	0.6	4.28	<0.5	48	40	12.6	16	1.9	10.8
79	262.6	<0.2	5.14	6	200	2	0.4	4.32	<0.5	26	40	14.3	14	3.79	12.4
80	264.2	<0.2	4.33	9	1240	2.5	0.3	6.27	<0.5	20	40	13.5	16	3.24	12.2
81	266.8	<0.2	5.85	10	740	2.5	0.3	3.13	<0.5	29	60	16.3	12	4.8	16.4
82	268.5	<0.2	6.24	18	360	3	0.3	2.54	<0.5	22	60	18.3	14	4.06	19.8
83	269.7	<0.2	5.73	13	240	3	0.3	4.33	<0.5	24	60	16.1	10	4.02	17.4
84	271.7	0.4	5.42	10	220	2	0.5	5.03	<0.5	25	60	14.9	12	1.75	18
85	273.4	<0.2	3.91	8	520	1.5	1.8	8	<0.5	21	40	8.8	16	1.03	12.2
86	274.6	<0.2	5.08	12	180	1.5	0.5	5.53	<0.5	21	40	10.5	14	3.26	15.4
87	276.2	<0.2	5.77	33	200	2.5	0.6	3.19	<0.5	27	60	12.4	16	4.94	18
88	277.3	<0.2	5.02	30	380	2	0.3	4.69	<0.5	21	40	10.3	26	3.17	13.4
89	279.1	<0.2	4.81	21	260	2.5	0.5	4.76	<0.5	19	40	12.9	16	2.21	15.6
90	280.6	<0.2	5.1	26	220	3	0.4	4.27	<0.5	24	40	13.9	14	2.22	18
91	281.3	<0.2	4.62	10	260	2	0.4	4.56	<0.5	22	40	11.8	16	3.09	15.4
92	282.8	<0.2	4.31	10	260	2	0.4	5.52	<0.5	25	40	9.1	18	3.23	13.8
93	284.9	<0.2	3.97	9	1160	0.5	0.4	5.67	<0.5	23	40	5	36	2.61	10.6
94	286.6	<0.2	4.35	10	420	2.5	0.4	4.01	<0.5	22	40	8.6	20	3.52	14.2
95	288	<0.2	4.55	11	240	1.5	0.8	4.66	<0.5	23	40	9.5	32	3.59	14.2
96	289.6	<0.2	4.86	28	240	2.5	0.4	3.68	<0.5	26	60	13	22	2.93	19.4
97	290.6	<0.2	4.47	21	220	3	0.4	4.38	<0.5	25	40	13.4	24	3.54	16.8
98	292.1	<0.2	3.86	10	1900	2	0.7	4.68	<0.5	36	20	9.2	26	2.36	13.4
99	293.9	<0.2	3.8	10	220	1.5	0.4	5.59	<0.5	24	40	10.4	24	2.54	14.6
100	295	<0.2	3.3	13	340	1.5	0.4	5.3	<0.5	25	20	10.9	24	2.63	14
101	296.2	<0.2	6.38	16	300	2.5	0.4	4.3	<0.5	22	40	16.1	18	4.77	18
102	297.9	<0.2	5.44	11	500	2.5	0.3	2.82	<0.5	34	40	12.9	18	3.15	14.4
103	299.5	<0.2	6.95	18	300	3	0.8	3.35	<0.5	21	60	18.5	18	2.37	21
104	301.4	<0.2	5.62	21	720	2	6.4	3.74	<0.5	31	40	13	24	3.31	14.8
105	302.7	<0.2	5.38	10	760	2	0.4	4.68	<0.5	34	40	12.5	20	3.41	13.2
106	304.9	<0.2	6.21	13	280	2.5	0.4	3.06	<0.5	24	40	13.9	28	4.58	16.4
107	306.2	<0.2	6.33	10	280	2.5	0.7	4.9	<0.5	25	40	13	14	2.21	15.8
108	307.4	<0.2	5.84	13	320	2.5	0.3	3.16	<0.5	26	40	15.2	16	3.19	16
109	308.9	<0.2	6.13	10	400	2	0.7	5.02	<0.5	21	40	14.3	20	2.11	16.6
110	310.4	<0.2	5.59	11	280	2.5	0.5	4.47	<0.5	29	40	14	18	3.62	15

111	311.2	<0.2	5.75	12	500	2.5	0.4	4.95	<0.5	30	40	12.9	16	3.43	13.8
112	312.8	<0.2	5.46	11	880	2	0.2	6.07	<0.5	20	40	14.1	14	1.87	14.2
113	314.3	<0.2	5.16	10	420	1.5	0.4	4.56	<0.5	28	40	12.7	16	3.34	13.2
114	315.5	<0.2	5.31	12	340	2.5	0.3	4.38	<0.5	29	40	13.3	18	3.01	14.6
115	317.4	<0.2	6.58	23	260	2.5	0.4	3.26	<0.5	26	60	13.8	40	4.33	16.2
116	318.5	<0.2	6.23	22	340	2	0.3	2.54	<0.5	23	60	14.9	30	4.29	16.2
117	319.3	<0.2	5.77	19	280	2	0.4	4.15	<0.5	24	40	15.8	18	3.68	15.4
118	323.6	<0.2	6.19	13	280	2.5	0.4	2.81	<0.5	23	40	16.2	12	4.3	17
119	325	<0.2	5.58	17	320	2.5	0.3	2.56	<0.5	30	40	15	20	4.27	15.6
120	326.7	<0.2	6.31	10	300	3	0.4	2.23	<0.5	27	40	15.6	22	4.6	17
121	329.1	<0.2	5.29	10	320	1.5	0.5	7.4	<0.5	17	40	8.3	44	3.68	13.8
122	330.1	<0.2	5.1	9	300	1.5	0.5	5.38	<0.5	24	40	10.8	16	4.35	13.4
123	331.7	<0.2	5.61	9	500	2	0.5	5.36	<0.5	19	40	13.6	16	3.95	14.6
124	332.9	<0.2	6.22	8	860	2.5	0.5	4.6	<0.5	19	40	13.1	12	4.43	16.2
125	334.2	<0.2	5.46	5	360	2.5	0.4	4.57	<0.5	34	40	10.6	8	1.74	14.8
126	353.4	<0.2	6.17	11	300	2	0.4	4.2	<0.5	20	40	12.4	20	4.9	15.6
127	336.8	<0.2	6.74	36	380	2.5	0.6	3.45	<0.5	17	40	12.3	24	4.08	19.4
128	340.8	<0.2	6.59	8	280	4	0.4	2.95	<0.5	23	40	14.2	10	4.35	17.2
129	341.7	<0.2	6.31	8	320	2	0.5	3.79	<0.5	19	40	12.5	10	3.88	15.4
130	344.9	<0.2	5.86	9	260	3	0.5	3.79	<0.5	20	40	12.9	8	5.01	14.6
IDENT	**Depth**	**Hf**	**In**	**K**	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Nb**	**Ni**	**P**	**Pb**	**Rb**	**Re**
UNITS		ppm	ppm	%	ppm	%	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA102	MA102	LB101	MA101	LB101	LB101	MA102	LB101	MA102	MA101	LB101	MA102	LB102	LB102
LOD		**0.2**	**0.05**	**0.01**	**10**	**0.005**	**0.005**	**0.5**	**0.01**	**0.5**	**2**	**0.005**	**1**	**0.5**	**0.1**
Shale1	165.2	4.4	<0.05	7.44	190	1.69	0.01	1.5	0.09	9.5	40	0.07	63	244	<0.1
Shale2	166.3	2.8	<0.05	7.36	140	1.73	0.01	1	0.06	9	32	0.04	5	234	<0.1
Shale3	167.3	3	<0.05	5.52	110	3.84	0.06	<0.5	0.07	11.5	18	0.065	5	234	<0.1
Shale4	167.9	2.2	<0.05	4.52	60	4.42	0.08	<0.5	0.06	8.5	14	0.045	10	139	<0.1
Shale5	169.9	2.8	<0.05	6.13	150	3.11	0.045	<0.5	0.09	9	54	0.085	15	237	<0.1
Shale6	170.7	3.2	<0.05	6.68	140	2.52	0.03	1	0.08	9	64	0.075	8	236	<0.1
Shale7	171.8	3	<0.05	5.91	100	1.46	0.015	<0.5	0.08	10.5	26	0.065	23	235	<0.1
Shale8	172.8	2.6	<0.05	5.1	90	3.66	0.085	<0.5	0.09	8.5	30	0.075	4	237	<0.1
Shale9	173.9	2.6	<0.05	6.75	80	1.7	0.015	<0.5	0.09	9	34	0.07	4	250	<0.1
Shale10	175.3	2.4	<0.05	7.3	80	1.77	0.01	<0.5	0.08	8.5	36	0.11	5	237	<0.1
Shale11	176.3	2.6	<0.05	6.51	80	1.9	0.02	1	0.09	8.5	42	0.08	5	264	<0.1
Shale12	177.5	2.8	<0.05	7.44	80	1.85	0.01	1	0.07	8.5	38	0.06	4	250	<0.1
Shale13	179.1	2.8	0.05	7.56	100	2.1	0.025	1	0.08	9	56	0.07	20	228	<0.1
Shale14	180.6	2.4	<0.05	8.74	20	0.895	<0.005	<0.5	0.04	8	48	0.025	10	114	<0.1
Shale15	181.6	3.2	<0.05	8.21	90	1.67	0.03	1.5	0.08	11.5	170	0.055	126	218	<0.1

Shale16	182.8	2.6	<0.05	5.59	70	3.89	0.09	1	0.07	9.5	30	0.07	32	178	<0.1
Shale17	184.2	5.2	<0.05	6.04	120	3.73	0.065	2.5	0.08	12.5	32	0.065	30	216	<0.1
Shale18	185.1	3	<0.05	4.84	80	4.26	0.085	1	0.08	9	16	0.05	5	178	<0.1
Shale19	185.9	2.4	<0.05	4.45	80	5.34	0.105	1	0.08	8.5	16	0.075	5	172	<0.1
Shale20	187.2	3.6	<0.05	6.76	90	1.35	0.015	2	0.07	11.5	22	0.14	48	199	<0.1
Shale21	188	2.8	<0.05	5.21	110	3.64	0.07	4.5	0.08	11.5	48	0.06	46	194	<0.1
Shale22	189.6	3.2	<0.05	4.73	50	3.81	0.085	<0.5	0.07	8.5	12	0.045	6	144	<0.1
Shale23	190.8	3	<0.05	5.63	110	4.11	0.07	2	0.07	10	30	0.06	33	178	<0.1
Shale24	192.3	3.8	<0.05	5.18	90	3.92	0.07	1.5	0.08	10.5	18	0.05	6	178	<0.1
Shale25	194	2	<0.05	3.32	100	6.99	0.15	1	0.07	6	12	0.065	6	120	<0.1
Shale26	195	2.4	<0.05	4.13	120	5.98	0.125	2	0.08	8.5	22	0.055	19	159	<0.1
Shale27	196.3	3.6	<0.05	5.89	140	3.5	0.05	1.5	0.07	11.5	26	0.045	6	228	<0.1
Shale28	197.6	3.8	<0.05	6.76	150	3.51	0.055	1	0.06	13	20	0.05	5	217	<0.1
Shale29	198.4	3.8	<0.05	5.72	130	3.69	0.055	1	0.07	11.5	18	0.045	6	192	<0.1
Shale30	199.5	3.6	<0.05	5.21	140	4.14	0.065	1	0.08	11.5	24	0.05	7	183	<0.1
Shale31	200.9	3.6	<0.05	4.93	100	4.35	0.07	1	0.07	10.5	20	0.06	6	162	<0.1
Shale32	201.6	4.2	<0.05	4.84	80	4.4	0.07	1	0.07	11.5	16	0.04	6	153	<0.1
Shale33	202.8	3.2	<0.05	5.03	120	4.43	0.06	1	0.07	11	22	0.045	6	183	<0.1
Shale34	203.9	3.6	<0.05	5.4	130	4.35	0.065	<0.5	0.08	10.5	22	0.04	10	182	<0.1
Shale35	204.9	3.6	<0.05	5.42	130	4.12	0.065	<0.5	0.09	11.5	20	0.045	6	178	<0.1
Shale36	206.6	2.8	<0.05	5.08	140	4.19	0.065	<0.5	0.08	10	18	0.035	6	177	<0.1
Shale37	207.9	3.6	<0.05	6.33	70	3.88	0.09	<0.5	0.06	12.5	12	0.03	6	132	<0.1
Shale38	209.3	3.6	<0.05	5.15	150	4.04	0.065	<0.5	0.09	11.5	20	0.035	6	195	<0.1
Shale39	210.5	3	<0.05	5.51	140	3.39	0.05	<0.5	0.09	10.5	26	0.04	6	197	<0.1
Shale40	211.4	2.8	<0.05	4.96	120	3.72	0.06	<0.5	0.08	8.5	20	0.03	6	179	<0.1
Shale41	212.6	2.4	<0.05	5.44	150	3.54	0.055	<0.5	0.08	8.5	26	0.03	6	186	<0.1
Shale42	213.9	2.8	<0.05	5.54	150	3.16	0.055	<0.5	0.08	8.5	24	0.04	8	195	<0.1
Shale43	214.9	2.8	<0.05	5.51	170	3.17	0.05	<0.5	0.1	8.5	22	0.045	6	203	<0.1
Shale44	216	2.8	<0.05	5.89	140	3.42	0.07	1	0.1	8.5	24	0.025	6	192	<0.1
Shale45	217	2.8	<0.05	5.11	140	3.99	0.07	<0.5	0.08	8.5	18	0.04	6	171	<0.1
Shale46	218.8	2.8	<0.05	5.74	80	4.06	0.065	<0.5	0.07	9	6	0.045	6	142	<0.1
Shale47	220.7	2.8	<0.05	7.2	90	2.21	0.025	1	0.07	10	12	0.06	40	183	<0.1
Shale48	221.9	<0.2	<0.05	0.51	<10	8.34	0.18	<0.5	0.03	1	4	0.015	6	9.5	<0.1
Shale49	222.9	<0.2	<0.05	0.44	<10	11	0.235	1	0.03	<0.5	6	0.015	55	6.5	<0.1
Shale50	224	0.8	<0.05	2.02	40	7.63	0.13	<0.5	0.04	3.5	4	0.02	5	53.5	<0.1
Shale51	224.9	<0.2	<0.05	0.18	<10	11	0.28	<0.5	0.04	<0.5	4	0.01	11	2.5	<0.1
Shale52	225.5	<0.2	<0.05	0.69	<10	10	0.185	1.5	0.06	1	4	0.025	4	9	<0.1
Shale53	227.8	<0.2	<0.05	0.49	<10	9.94	0.17	<0.5	0.06	1	4	0.02	5	6	<0.1
Shale54	229.1	0.8	<0.05	2.39	30	6.58	0.14	<0.5	0.07	3.5	4	0.02	5	46.5	<0.1

Shale55	229.9	<0.2	<0.05	0.33	<10	9.96	0.225	1	0.03	<0.5	4	0.01	6	5	<0.1
Shale56	232	3.8	<0.05	7.63	160	1.62	0.025	<0.5	0.09	13	16	0.045	34	228	<0.1
Shale57	232.6	<0.2	<0.05	0.25	<10	10.1	0.285	<0.5	0.04	<0.5	<2	0.01	<1	2.5	<0.1
Shale58	233.7	3.6	<0.05	4.99	170	2.75	0.04	<0.5	0.11	8.5	12	0.03	7	203	<0.1
Shale59	236.1	2.6	<0.05	3.63	90	3.82	0.095	<0.5	0.08	6	12	0.03	6	111	<0.1
Shale60	237.3	4.6	<0.05	7.42	550	1.58	<0.005	<0.5	0.11	17	6	0.025	13	218	<0.1
Shale61	238.8	2.8	<0.05	4.58	190	2.44	0.045	<0.5	0.1	9	16	0.035	6	184	<0.1
Shale62	240	<0.2	<0.05	0.12	<10	5.77	0.105	1	0.04	<0.5	<2	0.015	8	2	<0.1
Shale63	242.2	2.8	<0.05	4.78	560	5.86	0.06	<0.5	0.12	8.5	14	0.035	6	190	<0.1
Shale64	243.1	2	<0.05	4.09	470	7.32	0.115	<0.5	0.1	8	12	0.05	8	146	<0.1
Shale65	244.5	3	0.1	7.02	820	4.54	0.015	<0.5	0.12	11.5	16	0.1	6	220	<0.1
Shale66	245.8	2	<0.05	3.93	680	7.15	0.105	<0.5	0.09	7	12	0.045	6	154	<0.1
Shale67	246.9	2.6	<0.05	4.92	790	6.22	0.09	<0.5	0.11	8.5	14	0.055	6	220	<0.1
Shale68	247.5	2.2	<0.05	3.38	780	5.94	0.035	<0.5	0.1	8	18	0.05	6	234	<0.1
Shale69	248.6	2.6	<0.05	3.91	860	6.51	0.075	<0.5	0.1	7.5	14	0.07	6	216	<0.1
Shale70	249.7	4	<0.05	4.76	770	4.72	0.04	<0.5	0.11	10	16	0.07	7	255	<0.1
Shale71	251.5	2.8	<0.05	5.06	610	4.94	0.02	<0.5	0.13	10.5	18	0.07	7	226	<0.1
Shale72	252.5	3	<0.05	4.08	370	5.81	0.11	<0.5	0.1	8	14	0.06	6	167	<0.1
Shale73	254.5	1.2	<0.05	3.9	370	6.44	0.115	<0.5	0.11	5.5	14	0.055	5	188	<0.1
Shale74	255.5	1.8	<0.05	4.44	380	5.24	0.085	<0.5	0.1	7.5	14	0.055	6	201	<0.1
Shale75	256.8	0.6	<0.05	0.89	40	11.4	0.43	<0.5	0.06	2	4	0.03	21	22.5	<0.1
Shale76	258.3	2.8	<0.05	4.05	430	4.08	0.02	<0.5	0.1	8.5	18	0.08	9	196	<0.1
Shale77	259.8	2	<0.05	3.82	510	5.37	0.075	<0.5	0.1	8	22	0.085	5	197	<0.1
Shale78	261.6	2	<0.05	2.9	470	6.43	0.115	<0.5	0.08	6	24	0.07	40	145	<0.1
Shale79	262.6	2.8	<0.05	4.82	580	5.73	0.08	<0.5	0.1	8.5	18	0.055	7	205	<0.1
Shale80	264.2	2.6	<0.05	4.24	380	5.1	0.13	<0.5	0.08	7.5	18	0.03	6	179	<0.1
Shale81	266.8	3.4	<0.05	6.15	370	3.38	0.095	<0.5	0.08	11	24	0.035	7	196	<0.1
Shale82	268.5	2.6	<0.05	6.01	460	3.45	0.08	<0.5	0.08	10	30	0.045	9	210	<0.1
Shale83	269.7	2.8	<0.05	5.1	290	4.08	0.12	<0.5	0.09	9.5	28	0.04	6	209	<0.1
Shale84	271.7	2.8	<0.05	5.7	210	3.86	0.11	<0.5	0.09	9.5	26	0.035	29	189	<0.1
Shale85	273.4	3	<0.05	4.52	100	5.25	0.2	<0.5	0.07	7.5	16	0.03	26	133	<0.1
Shale86	274.6	2.4	<0.05	6.19	100	2.48	0.09	<0.5	0.07	9	18	0.05	7	168	<0.1
Shale87	276.2	2.8	<0.05	6.26	150	2.95	0.1	<0.5	0.09	10	26	0.03	7	208	<0.1
Shale88	277.3	3.6	<0.05	5.59	100	3.63	0.13	<0.5	0.08	9.5	20	0.035	8	164	<0.1
Shale89	279.1	4.2	<0.05	4.87	120	3.89	0.125	<0.5	0.09	10	26	0.045	7	202	<0.1
Shale90	280.6	4.2	<0.05	5.17	140	3.71	0.115	<0.5	0.09	11	28	0.04	6	209	<0.1
Shale91	281.3	3.8	<0.05	4.63	100	3.6	0.135	<0.5	0.08	9.5	24	0.035	8	174	<0.1
Shale92	282.8	3.4	<0.05	4.58	70	4	0.16	<0.5	0.07	8.5	16	0.03	7	163	<0.1
Shale93	284.9	2	<0.05	4.87	40	3.61	0.2	<0.5	0.05	7	10	0.03	7	114	<0.1

Shale94	286.6	3.6	<0.05	4.55	50	3.01	0.13	<0.5	0.06	9	16	0.03	8	172	<0.1
Shale95	288	3	<0.05	5.22	20	3.07	0.175	<0.5	0.05	10	12	0.045	13	149	<0.1
Shale96	289.6	3.6	<0.05	4.66	50	2.85	0.13	<0.5	0.06	10.5	22	0.035	10	202	<0.1
Shale97	290.6	3.8	<0.05	4.53	50	3.1	0.145	<0.5	0.06	10.5	22	0.03	8	195	<0.1
Shale98	292.1	3.4	<0.05	4.24	30	2.99	0.165	<0.5	0.06	8.5	16	0.025	17	140	<0.1
Shale99	293.9	2.8	<0.05	3.97	30	3.56	0.165	<0.5	0.06	8	16	0.035	8	165	<0.1
Shale100	295	3.6	<0.05	3.57	30	3.54	0.15	<0.5	<0.01	8.5	14	0.035	8	164	<0.1
Shale101	296.2	3	<0.05	5.5	40	3.49	0.16	<0.5	0.09	9.5	26	0.055	8	222	<0.1
Shale102	297.9	4.8	<0.05	4.52	40	2.23	0.095	<0.5	0.08	8.5	22	0.035	7	189	<0.1
Shale103	299.5	4.6	<0.05	5.79	60	2.67	0.095	<0.5	0.09	13	30	0.045	8	248	<0.1
Shale104	301.4	5	<0.05	5.02	40	2.35	0.11	<0.5	0.09	11	22	0.045	10	191	<0.1
Shale105	302.7	4.6	<0.05	5.1	40	3.25	0.175	<0.5	0.08	10	18	0.035	8	163	<0.1
Shale106	304.9	4.4	<0.05	5.53	40	2.64	0.11	<0.5	0.09	10.5	26	0.04	8	212	<0.1
Shale107	306.2	3	<0.05	5.21	40	3.62	0.14	<0.5	0.08	9	24	0.045	6	198	<0.1
Shale108	307.4	4.2	<0.05	4.89	40	2.68	0.105	<0.5	0.09	9.5	26	0.04	7	219	<0.1
Shale109	308.9	4.4	<0.05	5.33	40	3.55	0.145	<0.5	0.09	11	20	0.05	11	190	<0.1
Shale110	310.4	3.8	<0.05	4.75	40	3.31	0.13	<0.5	0.09	10.5	22	0.04	8	191	<0.1
Shale111	311.2	4	<0.05	4.9	30	3.53	0.14	<0.5	0.09	8.5	20	0.045	7	183	<0.1
Shale112	312.8	3.6	<0.05	4.6	40	4.25	0.155	<0.5	0.09	8.5	22	0.04	6	170	<0.1
Shale113	314.3	3.8	<0.05	4.58	30	3.34	0.135	<0.5	0.09	9	18	0.04	7	173	<0.1
Shale114	315.5	4.4	<0.05	4.52	40	3.32	0.13	<0.5	0.09	9	22	0.045	6	179	<0.1
Shale115	317.4	4	<0.05	5.63	40	2.87	0.11	<0.5	0.09	10.5	26	0.05	7	198	<0.1
Shale116	318.5	4.4	<0.05	4.96	40	2.41	0.1	<0.5	0.09	10	26	0.045	7	220	<0.1
Shale117	319.3	3.6	<0.05	4.85	40	3.22	0.13	<0.5	0.09	9.5	22	0.045	8	195	<0.1
Shale118	323.6	4.4	<0.05	4.8	40	2.69	0.095	<0.5	0.09	10.5	26	0.035	7	227	<0.1
Shale119	325	4.2	<0.05	4.41	40	2.31	0.095	<0.5	0.09	9.5	24	0.04	7	202	<0.1
Shale120	326.7	4.2	<0.05	4.88	40	2.28	0.08	<0.5	0.09	10	26	0.045	7	235	<0.1
Shale121	329.1	2.4	<0.05	4.85	20	3.25	0.125	<0.5	0.08	7.5	12	0.03	7	139	<0.1
Shale122	330.1	2.8	<0.05	4.75	30	3.67	0.13	1.5	0.09	8.5	14	0.045	9	149	<0.1
Shale123	331.7	3	<0.05	5.03	30	3.62	0.12	<0.5	0.09	9.5	16	0.045	10	170	<0.1
Shale124	332.9	4	<0.05	5.72	40	3.29	0.115	<0.5	0.09	11	16	0.045	9	177	<0.1
Shale125	334.2	3.4	<0.05	4.51	40	2.74	0.075	<0.5	0.09	8.5	20	0.05	11	182	<0.1
Shale126	353.4	3.2	<0.05	5.43	30	3.24	0.1	1	0.09	9	18	0.05	9	186	<0.1
Shale127	336.8	3.2	<0.05	6.4	30	2.56	0.095	<0.5	0.09	14	16	0.05	17	186	<0.1
Shale128	340.8	5.2	<0.05	5.55	30	2.56	0.065	1.5	0.09	11.5	20	0.055	7	204	<0.1
Shale129	341.7	3.4	<0.05	5.51	30	3.02	0.085	1	0.09	9.5	18	0.045	8	199	<0.1
Shale130	344.9	2.8	<0.05	5.17	30	2.82	0.085	1	0.09	8.5	14	0.04	7	189	<0.1

IDENT	Depth	S	Sb	Sc	Se	Si	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V
UNITS		ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA101	MA102	MA101	MA102	LB101	MA102	MA102	MA102	MA102	MA102	LB101	MA102	LB102	LB101
LOD		50	0.1	1	5	0.005	0.1	0.5	0.1	0.2	0.1	0.005	0.1	0.5	20
Shale1	165.2	5200	2.6	22	<5	27.7	2.8	44	0.8	<0.2	10.7	0.355	1.9	2	140
Shale2	166.3	500	1.2	34	<5	25.3	2.1	47	0.7	<0.2	7.5	0.415	0.4	2	180
Shale3	167.3	650	1.2	13	<5	22.9	3.1	59.5	1	<0.2	12.5	0.29	0.6	2.5	80
Shale4	167.9	600	1.4	12	<5	21	2.6	41	0.7	<0.2	9.5	0.215	0.5	2.5	60
Shale5	169.9	4300	1.6	24	<5	24.4	3	49	0.8	<0.2	10.4	0.31	1.2	2	120
Shale6	170.7	2400	1.8	28	<5	25.3	2.8	50	0.6	<0.2	8.5	0.385	0.8	2	160
Shale7	171.8	500	1	12	<5	31.3	3.2	34.5	0.9	<0.2	12.2	0.285	1.3	5	80
Shale8	172.8	<50	0.9	19	<5	22.7	2.3	47	0.7	<0.2	9.3	0.29	0.5	2	100
Shale9	173.9	100	1	26	<5	27.1	2.6	46.5	0.8	<0.2	9.9	0.36	0.6	2	140
Shale10	175.3	100	0.8	28	<5	26	2.1	43.5	0.7	<0.2	7.5	0.38	0.4	2.5	200
Shale11	176.3	450	1.1	25	<5	25.8	2.5	47	0.7	<0.2	9.2	0.36	0.5	2	140
Shale12	177.5	450	0.8	32	<5	25.8	2.2	44.5	0.7	<0.2	7.9	0.41	0.4	2	200
Shale13	179.1	1900	2	27	<5	25.4	2.5	47.5	0.7	<0.2	8	0.395	0.6	2	220
Shale14	180.6	5000	0.9	21	<5	31.2	2.2	34	0.6	<0.2	6.2	0.295	0.6	1.5	180
Shale15	181.6	11600	1.9	18	<5	27.4	3.2	45	1	<0.2	10.9	0.405	1.3	4.5	180
Shale16	182.8	3450	1.2	10	<5	23.2	2.9	49	0.8	<0.2	11.5	0.255	4.1	4	80
Shale17	184.2	4250	1.2	13	<5	24	3	50	1	<0.2	13.5	0.28	2.8	4	60
Shale18	185.1	100	0.8	11	<5	23.1	2.1	48	0.8	<0.2	10.4	0.245	0.4	2.5	60
Shale19	185.9	<50	0.8	10	<5	20.6	2.1	52.5	0.7	<0.2	9	0.235	0.3	3	60
Shale20	187.2	900	1	9	<5	31.6	3.3	48.5	1	<0.2	13	0.32	0.8	6.5	80
Shale21	188	3400	1.7	11	<5	25.6	3	48.5	0.9	<0.2	11.2	0.28	2.5	3.5	80
Shale22	189.6	<50	0.8	9	<5	25.4	2	64.5	0.7	<0.2	10.6	0.205	0.3	2.5	40
Shale23	190.8	1150	1.1	13	<5	23.4	3	52.5	0.9	<0.2	12.2	0.27	0.9	2.5	80
Shale24	192.3	<50	1.2	11	<5	24.8	2.6	61	0.9	<0.2	11.9	0.275	0.4	3	60
Shale25	194	<50	0.5	8	<5	16.1	1.7	61	0.5	<0.2	7	0.16	0.3	2.5	40
Shale26	195	750	1.3	11	<5	19.8	2.3	55	0.7	<0.2	9.2	0.24	1.1	2.5	60
Shale27	196.3	200	1.5	12	<5	25	3.1	50	1	<0.2	12.5	0.285	0.5	3.5	80
Shale28	197.6	100	1.1	11	<5	25	3.7	51.5	1.1	<0.2	14.1	0.27	0.5	3.5	60
Shale29	198.4	<50	1.4	9	<5	25.4	3	51	1	<0.2	13.4	0.26	0.4	4	60
Shale30	199.5	<50	1.5	10	<5	23.8	3.4	63	1	<0.2	13.8	0.25	0.5	3	60
Shale31	200.9	<50	1.4	10	<5	23.6	2.9	62	0.9	<0.2	12.2	0.245	0.4	2	40
Shale32	201.6	<50	1.3	9	<5	24.1	2.6	52	0.9	<0.2	12.6	0.23	0.4	3	40
Shale33	202.8	<50	1.4	10	<5	23.3	3.1	49.5	1	<0.2	12.6	0.24	0.5	2.5	60
Shale34	203.9	<50	1.4	11	<5	24.3	3	61.5	0.9	<0.2	12.7	0.26	0.5	2.5	40
Shale35	204.9	<50	1.5	10	<5	25.6	3	58	1	<0.2	13.3	0.265	0.4	3	40

Shale36	206.6	<50	1.2	10	<5	24.5	2.7	51	0.8	<0.2	10.8	0.235	0.4	2.5	60
Shale37	207.9	300	0.8	7	<5	25	2.3	111	0.9	<0.2	12.4	0.205	0.3	3.5	40
Shale38	209.3	<50	1.5	8	<5	25.3	2.7	59.5	0.9	<0.2	12.3	0.255	0.4	3	60
Shale39	210.5	100	2.1	11	<5	26.6	3	61	0.9	<0.2	11.5	0.26	0.5	3	40
Shale40	211.4	<50	2.4	9	<5	25.4	2.5	50	0.7	<0.2	10.6	0.24	0.4	2	40
Shale41	212.6	<50	1.4	12	<5	24.8	2.9	53	0.8	<0.2	10.8	0.245	0.5	2	40
Shale42	213.9	<50	1.5	11	<5	25.8	3	52.5	0.8	<0.2	10.9	0.25	0.5	2.5	60
Shale43	214.9	<50	1.4	11	<5	26.2	2.8	44.5	0.8	<0.2	10.9	0.245	0.5	3	60
Shale44	216	100	1.7	12	<5	25.4	3.3	55.5	0.8	0.4	10.9	0.23	0.6	3	60
Shale45	217	<50	1.7	9	<5	23.5	2.8	53	0.8	0.2	10.4	0.21	0.5	3.5	40
Shale46	218.8	<50	0.8	7	<5	23.7	2.6	59	0.8	<0.2	10.7	0.21	0.4	4	40
Shale47	220.7	1650	1.7	6	<5	28.6	2.7	52	1	0.2	12.8	0.295	1	7	40
Shale48	221.9	650	0.3	<1	<5	13.6	0.3	82.5	<0.1	<0.2	0.7	0.015	<0.1	1	<20
Shale49	222.9	2200	0.8	1	<5	3.47	0.3	50	<0.1	<0.2	0.6	0.01	0.2	5.5	<20
Shale50	224	<50	0.4	3	<5	13.5	0.9	41	0.3	<0.2	3.5	0.075	0.2	2	<20
Shale51	224.9	2450	<0.1	<1	<5	1.97	0.3	368	<0.1	<0.2	0.2	<0.005	<0.1	1	<20
Shale52	225.5	<50	0.4	<1	<5	5.21	0.4	31.5	<0.1	<0.2	0.8	0.015	<0.1	3.5	<20
Shale53	227.8	<50	0.5	<1	<5	4.18	0.3	51.5	<0.1	<0.2	0.7	0.01	<0.1	2.5	<20
Shale54	229.1	450	0.4	4	<5	15.1	0.9	34	0.3	<0.2	3.7	0.08	0.3	1.5	<20
Shale55	229.9	<50	0.2	<1	<5	2.69	0.2	33	<0.1	<0.2	0.3	0.005	<0.1	1.5	<20
Shale56	232	1150	2.5	10	<5	25.3	3.6	35.5	1.1	0.4	15.4	0.3	0.7	6.5	60
Shale57	232.6	<50	<0.1	<1	<5	1.31	0.2	50	<0.1	<0.2	0.3	<0.005	<0.1	<0.5	<20
Shale58	233.7	<50	1.3	9	<5	21.8	2.3	54	0.7	<0.2	12	0.2	0.5	3.5	40
Shale59	236.1	1000	0.7	7	<5	17.7	1.7	233	0.5	<0.2	8	0.13	0.3	2	<20
Shale60	237.3	<50	1.4	7	<5	20.2	4.3	17.5	2.1	0.2	34.1	0.1	0.2	3	<20
Shale61	238.8	<50	1.6	10	<5	16.6	2.4	41	0.8	<0.2	11	0.15	0.4	2.5	20
Shale62	240	<50	0.2	<1	<5	28.3	0.2	83.5	<0.1	<0.2	0.2	<0.005	<0.1	<0.5	<20
Shale63	242.2	<50	0.8	9	<5	25.6	2.1	50.5	0.7	<0.2	9.9	0.245	0.4	2	40
Shale64	243.1	<50	0.5	7	<5	22.5	2.1	65	0.6	<0.2	9	0.205	0.3	2	40
Shale65	244.5	150	0.8	8	<5	31.1	2.7	54.5	1	<0.2	14.3	0.275	0.5	2	40
Shale66	245.8	<50	0.6	7	<5	23.2	1.7	47.5	0.5	<0.2	7.5	0.195	0.3	2	40
Shale67	246.9	<50	0.8	8	<5	25	2	50	0.7	<0.2	9.5	0.24	0.4	3	40
Shale68	247.5	<50	0.9	9	<5	28.4	2.1	50	0.7	<0.2	9.1	0.205	0.4	2	40
Shale69	248.6	<50	1	7	<5	26.4	1.9	54	0.7	<0.2	9	0.19	0.3	2	40
Shale70	249.7	<50	0.8	9	<5	31.3	2.1	48	0.8	<0.2	11.4	0.26	0.4	4	40
Shale71	251.5	800	1	9	<5	30.2	2.3	60.5	0.9	<0.2	11.2	0.29	0.5	5.5	60
Shale72	252.5	<50	0.7	9	<5	26.9	1.7	66	0.8	<0.2	10.3	0.24	0.3	4	40
Shale73	254.5	<50	0.5	8	<5	25.8	1.3	68	0.4	<0.2	9.2	0.24	0.3	2.5	40
Shale74	255.5	<50	1	8	<5	27.6	1.9	49.5	0.5	<0.2	9.4	0.245	0.4	2.5	40

Shale75	256.8	<50	1.4	1	<5	5.77	0.4	66.5	0.1	<0.2	1.8	0.035	<0.1	1	<20
Shale76	258.3	150	1.4	8	<5	31.1	2.3	70.5	0.6	<0.2	10.9	0.265	0.4	3.5	60
Shale77	259.8	250	0.8	8	<5	29	2.1	49	0.6	<0.2	8.9	0.22	0.4	2	40
Shale78	261.6	200	0.6	6	<5	27.1	1.5	66	0.5	<0.2	6.6	0.17	0.3	3	40
Shale79	262.6	<50	0.9	8	<5	24.8	1.9	49	0.7	<0.2	9.8	0.23	0.3	4	40
Shale80	264.2	<50	1.1	7	<5	24.4	2.1	93	0.7	<0.2	8.9	0.195	0.3	2.5	40
Shale81	266.8	1100	1.1	10	<5	26.5	2.8	58	0.9	<0.2	11.5	0.245	0.4	2.5	60
Shale82	268.5	450	0.9	12	<5	27.2	2.6	56	0.9	<0.2	11.7	0.27	0.5	2.5	60
Shale83	269.7	<50	1	11	<5	25	2.4	47	0.8	<0.2	11.3	0.255	0.4	2.5	60
Shale84	271.7	6650	0.7	12	<5	22.3	2.8	94	0.9	<0.2	11.7	0.24	0.5	4	40
Shale85	273.4	1600	0.5	8	<5	19.2	2	80.5	0.6	<0.2	10.5	0.185	0.3	7.5	400
Shale86	274.6	24700	1.1	8	<5	20.9	2.8	59.5	0.8	<0.2	11	0.225	0.4	3	40
Shale87	276.2	<50	1.6	12	<5	22.5	3	47.5	0.9	<0.2	12.9	0.235	0.5	2.5	40
Shale88	277.3	<50	1.3	8	<5	21.7	2.5	56	0.9	0.2	11.5	0.22	0.4	2.5	20
Shale89	279.1	<50	1	9	<5	21.5	2.4	55.5	0.9	0.2	12.3	0.23	0.5	6.5	40
Shale90	280.6	200	1.1	10	<5	22.4	2.6	55.5	0.9	<0.2	13.2	0.24	0.5	4	40
Shale91	281.3	200	1.1	9	<5	22.5	2.3	53	0.8	<0.2	12	0.225	0.4	3	40
Shale92	282.8	100	1	8	<5	20.8	2.1	51	0.7	<0.2	11	0.2	0.3	3	40
Shale93	284.9	100	1	7	<5	21.3	2	86.5	0.5	<0.2	8.5	0.165	0.3	2	20
Shale94	286.6	<50	1.3	9	<5	21.6	2.4	61	0.7	<0.2	10.9	0.18	0.3	3	40
Shale95	288	<50	1.4	7	<5	20.9	2.4	54.5	0.9	<0.2	12.1	0.19	0.4	2.5	60
Shale96	289.6	500	1.4	10	<5	21.3	3	65.5	0.9	<0.2	13.2	0.215	0.7	3.5	60
Shale97	290.6	2300	1.6	9	<5	20.7	2.6	82	0.9	<0.2	12.7	0.2	0.4	3	20
Shale98	292.1	4700	1.1	9	<5	20.3	2.2	217	0.8	<0.2	11	0.16	0.3	2.5	20
Shale99	293.9	2000	1	9	<5	18.2	2.3	72.5	0.7	<0.2	10.2	0.17	0.3	2.5	20
Shale100	295	<50	1	8	<5	19.2	2.1	72	0.8	<0.2	11.5	0.17	0.4	2.5	20
Shale101	296.2	<50	1.3	10	<5	23	2.8	56.5	0.8	<0.2	12	0.275	0.4	3	40
Shale102	297.9	3700	1	9	<5	29.7	2.1	84.5	0.8	<0.2	12	0.265	0.4	3.5	40
Shale103	299.5	6450	0.9	12	<5	26	3	81.5	1.1	<0.2	15.3	0.31	0.5	6	40
Shale104	301.4	8150	1.1	9	<5	27.7	2.7	141	0.9	<0.2	12.8	0.27	0.4	4.5	60
Shale105	302.7	<50	1.1	9	<5	26	2.2	78.5	0.8	<0.2	12.1	0.245	0.3	2.5	40
Shale106	304.9	250	1.2	10	<5	26.7	2.6	55.5	0.9	<0.2	13.4	0.285	0.4	3.5	40
Shale107	306.2	1500	0.8	10	<5	25	2.7	63	0.8	<0.2	11.8	0.27	0.4	4	40
Shale108	307.4	750	1.1	10	<5	27.3	2.5	63	0.8	<0.2	12.1	0.275	0.4	4	40
Shale109	308.9	1050	0.9	10	<5	25.5	2.7	74.5	0.9	<0.2	13.6	0.295	0.4	5	40
Shale110	310.4	<50	1.1	10	<5	25	2.5	58	0.9	<0.2	12.4	0.28	0.4	3.5	40
Shale111	311.2	650	1.1	9	<5	27.1	2.4	67.5	0.8	<0.2	11.6	0.285	0.4	3	40
Shale112	312.8	<50	0.7	9	<5	24.1	2.3	94	0.7	<0.2	11.2	0.26	0.3	3	40
Shale113	314.3	<50	1.1	8	<5	25.9	2.1	61.5	0.8	<0.2	10.9	0.255	0.3	3	40

Shale114	315.5	100	1	9	<5	26.2	2.1	65.5	0.7	<0.2	11.8	0.265	0.4	3	40
Shale115	317.4	300	1.3	10	<5	25.6	2.6	57	0.9	<0.2	13.6	0.305	0.4	3.5	40
Shale116	318.5	250	1.3	10	<5	26.9	2.4	64.5	0.9	<0.2	13.1	0.295	0.5	3.5	40
Shale117	319.3	<50	1.2	10	<5	24.3	2.6	61	0.8	<0.2	12.2	0.265	0.4	3	40
Shale118	323.6	<50	1.5	10	<5	26.4	2.7	58.5	0.9	<0.2	13.2	0.3	0.5	3.5	60
Shale119	325	950	1.5	10	<5	28.3	2.6	62.5	0.8	<0.2	12.5	0.265	0.4	3	60
Shale120	326.7	200	1.4	10	<5	27.4	2.7	57	0.9	<0.2	13.2	0.3	0.4	3.5	100
Shale121	329.1	20000	1.3	8	<5	22.4	2.4	150	0.7	<0.2	9.9	0.22	0.3	2	80
Shale122	330.1	200	1.4	9	<5	23.8	2.3	63	0.7	<0.2	11	0.245	0.3	2.5	60
Shale123	331.7	<50	1.4	9	<5	23.8	2.5	77	0.8	<0.2	11.5	0.255	0.4	3	60
Shale124	332.9	1000	1.7	10	<5	23.6	2.9	96.5	0.9	<0.2	12.9	0.255	0.4	3	40
Shale125	334.2	10100	0.9	9	<5	26.9	2.4	129	0.8	<0.2	11.7	0.25	0.4	4	40
Shale126	353.4	<50	1.5	10	<5	24	2.5	56.5	0.8	<0.2	11.8	0.265	0.4	3	60
Shale127	336.8	1200	2.4	10	<5	24.7	3	63.5	1.1	<0.2	12.4	0.27	1.2	4	60
Shale128	340.8	<50	2.1	10	<5	26.3	3	68.5	1	<0.2	14.8	0.3	0.5	3.5	60
Shale129	341.7	<50	1.7	10	<5	24.9	2.7	62.5	0.9	<0.2	12.2	0.28	0.4	3.5	60
Shale130	344.9	<50	1.8	10	<5	24.7	2.6	55	0.8	<0.2	11.4	0.265	0.3	3	60
IDENT	**Depth**	**W**	**Y**	**Zn**	**Zr**	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**
UNITS		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME		LB102	LB102	MA101	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102
LOD		**3**	**1**	**2**	**1**	**0.1**	**0.1**	**0.05**	**0.05**	**0.05**	**0.05**	**0.2**	**0.02**	**0.05**	**0.02**
Shale1	165.2	21	17	30	103	23.9	45.7	5.6	20.6	4.1	0.85	3.8	0.54	3.3	0.64
Shale2	166.3	30	13	28	100	27.4	49.4	5.6	18.3	2.95	0.6	2.6	0.38	2.35	0.5
Shale3	167.3	27	20	24	109	40.4	76.8	9.1	31.8	5.35	1.1	5	0.68	3.9	0.74
Shale4	167.9	63	18	18	80	20	40.7	5.1	19.2	4.1	0.8	3.8	0.52	3.25	0.64
Shale5	169.9	33	16	30	100	26.9	51	6.05	22.1	4.05	0.85	3.8	0.5	3.1	0.62
Shale6	170.7	21	15	34	100	24.6	45.1	5.2	18.9	3.25	0.6	2.8	0.42	2.7	0.5
Shale7	171.8	42	20	24	111	27.9	56.6	7.15	26.5	5	0.95	4.6	0.6	3.35	0.64
Shale8	172.8	18	17	36	96	25.8	47.3	5.8	21.9	4.55	1	4.4	0.62	3.55	0.68
Shale9	173.9	18	16	44	96	31.8	58.2	6.7	23.3	4.3	0.9	4	0.54	3.1	0.6
Shale10	175.3	15	16	36	91	19.2	39.6	5.35	21.3	4.85	1.1	4.6	0.62	3.5	0.66
Shale11	176.3	18	17	42	99	28.1	55.3	6.65	23.6	4.3	0.95	4.2	0.58	3.45	0.66
Shale12	177.5	18	16	34	102	22.1	43.4	5.35	18.8	3.35	0.75	3.2	0.48	3.05	0.6
Shale13	179.1	21	20	46	99	25.2	49.4	6.15	22.6	4.5	1	4.2	0.62	3.7	0.78
Shale14	180.6	156	13	22	92	21	38.1	4.6	16.1	2.45	0.55	2	0.34	2.35	0.52
Shale15	181.6	66	14	48	120	20.5	34.9	3.6	12.4	2.55	0.6	2.8	0.36	2.3	0.48
Shale16	182.8	39	14	62	100	27.7	49.7	5.35	18	3.05	0.6	2.8	0.38	2.35	0.46
Shale17	184.2	39	28	44	183	34	67.3	8.25	30.3	5.4	1.05	5.2	0.78	4.9	0.96
Shale18	185.1	54	16	28	114	27.6	52.3	6.15	21.3	3.9	1.05	3.6	0.5	3	0.6

Shale19	185.9	45	16	30	96	23.8	48.8	5.95	22.4	4.4	0.8	4	0.56	3.1	0.6
Shale20	187.2	81	18	44	135	26.8	50.5	5.95	21.5	4.05	0.8	4	0.52	3.1	0.62
Shale21	188	39	17	44	110	31	63.9	7.65	28.3	5.1	0.9	4.4	0.58	3.5	0.66
Shale22	189.6	114	16	24	121	21.9	41.9	4.95	18.1	3.55	0.7	3.2	0.44	2.9	0.54
Shale23	190.8	42	16	40	104	33.5	65.1	7.8	27.3	4.85	0.9	4.4	0.58	3.55	0.7
Shale24	192.3	54	19	38	153	32.3	61.9	7.45	25.7	4.7	0.9	4.2	0.6	3.6	0.74
Shale25	194	39	15	28	74	17.6	36.8	4.55	17.6	3.7	0.75	3.6	0.48	2.75	0.48
Shale26	195	33	19	36	92	24.9	54.5	6.65	24.2	4.55	0.85	4.2	0.58	3.5	0.68
Shale27	196.3	36	19	40	142	35	68.9	8.2	29.1	4.9	0.85	4.2	0.6	3.55	0.7
Shale28	197.6	48	25	44	150	40	91	11.6	42.7	6.6	1.1	5.2	0.74	4.45	0.86
Shale29	198.4	48	24	34	146	38.4	77.1	9.3	32.5	5.55	0.95	4.8	0.68	4.3	0.84
Shale30	199.5	33	17	38	138	41.4	77.7	8.65	29.5	5.05	0.85	4.4	0.62	4.05	0.72
Shale31	200.9	39	17	34	137	31.9	63.9	7.55	26.2	4.65	0.85	4	0.56	3.45	0.66
Shale32	201.6	117	19	30	158	31.9	62.9	7.45	25.9	5.1	0.9	4.8	0.66	4	0.74
Shale33	202.8	39	17	40	121	31.7	65	7.85	28	4.8	0.85	4.2	0.56	3.3	0.62
Shale34	203.9	39	19	40	131	34.6	67.9	8.1	29.2	5.2	0.95	4.6	0.64	3.85	0.74
Shale35	204.9	63	20	40	143	37.4	69.8	8.15	28.1	5.25	0.9	4.8	0.66	3.95	0.74
Shale36	206.6	42	17	38	104	26	55.4	7	25.6	4.55	0.8	4	0.54	3.1	0.6
Shale37	207.9	72	21	34	116	28.5	64	8.1	29.8	5.2	0.85	4.6	0.62	3.65	0.74
Shale38	209.3	57	20	36	142	38.3	66.8	7.2	24.6	4.65	0.85	4.6	0.62	3.7	0.7
Shale39	210.5	69	18	42	116	30.9	58.9	6.85	23.5	4.25	0.85	4	0.56	3.35	0.64
Shale40	211.4	105	18	38	109	27.1	53.4	6.3	21.8	4.15	0.8	3.8	0.54	3.25	0.62
Shale41	212.6	51	17	44	96	28.5	56.5	6.7	24.2	4.35	0.85	4	0.54	3.25	0.62
Shale42	213.9	42	17	48	102	28.2	56.9	6.85	25.2	4.55	0.85	3.8	0.54	3.1	0.6
Shale43	214.9	48	19	44	104	31.9	58.7	6.95	24.5	4.45	0.8	4	0.54	3.3	0.64
Shale44	216	39	17	52	80	30.4	61.9	7.6	28.1	4.7	0.85	4	0.52	3.1	0.6
Shale45	217	63	16	38	101	27	53	6.45	23.2	4.25	0.75	3.8	0.54	3.15	0.62
Shale46	218.8	48	15	22	96	26.2	54.3	6.65	23.7	3.7	0.65	3.2	0.42	2.6	0.52
Shale47	220.7	72	14	30	105	27.6	47.2	5	16.7	3.05	0.55	3	0.36	2.15	0.44
Shale48	221.9	93	3	34	10	2.5	6.2	0.8	2.95	0.6	0.15	0.6	0.08	0.45	0.08
Shale49	222.9	36	4	36	4	2.7	7.2	1.1	4.35	1.05	0.2	1	0.14	0.8	0.14
Shale50	224	51	8	24	28	13.6	31.5	3.85	13.8	2.1	0.4	1.6	0.22	1.4	0.26
Shale51	224.9	27	3	16	3	2.1	6.1	0.85	3.35	0.8	0.2	0.8	0.1	0.6	0.12
Shale52	225.5	45	3	38	7	3.2	7.2	0.9	3.6	0.7	0.15	0.6	0.1	0.55	0.1
Shale53	227.8	63	2	6	5	2.5	6.2	0.8	3.35	0.6	0.1	0.6	0.08	0.45	0.08
Shale54	229.1	42	6	8	32	10	19.1	2.2	7.9	1.45	0.25	1.2	0.18	1.05	0.2
Shale55	229.9	21	3	4	4	2.1	5.3	0.7	2.8	0.6	0.15	0.6	0.08	0.5	0.08
Shale56	232	54	19	24	135	34.1	54.7	5.8	20	3.6	0.65	3.4	0.48	3.15	0.74
Shale57	232.6	36	3	4	3	2.1	6.8	0.95	3.65	0.85	0.2	0.8	0.12	0.65	0.12

Shale58	233.7	69	21	40	138	35	68.4	8	28.8	5.2	1	4.6	0.64	3.9	0.74
Shale59	236.1	153	15	30	96	21.1	42.9	5.15	19.1	3.8	0.75	3.6	0.48	2.75	0.5
Shale60	237.3	36	18	16	131	3.7	8.5	1.2	5.25	1.75	0.4	2.6	0.46	3.1	0.64
Shale61	238.8	48	18	46	101	33.4	62.7	7.3	25.9	4.7	0.9	4.2	0.56	3.5	0.66
Shale62	240	165	<1	8	2	2.1	4.2	0.7	1.8	0.35	0.1	0.4	0.04	0.25	0.04
Shale63	242.2	66	15	44	105	27.8	55.5	6.6	23.8	4	0.75	3.4	0.46	3	0.54
Shale64	243.1	39	14	36	78	19.4	39	4.65	17.3	3.4	0.65	3.4	0.44	2.6	0.5
Shale65	244.5	39	17	52	112	39.7	82	9.85	36.6	6.5	1.05	5.2	0.7	4.1	0.74
Shale66	245.8	45	13	48	87	19.5	39.5	4.75	17.5	3.15	0.55	2.8	0.4	2.35	0.48
Shale67	246.9	39	14	48	92	27.4	53.9	6.25	22.2	3.75	0.65	3.2	0.42	2.5	0.48
Shale68	247.5	51	13	52	83	23.1	45.7	5.25	18.6	2.85	0.5	2.4	0.34	2.1	0.42
Shale69	248.6	87	13	38	97	22.3	45.7	5.2	19.1	3.15	0.6	2.8	0.36	2.35	0.44
Shale70	249.7	54	16	48	150	28.9	56.8	6.6	23.9	3.85	0.7	3.2	0.44	2.75	0.52
Shale71	251.5	63	15	52	102	19.7	35.6	4.15	15.4	3.15	0.6	3	0.42	2.6	0.5
Shale72	252.5	78	16	38	118	25.2	49.8	5.9	22.2	4.05	0.7	3.6	0.5	3	0.58
Shale73	254.5	57	16	38	66	24	48.2	5.65	20.7	3.85	0.75	3.4	0.48	3	0.56
Shale74	255.5	48	15	40	67	27.6	56	6.4	23	3.85	0.7	3.2	0.42	2.65	0.48
Shale75	256.8	42	10	10	23	12.3	29.4	3.3	12.3	2.35	0.5	2.4	0.3	1.8	0.36
Shale76	258.3	93	16	48	121	22.3	43.9	5.15	19.3	3.65	0.7	3.4	0.44	2.75	0.54
Shale77	259.8	39	13	56	77	25.3	52.6	6.05	22.5	3.6	0.6	3	0.38	2.3	0.44
Shale78	261.6	84	13	40	71	15.3	31.8	3.75	14.1	2.75	0.55	2.6	0.34	2.05	0.4
Shale79	262.6	48	17	44	111	25	50.4	5.65	20.6	3.65	0.6	3	0.42	2.75	0.54
Shale80	264.2	63	16	32	96	22	43.7	5.2	19.5	3.65	0.7	3.4	0.48	2.85	0.54
Shale81	266.8	93	26	38	123	27.2	55.4	6.35	23.8	4.5	0.85	4.6	0.72	4.45	0.84
Shale82	268.5	36	16	48	96	29.4	53.2	6.2	22	4.15	0.8	3.8	0.54	3.1	0.6
Shale83	269.7	48	20	48	104	32.4	61.8	7.25	26.3	4.8	0.95	4.4	0.62	3.6	0.7
Shale84	271.7	54	21	44	100	33.2	64.2	7.55	27.9	5.05	1	4.6	0.64	3.9	0.76
Shale85	273.4	72	20	30	110	24.1	45.9	5.45	20.6	4.1	0.85	4	0.58	3.7	0.7
Shale86	274.6	54	19	34	88	27.6	59	6.9	25.9	4.8	0.85	4.2	0.56	3.4	0.64
Shale87	276.2	63	21	48	106	36.1	73.8	8.4	30.7	5.45	1	4.6	0.62	3.8	0.74
Shale88	277.3	78	25	104	116	29	61.9	7.2	27.6	5.05	1	4.8	0.68	4.15	0.82
Shale89	279.1	54	21	52	138	33.8	58.2	6.85	24.5	4.5	0.85	4.2	0.6	3.5	0.7
Shale90	280.6	69	23	44	149	37.9	63.4	7.35	25.8	4.7	0.9	4.6	0.66	4.1	0.78
Shale91	281.3	66	20	38	146	29.2	58.8	6.9	25.5	4.8	0.9	4.4	0.62	3.65	0.7
Shale92	282.8	111	20	30	127	26.5	49.9	5.95	22.1	4.3	0.8	4	0.58	3.35	0.66
Shale93	284.9	90	17	20	75	22.8	56.1	6.95	26.5	4.8	0.85	3.8	0.5	2.95	0.54
Shale94	286.6	93	23	32	129	25.5	53.4	6.15	23.3	4.5	0.85	4.2	0.64	3.8	0.74
Shale95	288	78	21	24	106	26.6	58.3	6.9	26.7	5.35	1	4.6	0.64	3.9	0.74
Shale96	289.6	75	21	36	126	36.1	73.3	8.45	30.7	5.25	0.95	4.6	0.64	3.8	0.72

Shale97	290.6	87	20	34	141	34.4	69.6	8.2	30.4	5.1	0.95	4.6	0.62	3.85	0.72
Shale98	292.1	183	21	28	123	26.3	52.7	6.25	22.9	4.6	0.9	4.2	0.6	3.7	0.72
Shale99	293.9	93	19	28	106	26.8	55	6.5	24.2	4.55	0.85	4	0.54	3.25	0.64
Shale100	295	102	23	26	140	30.8	61.6	7.4	27.6	5	0.9	4.6	0.66	3.7	0.74
Shale101	296.2	63	23	42	113	32.2	66.9	7.75	28.9	5.05	1	4.6	0.64	3.7	0.7
Shale102	297.9	171	21	34	178	30.5	61.9	7.2	26.9	4.75	0.95	4.2	0.58	3.55	0.7
Shale103	299.5	51	22	44	171	40.3	82.3	9.7	35.9	6.05	1.15	5.4	0.8	4.95	0.94
Shale104	301.4	117	25	36	188	31.5	65	7.7	28.9	5.4	1.05	5	0.68	4.15	0.78
Shale105	302.7	153	27	30	173	29	59.1	7.25	27.2	5.6	1.15	5.4	0.78	4.75	0.9
Shale106	304.9	87	26	36	166	31.8	64.6	7.55	27.6	5.3	1.05	5	0.7	4.35	0.82
Shale107	306.2	117	22	34	116	30.9	63.9	7.4	27.6	5.1	0.9	4.4	0.62	3.8	0.72
Shale108	307.4	117	24	36	158	31.6	63.6	7.45	28	4.9	0.95	4.4	0.62	3.7	0.72
Shale109	308.9	72	24	40	154	34.7	70.8	8.3	30.8	5.7	1.05	5.2	0.7	4.3	0.82
Shale110	310.4	132	25	34	150	30.9	63.4	7.45	27.2	5.15	1	4.8	0.66	4	0.74
Shale111	311.2	126	21	30	146	28.8	58.5	6.95	25.2	4.7	0.9	4.4	0.58	3.6	0.7
Shale112	312.8	66	22	34	135	30.2	61	7.4	27.4	4.95	0.95	4.4	0.62	3.8	0.72
Shale113	314.3	141	24	28	150	28.3	56.9	6.9	25.8	4.9	0.95	4.4	0.62	3.7	0.72
Shale114	315.5	138	22	34	170	31.5	63.9	7.8	28.5	5.2	0.95	4.6	0.66	3.9	0.74
Shale115	317.4	69	28	36	154	32.3	65.7	7.85	28.8	5.45	1	5	0.7	4.35	0.82
Shale116	318.5	69	24	38	172	32.4	66.2	7.8	29	5.1	0.95	4.6	0.64	3.9	0.74
Shale117	319.3	90	22	36	135	31.2	62.8	7.45	27.6	5.1	0.95	4.6	0.62	3.85	0.74
Shale118	323.6	75	25	40	170	33.9	68.4	8.2	29.5	5.1	0.9	4.6	0.62	3.85	0.74
Shale119	325	141	22	36	153	32	64.9	7.7	28.6	5.05	0.95	4.4	0.62	3.7	0.7
Shale120	326.7	108	24	36	160	30.5	62.2	7.3	26.6	4.95	0.95	4.4	0.64	3.8	0.72
Shale121	329.1	60	18	22	89	21.6	45	5.1	18.4	3.85	0.75	3.8	0.52	3.45	0.6
Shale122	330.1	114	21	28	113	28.1	56.3	6.65	24.7	4.6	0.9	4.2	0.6	3.45	0.66
Shale123	331.7	63	21	36	114	30.7	61.7	7.4	27.3	5.05	0.95	4.6	0.62	3.7	0.7
Shale124	332.9	63	29	36	151	31	62.9	7.6	28.2	5.55	1.1	5.6	0.84	5.2	1.02
Shale125	334.2	198	22	32	126	29	59.1	6.95	25.4	4.7	0.85	4.2	0.58	3.5	0.68
Shale126	353.4	93	24	28	119	31.2	63.4	7.5	27.3	4.85	0.9	4.4	0.62	3.75	0.74
Shale127	336.8	51	27	28	123	35.2	72.9	8.45	30.2	5.4	1	5.2	0.72	4.35	0.82
Shale128	340.8	93	23	36	196	39.6	83	9.5	34.3	5.35	0.9	4.4	0.64	3.95	0.76
Shale129	341.7	90	23	36	123	34.3	72.1	8.2	29.4	4.8	0.8	4	0.56	3.4	0.66
Shale130	344.9	93	23	32	104	28.2	57.8	6.75	24.9	4.25	0.8	3.8	0.52	3.2	0.6

IDENT	Depth	Er	Tm	Yb	Lu
UNITS		ppm	ppm	ppm	ppm
SCHEME		MA102	MA102	MA102	MA102
LOD		**0.05**	**0.05**	**0.05**	**0.02**
Shale1	165.2	1.9	0.3	1.85	0.3
Shale2	166.3	1.6	0.25	1.65	0.26
Shale3	167.3	2.3	0.35	2.15	0.34
Shale4	167.9	1.9	0.3	1.75	0.26
Shale5	169.9	1.9	0.3	1.9	0.3
Shale6	170.7	1.65	0.25	1.55	0.24
Shale7	171.8	1.9	0.3	1.8	0.28
Shale8	172.8	2	0.3	1.85	0.3
Shale9	173.9	1.8	0.3	1.8	0.28
Shale10	175.3	1.9	0.3	1.7	0.28
Shale11	176.3	1.95	0.3	1.85	0.3
Shale12	177.5	1.9	0.3	1.9	0.3
Shale13	179.1	2.05	0.3	2.05	0.3
Shale14	180.6	1.65	0.25	1.65	0.26
Shale15	181.6	1.65	0.25	1.6	0.28
Shale16	182.8	1.55	0.25	1.5	0.24
Shale17	184.2	2.85	0.45	2.7	0.44
Shale18	185.1	1.9	0.3	1.85	0.3
Shale19	185.9	1.8	0.25	1.75	0.26
Shale20	187.2	1.9	0.3	1.95	0.32
Shale21	188	2	0.3	2	0.32
Shale22	189.6	1.7	0.25	1.6	0.24
Shale23	190.8	2.05	0.3	1.9	0.32
Shale24	192.3	2.15	0.35	2.1	0.34
Shale25	194	1.45	0.2	1.4	0.22
Shale26	195	2.1	0.3	1.9	0.3
Shale27	196.3	2.1	0.35	2.15	0.34
Shale28	197.6	2.7	0.4	2.6	0.42
Shale29	198.4	2.6	0.4	2.55	0.4
Shale30	199.5	2.2	0.35	2.05	0.34
Shale31	200.9	2	0.3	1.95	0.32
Shale32	201.6	2.3	0.35	2.15	0.34
Shale33	202.8	1.9	0.3	1.85	0.28
Shale34	203.9	2.2	0.35	2.2	0.34
Shale35	204.9	2.65	0.35	2.15	0.36

Shale36	206.6	1.85	0.3	1.75	0.28
Shale37	207.9	2.2	0.35	2.2	0.34
Shale38	209.3	2	0.3	1.95	0.3
Shale39	210.5	1.95	0.3	2	0.3
Shale40	211.4	1.9	0.3	1.85	0.28
Shale41	212.6	1.9	0.3	1.85	0.28
Shale42	213.9	1.85	0.25	1.75	0.28
Shale43	214.9	1.9	0.3	1.85	0.3
Shale44	216	1.9	0.3	1.7	0.28
Shale45	217	1.9	0.3	1.8	0.3
Shale46	218.8	1.7	0.25	1.55	0.26
Shale47	220.7	1.5	0.25	1.6	0.26
Shale48	221.9	0.2	<0.05	0.2	0.04
Shale49	222.9	0.4	<0.05	0.3	0.04
Shale50	224	0.8	0.1	0.8	0.12
Shale51	224.9	0.25	<0.05	0.3	0.06
Shale52	225.5	0.25	<0.05	0.2	0.04
Shale53	227.8	0.25	<0.05	0.2	0.02
Shale54	229.1	0.6	0.1	0.6	0.1
Shale55	229.9	0.25	<0.05	0.2	0.02
Shale56	232	2.3	0.35	2.4	0.38
Shale57	232.6	0.3	<0.05	0.2	0.04
Shale58	233.7	2.3	0.35	2.25	0.36
Shale59	236.1	1.5	0.2	1.45	0.22
Shale60	237.3	1.95	0.3	2	0.34
Shale61	238.8	1.9	0.3	1.85	0.28
Shale62	240	0.1	<0.05	0.1	<0.02
Shale63	242.2	1.7	0.25	1.65	0.26
Shale64	243.1	1.55	0.25	1.5	0.24
Shale65	244.5	2.25	0.35	2.1	0.34
Shale66	245.8	1.45	0.2	1.4	0.22
Shale67	246.9	1.5	0.25	1.5	0.24
Shale68	247.5	1.3	0.2	1.3	0.2
Shale69	248.6	1.35	0.2	1.35	0.22
Shale70	249.7	1.65	0.25	1.65	0.26
Shale71	251.5	1.55	0.25	1.5	0.24
Shale72	252.5	1.85	0.25	1.75	0.28
Shale73	254.5	1.7	0.25	1.65	0.26
Shale74	255.5	1.6	0.2	1.45	0.24

Shale75	256.8	0.95	0.15	0.75	0.12
Shale76	258.3	1.7	0.25	1.65	0.28
Shale77	259.8	1.4	0.2	1.35	0.22
Shale78	261.6	1.2	0.2	1.15	0.18
Shale79	262.6	1.75	0.3	1.8	0.28
Shale80	264.2	1.65	0.25	1.5	0.26
Shale81	266.8	2.65	0.4	2.5	0.4
Shale82	268.5	1.9	0.25	1.65	0.28
Shale83	269.7	2.05	0.3	1.9	0.3
Shale84	271.7	2.4	0.35	2.15	0.34
Shale85	273.4	2.15	0.3	1.95	0.3
Shale86	274.6	1.9	0.3	1.75	0.28
Shale87	276.2	2.2	0.35	2.15	0.34
Shale88	277.3	2.5	0.35	2.15	0.36
Shale89	279.1	2.1	0.3	2	0.32
Shale90	280.6	2.4	0.35	2.25	0.36
Shale91	281.3	2.1	0.3	2.05	0.32
Shale92	282.8	1.95	0.3	1.9	0.3
Shale93	284.9	1.65	0.25	1.5	0.24
Shale94	286.6	2.25	0.35	2.1	0.34
Shale95	288	2.25	0.35	2.1	0.34
Shale96	289.6	2.15	0.35	2.05	0.34
Shale97	290.6	2.3	0.35	2.15	0.34
Shale98	292.1	2.2	0.3	2	0.34
Shale99	293.9	1.85	0.3	1.75	0.28
Shale100	295	2.1	0.3	2	0.32
Shale101	296.2	2.1	0.3	2	0.34
Shale102	297.9	2.05	0.3	2.05	0.32
Shale103	299.5	2.95	0.45	2.7	0.44
Shale104	301.4	2.45	0.4	2.3	0.38
Shale105	302.7	2.8	0.45	2.65	0.42
Shale106	304.9	2.5	0.4	2.35	0.38
Shale107	306.2	2.15	0.3	2	0.32
Shale108	307.4	2.2	0.3	2.1	0.32
Shale109	308.9	2.5	0.35	2.35	0.36
Shale110	310.4	2.3	0.35	2.1	0.36
Shale111	311.2	2.05	0.3	1.95	0.32
Shale112	312.8	2.2	0.3	2.05	0.32
Shale113	314.3	2.3	0.35	2	0.32

Shale114	315.5	2.25	0.35	2.15	0.34
Shale115	317.4	2.55	0.4	2.4	0.38
Shale116	318.5	2.3	0.35	2.2	0.34
Shale117	319.3	2.15	0.3	2.05	0.34
Shale118	323.6	2.3	0.35	2.2	0.36
Shale119	325	2.25	0.35	2.1	0.34
Shale120	326.7	2.2	0.35	2.1	0.34
Shale121	329.1	1.8	0.25	1.65	0.26
Shale122	330.1	1.95	0.3	1.9	0.3
Shale123	331.7	2.15	0.3	2.05	0.32
Shale124	332.9	3.2	0.45	3	0.48
Shale125	334.2	2.15	0.3	2	0.32
Shale126	353.4	2.25	0.35	2.1	0.34
Shale127	336.8	2.5	0.4	2.3	0.38
Shale128	340.8	2.45	0.35	2.3	0.36
Shale129	341.7	2	0.3	1.9	0.3
Shale130	344.9	1.9	0.3	1.85	0.3

Drill core MCDD0005 – Wollogorang formation

IDENT	Depth	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga
UNITS		ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm
SCHEME		MA102	LB101	MA102	LB101	MA102	MA102	LB101	MA102	MA102	LB101	MA102	MA101	LB101	MA102
LOD		**0.2**	**0.005**	**1**	**20**	**0.5**	**0.1**	**0.01**	**0.5**	**1**	**20**	**0.1**	**2**	**0.01**	**0.2**
Shale131	488.75	<0.2	6.9	39	2620	4.5	1.6	1.29	<0.5	37	60	13.6	26	11.7	21
Shale132	490.25	<0.2	7.19	32	400	3.5	1.3	1.34	<0.5	35	60	14.9	32	10.2	23
Shale133	390.83	<0.2	6.99	37	7860	4	1.5	1.1	<0.5	40	60	15.8	146	10.9	24
Shale134	491.9	<0.2	6.79	33	10100	3.5	1.4	0.95	<0.5	38	60	15.2	28	11.5	22.2
Shale135	492.83	<0.2	2.19	2	100	1	<0.1	13.6	<0.5	56	<20	3	40	2.07	7.2
Shale136	493.3	<0.2	1.88	5	660	<0.5	<0.1	8.58	<0.5	43	<20	2	58	2.68	4.8
Shale137	495.3	<0.2	7.29	19	420	4	0.4	2.46	<0.5	20	60	12.9	12	8.67	21.4
Shale138	495.62	<0.2	7.45	28	420	5	0.9	1	<0.5	24	60	13.8	18	12.1	22.2
Shale139	496.66	<0.2	5.89	12	1660	2.5	<0.1	3.93	<0.5	26	40	9.5	10	6.32	17.2
Shale140	498.08	<0.2	6.72	23	360	3	0.2	3.18	<0.5	20	40	10.7	16	7.79	18.6
Shale141	499	<0.2	10.4	22	680	4	<0.1	0.26	<0.5	21	<20	16.4	10	6.35	24.6
Shale142	500.05	<0.2	7.81	29	560	4.5	0.3	2.52	<0.5	20	60	15.7	12	8.47	22
Shale143	501.14	<0.2	7.45	61	1040	2.5	0.5	2.37	<0.5	21	60	14.1	18	9.36	21.6
Shale144	502.68/502.58b	<0.2	6.91	13	400	3.5	0.2	4.9	<0.5	16	40	13.8	4	5.68	21

Shale145	503.8	<0.2	5.95	7	320	3	<0.1	7.49	<0.5	13	40	9.5	6	3.25	18.4
Shale146	505.55	<0.2	7.56	3	2620	3.5	<0.1	3.63	<0.5	20	60	8.9	8	1.94	23.6
Shale147	506.6	<0.2	6.54	9	360	2.5	0.4	4.4	<0.5	20	60	7.3	8	3.5	20.6
Shale148	507.5	<0.2	7.01	24	500	2.5	0.2	4.06	<0.5	16	60	9.3	8	5.35	21.4
Shale149	508.6	<0.2	6.27	10	360	2	<0.1	5.91	<0.5	20	40	8.5	8	4.99	19.6
Shale150	509.2	<0.2	7.32	9	440	3	0.2	4.05	<0.5	18	60	10.1	26	4.36	21.4
Shale151	510.7	<0.2	7.3	8	400	3.5	<0.1	4.88	<0.5	17	60	9.8	4	3.46	21.6
Shale152	510.6	<0.2	2.79	2	2740	0.5	<0.1	5.85	<0.5	56	20	2.1	8	1.41	7.2
Shale153	512	<0.2	4.43	3	800	0.5	0.2	10.8	<0.5	20	40	3.1	4	1.83	13
Shale154	512.9	<0.2	2.85	11	11700	<0.5	0.6	12.6	<0.5	31	20	1.8	10	1.72	7.8
Shale155	514.28	<0.2	4.68	10	340	1.5	0.4	9.88	<0.5	18	40	6.2	26	5.48	14.4
Shale156	515.8	<0.2	5.92	2	480	2	0.2	7.17	<0.5	25	40	8.2	4	2.03	17.4
Shale157	516.9	<0.2	7.06	39	1360	2.5	2.5	5.17	<0.5	33	60	11.2	6	2.89	22.2
Shale158	517.9/517.7(b)	<0.2	8.04	4	400	3.5	<0.1	3.66	<0.5	19	40	12.8	30	3	23.2
Shale159	519.36	<0.2	4.39	5	780	1.5	0.4	10.4	<0.5	33	40	6.3	6	2.35	13.6
Shale160	520.8	<0.2	2.72	5	3720	0.5	0.2	12.6	<0.5	24	20	2.8	12	4.76	7
Shale161	523	<0.2	3.16	<1	980	1.5	0.3	14.4	<0.5	22	20	2.8	4	2.5	8.8
Shale162	524	<0.2	6.38	2	300	2.5	0.3	7.05	<0.5	20	60	7.7	54	3.14	21
Shale163	525.2	<0.2	4.84	3	1180	2	0.4	10.1	<0.5	20	40	6	64	3.03	16.2
Shale164	526.65	<0.2	5.28	3	2900	2	0.2	10	<0.5	17	20	5.2	8	2.65	14.2
Shale165	527	<0.2	7.05	9	600	4	0.3	4.61	<0.5	16	40	11.9	348	4.96	24.6
Shale166	527.65	<0.2	5.71	3	240	3	0.3	9.52	<0.5	17	40	6.7	16	3	16.4
Shale167	528.6	<0.2	6.66	4	620	6	0.5	4.3	<0.5	14	40	12.9	636	6.01	32
Shale168	529.5	<0.2	3.68	2	900	1.5	0.2	11.7	<0.5	18	20	4.8	8	4.03	10.8
Shale169	531.17	<0.2	6.57	4	260	4.5	<0.1	6.24	<0.5	17	<20	14.8	1980	2.67	19.8
Shale170	532.8	<0.2	4.86	6	680	3	0.4	6.96	<0.5	31	40	7.6	10	2.79	16
Shale171	534.3	0.6	7.55	29	400	4	1.5	2.45	<0.5	34	60	13.8	16	2.75	25.4
Shale172	335	0.6	6.46	25	340	4	0.5	4.97	<0.5	28	40	11.4	10	3.27	21.4
Shale173	537.45	0.4	7.92	13	360	5	0.5	4.32	<0.5	19	60	14.9	10	2.92	30
Shale174	538.1	<0.2	5.02	10	220	1.5	0.3	2.64	<0.5	36	20	3.5	10	1.37	9.4
Shale175	539.1	0.6	5.1	20	240	1.5	0.7	3.71	<0.5	33	40	4.1	126	1.78	10.8
Shale176	540.7	1.2	7.48	45	220	1.5	1.1	3.77	<0.5	44	20	4.3	34	2.56	13.4
Shale177	541.45	0.8	8.12	27	520	5.5	1.6	3.45	<0.5	22	60	12.1	8	2.73	29.8
Shale178	544.5	1.8	4.81	75	360	1	1.2	0.28	5.5	48	40	4.3	98	4	13.6
Shale179	544.8	1.4	4.93	62	300	2	1.1	0.55	3.5	48	40	4.8	56	3.56	14.6
Shale180	546.8	0.6	3.13	22	200	1	0.4	8.15	3.5	24	20	2.5	28	2.59	7.8
Shale181	547.9	0.4	2.93	7	200	1	1.3	1	3	48	<20	2.4	184	0.61	5.8
Shale182	548.9	1.8	8.58	70	440	5	1.3	0.28	2.5	42	40	10.4	26	3.66	27.2
Shale183	549.67	1.6	6.06	69	400	2	1.4	0.19	6.5	49	60	5.8	64	3.53	16.6

Shale184	550.5	1.8	7.34	111	420	3	3.3	0.26	4.5	50	40	7.9	32	4.7	15.4
Shale185	550.9	1.8	5.84	76	380	2	1.5	0.15	10.5	46	60	6.3	62	2.96	16.6
Shale186	551.1	1.4	4.64	59	300	1.5	1	0.18	5.5	47	40	4.4	90	2.55	11.6
Shale187	551.72	1.6	5.3	78	340	2	1.3	0.21	9	48	40	5.1	76	3.51	13.4
Shale188	553.38	1.6	5.77	61	400	1.5	1.1	0.59	<0.5	47	60	5.3	90	3.88	13.8
Shale189	554.25	1.6	6.44	76	380	2.5	1.5	0.56	3	48	60	7	76	4.87	17.2
Shale190	554.63	2.4	8.22	86	420	4	2.9	0.83	3.5	38	40	11.1	60	5.35	25.8
Shale191	555.39	1.2	5.27	55	320	2	1.3	0.45	2	49	40	5	134	3.55	13
IDENT	**Depth**	**Hf**	**In**	**K**	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Nb**	**Ni**	**P**	**Pb**	**Rb**	**Re**
UNITS		ppm	ppm	%	ppm	%	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA102	MA102	LB101	MA101	LB101	LB101	MA102	LB101	MA102	MA101	LB101	MA102	LB102	LB102
LOD		**0.2**	**0.05**	**0.01**	**10**	**0.005**	**0.005**	**0.5**	**0.01**	**0.5**	**2**	**0.005**	**1**	**0.5**	**0.1**
Shale131	488.75	4.4	0.1	5.86	50	1.47	0.185	3.5	0.1	11	26	0.045	23	232	<0.1
Shale132	490.25	3	<0.05	5.9	50	1.59	0.17	3	0.11	11	30	0.045	22	225	<0.1
Shale133	390.83	2.8	0.1	5.56	50	1.49	0.165	4	0.1	11	30	0.05	24	232	<0.1
Shale134	491.9	2.6	<0.05	5.44	50	1.36	0.15	3.5	0.09	9.5	30	0.05	23	222	<0.1
Shale135	492.83	0.8	0.1	2.08	20	7.57	1.05	<0.5	0.07	4	18	0.02	5	57.5	<0.1
Shale136	493.3	0.6	0.1	1.8	10	4.64	0.65	1	0.06	3	12	0.02	11	46.5	<0.1
Shale137	495.3	2.2	<0.05	5.91	70	2.29	0.09	4.5	0.09	10	30	0.075	16	238	<0.1
Shale138	495.62	2.4	<0.05	5.95	70	1.63	0.07	8.5	0.11	10.5	32	0.08	25	231	<0.1
Shale139	496.66	1.6	<0.05	5.48	50	2.86	0.16	2	0.1	8.5	20	0.055	11	186	<0.1
Shale140	498.08	2.4	0.1	6.09	50	2.45	0.125	2	0.09	10	28	0.06	14	219	<0.1
Shale141	499	7.6	<0.05	6.18	140	2.35	0.01	<0.5	0.15	19.5	38	0.025	6	244	<0.1
Shale142	500.05	2.2	0.1	5.95	70	2.56	0.08	2	0.12	10.5	38	0.075	17	227	<0.1
Shale143	501.14	2.4	0.1	5.95	60	2.3	0.15	3	0.11	11.5	32	0.075	31	230	<0.1
Shale144	502.68/502.58b	2.2	0.1	5.42	70	3.81	0.17	1	0.11	10.5	34	0.055	10	228	<0.1
Shale145	503.8	2	<0.05	5.24	50	4.75	0.29	<0.5	0.1	8.5	24	0.055	6	178	<0.1
Shale146	505.55	2.4	<0.05	7.36	40	2.4	0.18	<0.5	0.11	11.5	26	0.07	7	202	<0.1
Shale147	506.6	2.4	<0.05	6.39	50	2.89	0.305	1.5	0.1	10.5	20	0.07	9	182	<0.1
Shale148	507.5	2	<0.05	6.36	40	2.91	0.3	1.5	0.1	10	28	0.07	7	202	<0.1
Shale149	508.6	2	<0.05	6.26	40	3.85	0.395	1	0.1	10	26	0.06	6	183	<0.1
Shale150	509.2	2.4	<0.05	6.95	40	2.87	0.265	1.5	0.11	11.5	28	0.06	9	213	<0.1
Shale151	510.7	2.4	<0.05	6.95	40	3.38	0.225	1	0.12	11	28	0.075	6	201	<0.1
Shale152	510.6	4.8	0.1	3.06	10	3.16	0.265	<0.5	0.07	6	12	0.03	5	67	<0.1
Shale153	512	2	0.1	4.68	20	6.02	0.53	1	0.09	7.5	12	0.055	4	99.5	<0.1
Shale154	512.9	3.6	<0.05	3.08	10	6.33	0.66	1	0.08	6	16	0.04	4	65	<0.1
Shale155	514.28	2.4	<0.05	4.34	40	5.35	0.635	1.5	0.1	8	20	0.055	7	130	<0.1
Shale156	515.8	4.2	<0.05	5.24	40	4.03	0.365	<0.5	0.09	11.5	20	0.055	12	153	<0.1
Shale157	516.9	4	<0.05	5.81	60	3.33	0.255	1	0.1	13	28	0.07	9	188	<0.1

Shale158	517.9/517.7(b)	3.6	<0.05	7.11	130	3.09	0.175	1.5	0.13	11.5	32	0.075	5	251	<0.1
Shale159	519.36	3.2	<0.05	4.03	40	5.27	0.455	<0.5	0.1	9	20	0.05	6	134	<0.1
Shale160	520.8	0.8	<0.05	2.56	20	6.18	0.575	2.5	0.08	3.5	12	0.04	4	61.5	<0.1
Shale161	523	2	<0.05	3.11	20	6.88	0.595	1.5	0.09	6	14	0.05	4	72	<0.1
Shale162	524	3	<0.05	5.5	60	4.04	0.35	1	0.11	11	28	0.07	6	163	<0.1
Shale163	525.2	2.8	<0.05	4.25	50	4.96	0.465	1	0.09	9	22	0.06	6	119	<0.1
Shale164	526.65	2.4	<0.05	4.97	60	4.99	0.43	1.5	0.09	8	24	0.055	4	135	<0.1
Shale165	527	3.2	<0.05	5.95	300	4	0.23	1	0.12	13.5	26	0.05	5	253	<0.1
Shale166	527.65	2.6	<0.05	5.06	70	5.12	0.43	1.5	0.09	8.5	24	0.06	5	139	<0.1
Shale167	528.6	2.2	<0.05	5.3	360	3.92	0.24	1	0.12	8.5	26	0.04	6	262	<0.1
Shale168	529.5	1.4	<0.05	2.72	60	5.95	0.575	1	0.09	6	18	0.05	3	92.5	<0.1
Shale169	531.17	7.2	<0.05	5.23	110	3.86	0.265	1.5	0.11	18.5	18	0.05	6	181	<0.1
Shale170	532.8	2	<0.05	4	100	3.97	0.34	1.5	0.12	8.5	20	0.055	5	156	<0.1
Shale171	534.3	3.2	<0.05	5.59	170	2.55	0.11	3.5	0.13	13	42	0.06	13	245	<0.1
Shale172	335	2	<0.05	4.67	160	3.65	0.205	2	0.11	8.5	38	0.075	11	214	<0.1
Shale173	537.45	3.2	<0.05	5.92	180	3.32	0.17	3	0.12	13	26	0.07	10	239	<0.1
Shale174	538.1	1.6	<0.05	5.51	40	1.64	0.09	3	0.08	5.5	14	0.045	36	125	<0.1
Shale175	539.1	1.4	<0.05	5.51	40	2.15	0.13	16.5	0.07	6	20	0.035	43	128	<0.1
Shale176	540.7	2.2	<0.05	8.67	50	1.99	0.13	21	0.07	8.5	34	0.075	48	156	<0.1
Shale177	541.45	10.6	<0.05	6.71	140	2.69	0.115	29.5	0.12	27.5	32	0.065	29	244	<0.1
Shale178	544.5	2.2	<0.05	4.84	40	0.51	0.005	20	0.09	9	66	0.07	177	119	<0.1
Shale179	544.8	2	<0.05	5.04	40	0.54	0.005	12	0.09	8.5	50	0.12	97	124	<0.1
Shale180	546.8	1.2	<0.05	3.32	20	3.99	0.215	6.5	0.08	5	28	0.045	47	72	<0.1
Shale181	547.9	1.2	<0.05	3.05	70	0.69	0.025	13.5	0.1	5.5	12	0.02	81	72	<0.1
Shale182	548.9	5.4	<0.05	7.84	120	1.17	0.01	28.5	0.1	16.5	56	0.065	70	234	<0.1
Shale183	549.67	2.2	<0.05	5.6	60	0.79	0.01	26	0.11	10.5	64	0.035	223	169	<0.1
Shale184	550.5	2.4	0.1	7.01	70	0.81	0.01	17	0.11	11.5	78	0.08	204	222	<0.1
Shale185	550.9	2.2	<0.05	5.23	60	0.75	0.005	28	0.1	11	62	0.035	176	154	<0.1
Shale186	551.1	1.4	<0.05	4.54	40	0.53	<0.005	17	0.09	6.5	46	0.02	126	125	<0.1
Shale187	551.72	1.8	0.1	5.1	50	0.615	0.005	18	0.09	8	58	0.04	208	129	<0.1
Shale188	553.38	2	<0.05	5.45	50	0.875	0.02	18.5	0.1	8.5	56	0.02	54	142	<0.1
Shale189	554.25	2.2	<0.05	5.77	60	0.985	0.02	18.5	0.1	9.5	64	0.055	212	168	<0.1
Shale190	554.63	2.8	<0.05	6.89	120	1.51	0.035	26.5	0.1	15.5	66	0.035	116	207	<0.1
Shale191	555.39	1.4	0.1	4.83	50	0.815	0.015	24	0.1	6	44	0.045	109	130	<0.1

IDENT	Depth	S	Sb	Sc	Se	Si	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V
UNITS		ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA101	MA102	MA101	MA102	LB101	MA102	MA102	MA102	MA102	MA102	LB101	MA102	LB102	LB101
LOD		**50**	**0.1**	**1**	**5**	**0.005**	**0.1**	**0.5**	**0.1**	**0.2**	**0.1**	**0.005**	**0.1**	**0.5**	**20**
Shale131	488.75	550	9.8	11	<5	23.7	3.3	75.5	1.1	0.4	13.5	0.275	0.7	8	80
Shale132	490.25	<50	7.6	11	<5	23.8	3.8	68	1.1	0.2	14.5	0.275	0.7	6.5	80
Shale133	390.83	1850	9.3	12	<5	22.9	3.8	96.5	1	0.4	13.7	0.28	0.7	7	80
Shale134	491.9	2600	9.1	11	<5	22.6	3.4	109	0.9	<0.2	12.9	0.265	0.7	7	80
Shale135	492.83	<50	0.5	5	<5	9.05	1.3	18.5	0.4	<0.2	4.4	0.09	0.2	1.5	20
Shale136	493.3	<50	1	3	<5	20.1	1.2	21.5	0.3	<0.2	3.1	0.075	0.2	1	<20
Shale137	495.3	<50	5.2	11	<5	21.8	3	63.5	0.9	<0.2	13.5	0.28	0.6	7	60
Shale138	495.62	200	7.2	11	<5	22.2	3.6	91.5	0.9	<0.2	12.8	0.295	0.6	11.5	80
Shale139	496.66	200	2.8	8	<5	22.3	3.4	56.5	0.9	<0.2	11	0.215	0.5	5.5	60
Shale140	498.08	<50	4.2	10	<5	22	3.1	60	0.9	<0.2	13.3	0.245	0.5	5.5	60
Shale141	499	<50	2.2	6	<5	24.5	5.5	44	1.9	<0.2	37.6	0.14	0.3	3.5	<20
Shale142	500.05	<50	4.4	14	<5	23.1	3.2	75	1	<0.2	14	0.295	0.7	5	80
Shale143	501.14	<50	5.9	11	<5	23.1	3.7	74	1	<0.2	15.1	0.32	0.7	4.5	60
Shale144	502.68/502.58b	<50	2.5	10	<5	21.5	3.2	54	0.9	<0.2	13.4	0.27	0.6	3.5	60
Shale145	503.8	<50	1.4	9	<5	19.5	3	42.5	0.8	<0.2	12.1	0.245	0.4	2.5	60
Shale146	505.55	300	0.9	12	<5	25.2	3.4	59.5	1.1	<0.2	16	0.315	0.5	3.5	100
Shale147	506.6	<50	1.7	9	<5	24.1	2.9	26	0.9	<0.2	14	0.28	0.4	3.5	80
Shale148	507.5	<50	2.4	11	<5	22.2	3	44.5	0.9	<0.2	14	0.285	0.5	3.5	60
Shale149	508.6	<50	2	10	<5	21	3	41	0.9	<0.2	13.7	0.26	0.5	3	60
Shale150	509.2	<50	6.4	12	<5	23.5	3.5	47	1.1	<0.2	16	0.29	0.6	3.5	80
Shale151	510.7	<50	1.5	11	<5	22.8	3.1	49	1	<0.2	14.9	0.295	0.5	3.5	80
Shale152	510.6	400	0.5	6	<5	28.7	1.5	52	0.6	<0.2	8.8	0.215	0.3	2.5	40
Shale153	512	<50	0.7	9	<5	16.3	2.7	28	0.7	<0.2	9.3	0.21	0.3	2	60
Shale154	512.9	2100	0.8	5	<5	16.1	1.8	87	0.6	<0.2	8.8	0.205	0.3	2	40
Shale155	514.28	<50	2.7	9	<5	18.8	2.7	27	0.8	<0.2	10.8	0.25	0.3	3	60
Shale156	515.8	<50	0.8	10	<5	22.8	3.6	32.5	1	<0.2	13	0.34	0.5	14.5	80
Shale157	516.9	3700	2.5	11	<5	23.7	4.2	39	1.2	<0.2	16.4	0.385	0.6	4	80
Shale158	517.9/517.7(b)	<50	1.3	10	<5	24	3.6	33.5	1	<0.2	13.5	0.36	0.5	7	120
Shale159	519.36	<50	0.8	9	<5	18.7	2.9	36.5	0.9	<0.2	12.6	0.27	0.4	3	40
Shale160	520.8	400	1.1	4	<5	15.8	1.3	42.5	0.3	<0.2	4	0.095	0.2	2	40
Shale161	523	<50	0.5	5	<5	13.2	2.1	29	0.6	<0.2	7.9	0.175	0.3	2	40
Shale162	524	<50	0.7	10	<5	21.3	3.7	25	1	<0.2	14.8	0.33	0.4	4	80
Shale163	525.2	<50	0.7	9	<5	18.3	3.1	35	0.9	<0.2	12.4	0.28	0.4	3	60
Shale164	526.65	300	0.5	10	<5	18.1	2.7	36	0.7	<0.2	10.2	0.25	0.3	4	60
Shale165	527	1050	0.8	9	<5	22.4	3.9	30	1.1	0.4	15.2	0.24	0.5	5.5	120

Shale166	527.65	<50	0.6	9	<5	18.4	3.2	24	0.8	<0.2	11.7	0.25	0.3	5	60
Shale167	528.6	700	0.8	7	<5	22.8	4.1	28	0.9	0.2	12.5	0.245	0.6	5.5	140
Shale168	529.5	<50	0.5	6	<5	16.7	2.2	31	0.6	<0.2	7.4	0.17	0.3	2	60
Shale169	531.17	2400	0.5	8	<5	20	7.2	25.5	3.2	<0.2	49.6	0.22	0.4	9.5	60
Shale170	532.8	300	1.1	9	<5	22.3	2.8	32	0.8	<0.2	10.5	0.235	0.4	5	100
Shale171	534.3	1900	1.9	14	<5	26.1	4.4	30	1.2	<0.2	15.7	0.355	1.4	7.5	240
Shale172	335	3550	1.9	10	<5	23.3	3.5	26	0.8	<0.2	11.5	0.26	1.5	5	140
Shale173	537.45	2450	1.5	14	<5	23.1	5	30.5	1.1	<0.2	14.8	0.315	1.4	9	220
Shale174	538.1	1300	1.3	5	<5	32.4	1.7	14	0.5	0.4	6.2	0.155	0.9	6	120
Shale175	539.1	2850	2.4	7	<5	28.9	2	16.5	0.6	0.2	7.2	0.17	1.5	6.5	140
Shale176	540.7	14500	6.2	7	<5	25.1	2.9	15	0.7	0.4	10.6	0.125	2	7.5	60
Shale177	541.45	5100	3.4	13	<5	24.6	6.1	33	2.7	0.6	41.5	0.51	3.1	36.5	500
Shale178	544.5	40300	8.7	6	<5	31.9	2.4	18	0.9	0.4	11.7	0.24	7.1	10.5	120
Shale179	544.8	31400	6.3	7	<5	31.5	2.5	20	0.8	0.4	11.4	0.225	5.9	9	80
Shale180	546.8	9900	2.6	8	<5	24.4	1.7	16.5	0.5	<0.2	5.8	0.135	2	6	60
Shale181	547.9	1950	2.4	4	<5	39.9	1.5	14.5	0.5	<0.2	7.3	0.095	1.2	5	80
Shale182	548.9	29300	6.2	15	<5	26.3	4.5	26.5	1.2	0.4	25.4	0.28	7.6	13	100
Shale183	549.67	26300	6.7	10	<5	32.9	3	20	1	0.4	12.5	0.315	8.8	15.5	220
Shale184	550.5	45500	9.2	8	<5	27.5	3.1	25	1	0.4	14.9	0.28	9.4	14.5	140
Shale185	550.9	22000	7.5	10	<5	33.3	3.6	21	1	0.4	12.3	0.3	7.8	13.5	240
Shale186	551.1	20500	5.7	7	<5	35.7	2.2	18	0.6	0.2	8	0.19	6.1	9	140
Shale187	551.72	30400	7.2	8	<5	33.1	2.7	18	0.7	0.2	10.9	0.215	8.2	12.5	140
Shale188	553.38	32400	6	9	<5	33.4	2.5	17.5	0.8	0.4	10.5	0.27	9.2	10	120
Shale189	554.25	41100	8.3	11	<5	30.3	3	21	0.9	0.6	11.5	0.285	8.7	10.5	120
Shale190	554.63	41400	8.2	16	<5	25.8	4.5	26	1.3	0.4	20.8	0.29	10.7	13.5	140
Shale191	555.39	27800	5.4	8	<5	34.1	2.3	18	0.6	0.2	7.5	0.21	6.1	8.5	100
IDENT	**Depth**	**W**	**Y**	**Zn**	**Zr**	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**
UNITS		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME		LB102	LB102	MA101	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102
LOD		**3**	**1**	**2**	**1**	**0.1**	**0.1**	**0.05**	**0.05**	**0.05**	**0.05**	**0.2**	**0.02**	**0.05**	**0.02**
Shale131	488.75	111	19	44	113	58.3	116	11.1	35.9	4.65	0.95	3.6	0.5	3.1	0.58
Shale132	490.25	51	16	48	104	61.8	123	11.8	36	4.55	0.9	3.6	0.48	3.05	0.58
Shale133	390.83	63	16	50	101	63.9	121	11.8	37.3	4.7	0.95	3.6	0.48	3	0.56
Shale134	491.9	69	15	48	96	68.7	126	11.7	36.1	4.55	0.9	4.2	0.46	2.7	0.5
Shale135	492.83	60	15	78	34	9.9	21.6	2.95	13.1	3.4	0.8	3.6	0.5	2.9	0.52
Shale136	493.3	90	10	60	23	7.5	18.6	2.7	11.2	2.45	0.55	2.4	0.32	1.75	0.32
Shale137	495.3	36	17	46	78	71.2	122	11.4	35.2	5.15	1	4.2	0.52	2.95	0.54
Shale138	495.62	39	17	58	89	118	188	17	49.4	5.45	1.05	4	0.52	3	0.56
Shale139	496.66	108	16	24	61	57.3	88.4	9.85	32.3	4.75	0.95	4	0.5	2.7	0.48

Shale140	498.08	39	25	36	90	68.4	127	12.6	40.1	5.9	1.2	5	0.66	3.9	0.7
Shale141	499	15	44	36	210	8.3	29.4	4.45	19.7	5.15	1	5.8	1	6.85	1.42
Shale142	500.05	30	19	56	83	61.6	128	13	43.7	6.4	1.25	5.2	0.66	3.65	0.68
Shale143	501.14	39	22	50	96	57.7	108	12.1	42.3	6.55	1.4	5.2	0.66	3.75	0.7
Shale144	502.68/502.58(b)	21	22	44	88	48.8	93.6	10.5	35.4	5.7	1.1	4.8	0.64	3.7	0.7
Shale145	503.8	33	20	34	78	40.4	78.7	8.5	28	4.55	0.85	4	0.56	3.3	0.62
Shale146	505.55	60	20	30	90	46.8	88.4	9.8	32.9	5.4	0.95	4.8	0.62	3.7	0.68
Shale147	506.6	60	20	28	92	18.3	32.4	4.45	19.1	4.2	0.8	4	0.54	3.15	0.6
Shale148	507.5	39	17	30	76	40.7	78.1	9.35	32.1	4.55	0.85	3.8	0.5	3	0.54
Shale149	508.6	54	19	24	78	39.4	75.3	8.55	29.5	4.65	0.85	4.2	0.56	3.25	0.64
Shale150	509.2	42	20	30	92	47.2	96.3	10.2	33.5	5.2	1	4.4	0.58	3.5	0.68
Shale151	510.7	39	18	30	92	54.3	89.3	9.35	30.2	4.85	0.9	4.2	0.56	3.4	0.64
Shale152	510.6	309	16	10	151	14.1	31.3	4.2	16.7	3.7	0.7	3.6	0.5	3.1	0.58
Shale153	512	72	16	12	71	23.7	52.6	6.35	23.5	4.15	0.8	3.8	0.5	3.05	0.56
Shale154	512.9	114	17	10	135	17.6	40.5	5.3	20.6	4.15	0.8	4	0.54	3.25	0.62
Shale155	514.28	45	16	26	93	26.5	51.7	6.35	23.7	4.25	0.8	4	0.54	3.25	0.6
Shale156	515.8	93	18	26	125	39.1	66.4	7.5	25.6	4.55	0.85	4.2	0.62	3.85	0.74
Shale157	516.9	66	18	28	132	46.5	78.9	8.55	28	4.65	0.85	4.2	0.62	3.7	0.72
Shale158	517.9/517.7(b)	45	24	34	145	30.9	55.4	6.2	22	4	0.75	4	0.58	3.65	0.74
Shale159	519.36	123	20	20	125	29.8	58.2	6.9	24.4	4.65	0.9	4.4	0.62	3.75	0.74
Shale160	520.8	66	11	12	28	13.2	30.8	4.05	15.9	2.9	0.55	2.8	0.36	1.9	0.36
Shale161	523	63	13	16	73	19.6	38.9	4.65	17.3	3.3	0.65	3.2	0.46	2.7	0.5
Shale162	524	63	16	42	121	27.6	47.1	5.35	19.4	3.85	0.75	3.6	0.52	3	0.6
Shale163	525.2	60	16	36	113	26.4	47	5.5	20.1	3.95	0.75	3.8	0.52	3.2	0.62
Shale164	526.65	51	16	42	90	24.4	43.4	5.2	18.6	3.65	0.7	3.4	0.48	2.95	0.58
Shale165	527	42	16	36	121	19.6	29.8	3.35	12.3	2.75	0.55	3	0.44	2.85	0.58
Shale166	527.65	48	16	38	99	26.6	47.1	5.45	20.4	4.05	0.75	3.6	0.54	3.25	0.64
Shale167	528.6	30	11	38	83	14.9	27	3.2	11.6	2.35	0.5	2.4	0.34	2.1	0.44
Shale168	529.5	63	14	26	55	19.4	36.4	4.35	16.7	3.1	0.6	3	0.42	2.4	0.46
Shale169	531.17	60	21	30	227	19.2	37.6	4.7	18.4	4.55	0.95	4.6	0.7	4.5	0.94
Shale170	532.8	87	13	36	78	24.9	45.6	5.45	19.7	3.75	0.75	3.6	0.48	2.7	0.5
Shale171	534.3	60	15	48	125	36.8	55.9	6	21.7	3.85	0.75	3.6	0.48	3	0.58
Shale172	335	42	16	38	76	31.1	54.5	6.4	24	4.6	0.85	4.2	0.58	3.3	0.64
Shale173	537.45	33	19	42	125	44.1	77.8	9.3	33.4	8.15	1.15	5.4	0.76	4.55	0.88
Shale174	538.1	198	8	20	42	14.6	29.8	3.8	14.3	2.75	0.5	2.4	0.32	1.8	0.32
Shale175	539.1	162	8	20	48	17	32.2	4	15.3	2.8	0.5	2.6	0.34	1.9	0.38
Shale176	540.7	156	11	30	55	16.9	33.3	4.45	18.4	3.85	0.7	3.6	0.44	2.4	0.44
Shale177	541.45	75	37	34	346	17.1	33.9	4.6	19.4	5.9	1.3	6.6	0.98	6.4	1.36
Shale178	544.5	117	8	1540	80	16.6	33	4.15	15.4	3.05	0.55	2.8	0.34	2.05	0.4

Shale179	544.8	132	10	1030	77	22.1	44.4	5.7	22	4.35	0.7	3.8	0.46	2.45	0.44
Shale180	546.8	87	12	716	42	16.2	35	4.55	18.1	3.85	0.65	3.6	0.48	2.8	0.48
Shale181	547.9	219	8	878	45	38.4	75.9	8.4	27	3.8	0.5	2.6	0.32	1.85	0.34
Shale182	548.9	99	25	602	188	41.9	79.9	9.2	32.5	5.9	1	5.2	0.76	4.95	1.06
Shale183	549.67	174	11	1680	85	19.2	30.5	3.4	12.1	2.45	0.5	2.4	0.34	2	0.4
Shale184	550.5	135	18	1040	90	101	219	22.2	73.6	9.7	1.2	6	0.66	3.65	0.64
Shale185	550.9	150	9	2500	83	22.1	36.3	4.05	15.7	2.75	0.5	2.6	0.34	2	0.4
Shale186	551.1	165	6	1300	54	21.7	37.7	4.3	15.2	2.55	0.5	2.4	0.26	1.45	0.28
Shale187	551.72	123	7	1690	65	27.8	47.9	5.6	20.5	3.3	0.65	3	0.32	1.8	0.32
Shale188	553.38	129	8	48	74	25.1	46.1	5.25	18.3	3.05	0.6	2.6	0.32	1.75	0.34
Shale189	554.25	129	11	686	81	28.3	51	5.85	21	3.7	0.65	3.2	0.4	2.45	0.46
Shale190	554.63	72	10	730	104	34.3	47	4.7	15.7	2.8	0.55	2.6	0.36	2.3	0.48
Shale191	555.39	171	6	348	54	26.4	46.3	5.1	17.6	2.65	0.5	2	0.26	1.4	0.28

IDENT	Depth	Eu	Gd	Tb	Dy
UNITS		ppm	ppm	ppm	ppm
SCHEME		MA102	MA102	MA102	MA102
LOD		0.05	0.2	0.02	0.05
Shale131	488.75	0.95	3.6	0.5	3.1
Shale132	490.25	0.9	3.6	0.48	3.05
Shale133	390.83	0.95	3.6	0.48	3
Shale134	491.9	0.9	4.2	0.46	2.7
Shale135	492.83	0.8	3.6	0.5	2.9
Shale136	493.3	0.55	2.4	0.32	1.75
Shale137	495.3	1	4.2	0.52	2.95
Shale138	495.62	1.05	4	0.52	3
Shale139	496.66	0.95	4	0.5	2.7
Shale140	498.08	1.2	5	0.66	3.9
Shale141	499	1	5.8	1	6.85
Shale142	500.05	1.25	5.2	0.66	3.65
Shale143	501.14	1.4	5.2	0.66	3.75
Shale144	502.68/502.58b	1.1	4.8	0.64	3.7
Shale145	503.8	0.85	4	0.56	3.3
Shale146	505.55	0.95	4.8	0.62	3.7
Shale147	506.6	0.8	4	0.54	3.15
Shale148	507.5	0.85	3.8	0.5	3
Shale149	508.6	0.85	4.2	0.56	3.25
Shale150	509.2	1	4.4	0.58	3.5
Shale151	510.7	0.9	4.2	0.56	3.4
Shale152	510.6	0.7	3.6	0.5	3.1

Shale153	512	0.8	3.8	0.5	3.05
Shale154	512.9	0.8	4	0.54	3.25
Shale155	514.28	0.8	4	0.54	3.25
Shale156	515.8	0.85	4.2	0.62	3.85
Shale157	516.9	0.85	4.2	0.62	3.7
Shale158	517.9/517.7(b)	0.75	4	0.58	3.65
Shale159	519.36	0.9	4.4	0.62	3.75
Shale160	520.8	0.55	2.8	0.36	1.9
Shale161	523	0.65	3.2	0.46	2.7
Shale162	524	0.75	3.6	0.52	3
Shale163	525.2	0.75	3.8	0.52	3.2
Shale164	526.65	0.7	3.4	0.48	2.95
Shale165	527	0.55	3	0.44	2.85
Shale166	527.65	0.75	3.6	0.54	3.25
Shale167	528.6	0.5	2.4	0.34	2.1
Shale168	529.5	0.6	3	0.42	2.4
Shale169	531.17	0.95	4.6	0.7	4.5
Shale170	532.8	0.75	3.6	0.48	2.7
Shale171	534.3	0.75	3.6	0.48	3
Shale172	335	0.85	4.2	0.58	3.3
Shale173	537.45	1.15	5.4	0.76	4.55
Shale174	538.1	0.5	2.4	0.32	1.8
Shale175	539.1	0.5	2.6	0.34	1.9
Shale176	540.7	0.7	3.6	0.44	2.4
Shale177	541.45	1.3	6.6	0.98	6.4
Shale178	544.5	0.55	2.8	0.34	2.05
Shale179	544.8	0.7	3.8	0.46	2.45
Shale180	546.8	0.65	3.6	0.48	2.8
Shale181	547.9	0.5	2.6	0.32	1.85
Shale182	548.9	1	5.2	0.76	4.95
Shale183	549.67	0.5	2.4	0.34	2
Shale184	550.5	1.2	6	0.66	3.65
Shale185	550.9	0.5	2.6	0.34	2
Shale186	551.1	0.5	2.4	0.26	1.45
Shale187	551.72	0.65	3	0.32	1.8
Shale188	553.38	0.6	2.6	0.32	1.75
Shale189	554.25	0.65	3.2	0.4	2.45
Shale190	554.63	0.55	2.6	0.36	2.3
Shale191	555.39	0.5	2	0.26	1.4

Drill core MCDD0003 – Wollogorang formation

IDENT	Depth	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga
UNITS		ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm
SCHEME		MA102	LB101	MA102	LB101	MA102	MA102	LB101	MA102	MA102	LB101	MA102	MA101	LB101	MA102
LOD		**0.2**	**0.005**	**1**	**20**	**0.5**	**0.1**	**0.01**	**0.5**	**1**	**20**	**0.1**	**2**	**0.01**	**0.2**
Shale1	8.67	<0.2	2.65	4	180	1	0.4	11.5	<0.5	25	<20	3.1	342	1.88	7
Shale2	9.35	<0.2	2.82	12	140	1.5	4.2	11.4	<0.5	25	<20	4.1	886	3.63	7.8
Shale3	10.68	<0.2	2.88	4	500	1	0.5	13.2	<0.5	17	20	3.1	24	2.11	8.4
Shale4	11.55	<0.2	2.48	4	120	1.5	2.2	14.5	<0.5	23	<20	3.2	152	2.34	9
Shale5	12.7	<0.2	3.47	4	300	2	<0.1	10.3	<0.5	18	20	4.1	26	2.16	10
Shale6	13.7	<0.2	3.68	6	3100	1.5	0.2	10.5	<0.5	20	20	4.1	10	2.47	11.2
Shale7	15.05	<0.2	5.04	3	420	2.5	0.6	9.49	<0.5	17	40	5.8	38	2.45	15.8
Shale8	16.35	<0.2	3.57	2	620	2	0.2	11.4	<0.5	17	20	4.2	40	2.47	11.4
Shale9	17.72	<0.2	3.25	3	140	2	0.3	12.3	<0.5	15	20	4.1	232	3.64	10.8
Shale10	8.67	<0.2	3.26	4	140	1.5	0.3	11.5	<0.5	15	20	3.7	4	2.64	9.4
Shale11	20.44	<0.2	4.83	8	240	2	1.5	8.58	<0.5	17	40	5.4	20	2.56	14.6
Shale12	21.34	<0.2	4.61	4	200	2.5	0.3	9.23	<0.5	17	40	4.9	20	2.56	13
Shale13	22.55	<0.2	3.79	9	200	1.5	0.6	9.56	<0.5	16	20	4.6	16	2.63	11.2
Shale14	23.9	0.4	7.15	17	280	5	1.8	3.35	<0.5	18	60	13.1	12	2.52	23.2
Shale15	24.95	0.4	5.53	39	240	4	0.9	4.52	<0.5	30	40	9.2	18	2.58	18.6
Shale16	25.78	0.4	6.39	21	280	4	0.6	6.01	<0.5	25	40	10.8	8	3.1	20.4
Shale17	26.12	0.4	6.9	26	320	5.5	0.8	1.97	<0.5	24	60	11.7	14	2.43	25
Shale18	28.1	1.2	4.36	54	200	2.5	1.6	9.28	<0.5	35	40	5.8	10	4.44	12.6
Shale19	29	0.4	7.09	27	280	4	0.6	5.42	<0.5	18	40	10.5	8	2.86	21
Shale20	30.18	0.8	4.37	25	200	2	1	7.56	<0.5	18	40	6.4	10	3.04	13.6
Shale21	31.1	1	7	56	340	5	1.5	2.19	<0.5	27	60	11.3	216	2.78	27
Shale22	32.15	1.6	5.34	64	260	4	1.8	6.62	<0.5	39	40	7.7	62	4.95	18.8
Shale23	33.21	2.2	6	75	340	3.5	1.9	4.55	<0.5	44	40	7.9	38	4.35	19.4
Shale24	34.12	<0.2	3.46	28	160	2	0.2	5.34	1	19	20	4	108	2.36	10.6
Shale25	35.6	0.4	4.46	10	240	2.5	0.4	4.95	<0.5	12	80	6.2	248	2.4	16
Shale26	36.4	1.4	5.02	71	280	2.5	1.6	0.81	3	42	40	5.4	24	3.44	15
Shale27	38.4	1.6	5.93	74	340	1.5	1.3	0.81	2.5	44	40	4.8	34	5.21	13
Shale28	39.35	1.4	5.72	57	340	1.5	1.4	1.3	6	39	40	4.8	34	3.88	13
Shale29	40.65	1.2	3.98	101	460	1	0.8	6.01	<0.5	39	20	2.9	102	5.25	8.4
Shale30	41.75	1.2	4.45	51	260	1	0.8	2.18	3.5	47	20	3.6	16	3.78	8.8
Shale31	42.69	1.4	6.47	52	360	2.5	1	0.4	3	42	40	5.3	24	3.72	15
Shale32	43.7	1	4.75	43	280	1.5	0.9	1.17	5	42	40	3.8	18	2.67	9.8

Shale33	44.76	1.8	7.48	98	400	4	1.8	0.84	5	50	60	8.2	46	4.59	20.8
Shale34	45.85	1	6.07	55	260	4	1.6	6.49	<0.5	34	40	7.4	108	4.15	21.6
Shale35	46.65	1.2	6.48	50	300	4.5	2.8	4.58	<0.5	31	60	8.7	10	4.36	25.2
Shale36	47.75	2	6.33	77	400	3	1.5	0.86	6.5	39	80	8.1	40	3.88	19
Shale37	48.52	1.6	6.36	76	380	2.5	1.6	0.6	1.5	35	40	7.6	48	4.19	17.4
Shale38	49.73	1	5.28	51	300	4	1.7	4.41	<0.5	29	40	8.7	248	3.55	20.6
Shale39	51.62	2	7.65	117	420	4.5	2.2	0.44	<0.5	48	60	11.5	38	6.48	28.6
Shale40	52.45	2	6.91	110	400	4	2.2	1.36	<0.5	46	80	9.5	40	7.66	28.4
Shale41	53.42	0.4	3.44	21	200	1	0.5	2	<0.5	32	20	3	14	1.62	8.8
Shale42	54.55	0.8	6.2	120	360	2	0.9	0.89	<0.5	52	40	5.2	28	2.64	15.2
Shale43	55.7	1.2	8.46	99	460	3.5	1.7	0.46	<0.5	34	40	7	50	2.01	19.6
Shale44	56.3	1.2	7.25	47	460	3	1.3	1.06	<0.5	37	60	6.5	76	2.85	19
Shale45	57.44	1.2	6.88	35	460	2.5	1.2	0.76	8	29	60	5.6	56	2.46	18.4
Shale46	58.55	1.6	8.38	263	500	5	2	0.62	<0.5	50	60	9.3	26	3.17	24
Shale47	59.63	1	9.38	67	460	6	2	0.31	<0.5	39	60	10.3	22	2.55	37
Shale48	60.2	1	5.22	45	280	1	1	5.24	<0.5	45	40	3.9	360	2.56	12.8
Shale49	61.03	0.8	7.08	35	360	2.5	1.1	0.45	<0.5	66	60	5.2	12	3.06	17
Shale50	62.33	1.2	5.61	59	380	2	1.1	0.28	<0.5	58	40	5.7	1540	1.36	17
Shale51	63.65	<0.2	2.37	4	60	0.5	<0.1	16.1	<0.5	12	<20	0.8	16	1.92	3.2
Shale52	64.72	<0.2	9.2	13	400	3.5	0.5	2.5	<0.5	29	60	8.7	64	1.32	33.6
Shale53	65.05	<0.2	2.31	8	100	0.5	<0.1	13.5	<0.5	13	<20	1.7	134	1.82	6
Shale54	65.99	<0.2	1.72	10	80	0.5	<0.1	14.7	<0.5	14	<20	1.1	312	2.55	3.8
Shale55	66.93	<0.2	2.13	8	100	<0.5	0.2	13.5	<0.5	17	<20	1.6	186	2.31	5.6
Shale56	68.68	<0.2	1.76	14	80	0.5	0.6	13.3	<0.5	17	<20	1.6	40	2.53	5.2
Shale57	69.75	<0.2	8.66	9	280	3.5	1.5	3.43	<0.5	18	60	11.2	318	2.88	29.4
Shale58	70.6	<0.2	3.94	7	180	2	0.6	4.35	<0.5	15	20	4.1	50	2.65	12
Shale59	71.65	<0.2	5.45	4	700	3	0.2	8.56	<0.5	18	20	7.9	22	2.43	15.8
Shale60	73.01	<0.2	3.11	5	100	1.5	0.9	8.14	<0.5	19	20	4	8	2.62	9.2
Shale61	74.79	<0.2	3.63	4	5220	1	0.8	10.7	<0.5	18	20	3.9	12	2.55	8
Shale62	76.21	<0.2	8.45	2	220	5	0.4	4.3	<0.5	13	60	16.4	30	3.54	23.6
Shale63	77.2	<0.2	5.42	<1	180	3.5	0.2	8.44	<0.5	15	40	9.2	4	2.91	17.4
Shale64	78.11	<0.2	5.21	6	680	3.5	0.2	8.66	<0.5	13	40	9.5	132	5.8	16.4
Shale65	78.95	<0.2	4.68	2	1820	1.5	0.3	9.26	<0.5	9	40	5.1	12	2.24	11
Shale66	81.12	<0.2	4.92	6	1320	2.5	0.2	8.86	<0.5	18	40	10.4	14	4.66	14.8
Shale67	82.01	<0.2	5.66	14	140	3	0.6	7.32	<0.5	18	40	12.1	12	4.59	16
Shale68	82.61	<0.2	5.67	6	160	3.5	0.3	6.87	<0.5	18	40	12.7	20	5.02	16.8
Shale69	83.59	<0.2	5.64	10	140	3.5	0.3	6	<0.5	18	40	13.4	18	5.79	17.6
Shale70	84.16	<0.2	5.93	10	360	4	0.3	5.57	<0.5	18	40	13.7	24	5.78	18.6
Shale71	85.21	<0.2	4.61	5	100	2	0.2	8.5	<0.5	18	40	8.3	6	2.48	11.8

Shale72	86.31	<0.2	7.81	7	220	3.5	0.5	3.83	<0.5	18	60	14.5	10	3.42	21.6
Shale73	86.79	<0.2	7.28	6	160	3	0.3	3.86	<0.5	18	60	13.7	10	6.9	19.8
Shale74	89.22	<0.2	6.68	3	180	2	<0.1	1.87	<0.5	26	40	5.8	26	4.26	18.4
Shale75	91.01	<0.2	7.77	7	180	2.5	0.3	1.37	<0.5	18	60	10.5	24	8.82	19
Shale76	91.6	<0.2	7.61	6	240	4	0.5	1.92	<0.5	18	60	12.7	18	7.77	21.2
Shale77	92.29	<0.2	7.5	4	200	3	0.2	1.45	<0.5	23	60	10.5	16	3.6	20.6
Shale78	93.46	<0.2	8.66	13	260	4.5	0.7	0.48	<0.5	24	60	11.5	14	3.86	24.6
Shale79	94.71	<0.2	8.78	6	160	3	0.3	0.24	<0.5	19	60	10.7	8	7.3	23.6
Shale80	95.16	<0.2	8.65	8	160	3	0.4	0.24	<0.5	20	60	9.9	6	7.63	23
Shale81	96.12	<0.2	8.6	9	160	2.5	0.3	0.22	<0.5	18	80	8.2	8	7.62	22
Shale82	97.09	<0.2	8.1	7	180	3	0.2	0.24	<0.5	21	80	8.7	14	7.61	22.6
IDENT	**Depth**	**Hf**	**In**	**K**	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Nb**	**Ni**	**P**	**Pb**	**Rb**	**Re**
UNITS		ppm	ppm	%	ppm	%	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA102	MA102	LB101	MA101	LB101	LB101	MA102	LB101	MA102	MA101	LB101	MA102	LB102	LB102
LOD		**0.2**	**0.05**	**0.01**	**10**	**0.005**	**0.005**	**0.5**	**0.01**	**0.5**	**2**	**0.005**	**1**	**0.5**	**0.1**
Shale1	8.67	2	0.1	2.45	20	5.85	0.51	1	0.05	6.5	10	0.03	4	79	<0.1
Shale2	9.35	1.2	<0.05	2.4	20	5.97	0.535	3	0.05	5	16	0.04	6	80.5	<0.1
Shale3	10.68	1.4	<0.05	2.73	20	6.69	0.545	1	0.06	5	10	0.045	3	80.5	<0.1
Shale4	11.55	1.4	<0.05	2.24	20	7.41	0.545	1	0.06	5	16	0.035	5	72	<0.1
Shale5	12.7	2.8	<0.05	3.08	20	5.22	0.415	1	0.06	8	12	0.045	4	101	<0.1
Shale6	13.7	3.4	<0.05	3.31	30	5.27	0.415	2	0.06	8.5	12	0.04	4	104	<0.1
Shale7	15.05	2.6	0.1	4.29	50	4.97	0.385	1	0.06	10	14	0.055	5	141	<0.1
Shale8	16.35	2.2	<0.05	3.18	50	5.74	0.425	5	0.06	7.5	14	0.045	4	99	<0.1
Shale9	17.72	1.2	<0.05	2.71	40	6.31	0.42	1	0.06	5	18	0.04	4	90.5	<0.1
Shale10	8.67	1.6	<0.05	2.81	30	5.65	0.51	1	0.05	6	12	0.04	3	88.5	<0.1
Shale11	20.44	2.8	0.1	3.72	50	4.48	0.34	1.5	0.05	10	16	0.06	16	134	<0.1
Shale12	21.34	2.4	0.1	3.61	40	4.86	0.34	1	0.06	8	16	0.055	4	121	<0.1
Shale13	22.55	2.2	0.1	2.99	50	4.87	0.385	2	0.05	7.5	12	0.045	6	108	<0.1
Shale14	23.9	2.8	<0.05	4.47	150	2.86	0.14	2.5	0.05	11	32	0.055	18	218	<0.1
Shale15	24.95	1.6	<0.05	3.49	110	3.2	0.18	2.5	0.05	8	44	0.075	18	160	<0.1
Shale16	25.78	2.2	<0.05	4.41	110	3.79	0.205	5	0.06	11	32	0.08	22	178	<0.1
Shale17	26.12	2.2	<0.05	4.41	150	2.26	0.065	3.5	0.06	11	46	0.045	23	211	<0.1
Shale18	28.1	1.2	<0.05	3.12	60	4.71	0.245	38.5	0.06	6.5	44	0.07	32	123	<0.1
Shale19	29	3	<0.05	4.99	110	3.64	0.145	5	0.06	11	28	0.075	11	190	<0.1
Shale20	30.18	1.4	<0.05	2.92	70	4.24	0.185	30.5	0.06	7	34	0.085	30	120	<0.1
Shale21	31.1	2.2	<0.05	4.54	140	2.22	0.055	22	0.06	11.5	60	0.055	31	197	<0.1
Shale22	32.15	1.6	<0.05	3.96	80	3.75	0.16	35.5	0.06	9.5	54	0.105	51	146	<0.1
Shale23	33.21	2.4	<0.05	4.53	70	2.87	0.11	34.5	0.07	11	68	0.05	54	160	<0.1
Shale24	34.12	1	<0.05	2.69	50	2.89	0.13	2.5	0.05	5	16	0.025	6	90	<0.1

Shale25	35.6	1.6	<0.05	3.13	70	3.13	0.115	1	0.06	7	16	0.035	12	130	<0.1
Shale26	36.4	2	0.15	4.26	50	0.835	0.015	25.5	0.05	8	60	0.05	103	120	<0.1
Shale27	38.4	2	<0.05	4.93	40	0.64	0.01	20.5	0.06	9	76	0.175	138	132	<0.1
Shale28	39.35	2	<0.05	4.87	40	1	0.025	18	0.06	9	54	0.055	156	123	<0.1
Shale29	40.65	1.2	<0.05	3.62	20	2.96	0.115	12	0.05	6	52	0.085	59	82.5	<0.1
Shale30	41.75	1.2	<0.05	3.96	20	1.29	0.035	15	0.05	6.5	38	0.08	88	91	<0.1
Shale31	42.69	2	<0.05	5.55	40	0.66	0.005	26.5	0.06	8.5	54	0.045	106	136	<0.1
Shale32	43.7	1.4	<0.05	4.05	30	0.895	0.02	15.5	0.05	7	48	0.03	86	101	<0.1
Shale33	44.76	2.2	0.1	5.56	60	1.03	0.015	30.5	0.06	11	84	0.09	195	178	<0.1
Shale34	45.85	2	<0.05	5.69	60	3.48	0.13	18	0.06	9	38	0.055	34	141	<0.1
Shale35	46.65	2.6	<0.05	5.41	80	2.87	0.1	33.5	0.06	12	44	0.045	28	176	<0.1
Shale36	47.75	2.2	0.1	5.75	70	1.13	0.015	23	0.06	10.5	64	0.04	106	158	<0.1
Shale37	48.52	2	<0.05	5.8	60	0.95	0.015	28.5	0.06	10	64	0.05	152	161	<0.1
Shale38	49.73	1.8	<0.05	4.38	80	2.63	0.095	24	0.06	8.5	36	0.04	36	142	<0.1
Shale39	51.62	3.4	<0.05	6.3	90	1.11	0.01	31	0.07	14	62	0.05	75	218	<0.1
Shale40	52.45	2.8	<0.05	5.96	70	1.27	0.03	29.5	0.07	13.5	66	0.13	85	191	<0.1
Shale41	53.42	1.4	<0.05	3.76	20	1.07	0.035	8	0.06	6	20	0.06	17	80	<0.1
Shale42	54.55	2.8	<0.05	6.69	30	0.65	0.01	14.5	0.08	11	34	0.145	35	135	<0.1
Shale43	55.7	3.2	<0.05	8.88	40	0.555	<0.005	41.5	0.1	14	38	0.135	259	184	<0.1
Shale44	56.3	3.6	<0.05	7.32	40	0.83	0.01	42	0.1	14.5	44	0.195	1450	183	<0.1
Shale45	57.44	3.6	<0.05	6.96	30	0.53	0.005	43.5	0.1	13	60	0.3	185	179	<0.1
Shale46	58.55	4.8	<0.05	8.37	60	0.775	0.01	25.5	0.1	16.5	62	0.135	53	208	<0.1
Shale47	59.63	4.6	<0.05	8.99	60	0.745	<0.005	23.5	0.1	18.5	60	0.11	33	216	<0.1
Shale48	60.2	2.6	<0.05	5.51	20	2.78	0.095	13.5	0.07	9.5	26	0.1	30	127	<0.1
Shale49	61.03	3.2	<0.05	7.4	30	0.44	<0.005	29	0.07	10	32	0.085	31	172	<0.1
Shale50	62.33	2.8	<0.05	5.31	30	0.45	<0.005	31	0.08	10	36	0.05	56	151	<0.1
Shale51	63.65	0.4	<0.05	2.96	<10	8.36	0.4	<0.5	0.07	2	<2	0.06	<1	44.5	<0.1
Shale52	64.72	4.2	<0.05	8.9	50	1.83	0.065	1	0.1	17	16	0.14	16	219	<0.1
Shale53	65.05	0.8	<0.05	2.58	<10	7.06	0.325	1	0.06	4	6	0.05	2	55	<0.1
Shale54	65.99	0.4	<0.05	1.97	<10	7.35	0.405	1	0.06	2.5	6	0.045	2	39	<0.1
Shale55	66.93	0.4	<0.05	2.15	10	6.51	0.445	1.5	0.06	3	6	0.025	3	52	<0.1
Shale56	68.68	0.4	<0.05	1.56	20	6.76	0.5	2.5	0.07	2.5	10	0.02	14	41	<0.1
Shale57	69.75	2.2	<0.05	6.64	120	3.07	0.145	26.5	0.08	11.5	28	0.07	12	263	<0.1
Shale58	70.6	1	<0.05	2.97	40	2.99	0.195	3	0.06	6	18	0.05	9	98	<0.1
Shale59	71.65	2.4	<0.05	3.94	60	5.41	0.39	1	0.07	10	20	0.05	17	150	<0.1
Shale60	73.01	0.8	<0.05	2.12	30	4.93	0.4	1	0.06	5	14	0.045	5	82.5	<0.1
Shale61	74.79	1.2	<0.05	3.08	30	6.31	0.22	3	0.07	5	4	0.05	4	94.5	<0.1
Shale62	76.21	2	<0.05	5.12	70	3.79	0.065	<0.5	0.08	10.5	32	0.08	4	279	<0.1
Shale63	77.2	1.2	<0.05	3.36	40	5.71	0.1	<0.5	0.06	7.5	22	0.05	3	159	<0.1

Shale64	78.11	1.6	<0.05	3.75	40	5.59	0.095	1.5	0.06	7.5	20	0.065	5	160	<0.1
Shale65	78.95	1	<0.05	3.69	20	5.7	0.11	<0.5	0.07	5.5	12	0.055	5	128	<0.1
Shale66	81.12	1.4	0.1	2.88	50	5.79	0.26	1.5	0.06	7.5	22	0.06	4	164	<0.1
Shale67	82.01	1.4	0.1	3.21	70	5.34	0.23	1.5	0.06	8	26	0.06	4	196	<0.1
Shale68	82.61	1.6	0.1	2.97	60	5.21	0.195	1.5	0.07	8.5	26	0.065	4	177	<0.1
Shale69	83.59	1.6	0.1	2.99	60	4.63	0.165	1.5	0.06	8	26	0.06	4	186	<0.1
Shale70	84.16	1.6	0.1	3.03	70	4.67	0.15	1.5	0.06	8.5	28	0.06	5	192	<0.1
Shale71	85.21	1.2	0.1	2.34	50	6.44	0.23	1	0.06	6.5	22	0.05	3	118	<0.1
Shale72	86.31	1.8	0.1	3.93	150	4.41	0.11	<0.5	0.07	10	34	0.075	4	208	<0.1
Shale73	86.79	1.8	0.1	3.57	70	4.48	0.12	1	0.06	10	32	0.065	4	198	<0.1
Shale74	89.22	1.6	<0.05	2.44	140	6.61	0.055	<0.5	0.07	9	36	0.05	3	115	<0.1
Shale75	91.01	1.8	0.1	3.08	100	5.48	0.04	1	0.06	10	30	0.075	4	173	<0.1
Shale76	91.6	1.8	0.1	3.53	80	4.53	0.06	1.5	0.06	10	32	0.07	5	200	<0.1
Shale77	92.29	2	0.1	3.14	110	5.35	0.045	<0.5	0.07	10.5	36	0.07	7	170	<0.1
Shale78	93.46	2.2	0.15	3.72	130	5.31	0.02	<0.5	0.06	11.5	42	0.08	4	220	<0.1
Shale79	94.71	2	0.1	3.39	100	5.7	0.01	1	0.06	11	40	0.08	4	187	<0.1
Shale80	95.16	2.2	0.1	3.08	110	6.42	0.01	1	0.06	11	42	0.075	4	167	<0.1
Shale81	96.12	2	0.1	3.14	100	6.02	<0.005	1	0.08	10.5	40	0.08	4	166	<0.1
Shale82	97.09	1.8	0.1	2.93	100	6.26	0.01	1	0.08	10.5	42	0.085	4	155	<0.1
IDENT	**Depth**	**S**	**Sb**	**Sc**	**Se**	**Si**	**Sn**	**Sr**	**Ta**	**Te**	**Th**	**Ti**	**Tl**	**U**	**V**
UNITS		ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA101	MA102	MA101	MA102	LB101	MA102	MA102	MA102	MA102	MA102	LB101	MA102	MA102	LB101
LOD		**50**	**0.1**	**1**	**5**	**0.005**	**0.1**	**0.5**	**0.1**	**0.2**	**0.1**	**0.005**	**0.1**	**0.1**	**20**
Shale1	8.67	<50	0.5	6	<5	14.8	1.8	23.5	0.5	<0.2	7	0.19	0.2	2	40
Shale2	9.35	15100	1.1	4	<5	15.1	1.5	20	0.4	<0.2	5	0.125	0.2	1.9	40
Shale3	10.68	<50	0.4	5	<5	12.8	1.8	21.5	0.4	<0.2	5.6	0.15	0.2	1.9	40
Shale4	11.55	<50	0.5	5	<5	11	1.7	20	0.4	<0.2	6.1	0.13	0.2	2	40
Shale5	12.7	650	0.6	8	<5	17.3	2.3	28	0.7	<0.2	10.2	0.225	0.4	3.4	40
Shale6	13.7	3650	1.1	8	<5	17	2.5	39	0.7	<0.2	10.7	0.23	0.4	3.4	40
Shale7	15.05	850	0.6	9	<5	18.1	3.3	28	0.8	<0.2	11.4	0.26	0.4	3.8	60
Shale8	16.35	100	0.5	8	<5	16	2.2	28.5	0.7	<0.2	9	0.19	0.3	3	40
Shale9	17.72	1350	0.6	6	<5	13.3	1.8	22	0.4	0.2	5.3	0.13	0.2	2.2	60
Shale10	8.67	350	0.5	6	<5	16.4	2.1	22	0.5	<0.2	6.9	0.16	0.2	2.3	40
Shale11	20.44	750	1.2	9	<5	19	3.1	29.5	0.9	<0.2	12.1	0.26	0.6	4.1	60
Shale12	21.34	<50	0.7	8	<5	19.4	3	25	0.7	<0.2	10.7	0.25	0.4	4.4	60
Shale13	22.55	<50	1.3	7	<5	20.4	2.4	30.5	0.6	<0.2	9.3	0.22	0.3	3.2	60
Shale14	23.9	1800	1.5	10	<5	26.7	3.7	32.5	0.9	<0.2	11.5	0.28	1.6	6.5	140
Shale15	24.95	1950	1.9	9	<5	28.1	3.2	27	0.7	<0.2	9.4	0.23	1.3	7.6	160
Shale16	25.78	5050	1.4	11	<5	22.1	3.9	31.5	0.9	<0.2	12.8	0.265	2.2	7.8	180

Shale17	26.12	1950	1.9	12	<5	29.2	4.1	28	1	<0.2	12.4	0.3	1.4	7.8	280
Shale18	28.1	23100	3.9	8	<5	17.9	2.6	34	0.5	0.2	7.5	0.18	3	11.3	140
Shale19	29	3250	1.7	12	<5	22.5	3.9	30.5	0.9	<0.2	12.6	0.285	1.4	7.6	200
Shale20	30.18	4600	3	8	<5	22.4	2.6	29	0.6	<0.2	7.7	0.185	1.7	9.2	140
Shale21	31.1	7450	4.3	11	<5	28.9	4.8	32.5	1	0.4	13.8	0.315	3.5	10	280
Shale22	32.15	29600	6.6	11	<5	21	3.9	32	0.7	0.4	10.8	0.23	3.4	10	140
Shale23	33.21	26500	7.4	9	<5	24.6	3.9	32	1	0.4	14.1	0.265	5.3	19.3	260
Shale24	34.12	6100	1.3	7	<5	28.9	2.1	22	0.4	<0.2	5.7	0.13	0.9	2.3	60
Shale25	35.6	1150	1.8	8	<5	27.6	2.8	26	0.6	<0.2	7.6	0.205	0.6	3.9	160
Shale26	36.4	29900	7.5	4	<5	32.5	3.2	21	0.7	0.2	9.4	0.215	7.1	6.8	100
Shale27	38.4	46500	8.6	5	<5	30.9	2.3	21	0.8	<0.2	11.9	0.28	6.9	12	120
Shale28	39.35	33900	8.9	7	<5	31.4	2.8	22.5	0.8	0.4	10.9	0.26	5.8	11	100
Shale29	40.65	37500	6	7	<5	24.4	1.6	20.5	0.5	0.4	7.6	0.17	5.4	9.4	100
Shale30	41.75	28700	5.6	5	<5	32.1	2	18	0.5	0.2	7.6	0.185	6.7	10.1	80
Shale31	42.69	28000	5.8	7	<5	32.7	2.5	23	0.7	0.4	10.7	0.275	8.8	11.6	140
Shale32	43.7	18600	4.5	5	<5	34.2	2.1	18	0.6	0.2	7.5	0.205	5.6	9.8	100
Shale33	44.76	34700	8.6	8	5	29.4	3.8	29	1	0.6	13.5	0.34	8.7	13.3	260
Shale34	45.85	19200	3.8	13	<5	20.3	3.9	29.5	0.8	0.2	11.2	0.26	4.4	9.7	220
Shale35	46.65	25000	3.8	10	<5	22.7	5	34.5	1.1	0.2	16.8	0.295	8.5	11.8	180
Shale36	47.75	34700	7	11	<5	29.1	3.4	27	1	0.2	12	0.305	10.1	9.9	160
Shale37	48.52	35400	7.3	9	<5	29.8	3.1	25	0.8	0.4	11.1	0.275	7	9.9	140
Shale38	49.73	21700	3.7	10	<5	26.1	3.4	32	0.7	0.2	10.2	0.22	8.2	7.2	140
Shale39	51.62	59200	9.5	9	<5	25.2	5.1	29.5	1.3	0.2	17.4	0.42	10.1	12.5	160
Shale40	52.45	72200	11.4	8	<5	23.9	5.3	27	1.2	0.4	17.7	0.4	10.4	15.3	180
Shale41	53.42	12000	2.3	6	<5	33	1.7	16.5	0.5	<0.2	7	0.16	1.7	7.8	60
Shale42	54.55	22500	3.8	9	<5	29.5	3.3	25	1	0.4	14.6	0.27	3	14.4	100
Shale43	55.7	16100	6.6	8	<5	28.4	4.5	28	1.2	<0.2	26.6	0.335	2.1	19.2	120
Shale44	56.3	25300	7.2	10	<5	28	3.4	31	1.4	0.6	16.6	0.375	2.9	22.6	160
Shale45	57.44	19400	8.6	11	<5	27.7	3.3	31	1.2	0.6	15.2	0.345	2.6	24.1	180
Shale46	58.55	32800	7.7	13	<5	25.7	4.3	29.5	1.4	0.6	22.7	0.355	3.9	17.1	160
Shale47	59.63	21100	5.7	11	<5	27.5	6.7	27	2	0.6	28.9	0.37	4.6	22.8	160
Shale48	60.2	19100	4.6	8	<5	22.8	3.2	16	0.9	0.4	11.3	0.29	4.6	14.4	120
Shale49	61.03	31200	3.1	5	5	28.6	3.7	15.5	0.9	0.4	13.9	0.325	8.4	13.7	140
Shale50	62.33	13000	5.7	8	<5	33.8	4.1	20	0.9	0.6	12.5	0.28	9	12.4	300
Shale51	63.65	<50	0.3	5	<5	8.17	0.6	12.5	0.2	<0.2	2.9	0.055	<0.1	1.3	<20
Shale52	64.72	1100	1.3	10	<5	25.8	6.5	19	1.7	<0.2	24.3	0.39	0.6	8.6	100
Shale53	65.05	<50	0.4	5	<5	12.3	1.4	14	0.4	<0.2	4	0.1	0.2	1.7	40
Shale54	65.99	100	0.5	4	<5	9.93	0.9	17	0.3	<0.2	2.6	0.065	0.2	1.1	40
Shale55	66.93	400	0.8	5	<5	15.3	1.2	17.5	0.3	<0.2	3.2	0.085	0.2	1.1	60

Shale56	68.68	1100	0.8	4	<5	15.1	0.9	23.5	0.3	<0.2	2.6	0.07	0.2	1.6	40
Shale57	69.75	1350	1.3	12	<5	23	4.4	24	1.1	<0.2	14.3	0.36	0.6	5.6	240
Shale58	70.6	1950	0.8	7	<5	29.7	2.4	19.5	0.5	<0.2	6.3	0.17	0.3	3.4	40
Shale59	71.65	2250	1	8	<5	18.5	4.3	29	1	<0.2	16	0.185	0.3	5.2	40
Shale60	73.01	1850	1	6	<5	23.1	2	22	0.4	<0.2	5.4	0.12	0.2	1.9	40
Shale61	74.79	1300	0.7	7	<5	16.8	1.9	103	0.5	<0.2	6	0.16	0.3	2.6	40
Shale62	76.21	150	1.5	14	<5	23.4	3.5	42	1	<0.2	14.2	0.31	0.6	6.2	100
Shale63	77.2	<50	0.9	11	<5	19.7	2.7	29.5	0.6	<0.2	8.1	0.225	0.3	4	80
Shale64	78.11	350	2.7	9	<5	17.1	3.3	37.5	0.7	<0.2	10.3	0.225	0.4	7.4	80
Shale65	78.95	200	0.6	8	<5	19.5	2	39.5	0.5	<0.2	7.3	0.21	0.2	5.4	60
Shale66	81.12	<50	2.2	9	<5	16.6	3.1	44.5	0.6	<0.2	8.9	0.205	0.3	3.4	60
Shale67	82.01	350	2.7	11	<5	18	3.2	31.5	0.7	<0.2	9.5	0.21	0.4	4.3	60
Shale68	82.61	<50	2.5	11	<5	18.6	3.5	33.5	0.7	<0.2	11	0.22	0.4	4.3	80
Shale69	83.59	<50	2.9	12	<5	18.4	3.3	34.5	0.8	<0.2	10.5	0.215	0.4	4.9	80
Shale70	84.16	<50	3	12	<5	19.3	3.6	39.5	0.7	<0.2	10.8	0.225	0.4	5.5	80
Shale71	85.21	<50	0.9	8	<5	19.5	2.2	29.5	0.5	<0.2	7.9	0.19	0.2	3.7	60
Shale72	86.31	100	1.3	13	<5	24.2	3.3	35.5	0.9	<0.2	13	0.285	0.5	7.5	100
Shale73	86.79	<50	2.4	13	<5	23	3.2	32.5	0.9	<0.2	12.8	0.275	0.4	6.2	80
Shale74	89.22	<50	0.6	11	<5	27	3	23	0.8	<0.2	10.9	0.26	0.3	5.4	80
Shale75	91.01	200	2.8	12	<5	24.5	2.7	24.5	0.8	<0.2	11.3	0.305	0.4	5.9	100
Shale76	91.6	100	2.5	14	<5	24.1	3	28	0.8	<0.2	12.6	0.295	0.4	5.5	100
Shale77	92.29	<50	0.9	14	<5	25.9	3.3	27	0.9	<0.2	12.2	0.32	0.4	3.7	80
Shale78	93.46	650	1.2	17	<5	26.1	3.5	31	1	<0.2	14.1	0.35	0.4	5.1	100
Shale79	94.71	<50	2.2	17	<5	26	3.3	29	0.9	<0.2	12.9	0.35	0.4	6.4	100
Shale80	95.16	100	2.2	16	<5	26.1	3.3	29	0.9	<0.2	12.6	0.35	0.4	5.6	100
Shale81	96.12	<50	2.3	16	<5	25.5	3.2	26.5	0.9	<0.2	11.5	0.33	0.4	4.1	100
Shale82	97.09	100	2	17	<5	24.7	3.4	27	0.8	<0.2	12.4	0.33	0.4	3.7	120
IDENT	**Depth**	**W**	**Y**	**Zn**	**Zr**	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**
UNITS		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME		LB102	LB102	MA101	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102
LOD		**3**	**1**	**2**	**1**	**0.1**	**0.1**	**0.05**	**0.05**	**0.05**	**0.05**	**0.2**	**0.02**	**0.05**	**0.02**
Shale1	8.67	111	15	20	88	16.9	37.5	4.65	18.5	3.8	0.75	3.6	0.5	3.1	0.6
Shale2	9.35	60	11	10	48	13.3	28.6	3.6	14.1	3.05	0.6	2.8	0.38	2.1	0.42
Shale3	10.68	51	11	8	53	16	33.3	4.05	15.3	2.8	0.6	2.8	0.38	2.3	0.46
Shale4	11.55	45	11	10	59	16.1	33.7	4.05	15.2	3.05	0.6	3	0.38	2.35	0.42
Shale5	12.7	81	14	18	126	21.7	45.1	5.35	19.8	3.85	0.7	3.8	0.52	3.1	0.6
Shale6	13.7	75	15	18	138	24.1	47.8	5.5	20.5	3.65	0.8	4	0.52	3.2	0.66
Shale7	15.05	42	15	20	107	25.7	49.4	5.6	20.8	3.8	0.75	4	0.52	3.15	0.6
Shale8	16.35	48	15	18	95	22.1	46.9	5.65	21.5	4.15	0.85	4	0.54	3.3	0.62

Shale9	17.72	30	11	16	46	18.1	37.9	4.4	16.7	3.05	0.55	3	0.38	2.15	0.4
Shale10	8.67	48	11	18	65	15.9	32.6	3.95	14.8	2.8	0.6	2.6	0.38	2.3	0.42
Shale11	20.44	42	14	24	106	25.3	49.3	5.65	20.6	3.9	0.75	3.8	0.48	3.05	0.58
Shale12	21.34	42	15	22	100	25.2	51.4	6.05	21.5	4.05	0.8	4	0.52	3.3	0.62
Shale13	22.55	48	13	20	93	22.9	44.9	5.25	19.5	3.8	0.75	3.6	0.44	2.9	0.52
Shale14	23.9	15	11	32	95	36.2	53.4	5.25	16.9	2.9	0.6	2.6	0.38	2.35	0.44
Shale15	24.95	30	12	32	71	28.4	54.9	6.5	23.3	4.05	0.8	3.8	0.46	2.8	0.52
Shale16	25.78	36	15	36	97	32.8	60.4	7	26.2	5.05	0.95	4.4	0.58	3.7	0.7
Shale17	26.12	27	10	44	94	30.8	49	5.1	17.1	3.05	0.55	2.8	0.38	2.35	0.44
Shale18	28.1	54	15	36	55	24.7	48.1	6.15	23.6	4.5	0.9	4.2	0.54	3.2	0.56
Shale19	29	30	17	28	119	33.6	62.8	7.6	28.6	5.35	1.05	4.8	0.64	3.85	0.74
Shale20	30.18	24	14	26	57	25.6	52.9	6.9	27	5.35	0.9	4.4	0.56	3.2	0.56
Shale21	31.1	24	12	44	97	37.9	58.3	6.15	20.6	3.8	0.75	3.6	0.48	2.85	0.52
Shale22	32.15	51	15	36	70	33.3	65.8	8.25	31.4	6.1	1.1	5.2	0.64	3.6	0.66
Shale23	33.21	75	12	52	102	29.7	49	5.5	22.2	3.8	0.7	3.4	0.46	2.65	0.52
Shale24	34.12	81	8	170	46	21	41.6	4.85	16.3	2.5	0.5	2.2	0.3	1.85	0.38
Shale25	35.6	36	10	22	59	27.9	45.2	4.75	16.3	2.55	0.5	2.2	0.32	2	0.4
Shale26	36.4	111	8	732	80	15.5	30.2	3.5	12.9	2.35	0.5	2	0.28	1.8	0.36
Shale27	38.4	114	14	690	84	22.6	51.1	6.8	27.6	5.25	0.9	4.6	0.52	2.9	0.52
Shale28	39.35	102	10	1470	88	22.9	41.4	4.7	16.8	2.8	0.5	2.4	0.34	2.2	0.44
Shale29	40.65	93	13	22	55	20.4	38.9	4.9	19.8	4.2	0.7	4.4	0.54	3.3	0.5
Shale30	41.75	156	11	852	56	15.1	30.9	4.05	15.7	3.55	0.6	3.6	0.44	2.6	0.46
Shale31	42.69	120	9	798	87	24.7	38.3	4.05	13.9	2.6	0.5	2.2	0.3	1.85	0.34
Shale32	43.7	165	9	1090	60	14.6	27	3.1	11.2	2.1	0.4	1.8	0.28	1.75	0.34
Shale33	44.76	105	13	1240	97	40.8	64.6	7.15	26	5	0.95	4.4	0.52	2.9	0.52
Shale34	45.85	84	13	34	88	39.3	60.9	6.5	22.2	4.05	0.75	4	0.52	3.05	0.54
Shale35	46.65	45	15	46	112	44.1	66.2	6.65	22.2	3.8	0.75	3.6	0.48	3.15	0.6
Shale36	47.75	84	11	1600	96	35.6	62.6	6.85	22.9	3.45	0.65	2.8	0.38	2.45	0.48
Shale37	48.52	87	10	348	80	32.2	57.5	6.5	21.2	3.3	0.6	2.6	0.34	2.15	0.42
Shale38	49.73	54	11	54	77	37	59.9	6.45	21.3	3.5	0.7	3.2	0.44	2.7	0.52
Shale39	51.62	60	13	52	148	32	45.3	4.6	15.6	3.25	0.7	3	0.42	2.45	0.5
Shale40	52.45	51	16	42	125	34.8	60.3	7	25.9	4.95	0.95	4.4	0.56	3.35	0.6
Shale41	53.42	138	8	18	60	11.3	21.7	2.65	10.1	2.15	0.45	2	0.28	1.55	0.3
Shale42	54.55	144	15	18	120	25.6	51.7	6.3	23	4.5	0.85	4.4	0.56	3.55	0.64
Shale43	55.7	84	17	128	128	31.8	56.3	6.55	23.3	4.4	0.75	4.2	0.52	3.25	0.64
Shale44	56.3	120	22	24	137	32.9	58.7	7.05	27	5.5	1	5.4	0.66	4.35	0.82
Shale45	57.44	72	27	1440	115	35.4	76.8	9.75	37.3	7.45	1.55	7.2	0.88	5.3	0.94
Shale46	58.55	81	25	18	181	49.6	73	7.8	27.3	5.5	1.1	5.4	0.74	4.85	0.94
Shale47	59.63	102	17	20	180	42.4	56.1	5.7	19.8	3.8	0.75	4	0.52	3.35	0.66

Shale48	60.2	129	13	26	93	15.1	33	4.15	15.6	3.05	0.55	3	0.4	2.35	0.48
Shale49	61.03	156	14	<2	106	15.2	32.4	3.95	13.7	2.65	0.5	2.4	0.4	2.3	0.5
Shale50	62.33	135	9	<2	98	24.8	44.5	4.85	16	2.75	0.5	2.2	0.3	1.9	0.42
Shale51	63.65	60	8	6	20	9.1	21.1	2.7	10.6	2.1	0.4	2	0.28	1.55	0.28
Shale52	64.72	108	15	12	157	17	26.3	3.1	12.3	2.75	0.55	3	0.44	2.65	0.58
Shale53	65.05	54	7	4	30	8	18.7	2.45	9.3	1.8	0.35	1.8	0.22	1.3	0.26
Shale54	65.99	51	8	6	18	9.8	26.1	3.4	13.8	2.5	0.45	2.2	0.3	1.6	0.3
Shale55	66.93	57	7	10	24	10.9	23.8	2.9	10.5	2	0.4	2	0.22	1.4	0.26
Shale56	68.68	36	8	16	18	9	21.1	2.8	11.1	2.25	0.4	2	0.26	1.5	0.26
Shale57	69.75	30	11	28	96	28.3	43.6	4.6	16	3	0.6	3	0.36	2.15	0.44
Shale58	70.6	36	7	32	45	23.9	34.2	3.25	10.8	1.95	0.4	1.8	0.22	1.3	0.26
Shale59	71.65	24	15	20	98	34.4	71.6	8.45	29	4.35	0.8	3.6	0.5	3	0.58
Shale60	73.01	36	13	12	34	23.1	42.1	4.7	17.1	3.3	0.65	2.8	0.38	2.35	0.42
Shale61	74.79	57	13	<2	44	21	40.1	4.5	16.5	3.65	0.85	3.2	0.44	2.4	0.48
Shale62	76.21	21	17	32	80	54.7	104	11.6	36.3	4.35	1.05	4	0.52	3.3	0.62
Shale63	77.2	36	14	22	54	28.5	55.4	6.4	21.6	3.3	0.7	3.2	0.44	2.7	0.52
Shale64	78.11	30	15	18	66	34.8	67.8	7.75	26.7	4.5	1	3.8	0.52	3.1	0.58
Shale65	78.95	33	15	12	45	23.5	45.3	5.05	18.1	3	0.7	2.8	0.38	2.25	0.42
Shale66	81.12	24	17	26	56	30.1	57.7	6.8	24.3	4.55	1.1	4.4	0.56	3.25	0.6
Shale67	82.01	21	17	28	57	35.1	65.9	7.65	26.3	4.3	1.1	4.2	0.54	3.3	0.6
Shale68	82.61	24	17	28	64	37.6	70.1	8.2	28.7	4.85	1.15	4.6	0.58	3.55	0.66
Shale69	83.59	21	16	30	62	41.7	77.4	8.8	30.1	4.9	1.15	4.4	0.56	3.45	0.66
Shale70	84.16	15	16	34	65	44.6	82	9.15	30.4	4.9	1.15	4.4	0.58	3.45	0.66
Shale71	85.21	24	17	22	50	28.7	55.2	6.25	22	4.35	1.1	4.2	0.56	3.4	0.66
Shale72	86.31	15	18	42	74	49.1	89.4	9.75	32	5.05	1.2	4.6	0.62	3.75	0.74
Shale73	86.79	18	19	36	77	45.5	84.4	9.6	34.2	6.1	1.35	5.2	0.64	4	0.76
Shale74	89.22	21	17	32	72	20.5	49.6	6.55	26.3	5.15	1.1	4.4	0.52	3.35	0.62
Shale75	91.01	12	18	36	72	29	58.6	6.85	24.8	4.75	1.2	4.6	0.58	3.5	0.64
Shale76	91.6	9	21	42	77	36.8	74	8.7	32.1	5.9	1.5	5.6	0.7	4.3	0.8
Shale77	92.29	30	23	42	86	37.3	74.3	8.7	31.5	5.75	1.35	5.4	0.72	4.65	0.86
Shale78	93.46	6	20	42	92	83.7	181	17.9	62.8	9.5	2.1	7.2	0.8	4.3	0.8
Shale79	94.71	9	19	44	88	58.8	112	13	46.4	7.55	1.75	6.2	0.68	4.05	0.72
Shale80	95.16	9	19	38	87	52.5	99.9	11.5	41.6	7.2	1.65	5.8	0.7	4.15	0.78
Shale81	96.12	12	19	36	80	16	32.6	4.1	15.3	3.45	1	4	0.58	3.85	0.76
Shale82	97.09	24	21	42	80	32.7	65.8	7.9	28.7	5.25	1.3	4.8	0.6	3.9	0.78

IDENT	Depth	Er	Tm	Yb	Lu
UNITS		ppm	ppm	ppm	ppm
SCHEME		MA102	MA102	MA102	MA102
LOD		0.05	0.05	0.05	0.02
Shale1	8.67	1.8	0.25	1.65	0.26
Shale2	9.35	1.15	0.15	1	0.14
Shale3	10.68	1.25	0.2	1.2	0.16
Shale4	11.55	1.25	0.15	1.2	0.16
Shale5	12.7	1.85	0.25	1.75	0.26
Shale6	13.7	1.9	0.25	1.9	0.28
Shale7	15.05	1.8	0.25	1.75	0.26
Shale8	16.35	1.8	0.25	1.7	0.26
Shale9	17.72	1.15	0.15	1	0.14
Shale10	8.67	1.25	0.15	1.15	0.16
Shale11	20.44	1.75	0.25	1.8	0.26
Shale12	21.34	1.85	0.25	1.7	0.26
Shale13	22.55	1.55	0.2	1.45	0.22
Shale14	23.9	1.3	0.2	1.3	0.2
Shale15	24.95	1.45	0.2	1.3	0.2
Shale16	25.78	2	0.3	1.95	0.28
Shale17	26.12	1.3	0.2	1.45	0.2
Shale18	28.1	1.55	0.2	1.3	0.18
Shale19	29	2.15	0.3	2.1	0.3
Shale20	30.18	1.55	0.2	1.35	0.18
Shale21	31.1	1.5	0.2	1.5	0.24
Shale22	32.15	1.8	0.25	1.55	0.24
Shale23	33.21	1.6	0.2	1.45	0.22
Shale24	34.12	1.05	0.15	0.95	0.16
Shale25	35.6	1.15	0.15	1.2	0.18
Shale26	36.4	1.05	0.15	1.15	0.16
Shale27	38.4	1.4	0.15	1.2	0.16
Shale28	39.35	1.4	0.2	1.3	0.18
Shale29	40.65	1.3	0.15	1.15	0.16
Shale30	41.75	1.25	0.15	1.15	0.16
Shale31	42.69	1.15	0.15	1.2	0.16
Shale32	43.7	1.05	0.1	0.95	0.14
Shale33	44.76	1.5	0.2	1.45	0.2
Shale34	45.85	1.6	0.2	1.5	0.22
Shale35	46.65	1.85	0.25	1.7	0.22

Shale36	47.75	1.55	0.25	1.6	0.24
Shale37	48.52	1.3	0.2	1.45	0.22
Shale38	49.73	1.5	0.2	1.45	0.2
Shale39	51.62	1.5	0.25	1.7	0.24
Shale40	52.45	1.75	0.25	1.7	0.22
Shale41	53.42	0.95	0.1	0.85	0.14
Shale42	54.55	1.95	0.3	2.2	0.3
Shale43	55.7	2.05	0.3	2.2	0.32
Shale44	56.3	2.4	0.3	2.2	0.3
Shale45	57.44	2.6	0.3	2.3	0.34
Shale46	58.55	3	0.45	3.05	0.44
Shale47	59.63	2.05	0.3	2.2	0.32
Shale48	60.2	1.45	0.2	1.45	0.22
Shale49	61.03	1.55	0.25	1.6	0.24
Shale50	62.33	1.2	0.2	1.35	0.2
Shale51	63.65	0.85	0.1	0.7	0.08
Shale52	64.72	1.75	0.3	1.75	0.26
Shale53	65.05	0.65	0.1	0.65	0.1
Shale54	65.99	0.85	0.1	0.75	0.1
Shale55	66.93	0.75	0.1	0.65	0.08
Shale56	68.68	0.7	0.1	0.6	0.08
Shale57	69.75	1.25	0.2	1.2	0.2
Shale58	70.6	0.8	0.1	0.7	0.1
Shale59	71.65	1.7	0.25	1.65	0.24
Shale60	73.01	1.2	0.15	1.1	0.16
Shale61	74.79	1.35	0.15	1.15	0.18
Shale62	76.21	1.8	0.25	1.7	0.24
Shale63	77.2	1.5	0.2	1.35	0.2
Shale64	78.11	1.75	0.2	1.65	0.24
Shale65	78.95	1.2	0.15	1.2	0.16
Shale66	81.12	1.75	0.2	1.5	0.22
Shale67	82.01	1.75	0.25	1.55	0.22
Shale68	82.61	1.85	0.25	1.7	0.26
Shale69	83.59	1.85	0.25	1.75	0.26
Shale70	84.16	1.8	0.25	1.75	0.24
Shale71	85.21	1.8	0.25	1.6	0.22
Shale72	86.31	2.05	0.3	1.95	0.28
Shale73	86.79	2.25	0.3	2.2	0.28
Shale74	89.22	1.8	0.25	1.6	0.22

Shale75	91.01	1.8	0.2	1.55	0.22
Shale76	91.6	2.25	0.3	2	0.28
Shale77	92.29	2.5	0.3	2.3	0.3
Shale78	93.46	2.2	0.3	2.15	0.34
Shale79	94.71	2	0.3	1.9	0.3
Shale80	95.16	2.2	0.3	1.95	0.3
Shale81	96.12	2.15	0.3	1.9	0.28
Shale82	97.09	2.3	0.3	2.1	0.3

Drill core MCDD0003 – Wuraliwuntya formation

IDENT	Depth	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cs	Cu	Fe	Ga
UNITS		ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm
SCHEME		MA102	LB101	MA102	LB101	MA102	MA102	LB101	MA102	MA102	LB101	MA102	MA101	LB101	MA102
LOD		**0.2**	**0.005**	**1**	**20**	**0.5**	**0.1**	**0.01**	**0.5**	**1**	**20**	**0.1**	**2**	**0.01**	**0.2**
Shale83	218.33	<0.2	6.83	10	9640	1	0.4	1.48	<0.5	50	60	0.6	20	6.08	12.4
Shale84	219.3	<0.2	6.58	14	5000	2	0.3	4.28	<0.5	34	40	0.6	44	5.49	13.6
Shale85	220.65	<0.2	6.51	17	1680	3.5	0.8	5.95	<0.5	30	40	5.4	44	5.73	18.8
Shale86	222.21	<0.2	4.76	17	6220	4	0.7	9.75	<0.5	34	40	8.3	68	5.27	13.4
Shale87	223.47	<0.2	6.48	33	880	5	0.8	6.45	<0.5	33	60	15.1	36	6.2	18.8
Shale88	223.75	<0.2	6.92	39	380	5.5	0.8	5.8	<0.5	31	60	15.8	40	7.21	19.2
Shale89	224.3	<0.2	7.19	38	260	6.5	0.9	5.3	<0.5	34	60	17.8	56	8.05	21.6
Shale90	225.1	<0.2	11.4	18	340	9.5	0.2	0.91	<0.5	24	100	25.3	12	3.15	33.6
Shale91	227.95	<0.2	11.9	11	400	8.5	0.7	0.14	<0.5	12	120	26.3	14	10.2	41.2
Shale92	235.1	<0.2	9.29	10	380	6.5	0.5	0.16	<0.5	24	80	19.5	4	8.59	26.8
Shale93	255.9	<0.2	7.48	9	280	6	0.9	0.12	<0.5	48	60	14.9	6	7.03	22.2
Shale94	257.69	<0.2	12	8	500	8.5	1.8	0.11	<0.5	15	160	28	6	9.56	40.2
Shale95	259.83	<0.2	10.7	20	440	6.5	0.7	0.18	<0.5	16	100	20.6	6	9.47	30.6
Shale96	260.9	<0.2	11.2	13	480	8	0.8	0.14	<0.5	13	120	20.7	8	10.6	35
Shale97	262.13	<0.2	12.1	6	480	10	0.2	0.15	<0.5	18	120	22.5	6	2.97	37.6
Shale98	263.05	<0.2	10.5	6	480	7.5	0.8	0.15	<0.5	29	120	17.9	6	8.55	33
Shale99	264.91	<0.2	8.97	5	420	5.5	0.4	0.16	<0.5	29	80	13.3	6	6.34	25.8
Shale100	265.9	<0.2	10.3	6	440	8	0.8	0.19	<0.5	18	100	16	6	6.93	30.8
Shale101	266.75	0.4	12.2	33	460	10.5	16.7	0.2	<0.5	34	100	15.5	18	2.8	38.6
Shale102	268.35	0.4	11.1	36	420	6.5	5.3	1.06	<0.5	34	80	13.9	58	3.07	34.4
Shale103	269.78	<0.2	6.81	20	520	4.5	1	6.33	<0.5	32	60	8.2	26	4.04	20.8
Shale104	271.21	<0.2	13.6	7	440	8.5	<0.1	0.11	<0.5	10	120	16.1	4	5.53	41.2

Shale105	272.37	<0.2	6.53	17	320	3.5	1	0.23	<0.5	62	60	6.4	46	2.51	18.2
Shale111	274.54	<0.2	9.74	4	420	5	<0.1	1.12	<0.5	13	80	13	52	4.08	29.6
Shale112	276	<0.2	9.9	4	420	5.5	<0.1	0.32	<0.5	22	80	13	8	4.27	30.4
Shale113	281.91	<0.2	10.8	4	480	6	<0.1	0.18	<0.5	11	100	13.8	6	4.11	33.8
Shale114	284.25	<0.2	11.4	12	500	6.5	0.7	0.18	<0.5	18	100	15.3	6	3.02	35.8
Shale115	290.71	0.4	10.5	48	420	6.5	2.3	0.18	<0.5	29	80	15.2	32	2.81	31.2
Shale116	294.5	<0.2	12.3	6	520	8	0.6	0.19	<0.5	13	120	20.2	6	3.97	37.6
Shale117	297.57	<0.2	5.24	24	260	3	2.9	1.5	<0.5	97	40	6.1	8	2.27	14.6
Shale118	298.33	0.4	8.78	37	380	5	7.4	0.39	<0.5	50	80	9.8	16	2.71	25.6
Shale119	299.1	<0.2	10.7	14	320	8.5	1.1	0.24	<0.5	20	60	12.8	26	2.81	33.8
Shale120	301.34	<0.2	11.4	6	480	8	0.3	0.21	<0.5	11	120	16	6	5.29	36.8
Shale121	303.11	<0.2	10.1	4	420	5.5	0.2	0.17	<0.5	16	80	12.7	<2	5.25	29.8
Shale122	304.9	<0.2	9.28	4	400	6.5	<0.1	0.14	<0.5	18	80	13.1	32	3.9	29.2
Shale123	306.53	<0.2	10	4	420	6.5	<0.1	0.19	<0.5	19	80	13.1	46	4.13	30.6
Shale124	309.25	<0.2	9.41	6	400	6	0.6	0.21	<0.5	15	80	16.6	10	7.48	27.2
Shale125	310.79	<0.2	9.74	12	380	8	0.5	0.18	<0.5	16	80	20.6	10	10.3	29.6
Shale126	311.17	<0.2	10.1	17	380	7	1	0.2	<0.5	20	80	22.5	16	8.91	30.8
Shale127	335.16	<0.2	11.4	10	420	7	0.5	0.23	<0.5	15	100	25.2	14	4.69	33.6
Shale128	335.96	<0.2	10.5	7	400	6	0.3	0.19	<0.5	16	80	20.5	8	2.94	26.6
Shale129	337.9	<0.2	9.4	5	400	5	0.3	0.18	<0.5	18	80	15.1	6	5.29	28.2
Shale130	339.08	<0.2	9.77	5	400	6	0.4	0.25	<0.5	19	80	15.4	6	4.76	29
Shale131	339.94	<0.2	9.27	7	400	4	0.4	0.21	<0.5	22	80	14.6	180	4.74	28.6
Shale132	341.56	<0.2	10.4	4	380	7	0.3	0.24	<0.5	15	80	19.9	48	5.26	33.2
Shale133	343.18	<0.2	10	6	420	6.5	0.2	0.19	<0.5	14	80	17.4	6	4.69	32.4
Shale134	344.25	<0.2	10.4	4	440	6	0.2	0.19	<0.5	13	100	19.2	<2	5.06	31
Shale135	345.4	<0.2	9.57	4	440	5	0.4	0.29	<0.5	19	80	15.1	6	2.59	29
Shale136	347.81	<0.2	8.61	9	400	5.5	1	0.31	<0.5	28	60	12.6	22	3.23	25.4
Shale137	348.62	<0.2	10.4	6	420	6	<0.1	0.18	<0.5	16	100	14.2	<2	2.41	33
Shale138	350.1	<0.2	9.35	6	400	5	0.6	0.14	<0.5	18	80	13.9	4	5.9	27.6
Shale139	350.91	<0.2	9.76	5	440	5.5	0.7	0.16	<0.5	16	80	13.6	110	4.82	28.8
Shale140	352.71	<0.2	10.8	4	440	8	0.3	0.15	<0.5	14	80	15.6	4	2.52	32.6
Shale141	353.46	<0.2	7.16	6	360	3.5	0.7	0.12	<0.5	43	60	10	16	7.16	20.2
Shale142	355.11	<0.2	10.2	12	660	6.5	0.8	0.14	<0.5	17	80	19.8	12	8.04	31.2
Shale143	357.29	<0.2	10.9	9	460	6.5	0.8	0.17	<0.5	14	80	19.1	24	9.35	29.4

IDENT	Depth	Hf	In	K	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb	Re
UNITS		ppm	ppm	%	ppm	%	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA102	MA102	LB101	MA101	LB101	LB101	MA102	LB101	MA102	MA101	LB101	MA102	LB102	LB102
LOD		**0.2**	**0.05**	**0.01**	**10**	**0.005**	**0.005**	**0.5**	**0.01**	**0.5**	**2**	**0.005**	**1**	**0.5**	**0.1**
Shale83	218.33	1.6	<0.05	7.88	<10	1.19	0.125	<0.5	0.16	8	8	0.055	5	169	<0.1
Shale84	219.3	1.6	0.1	7.02	<10	2.59	0.24	1	0.25	8	10	0.055	5	153	<0.1
Shale85	220.65	1.8	0.15	5.12	20	3.82	0.36	1	0.13	8.5	18	0.06	8	179	<0.1
Shale86	222.21	1.2	0.15	3.23	30	5.82	0.5	1	0.09	7	22	0.065	9	147	<0.1
Shale87	223.47	3.2	0.15	4.26	30	4.39	0.535	1.5	0.09	10.5	20	0.07	19	200	<0.1
Shale88	223.75	2.4	0.15	4.39	30	4.05	0.48	1.5	0.09	10	20	0.075	19	211	<0.1
Shale89	224.3	2.2	0.15	4.35	30	3.87	0.465	3.5	0.09	10	20	0.075	17	213	<0.1
Shale90	225.1	3.6	0.15	6.34	40	2.24	0.04	1	0.1	14.5	28	0.075	5	353	<0.1
Shale91	227.95	5.8	0.15	6.56	30	1.49	0.01	12.5	0.09	20.5	20	0.045	11	356	<0.1
Shale92	235.1	5.2	0.1	5.49	20	1.03	<0.005	6	0.09	15.5	20	0.055	14	312	<0.1
Shale93	255.9	5.2	0.15	4.47	20	1.19	<0.005	5	0.07	12	20	0.045	13	230	<0.1
Shale94	257.69	7.4	0.15	6.89	20	1.35	<0.005	5	0.1	28	22	0.035	19	382	<0.1
Shale95	259.83	4.8	0.1	6.32	20	1.23	<0.005	4.5	0.09	18	22	0.075	15	331	<0.1
Shale96	260.9	8.4	0.15	6.61	20	1.17	0.01	3.5	0.1	25	20	0.055	17	348	<0.1
Shale97	262.13	6.6	0.2	7.25	20	1.37	<0.005	1	0.11	22	26	0.055	7	373	<0.1
Shale98	263.05	5.6	0.15	6.1	20	1.14	<0.005	2	0.1	17.5	20	0.065	14	319	<0.1
Shale99	264.91	5.2	0.1	5.81	10	0.935	<0.005	1	0.09	14	20	0.065	11	284	<0.1
Shale100	265.9	5.6	0.1	6.27	20	1.13	<0.005	1	0.09	18	20	0.08	14	323	<0.1
Shale101	266.75	4.8	0.1	7.44	30	1.42	<0.005	40.5	0.1	19	34	0.08	46	363	<0.1
Shale102	268.35	4.4	0.1	6.55	20	1.71	0.025	4	0.09	19	30	0.08	16	324	<0.1
Shale103	269.78	5.6	0.15	4.32	10	3.97	0.125	1	0.08	11	24	0.055	10	196	<0.1
Shale104	271.21	5.8	0.15	7.33	20	1.41	<0.005	1	0.08	22.5	22	0.035	9	388	<0.1
Shale105	272.37	3.6	<0.05	4.19	20	1.09	<0.005	1	0.08	10	24	0.06	12	193	<0.1
Shale111	274.54	3.6	<0.05	6.26	20	1.5	0.03	<0.5	0.08	14.5	22	0.08	8	303	<0.1
Shale112	276	4.4	0.1	6.48	20	1.1	<0.005	<0.5	0.08	17	22	0.065	9	296	<0.1
Shale113	281.91	5	0.1	6.93	20	1.14	<0.005	<0.5	0.1	19	20	0.07	8	344	<0.1
Shale114	284.25	5.4	0.1	6.84	20	1.19	<0.005	1	0.09	22	22	0.075	12	339	<0.1
Shale115	290.71	4.4	<0.05	6.57	20	1.2	<0.005	2	0.08	16.5	26	0.075	28	319	<0.1
Shale116	294.5	5.4	0.1	7.4	10	1.28	<0.005	<0.5	0.1	23.5	20	0.08	11	402	<0.1
Shale117	297.57	4.2	0.1	3.58	10	1.39	0.025	1.5	0.07	10	14	0.055	17	165	<0.1
Shale118	298.33	3.6	0.1	5.96	10	1.09	<0.005	7.5	0.09	13	22	0.075	32	270	<0.1
Shale119	299.1	6	0.1	6.44	20	1.28	<0.005	<0.5	0.07	19	22	0.08	10	287	<0.1
Shale120	301.34	5	0.1	6.72	10	1.18	<0.005	1	0.09	20.5	20	0.09	11	357	<0.1
Shale121	303.11	3.6	0.1	6.44	10	1.11	<0.005	1	0.08	16	22	0.07	9	308	<0.1
Shale122	304.9	4.2	0.1	6.07	10	1.09	<0.005	1	0.09	16	28	0.06	8	307	<0.1

Shale123	306.53	4.2	0.1	6.52	10	1.19	<0.005	1.5	0.08	16	24	0.075	8	304	<0.1
Shale124	309.25	3.6	0.1	6.09	10	1.05	<0.005	4	0.08	13.5	24	0.09	12	315	<0.1
Shale125	310.79	3.6	0.1	6.06	10	1.04	<0.005	7.5	0.09	14.5	20	0.08	16	335	<0.1
Shale126	311.17	4.2	0.1	6.08	10	1.02	<0.005	6	0.08	15.5	20	0.085	23	345	<0.1
Shale127	335.16	5.2	0.1	6.94	20	1.3	<0.005	2	0.09	16.5	22	0.1	9	379	<0.1
Shale128	335.96	4.2	<0.05	6.55	<10	1.14	<0.005	3.5	0.09	14	16	0.08	7	363	<0.1
Shale129	337.9	3.6	<0.05	6.02	10	1.06	<0.005	1	0.08	14	24	0.07	11	292	<0.1
Shale130	339.08	3.6	0.1	6.07	10	1.18	<0.005	1	0.09	14.5	26	0.08	10	311	<0.1
Shale131	339.94	5.4	<0.05	5.87	10	1.1	<0.005	1	0.09	16.5	28	0.07	11	291	<0.1
Shale132	341.56	4.4	0.1	6.43	20	1.21	<0.005	1.5	0.09	18	22	0.11	12	334	<0.1
Shale133	343.18	4.2	0.1	6.45	10	1.12	<0.005	1	0.09	17	24	0.08	11	337	<0.1
Shale134	344.25	4.2	<0.05	6.42	20	1.13	<0.005	1	0.09	17	22	0.085	11	338	<0.1
Shale135	345.4	4.6	<0.05	6.18	10	1.14	<0.005	1	0.09	17	22	0.085	8	306	<0.1
Shale136	347.81	4.4	<0.05	5.5	10	1.08	<0.005	1	0.08	14	26	0.07	12	271	<0.1
Shale137	348.62	4.4	0.1	6.48	20	1.18	<0.005	<0.5	0.09	17	22	0.065	7	313	<0.1
Shale138	350.1	3.4	<0.05	6.05	10	1.08	<0.005	1.5	0.08	14	22	0.065	12	289	<0.1
Shale139	350.91	3.8	0.15	6.15	10	1.11	<0.005	2	0.09	15	28	0.065	10	291	<0.1
Shale140	352.71	3.8	0.15	6.74	10	1.19	<0.005	3.5	0.08	16	26	0.065	7	315	<0.1
Shale141	353.46	4.4	0.15	4.5	10	1.07	<0.005	5.5	0.08	12.5	22	0.055	14	206	<0.1
Shale142	355.11	3.6	0.15	6.08	10	1.1	0.005	8	0.08	15	28	0.06	13	307	<0.1
Shale143	357.29	3.8	0.15	6.4	10	1.12	<0.005	14.5	0.09	14.5	20	0.07	12	315	<0.1
IDENT	**Depth**	**S**	**Sb**	**Sc**	**Se**	**Si**	**Sn**	**Sr**	**Ta**	**Te**	**Th**	**Ti**	**Tl**	**U**	**V**
UNITS		ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
SCHEME		MA101	MA102	MA101	MA102	LB101	MA102	MA102	MA102	MA102	MA102	LB101	MA102	MA102	LB101
LOD		**50**	**0.1**	**1**	**5**	**0.005**	**0.1**	**0.5**	**0.1**	**0.2**	**0.1**	**0.005**	**0.1**	**0.1**	**20**
Shale83	218.33	1250	2	11	<5	27.4	2.9	144	0.7	<0.2	9.7	0.255	0.5	3.4	40
Shale84	219.3	<50	2.3	12	<5	23.6	3.3	82.5	0.7	<0.2	11	0.265	0.4	4.1	60
Shale85	220.65	<50	4.8	11	<5	21.4	3.3	55	0.7	<0.2	11.3	0.26	0.6	2.7	60
Shale86	222.21	1100	4.1	8	<5	14.4	2.3	151	0.6	<0.2	8.6	0.185	0.4	3.5	60
Shale87	223.47	<50	4	14	<5	18.2	3.3	64.5	1	0.2	12.2	0.275	0.6	4.1	80
Shale88	223.75	<50	4.8	14	<5	19	3.3	55	0.9	<0.2	12.6	0.275	0.7	4.2	80
Shale89	224.3	<50	5.1	15	<5	19	3.6	56.5	1	<0.2	13.5	0.285	0.7	4.4	100
Shale90	225.1	250	2.2	21	<5	24	5.7	80	1.4	<0.2	18.9	0.46	1	7.3	300
Shale91	227.95	<50	4.1	25	<5	21	7.6	119	1.8	<0.2	27.8	0.62	1	6.9	200
Shale92	235.1	<50	3.9	20	<5	25.5	5.1	55	1.4	<0.2	22.3	0.5	0.9	3.9	140
Shale93	255.9	<50	3.1	17	<5	29.5	4.2	60	1	<0.2	18	0.38	0.6	4.3	120
Shale94	257.69	<50	5	36	<5	21.1	9.2	49	2.6	<0.2	32.8	0.785	1.2	6.9	220
Shale95	259.83	<50	3.8	25	<5	23.4	5.4	91	1.6	<0.2	22.7	0.575	1	6.6	180
Shale96	260.9	<50	4.4	27	<5	21.3	8.2	135	2.2	<0.2	37.6	0.775	1	7	200

Shale97	262.13	<50	1.3	28	<5	25.5	7.1	107	1.8	<0.2	30.1	0.72	1.1	6.3	160
Shale98	263.05	<50	3.7	21	<5	24	7	101	1.4	<0.2	31.5	0.65	1	5.6	200
Shale99	264.91	<50	2.3	21	<5	27.9	4.8	80.5	1.2	<0.2	20.1	0.49	0.9	4.3	140
Shale100	265.9	<50	3.1	25	<5	25	6.4	105	1.7	<0.2	28.8	0.575	1	5.5	180
Shale101	266.75	3850	3	26	<5	26.5	6.6	117	1.7	<0.2	25.1	0.555	1.8	32.3	240
Shale102	268.35	2600	2.2	20	<5	25	6	97	1.7	<0.2	23.8	0.535	1.7	6.9	160
Shale103	269.78	600	1.3	18	<5	21.9	3.8	65.5	1	<0.2	16.2	0.335	0.8	4	100
Shale104	271.21	<50	2.2	20	<5	22.8	8	123	2.1	<0.2	30.6	0.655	1	6.8	200
Shale105	272.37	1000	1.2	15	<5	35.1	3.3	52	0.8	<0.2	14.6	0.315	0.7	3.4	80
Shale111	274.54	<50	1.7	23	<5	26.5	5.1	83	1.4	<0.2	20	0.46	0.9	5.7	140
Shale112	276	100	2	23	<5	29.4	5.8	96	1.5	<0.2	23.6	0.515	0.9	6.2	160
Shale113	281.91	100	2	20	<5	27.1	6.5	104	1.7	<0.2	26.8	0.59	1	6.9	160
Shale114	284.25	1450	2.1	26	<5	27.5	7.6	110	2	<0.2	30.3	0.64	1.4	6.5	160
Shale115	290.71	2150	2.2	24	<5	28	5.6	93.5	1.5	<0.2	22.1	0.485	2	4.9	140
Shale116	294.5	400	1.9	27	<5	25.1	7.5	141	2.1	<0.2	31.9	0.69	1.9	6.8	200
Shale117	297.57	2000	1.2	13	<5	33.5	3.1	44.5	0.9	<0.2	12.8	0.31	2.2	3.2	80
Shale118	298.33	4600	2.1	20	<5	30.7	4.9	70.5	1.2	<0.2	18.2	0.415	2.7	4.2	140
Shale119	299.1	700	1.8	24	<5	27.5	5.7	83.5	1.5	<0.2	24.1	0.555	0.9	8.5	140
Shale120	301.34	100	2.3	29	<5	25.4	7.8	119	1.9	<0.2	31.6	0.61	1	6.9	180
Shale121	303.11	<50	2.2	24	<5	27.6	5.2	85.5	1.5	<0.2	21.1	0.465	0.9	4.9	140
Shale122	304.9	<50	1.8	23	<5	29.9	5.3	79	1.4	<0.2	21	0.445	0.9	4.4	120
Shale123	306.53	100	1.7	24	<5	28.2	5.5	80.5	1.4	<0.2	22	0.49	0.9	4.9	140
Shale124	309.25	<50	3.5	23	<5	27.1	5	76.5	1.3	<0.2	19.4	0.425	1	4.5	160
Shale125	310.79	<50	5.4	24	<5	24.6	5.4	89.5	1.3	<0.2	21.2	0.445	1	4.3	160
Shale126	311.17	100	6.8	24	<5	25	5.7	94.5	1.4	<0.2	23.3	0.47	1	4.3	160
Shale127	335.16	100	3.4	30	<5	26.5	6.3	82.5	1.6	<0.2	24.8	0.51	1.3	4.3	140
Shale128	335.96	<50	2	22	<5	28.3	5	73.5	1.3	<0.2	19.9	0.49	1.1	3.9	120
Shale129	337.9	<50	2.6	22	<5	28.2	5	80.5	1.4	<0.2	20.1	0.445	0.9	4.4	140
Shale130	339.08	150	2.3	21	<5	27.9	5.2	120	1.4	<0.2	21.1	0.47	0.9	4.5	140
Shale131	339.94	250	2.4	23	<5	29.1	5.6	82	1.6	0.2	20.9	0.455	1	4.5	120
Shale132	341.56	<50	2.5	24	<5	26.2	6.2	106	1.6	<0.2	25	0.515	1.1	5.6	160
Shale133	343.18	<50	2.2	23	<5	27.8	5.8	98	1.6	0.2	22.8	0.505	1.1	4.9	180
Shale134	344.25	<50	2.2	23	<5	27.1	6.1	104	1.5	<0.2	24.3	0.53	1	5	160
Shale135	345.4	<50	1.5	18	<5	30	5.3	92	1.5	<0.2	21.3	0.525	1	4.5	120
Shale136	347.81	300	1.6	16	<5	29.8	4.8	72.5	1.3	<0.2	19	0.48	1.3	4	120
Shale137	348.62	<50	1.5	22	<5	28.5	5.9	93.5	1.5	<0.2	23.5	0.535	1	14.4	160
Shale138	350.1	<50	2.7	17	<5	28.3	5	102	1.4	<0.2	20.4	0.435	0.9	4.1	140
Shale139	350.91	150	2.2	19	<5	28.6	5.2	111	1.4	<0.2	21	0.46	1	4.3	140
Shale140	352.71	<50	1.8	22	<5	28.7	5.7	98	1.5	0.2	22.3	0.485	1.1	4.8	120

Shale141	353.46	100	3.7	16	<5	31.8	4.1	63.5	1.2	<0.2	17.7	0.425	0.7	4.9	120
Shale142	355.11	<50	4	21	<5	26.1	5.4	102	1.4	<0.2	21.3	0.455	1	4.1	140
Shale143	357.29	<50	4.2	19	<5	25.9	5.4	70	1.4	<0.2	20.6	0.49	1	4.3	140

IDENT	Depth	W	Y	Zn	Zr	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho
UNITS		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME		LB102	LB102	MA101	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102	MA102
LOD		**3**	**1**	**2**	**1**	**0.1**	**0.1**	**0.05**	**0.05**	**0.05**	**0.05**	**0.2**	**0.02**	**0.05**	**0.02**
Shale83	218.33	249	11	4	62	7.8	21.1	1.65	6	1.35	0.55	1.8	0.28	1.7	0.34
Shale84	219.3	135	15	6	70	25.2	68	7.3	27	4.3	0.95	3.6	0.46	2.5	0.5
Shale85	220.65	45	17	18	73	26.2	49.9	5.8	21.5	4.05	0.95	4	0.54	3.25	0.64
Shale86	222.21	36	17	18	56	26.1	47.9	6.15	22.9	4.55	1.05	4.4	0.56	3.3	0.62
Shale87	223.47	48	18	22	84	36.1	70.8	8.25	29.1	4.6	1	4.4	0.6	3.65	0.72
Shale88	223.75	30	18	22	86	36.4	70.9	8.3	29.2	4.75	1.05	4.4	0.62	3.7	0.72
Shale89	224.3	30	19	24	90	38.2	75	9.05	32.3	5.2	1.1	4.8	0.66	4.15	0.8
Shale90	225.1	15	22	36	137	62	124	14.1	50.3	6.3	1.1	4.4	0.58	4	0.82
Shale91	227.95	15	19	36	212	82.1	169	16.9	56.8	8.2	1.45	4.8	0.58	3.7	0.78
Shale92	235.1	114	33	30	217	35.6	68.4	7.7	28	5.45	1.2	5.8	0.78	5.15	0.98
Shale93	255.9	309	27	28	234	42.2	83.2	9.75	33.9	6.1	1.2	5	0.8	4.7	1.02
Shale94	257.69	30	31	38	302	35.8	66.3	7.35	24.9	5	1.1	5.4	0.84	5.7	1.12
Shale95	259.83	45	32	34	203	64.4	122	13.9	48.4	7.55	1.45	5.6	0.92	5.2	1.02
Shale96	260.9	24	32	32	368	89.5	194	20.5	72.6	11	1.9	7.2	0.94	5.95	1.16
Shale97	262.13	39	42	34	283	64.5	127	14.7	52.5	8.85	1.7	8.2	1.12	8.1	1.48
Shale98	263.05	165	26	30	242	71.4	140	16	56.3	8.75	1.5	6	0.76	4.8	0.96
Shale99	264.91	177	29	26	225	50.2	101	11.9	43.3	7.25	1.4	5.8	0.8	5	0.98
Shale100	265.9	69	31	26	241	66.2	131	15.6	55.8	9.5	1.75	7	0.92	6.1	1.1
Shale101	266.75	27	34	28	187	71.3	144	16.8	61.5	10.3	1.85	8	1.08	6.75	1.28
Shale102	268.35	30	29	30	201	63.2	126	14.9	52.9	9.2	1.7	7.6	0.94	6	1.12
Shale103	269.78	135	25	20	264	41.4	82.8	10	37.5	7.25	1.55	8	0.84	5.15	0.92
Shale104	271.21	21	31	30	239	80.9	167	19	68.8	11	1.8	7	0.88	6.25	1.16
Shale105	272.37	423	24	24	160	41.2	83.2	10.1	36.2	7	1.25	6.2	0.86	5.6	0.98
Shale111	274.54	48	29	30	149	55.2	110	13.3	48.6	8.5	1.55	7.2	0.9	5.65	1.04
Shale112	276	102	27	28	189	67.9	134	15.6	54.9	8.85	1.55	7	0.86	5.35	1.02
Shale113	281.91	36	35	32	210	68.8	136	15.8	57	9.6	1.75	7.6	0.98	6.55	1.24
Shale114	284.25	30	38	28	234	82.1	180	19.2	68.4	11.2	1.95	9	1.14	7.25	1.36
Shale115	290.71	54	30	30	185	62.6	126	14.9	54.3	9.2	1.6	7.2	0.92	5.95	1.12
Shale116	294.5	24	39	34	201	95.9	216	23.1	85.1	13.2	2.25	9.2	1.18	8.15	1.36
Shale117	297.57	666	23	18	167	30.8	62	7.5	27.3	5.3	1	5	0.68	4.25	0.88
Shale118	298.33	201	28	20	164	51.7	103	12.2	44.2	7.7	1.4	6.2	0.8	5.1	0.94
Shale119	299.1	51	36	30	268	47.6	98	12	45	9.4	1.85	9	1.2	7.75	1.46
Shale120	301.34	27	39	30	212	88.6	194	21.2	78.3	13.2	2.45	11	1.28	7.7	1.4
Shale121	303.11	51	31	26	163	56.6	113	13.5	50	9.1	1.7	7.8	0.96	6	1.12

Shale122	304.9	78	34	30	183	53	106	12.6	46.5	8.5	1.6	7.4	0.94	5.95	1.12
Shale123	306.53	75	31	28	172	54.7	108	13.1	47.3	8.9	1.75	8	1.06	6.2	1.14
Shale124	309.25	45	31	34	148	49.4	98.9	11.7	43	7.95	1.5	7.2	0.94	5.45	1
Shale125	310.79	30	32	34	157	55.1	110	12.9	46.2	7.95	1.5	6.8	0.86	5.55	1.04
Shale126	311.17	57	34	36	179	61.8	121	14.2	50.9	8.9	1.8	7.8	1	6.15	1.16
Shale127	335.16	33	36	22	181	54.7	108	13	47.1	9.3	1.7	8	1.06	6.65	1.32
Shale128	335.96	48	34	16	144	47.1	93.7	11.4	40.8	7.65	1.35	6.6	0.92	5.45	1.1
Shale129	337.9	60	30	34	153	50.3	99.9	11.7	43	7.7	1.45	7.2	0.92	5.85	1.06
Shale130	339.08	84	33	36	161	76.5	152	19.2	71	12	2	8.4	0.98	6.25	1.12
Shale131	339.94	84	29	38	180	51.3	101	12.2	44.4	8.05	1.5	7.2	0.94	5.9	1.12
Shale132	341.56	39	31	54	179	71.1	141	16.9	62	10.7	1.95	8.6	1.02	6.5	1.2
Shale133	343.18	33	31	34	175	60.4	119	14.2	51.5	8.9	1.6	7.2	0.92	5.7	1.06
Shale134	344.25	36	30	34	176	67.5	133	15.8	56.3	9.3	1.7	7.4	0.92	5.5	1.06
Shale135	345.4	81	31	30	201	56.1	111	13.5	49	8.6	1.55	7.2	0.9	5.85	1.08
Shale136	347.81	126	28	26	189	43.9	87.7	10.3	37.5	6.8	1.25	6.4	0.8	5.3	1
Shale137	348.62	63	33	24	189	60	118	13.9	50.7	8.65	1.65	7.6	1.02	6.65	1.28
Shale138	350.1	57	28	26	145	64.4	127	15.6	57.8	9.6	1.7	7	0.9	5.5	1.02
Shale139	350.91	54	31	26	159	71.2	141	17.2	62.5	10.3	1.8	7.4	0.94	5.65	1.12
Shale140	352.71	30	33	28	159	67.4	141	17.4	65.8	11.7	2.05	9	1.2	6.75	1.36
Shale141	353.46	261	28	26	202	43	81.8	9.65	34.4	6.25	1.35	6	0.92	5.05	1
Shale142	355.11	36	28	32	154	56.6	112	13.4	48.8	8.6	1.65	6.8	0.92	5.55	1.12
Shale143	357.29	42	30	28	167	46.1	91	10.7	38.1	7.15	1.4	5.8	0.84	5.15	1.04

IDENT	**Depth**	**Er**	**Tm**	**Yb**	**Lu**
UNITS		ppm	ppm	ppm	ppm
SCHEME		MA102	MA102	MA102	MA102
LOD		**0.05**	**0.05**	**0.05**	**0.02**
Shale83	218.33	1.05	0.15	1.1	0.18
Shale84	219.3	1.5	0.2	1.4	0.22
Shale85	220.65	1.8	0.25	1.75	0.26
Shale86	222.21	1.75	0.25	1.65	0.24
Shale87	223.47	1.95	0.3	1.95	0.28
Shale88	223.75	2.05	0.3	1.9	0.3
Shale89	224.3	2.35	0.3	2.05	0.32
Shale90	225.1	2.55	0.35	2.6	0.42
Shale91	227.95	2.45	0.35	2.75	0.42
Shale92	235.1	3.05	0.4	3	0.44
Shale93	255.9	2.85	0.5	2.95	0.5
Shale94	257.69	3.45	0.5	3.75	0.58

Shale95	259.83	3.2	0.45	3.3	0.48
Shale96	260.9	3.75	0.5	3.95	0.62
Shale97	262.13	4.45	0.6	4.2	0.66
Shale98	263.05	2.95	0.45	3.05	0.46
Shale99	264.91	2.8	0.4	2.75	0.42
Shale100	265.9	3.35	0.45	3.35	0.5
Shale101	266.75	3.95	0.5	3.65	0.56
Shale102	268.35	3.4	0.45	3.25	0.46
Shale103	269.78	2.7	0.35	2.6	0.38
Shale104	271.21	3.4	0.5	3.6	0.52
Shale105	272.37	2.85	0.4	2.5	0.4
Shale111	274.54	3.1	0.45	2.9	0.42
Shale112	276	3.1	0.45	3	0.44
Shale113	281.91	3.7	0.5	3.45	0.52
Shale114	284.25	4.05	0.55	3.95	0.56
Shale115	290.71	3.35	0.45	3.2	0.44
Shale116	294.5	4.2	0.55	4.1	0.6
Shale117	297.57	2.3	0.3	2.2	0.32
Shale118	298.33	2.75	0.35	2.7	0.38
Shale119	299.1	4.35	0.6	4.5	0.66
Shale120	301.34	4.2	0.55	3.95	0.56
Shale121	303.11	3.25	0.45	3.15	0.5
Shale122	304.9	3.35	0.45	3.1	0.44
Shale123	306.53	3.3	0.45	3.15	0.44
Shale124	309.25	2.9	0.35	2.75	0.42
Shale125	310.79	3.2	0.4	2.95	0.42
Shale126	311.17	3.4	0.45	3.35	0.46
Shale127	335.16	4	0.55	3.75	0.54
Shale128	335.96	3.2	0.45	3.05	0.44
Shale129	337.9	3.25	0.4	3	0.42
Shale130	339.08	3.35	0.45	3.05	0.44
Shale131	339.94	3.25	0.45	3.1	0.44
Shale132	341.56	3.6	0.5	3.5	0.52
Shale133	343.18	3.35	0.45	3.05	0.44
Shale134	344.25	3.15	0.5	3	0.44
Shale135	345.4	3.35	0.65	3.15	0.48
Shale136	347.81	3	0.6	2.9	0.42
Shale137	348.62	3.85	0.5	3.6	0.5

Shale138	350.1	3.15	0.4	2.8	0.4
Shale139	350.91	3.25	0.45	2.9	0.48
Shale140	352.71	3.85	0.55	3.65	0.6
Shale141	353.46	2.9	0.45	2.8	0.48
Shale142	355.11	3.15	0.5	3	0.48
Shale143	357.29	3.15	0.5	3.05	0.52

Drill Core MCDD0003 – TOC report

Client ID	Depth	TOC	S1	S2	S3	Tmax (°C)	Calc. % Ro	HI	OI	S2/S3	S1/TOC *100	PI
1	8.67	0.27			0.54	565	3.01		200			
2	9.35	0.82	0.00	0.02	0.58	558	2.88	2	71	0.0		
3	10.68	0.32	0.00		0.65	524	2.27		203			
4	11.55	0.26	0.00		0.63	596	3.57		242			
5	12.7	0.33	0.01	0.02	0.49	560	2.93	6	148	0.0	3	0.33
6	13.7	0.49	0.01	0.03	0.56	570	3.10	6	114	0.1	2	0.25
7	15.05	0.40	0.01	0.03	0.48	309		8	120	0.1	3	0.25
8	16.35	0.32	0.00		0.42	557	2.87		131			
13	22.55	0.39	0.01	0.04	0.60	609	3.80	10	154	0.1	3	0.20
23	33.21	0.23	0.01	0.01	0.12	607	3.77	4	52	0.1	4	0.50
28	39.35	0.30	0.00	0.01	0.07	609	3.81	3	23	0.1		
30	41.75	2.71	0.69	4.43	0.34	422	0.44	163	13	13.0	25	0.13
31	42.69	2.61	0.48	3.11	0.05	427	0.52	119	2	62.2	18	0.13
32	43.7	3.23	0.69	3.88	0.21	423	0.46	120	7	18.5	21	0.15
33	44.76	2.53	0.75	2.19	0.07	428	0.55	87	3	31.3	30	0.26
34	45.85	1.06	0.16	0.37	0.70	434	0.64	35	66	0.5	15	0.30
35	46.65	1.00	0.13	0.55	0.19	441	0.78	55	19	2.9	13	0.19
36	47.75	1.79	0.39	1.09	0.04	444	0.83	61	2	27.3	22	0.26
37	48.52	2.26	2.00	2.01	0.27	426	0.52	89	12	7.4	88	0.50
38	49.73	0.64	0.08	0.21	0.24	427	0.53	33	38	0.9	13	0.28
39	51.62	0.30	0.01	0.02		583	3.33	7			3	0.33
40	52.45	2.09	0.22	0.83	0.18	438	0.73	40	9	4.6	11	0.21
41	53.42	3.18	0.22	1.75	0.29	440	0.76	55	9	6.0	7	0.11
42	54.55	4.00	0.47	3.12	0.09	440	0.77	78	2	34.7	12	0.13
43	55.7	3.53	0.20	2.29	0.11	446	0.87	65	3	20.8	6	0.08
44	56.3	4.71	0.36	3.63	0.19	439	0.75	77	4	19.1	8	0.09
45	57.44	8.31	0.58	8.52	0.08	448	0.90	103	1	106.5	7	0.06

46	58.55	4.47	0.30	2.95	0.20	444	0.82	66	4	14.8	7	0.09
47	59.63	4.01	0.23	2.50	0.14	447	0.88	62	3	17.9	6	0.08
48	60.2	7.81	0.53	7.88	0.14	447	0.89	101	2	56.3	7	0.06
49	61.03	4.58	0.43	2.99	0.15	440	0.75	65	3	19.9	9	0.13
50	62.33	3.07	0.20	3.46	0.14	426	0.50	113	5	24.7	7	0.05
51	63.65	0.39	0.01	0.01	1.24	553	2.80	3	318	0.0	3	0.50
52	64.72	0.45	0.02	0.11	0.25	404	0.12	24	56	0.4	4	0.15
53	65.05	0.39	0.00	0.01	0.68	535	2.48	3	174	0.0		
54	65.99	0.75	0.10	0.32	0.67	440	0.75	43	89	0.5	13	0.24
55	66.93	0.68	0.05	0.30	0.62	436	0.69	44	91	0.5	7	0.14
56	68.68	0.69	0.07	0.36	0.52	439	0.75	52	75	0.7	10	0.16
57	69.75	0.47	0.03	0.07	0.17	430	0.58	15	36	0.4	6	0.30
58	70.6	0.35	0.01	0.04	0.13	449	0.93	11	37	0.3	3	0.20
59	71.65	0.42	0.00	0.01	0.11	394		2	26	0.1		
60	73.01	0.35	0.01	0.03	0.34	444	0.83	9	97	0.1	3	0.25
61	74.79	0.28	0.01	0.02	0.72	501	1.86	7	257	0.0	4	0.33
62	76.21	0.27	0.01	0.03	0.17	338		11	63	0.2	4	0.25
63	77.2	0.28	0.01	0.03	0.23			11	82	0.1	4	0.25
64	78.11	0.36	0.01	0.02	0.12	404	0.12	6	33	0.2	3	0.33
65	78.95	0.31	0.01	0.03	0.23	454	1.02	10	74	0.1	3	0.25
66	81.12	0.26	0.01	0.02	0.10	451	0.96	8	38	0.2	4	0.33
67	82.01	0.29	0.02	0.04	0.11	320		14	38	0.4	7	0.33
68	82.61	0.35	0.00	0.02	0.86	427	0.53	6	246	0.0		
69	83.59	0.35	0.04	0.04	0.07	307		11	20	0.6	11	0.50
70	84.16	0.35	0.01	0.01	0.68	598	3.60	3	194	0.0	3	0.50
71	85.21	0.27	0.04	0.02	0.24	302		7	89	0.1	15	0.67
72	86.31	0.20	0.00		0.10	565	3.01		50			
73	86.79	0.81	0.01	0.03	0.19	558	2.89	4	23	0.2	1	0.25
74	89.22	0.12	0.00	0.01	0.08	566	3.03	8	67	0.1		
75	91.01	0.13	0.00	0.01	0.05	565	3.00	8	38	0.2		
76	91.6	0.13	0.00		0.08	560	2.91		62			
77	92.29	0.15	0.00	0.01	0.09	306		7	60	0.1		
78	93.46	0.12	0.00		0.02	603	3.70		17			
79	94.71	0.11	0.00	0.01	0.05	564	2.99	9	45	0.2		
80	95.16	0.10	0.00		0.03	570	3.10		30			
81	96.12	0.10	0.01	0.02	0.03	603	3.69	20	30	0.7	10	0.33
82	97.09	0.10	0.01	0.01	0.04	500	1.83	10	40	0.3	10	0.50
83	218.33	0.10	0.04	0.01	0.23	542	2.60	10	230	0.0	40	0.80

84	219.3	0.47	0.04	0.03	0.43	319		6	91	0.1	9	0.57
85	220.65	0.07	0.03	0.02	0.15			29	214	0.1	43	0.60
86	222.21	0.25	0.01	0.03	0.33	338		12	132	0.1	4	0.25
87	223.47	0.20	0.01	0.02	0.22	335		10	110	0.1	5	0.33
88	223.75	0.21	0.02	0.04	0.17	308		19	81	0.2	10	0.33
89	224.3	0.19	0.01	0.02	0.16	319		11	84	0.1	5	0.33
90	225.1	0.17	0.02	0.01	0.09	344		6	53	0.1	12	0.67
91	227.95	0.09	0.02	0.02	0.06	308		22	67	0.3	22	0.50
93	255.9	0.06	0.01	0.03	0.02	329		50	33	1.5	17	0.25
94	257.69	0.34	0.00									
95	259.83	0.01	0.00	0.01	0.03	346		100	300	0.3		
96	260.9	0.05	0.01	0.02	0.09	307		40	180	0.2	20	0.33
97	262.13		0.00	0.01	0.07	322				0.1		
98	263.05	0.08	0.10	0.25	0.07	320		313	88	3.6	125	0.29
99	264.91	0.04	0.02	0.08	0.06	337		200	150	1.3	50	0.20
100	265.9	0.06	0.01	0.03	0.07	352		50	117	0.4	17	0.25
101	266.75	0.05	0.00	0.01	0.05	327		20	100	0.2		
102	268.35	0.06	0.00	0.02	0.08	361		33	133	0.3		
103	269.78	0.03	0.00		0.17	331			567			
104	271.21	0.05	0.00		0.19	341			380			
105	272.37	0.06	0.00	0.02	0.13	490	1.66	33	217	0.2		
111	274.54	0.08	0.00	0.01	0.18	307		13	225	0.1		
112	276	0.05	0.05	0.06	0.07	333		120	140	0.9	100	0.45
113	281.91	0.07	0.22	0.03	0.10	387		43	143	0.3	314	0.88
114	284.25	0.06	0.01	0.04	0.03	370		67	50	1.3	17	0.20
115	290.71	0.07	0.01	0.02	0.16	388		29	229	0.1	14	0.33
116	294.5	0.06	0.01	0.01	0.07	339		17	117	0.1	17	0.50
117	297.57	0.09	0.28	0.10	0.23			111	256	0.4	311	0.74
118	298.33	0.05	0.03	0.02	0.06			40	120	0.3	60	0.60
119	299.1	0.06	0.02	0.02	0.07	347		33	117	0.3	33	0.50
120	301.34	0.08	0.00	0.01	0.06	378		13	75	0.2		
121	303.11	0.07	0.00	0.01	0.04	325		14	57	0.3		
122	304.9	0.02	0.00	0.01	0.04	373		50	200	0.3		
125	310.79	0.07	0.01	0.01	0.08	321		14	114	0.1	14	0.50
126	311.17	0.05	0.01	0.05	0.05	339		100	100	1.0	20	0.17
128	335.96	0.06	0.01	0.02	0.07	334		33	117	0.3	17	0.33
129	337.9	0.07	0.01	0.02	0.12	321		29	171	0.2	14	0.33
130	339.08	0.06	0.03	0.07	0.19	337		117	317	0.4	50	0.30

131	339.94	0.04	0.01	0.02	0.05	327		50	125	0.4	25	0.33
132	341.56	0.08	0.04	0.12	0.11	317		150	138	1.1	50	0.25
138	350.1	0.20	0.03	0.07	0.07	328		35	35	1.0	15	0.30
139	350.91	0.17	0.02	0.08	0.11	335		47	65	0.7	12	0.20
140	352.71	0.23	0.02	0.05	0.14	324		22	61	0.4	9	0.29
141	353.46	0.19	0.20	0.11	0.06			58	32	1.8	105	0.65
142	355.11	0.14	0.03	0.06	0.09	322		43	64	0.7	21	0.33
143	357.29	0.15	0.02	0.03	0.19	335		20	127	0.2	13	0.40

Drill core MCDD0005 – TOC report

Client ID	Depth	TOC	S1	S2	S3	Tmax (°C)	Calc. % Ro	HI	OI	S2/S3	S1/TOC *100	PI
1	165.2	0.45	0.03	0.04	0.32	359		9	71	0.1	7	0.43
2	166.3	0.23	0.01	0.03	0.11	N/A		13	48	0.3	4	0.25
3	167.3	0.25	0.01	0.02	0.17	346		8	68	0.1	4	0.33
4	167.9	0.40	0.04	0.07	0.32	309		18	80	0.2	10	0.36
5	169.9	0.74	0.02	0.09	0.22	334		12	30	0.4	3	0.18
6	170.7	0.21	0.01	0.03	0.10	553	2.79	14	48	0.3	5	0.25
7	171.8	0.12	0.00	0.02	0.08	338		17	67	0.3		
8	172.8	0.06	0.00		0.02	336			33			
9	173.9	0.05	0.00			390						
19	185.9	0.38	0.01	0.04	0.25	314		11	66	0.2	3	0.20
29	198.4	0.19	0.00		0.16	609	3.81		84			
39	210.5	0.20	0.00	0.02	0.17	606	3.75	10	85	0.1		
49	222.9	0.42	0.00	0.01	0.41	432	0.61	2	98	0.0		
59	236.1	0.22	0.00		0.41	342			186			
69	248.6	0.20	0.01	0.01	0.19	369		5	95	0.1	5	0.50
79	262.6	0.17	0.00		0.14	550	2.73		82			
89	279.1	0.22	0.01	0.05	0.23	333		23	105	0.2	5	0.17
99	293.9	0.20	0.01	0.02	0.24	319		10	120	0.1	5	0.33
109	308.9	0.15	0.00		0.15	576	3.20		100			
119	325	0.17	0.01	0.02	0.10	368		12	59	0.2	6	0.33
129	341.7	0.58	0.01	0.02	0.32	336		3	55	0.1	2	0.33
139	496.66	0.21	0.00	0.03	0.30	364		14	143	0.1		
149	508.6	0.29	0.03	0.12	0.36	323		41	124	0.3	10	0.20
159	519.36	0.29	0.01	0.03	0.47	308		10	162	0.1	3	0.25

169	531.17	0.43	0.00	0.06	0.22	358		14	51	0.3		
175	539.1	0.61	0.09	0.22	0.31	440	0.76	36	51	0.7	15	0.29
176	540.7	0.71	0.13	0.39	0.28	451	0.95	55	39	1.4	18	0.25
177	541.45	0.94	0.13	0.49	0.28	438	0.73	52	30	1.8	14	0.21
178	544.5	3.74	1.37	5.53	0.29	433	0.63	148	8	19.1	37	0.20
179	544.8	3.52	1.50	5.38	0.08	430	0.59	153	2	67.3	43	0.22
180	546.8	2.79	1.04	3.42	0.35	436	0.68	123	13	9.8	37	0.23
181	547.9	1.80	0.95	4.57	0.20	422	0.44	254	11	22.9	53	0.17
182	548.9	1.54	0.33	0.97	0.08	440	0.76	63	5	12.1	21	0.25
183	549.67	2.63	1.03	3.50	0.04	424	0.47	133	2	87.5	39	0.23
184	550.5	2.36	0.80	1.83	0.04	438	0.73	78	2	45.8	34	0.30
185	550.9	2.47	1.02	4.12	0.04	418	0.37	167	2	103.0	41	0.20
186	551.1	2.52	1.20	5.02	0.09	418	0.36	199	4	55.8	48	0.19
187	551.72	2.32	0.88	3.82	0.07	416	0.33	165	3	54.6	38	0.19
188	553.38	2.23	0.79	2.90	0.08	423	0.46	130	4	36.3	35	0.21
189	554.25	2.30	0.72	2.02	0.09	437	0.70	88	4	22.4	31	0.26
190	554.63	1.48	0.38	0.89	0.01	438	0.73	60	1	89.0	26	0.30
191	555.39	1.81	0.72	2.97	0.09	416	0.32	164	5	33.0	40	0.20

Drill core MCDD0005 – Rare earth element concentrations (PAAS normalised)

ID	LaN	CeN	PrN	NdN	SmN	EuN	GdN	TbN	DyN	HoN	ErN	TmN	YbN	LuN	YN
1	0.44	0.47	0.52	0.58	0.68	0.68	0.77	0.65	0.7	0.6	0.62	0.5	0.59	0.52	0.54
2	0.35	0.36	0.4	0.44	0.54	0.55	0.6	0.49	0.48	0.42	0.4	0.3	0.36	0.28	0.39
3	0.42	0.42	0.46	0.48	0.5	0.55	0.6	0.49	0.52	0.46	0.43	0.4	0.43	0.32	0.39
4	0.42	0.42	0.46	0.48	0.54	0.55	0.64	0.49	0.53	0.42	0.43	0.3	0.43	0.32	0.39
5	0.57	0.56	0.6	0.62	0.69	0.64	0.81	0.68	0.7	0.6	0.64	0.5	0.62	0.52	0.5
6	0.63	0.6	0.62	0.64	0.65	0.73	0.85	0.68	0.73	0.66	0.66	0.5	0.68	0.56	0.54
7	0.68	0.62	0.63	0.65	0.68	0.68	0.85	0.68	0.72	0.6	0.62	0.5	0.62	0.52	0.54
8	0.58	0.59	0.63	0.67	0.74	0.77	0.85	0.7	0.75	0.62	0.62	0.5	0.61	0.52	0.54
9	0.48	0.47	0.49	0.52	0.54	0.5	0.64	0.49	0.49	0.4	0.4	0.3	0.36	0.28	0.39
10	0.42	0.41	0.44	0.46	0.5	0.55	0.55	0.49	0.52	0.42	0.43	0.3	0.41	0.32	0.39
11	0.67	0.62	0.63	0.64	0.7	0.68	0.81	0.62	0.69	0.58	0.6	0.5	0.64	0.52	0.5
12	0.66	0.64	0.68	0.67	0.72	0.73	0.85	0.68	0.75	0.62	0.64	0.5	0.61	0.52	0.54
13	0.6	0.56	0.59	0.61	0.68	0.68	0.77	0.57	0.66	0.52	0.53	0.4	0.52	0.44	0.46
14	0.95	0.67	0.59	0.53	0.52	0.55	0.55	0.49	0.53	0.44	0.45	0.4	0.46	0.4	0.39
15	0.75	0.69	0.73	0.73	0.72	0.73	0.81	0.6	0.64	0.52	0.5	0.4	0.46	0.4	0.43

16	0.86	0.76	0.79	0.82	0.9	0.86	0.94	0.75	0.84	0.7	0.69	0.6	0.7	0.56	0.54
17	0.81	0.61	0.57	0.53	0.54	0.5	0.6	0.49	0.53	0.44	0.45	0.4	0.52	0.4	0.36
18	0.65	0.6	0.69	0.74	0.8	0.82	0.89	0.7	0.73	0.56	0.53	0.4	0.46	0.36	0.54
19	0.88	0.78	0.85	0.89	0.96	0.95	1.02	0.83	0.88	0.74	0.74	0.6	0.75	0.6	0.61
20	0.67	0.66	0.78	0.84	0.96	0.82	0.94	0.73	0.73	0.56	0.53	0.4	0.48	0.36	0.5
21	1	0.73	0.69	0.64	0.68	0.68	0.77	0.62	0.65	0.52	0.52	0.4	0.54	0.48	0.43
22	0.88	0.82	0.93	0.98	1.09	1	1.11	0.83	0.82	0.66	0.62	0.5	0.55	0.48	0.54
23	0.78	0.61	0.62	0.69	0.68	0.64	0.72	0.6	0.6	0.52	0.55	0.4	0.52	0.44	0.43
24	0.55	0.52	0.54	0.51	0.45	0.45	0.47	0.39	0.42	0.38	0.36	0.3	0.34	0.32	0.29
25	0.73	0.57	0.53	0.51	0.46	0.45	0.47	0.42	0.45	0.4	0.4	0.3	0.43	0.36	0.36
26	0.41	0.38	0.39	0.4	0.42	0.45	0.43	0.36	0.41	0.36	0.36	0.3	0.41	0.32	0.29
27	0.59	0.64	0.76	0.86	0.94	0.82	0.98	0.68	0.66	0.52	0.48	0.3	0.43	0.32	0.5
28	0.6	0.52	0.53	0.52	0.5	0.45	0.51	0.44	0.5	0.44	0.48	0.4	0.46	0.36	0.36
29	0.54	0.49	0.55	0.62	0.75	0.64	0.94	0.7	0.75	0.5	0.45	0.3	0.41	0.32	0.46
30	0.4	0.39	0.46	0.49	0.63	0.55	0.77	0.57	0.59	0.46	0.43	0.3	0.41	0.32	0.39
31	0.65	0.48	0.46	0.43	0.46	0.45	0.47	0.39	0.42	0.34	0.4	0.3	0.43	0.32	0.32
32	0.38	0.34	0.35	0.35	0.38	0.36	0.38	0.36	0.4	0.34	0.36	0.2	0.34	0.28	0.32
33	1.07	0.81	0.8	0.81	0.89	0.86	0.94	0.68	0.66	0.52	0.52	0.4	0.52	0.4	0.46
34	1.03	0.76	0.73	0.69	0.72	0.68	0.85	0.68	0.69	0.54	0.55	0.4	0.54	0.44	0.46
35	1.16	0.83	0.75	0.69	0.68	0.68	0.77	0.62	0.72	0.6	0.64	0.5	0.61	0.44	0.54
36	0.94	0.78	0.77	0.72	0.62	0.59	0.6	0.49	0.56	0.48	0.53	0.5	0.57	0.48	0.39
37	0.85	0.72	0.73	0.66	0.59	0.55	0.55	0.44	0.49	0.42	0.45	0.4	0.52	0.44	0.36
38	0.97	0.75	0.72	0.67	0.62	0.64	0.68	0.57	0.61	0.52	0.52	0.4	0.52	0.4	0.39
39	0.84	0.57	0.52	0.49	0.58	0.64	0.64	0.55	0.56	0.5	0.52	0.5	0.61	0.48	0.46
40	0.92	0.75	0.79	0.81	0.88	0.86	0.94	0.73	0.76	0.6	0.6	0.5	0.61	0.44	0.57
41	0.3	0.27	0.3	0.32	0.38	0.41	0.43	0.36	0.35	0.3	0.33	0.2	0.3	0.28	0.29
42	0.67	0.65	0.71	0.72	0.8	0.77	0.94	0.73	0.81	0.64	0.67	0.6	0.79	0.6	0.54
43	0.84	0.7	0.74	0.73	0.79	0.68	0.89	0.68	0.74	0.64	0.71	0.6	0.79	0.64	0.61
44	0.87	0.73	0.79	0.84	0.98	0.91	1.15	0.86	0.99	0.82	0.83	0.6	0.79	0.6	0.79
45	0.93	0.96	1.1	1.17	1.33	1.41	1.53	1.14	1.2	0.94	0.9	0.6	0.82	0.68	0.96
46	1.31	0.91	0.88	0.85	0.98	1	1.15	0.96	1.1	0.94	1.03	0.9	1.09	0.88	0.89
47	1.12	0.7	0.64	0.62	0.68	0.68	0.85	0.68	0.76	0.66	0.71	0.6	0.79	0.64	0.61
48	0.4	0.41	0.47	0.49	0.54	0.5	0.64	0.52	0.53	0.48	0.5	0.4	0.52	0.44	0.46
49	0.4	0.4	0.44	0.43	0.47	0.45	0.51	0.52	0.52	0.5	0.53	0.5	0.57	0.48	0.5
50	0.65	0.56	0.54	0.5	0.49	0.45	0.47	0.39	0.43	0.42	0.41	0.4	0.48	0.4	0.32
51	0.24	0.26	0.3	0.33	0.38	0.36	0.43	0.36	0.35	0.28	0.29	0.2	0.25	0.16	0.29
52	0.45	0.33	0.35	0.38	0.49	0.5	0.64	0.57	0.6	0.58	0.6	0.6	0.62	0.52	0.54
53	0.21	0.23	0.28	0.29	0.32	0.32	0.38	0.29	0.3	0.26	0.22	0.2	0.23	0.2	0.25

54	0.26	0.33	0.38	0.43	0.45	0.41	0.47	0.39	0.36	0.3	0.29	0.2	0.27	0.2	0.29
55	0.29	0.3	0.33	0.33	0.36	0.36	0.43	0.29	0.32	0.26	0.26	0.2	0.23	0.16	0.25
56	0.24	0.26	0.31	0.35	0.4	0.36	0.43	0.34	0.34	0.26	0.24	0.2	0.21	0.16	0.29
57	0.74	0.55	0.52	0.5	0.54	0.55	0.64	0.47	0.49	0.44	0.43	0.4	0.43	0.4	0.39
58	0.63	0.43	0.37	0.34	0.35	0.36	0.38	0.29	0.3	0.26	0.28	0.2	0.25	0.2	0.25
59	0.91	0.89	0.95	0.91	0.78	0.73	0.77	0.65	0.68	0.58	0.59	0.5	0.59	0.48	0.54
60	0.61	0.53	0.53	0.53	0.59	0.59	0.6	0.49	0.53	0.42	0.41	0.3	0.39	0.32	0.46
61	0.55	0.5	0.51	0.52	0.65	0.77	0.68	0.57	0.55	0.48	0.47	0.3	0.41	0.36	0.46
62	1.44	1.3	1.3	1.13	0.78	0.95	0.85	0.68	0.75	0.62	0.62	0.5	0.61	0.48	0.61
63	0.75	0.69	0.72	0.68	0.59	0.64	0.68	0.57	0.61	0.52	0.52	0.4	0.48	0.4	0.5
64	0.92	0.85	0.87	0.83	0.8	0.91	0.81	0.68	0.7	0.58	0.6	0.4	0.59	0.48	0.54
65	0.62	0.57	0.57	0.57	0.54	0.64	0.6	0.49	0.51	0.42	0.41	0.3	0.43	0.32	0.54
66	0.79	0.72	0.76	0.76	0.81	1	0.94	0.73	0.74	0.6	0.6	0.4	0.54	0.44	0.61
67	0.92	0.82	0.86	0.82	0.77	1	0.89	0.7	0.75	0.6	0.6	0.5	0.55	0.44	0.61
68	0.99	0.88	0.92	0.9	0.87	1.05	0.98	0.75	0.81	0.66	0.64	0.5	0.61	0.52	0.61
69	1.1	0.97	0.99	0.94	0.88	1.05	0.94	0.73	0.78	0.66	0.64	0.5	0.62	0.52	0.57
70	1.17	1.02	1.03	0.95	0.88	1.05	0.94	0.75	0.78	0.66	0.62	0.5	0.62	0.48	0.57
71	0.76	0.69	0.7	0.69	0.78	1	0.89	0.73	0.77	0.66	0.62	0.5	0.57	0.44	0.61
72	1.29	1.12	1.1	1	0.9	1.09	0.98	0.81	0.85	0.74	0.71	0.6	0.7	0.56	0.64
73	1.2	1.06	1.08	1.07	1.09	1.23	1.11	0.83	0.91	0.76	0.78	0.6	0.79	0.56	0.68
74	0.54	0.62	0.74	0.82	0.92	1	0.94	0.68	0.76	0.62	0.62	0.5	0.57	0.44	0.61
75	0.76	0.73	0.77	0.78	0.85	1.09	0.98	0.75	0.8	0.64	0.62	0.4	0.55	0.44	0.64
76	0.97	0.92	0.98	1	1.05	1.36	1.19	0.91	0.98	0.8	0.78	0.6	0.71	0.56	0.75
77	0.98	0.93	0.98	0.98	1.03	1.23	1.15	0.94	1.06	0.86	0.86	0.6	0.82	0.6	0.82
78	2.2	2.26	2.01	1.96	1.7	1.91	1.53	1.04	0.98	0.8	0.76	0.6	0.77	0.68	0.71
79	1.55	1.4	1.46	1.45	1.35	1.59	1.32	0.88	0.92	0.72	0.69	0.6	0.68	0.6	0.68
80	1.38	1.25	1.29	1.3	1.29	1.5	1.23	0.91	0.94	0.78	0.76	0.6	0.7	0.6	0.68
81	0.42	0.41	0.46	0.48	0.62	0.91	0.85	0.75	0.88	0.76	0.74	0.6	0.68	0.56	0.68
82	0.86	0.82	0.89	0.9	0.94	1.18	1.02	0.78	0.89	0.78	0.79	0.6	0.75	0.6	0.75
83	0.21	0.26	0.19	0.19	0.24	0.5	0.38	0.36	0.39	0.34	0.36	0.3	0.39	0.36	0.39
84	0.66	0.85	0.82	0.84	0.77	0.86	0.77	0.6	0.57	0.5	0.52	0.4	0.5	0.44	0.54
85	0.69	0.62	0.65	0.67	0.72	0.86	0.85	0.7	0.74	0.64	0.62	0.5	0.62	0.52	0.61
86	0.69	0.6	0.69	0.72	0.81	0.95	0.94	0.73	0.75	0.62	0.6	0.5	0.59	0.48	0.61
87	0.95	0.88	0.93	0.91	0.82	0.91	0.94	0.78	0.83	0.72	0.67	0.6	0.7	0.56	0.64
88	0.96	0.89	0.93	0.91	0.85	0.95	0.94	0.81	0.84	0.72	0.71	0.6	0.68	0.6	0.64
89	1.01	0.94	1.02	1.01	0.93	1	1.02	0.86	0.94	0.8	0.81	0.6	0.73	0.64	0.68
90	1.63	1.55	1.58	1.57	1.12	1	0.94	0.75	0.91	0.82	0.88	0.7	0.93	0.84	0.79
91	2.16	2.11	1.9	1.77	1.46	1.32	1.02	0.75	0.84	0.78	0.84	0.7	0.98	0.84	0.68

92	0.94	0.86	0.87	0.88	0.97	1.09	1.23	1.01	1.17	0.98	1.05	0.8	1.07	0.88	1.18
93	1.11	1.04	1.1	1.06	1.09	1.09	1.06	1.04	1.07	1.02	0.98	1	1.05	1	0.96
94	0.94	0.83	0.83	0.78	0.89	1	1.15	1.09	1.3	1.12	1.19	1	1.34	1.16	1.11
95	1.69	1.52	1.56	1.51	1.35	1.32	1.19	1.19	1.18	1.02	1.1	0.9	1.18	0.96	1.14
96	2.36	2.42	2.3	2.27	1.96	1.73	1.53	1.22	1.35	1.16	1.29	1	1.41	1.24	1.14
97	1.7	1.59	1.65	1.64	1.58	1.55	1.74	1.45	1.84	1.48	1.53	1.2	1.5	1.32	1.5
98	1.88	1.75	1.8	1.76	1.56	1.36	1.28	0.99	1.09	0.96	1.02	0.9	1.09	0.92	0.93
99	1.32	1.26	1.34	1.35	1.29	1.27	1.23	1.04	1.14	0.98	0.97	0.8	0.98	0.84	1.04
100	1.74	1.64	1.75	1.74	1.7	1.59	1.49	1.19	1.39	1.1	1.16	0.9	1.2	1	1.11
101	1.88	1.8	1.89	1.92	1.84	1.68	1.7	1.4	1.53	1.28	1.36	1	1.3	1.12	1.21
102	1.66	1.57	1.67	1.65	1.64	1.55	1.62	1.22	1.36	1.12	1.17	0.9	1.16	0.92	1.04
103	1.09	1.03	1.12	1.17	1.29	1.41	1.7	1.09	1.17	0.92	0.93	0.7	0.93	0.76	0.89
104	2.13	2.09	2.13	2.15	1.96	1.64	1.49	1.14	1.42	1.16	1.17	1	1.29	1.04	1.11
105	1.08	1.04	1.13	1.13	1.25	1.14	1.32	1.12	1.27	0.98	0.98	0.8	0.89	0.8	0.86
111	1.45	1.38	1.49	1.52	1.52	1.41	1.53	1.17	1.28	1.04	1.07	0.9	1.04	0.84	1.04
112	1.79	1.68	1.75	1.72	1.58	1.41	1.49	1.12	1.22	1.02	1.07	0.9	1.07	0.88	0.96
113	1.81	1.7	1.78	1.78	1.71	1.59	1.62	1.27	1.49	1.24	1.28	1	1.23	1.04	1.25
114	2.16	2.25	2.16	2.14	2	1.77	1.91	1.48	1.65	1.36	1.4	1.1	1.41	1.12	1.36
115	1.65	1.57	1.67	1.7	1.64	1.45	1.53	1.19	1.35	1.12	1.16	0.9	1.14	0.88	1.07
116	2.52	2.7	2.6	2.66	2.36	2.05	1.96	1.53	1.85	1.36	1.45	1.1	1.46	1.2	1.39
117	0.81	0.78	0.84	0.85	0.95	0.91	1.06	0.88	0.97	0.88	0.79	0.6	0.79	0.64	0.82
118	1.36	1.29	1.37	1.38	1.38	1.27	1.32	1.04	1.16	0.94	0.95	0.7	0.96	0.76	1
119	1.25	1.23	1.35	1.41	1.68	1.68	1.91	1.56	1.76	1.46	1.5	1.2	1.61	1.32	1.29
120	2.33	2.42	2.38	2.45	2.36	2.23	2.34	1.66	1.75	1.4	1.45	1.1	1.41	1.12	1.39
121	1.49	1.41	1.52	1.56	1.62	1.55	1.66	1.25	1.36	1.12	1.12	0.9	1.12	1	1.11
122	1.39	1.32	1.42	1.45	1.52	1.45	1.57	1.22	1.35	1.12	1.16	0.9	1.11	0.88	1.21
123	1.44	1.35	1.47	1.48	1.59	1.59	1.7	1.38	1.41	1.14	1.14	0.9	1.12	0.88	1.11
124	1.3	1.24	1.31	1.34	1.42	1.36	1.53	1.22	1.24	1	1	0.7	0.98	0.84	1.11
125	1.45	1.38	1.45	1.44	1.42	1.36	1.45	1.12	1.26	1.04	1.1	0.8	1.05	0.84	1.14
126	1.63	1.51	1.6	1.59	1.59	1.64	1.66	1.3	1.4	1.16	1.17	0.9	1.2	0.92	1.21
127	1.44	1.35	1.46	1.47	1.66	1.55	1.7	1.38	1.51	1.32	1.38	1.1	1.34	1.08	1.29
128	1.24	1.17	1.28	1.27	1.37	1.23	1.4	1.19	1.24	1.1	1.1	0.9	1.09	0.88	1.21
129	1.32	1.25	1.31	1.34	1.38	1.32	1.53	1.19	1.33	1.06	1.12	0.8	1.07	0.84	1.07
130	2.01	1.9	2.16	2.22	2.14	1.82	1.79	1.27	1.42	1.12	1.16	0.9	1.09	0.88	1.18
131	1.35	1.26	1.37	1.39	1.44	1.36	1.53	1.22	1.34	1.12	1.12	0.9	1.11	0.88	1.04
132	1.87	1.76	1.9	1.94	1.91	1.77	1.83	1.32	1.48	1.2	1.24	1	1.25	1.04	1.11
133	1.59	1.49	1.6	1.61	1.59	1.45	1.53	1.19	1.3	1.06	1.16	0.9	1.09	0.88	1.11
134	1.78	1.66	1.78	1.76	1.66	1.55	1.57	1.19	1.25	1.06	1.09	1	1.07	0.88	1.07

135	1.48	1.39	1.52	1.53	1.54	1.41	1.53	1.17	1.33	1.08	1.16	1.3	1.12	0.96	1.11
136	1.16	1.1	1.16	1.17	1.21	1.14	1.36	1.04	1.2	1	1.03	1.2	1.04	0.84	1
137	1.58	1.48	1.56	1.58	1.54	1.5	1.62	1.32	1.51	1.28	1.33	1	1.29	1	1.18
138	1.69	1.59	1.75	1.81	1.71	1.55	1.49	1.17	1.25	1.02	1.09	0.8	1	0.8	1
139	1.87	1.76	1.93	1.95	1.84	1.64	1.57	1.22	1.28	1.12	1.12	0.9	1.04	0.96	1.11
140	1.77	1.76	1.96	2.06	2.09	1.86	1.91	1.56	1.53	1.36	1.33	1.1	1.3	1.2	1.18
141	1.13	1.02	1.08	1.07	1.12	1.23	1.28	1.19	1.15	1	1	0.9	1	0.96	1
142	1.49	1.4	1.51	1.52	1.54	1.5	1.45	1.19	1.26	1.12	1.09	1	1.07	0.96	1
143	1.21	1.14	1.2	1.19	1.28	1.27	1.23	1.09	1.17	1.04	1.09	1	1.09	1.04	1.07

Drill core MCDD0005 – Rare earth element concentrations (PAAS normalised)

ID	LaN	CeN	PrN	NdN	SmN	EuN	GdN	TbN	DyN	HoN	ErN	TmN	YbN	LuN	YN
1	0.63	0.57	0.63	0.64	0.73	0.77	0.81	0.7	0.75	0.64	0.66	0.6	0.66	0.6	0.61
2	0.72	0.62	0.63	0.57	0.53	0.55	0.55	0.49	0.53	0.5	0.55	0.5	0.59	0.52	0.46
3	1.06	0.96	1.02	0.99	0.96	1	1.06	0.88	0.89	0.74	0.79	0.7	0.77	0.68	0.71
4	0.53	0.51	0.57	0.6	0.73	0.73	0.81	0.68	0.74	0.64	0.66	0.6	0.62	0.52	0.64
5	0.71	0.64	0.68	0.69	0.72	0.77	0.81	0.65	0.7	0.62	0.66	0.6	0.68	0.6	0.57
6	0.65	0.56	0.58	0.59	0.58	0.55	0.6	0.55	0.61	0.5	0.57	0.5	0.55	0.48	0.54
7	0.73	0.71	0.8	0.83	0.89	0.86	0.98	0.78	0.76	0.64	0.66	0.6	0.64	0.56	0.71
8	0.68	0.59	0.65	0.68	0.81	0.91	0.94	0.81	0.81	0.68	0.69	0.6	0.66	0.6	0.61
9	0.84	0.73	0.75	0.73	0.77	0.82	0.85	0.7	0.7	0.6	0.62	0.6	0.64	0.56	0.57
10	0.51	0.5	0.6	0.67	0.87	1	0.98	0.81	0.8	0.66	0.66	0.6	0.61	0.56	0.57
11	0.74	0.69	0.75	0.74	0.77	0.86	0.89	0.75	0.78	0.66	0.67	0.6	0.66	0.6	0.61
12	0.58	0.54	0.6	0.59	0.6	0.68	0.68	0.62	0.69	0.6	0.66	0.6	0.68	0.6	0.57
13	0.66	0.62	0.69	0.71	0.8	0.91	0.89	0.81	0.84	0.78	0.71	0.6	0.73	0.6	0.71
14	0.55	0.48	0.52	0.5	0.44	0.5	0.43	0.44	0.53	0.52	0.57	0.5	0.59	0.52	0.46
15	0.54	0.44	0.4	0.39	0.46	0.55	0.6	0.47	0.52	0.48	0.57	0.5	0.57	0.56	0.5
16	0.73	0.62	0.6	0.56	0.54	0.55	0.6	0.49	0.53	0.46	0.53	0.5	0.54	0.48	0.5
17	0.89	0.84	0.93	0.95	0.96	0.95	1.11	1.01	1.11	0.96	0.98	0.9	0.96	0.88	1
18	0.73	0.65	0.69	0.67	0.7	0.95	0.77	0.65	0.68	0.6	0.66	0.6	0.66	0.6	0.57
19	0.63	0.61	0.67	0.7	0.79	0.73	0.85	0.73	0.7	0.6	0.62	0.5	0.62	0.52	0.57
20	0.71	0.63	0.67	0.67	0.72	0.73	0.85	0.68	0.7	0.62	0.66	0.6	0.7	0.64	0.64
21	0.82	0.8	0.86	0.88	0.91	0.82	0.94	0.75	0.8	0.66	0.69	0.6	0.71	0.64	0.61
22	0.58	0.52	0.56	0.57	0.63	0.64	0.68	0.57	0.66	0.54	0.59	0.5	0.57	0.48	0.57

23	0.88	0.81	0.88	0.85	0.87	0.82	0.94	0.75	0.81	0.7	0.71	0.6	0.68	0.64	0.57
24	0.85	0.77	0.84	0.8	0.84	0.82	0.89	0.78	0.82	0.74	0.74	0.7	0.75	0.68	0.68
25	0.46	0.46	0.51	0.55	0.66	0.68	0.77	0.62	0.62	0.48	0.5	0.4	0.5	0.44	0.54
26	0.66	0.68	0.75	0.76	0.81	0.77	0.89	0.75	0.8	0.68	0.72	0.6	0.68	0.6	0.68
27	0.92	0.86	0.92	0.91	0.88	0.77	0.89	0.78	0.81	0.7	0.72	0.7	0.77	0.68	0.68
28	1.05	1.14	1.3	1.33	1.18	1	1.11	0.96	1.01	0.86	0.93	0.8	0.93	0.84	0.89
29	1.01	0.96	1.04	1.02	0.99	0.86	1.02	0.88	0.98	0.84	0.9	0.8	0.91	0.8	0.86
30	1.09	0.97	0.97	0.92	0.9	0.77	0.94	0.81	0.92	0.72	0.76	0.7	0.73	0.68	0.61
31	0.84	0.8	0.85	0.82	0.83	0.77	0.85	0.73	0.78	0.66	0.69	0.6	0.7	0.64	0.61
32	0.84	0.79	0.84	0.81	0.91	0.82	1.02	0.86	0.91	0.74	0.79	0.7	0.77	0.68	0.68
33	0.83	0.81	0.88	0.88	0.86	0.77	0.89	0.73	0.75	0.62	0.66	0.6	0.66	0.56	0.61
34	0.91	0.85	0.91	0.91	0.93	0.86	0.98	0.83	0.88	0.74	0.76	0.7	0.79	0.68	0.68
35	0.98	0.87	0.92	0.88	0.94	0.82	1.02	0.86	0.9	0.74	0.91	0.7	0.77	0.72	0.71
36	0.68	0.69	0.79	0.8	0.81	0.73	0.85	0.7	0.7	0.6	0.64	0.6	0.62	0.56	0.61
37	0.75	0.8	0.91	0.93	0.93	0.77	0.98	0.81	0.83	0.74	0.76	0.7	0.79	0.68	0.75
38	1.01	0.84	0.81	0.77	0.83	0.77	0.98	0.81	0.84	0.7	0.69	0.6	0.7	0.6	0.71
39	0.81	0.74	0.77	0.73	0.76	0.77	0.85	0.73	0.76	0.64	0.67	0.6	0.71	0.6	0.64
40	0.71	0.67	0.71	0.68	0.74	0.73	0.81	0.7	0.74	0.62	0.66	0.6	0.66	0.56	0.64
41	0.75	0.71	0.75	0.76	0.78	0.77	0.85	0.7	0.74	0.62	0.66	0.6	0.66	0.56	0.61
42	0.74	0.71	0.77	0.79	0.81	0.77	0.81	0.7	0.7	0.6	0.64	0.5	0.62	0.56	0.61
43	0.84	0.73	0.78	0.77	0.79	0.73	0.85	0.7	0.75	0.64	0.66	0.6	0.66	0.6	0.68
44	0.8	0.77	0.85	0.88	0.84	0.77	0.85	0.68	0.7	0.6	0.66	0.6	0.61	0.56	0.61
45	0.71	0.66	0.72	0.72	0.76	0.68	0.81	0.7	0.72	0.62	0.66	0.6	0.64	0.6	0.57
46	0.69	0.68	0.75	0.74	0.66	0.59	0.68	0.55	0.59	0.52	0.59	0.5	0.55	0.52	0.54
47	0.73	0.59	0.56	0.52	0.54	0.5	0.64	0.47	0.49	0.44	0.52	0.5	0.57	0.52	0.5
48	0.07	0.08	0.09	0.09	0.11	0.14	0.13	0.1	0.1	0.08	0.07	NA	0.07	0.08	0.11
49	0.07	0.09	0.12	0.14	0.19	0.18	0.21	0.18	0.18	0.14	0.14	NA	0.11	0.08	0.14
50	0.36	0.39	0.43	0.43	0.38	0.36	0.34	0.29	0.32	0.26	0.28	0.2	0.29	0.24	0.29
51	0.06	0.08	0.1	0.1	0.14	0.18	0.17	0.13	0.14	0.12	0.09	NA	0.11	0.12	0.11
52	0.08	0.09	0.1	0.11	0.12	0.14	0.13	0.13	0.12	0.1	0.09	NA	0.07	0.08	0.11
53	0.07	0.08	0.09	0.1	0.11	0.09	0.13	0.1	0.1	0.08	0.09	NA	0.07	0.04	0.07
54	0.26	0.24	0.25	0.25	0.26	0.23	0.26	0.23	0.24	0.2	0.21	0.2	0.21	0.2	0.21
55	0.06	0.07	0.08	0.09	0.11	0.14	0.13	0.1	0.11	0.08	0.09	NA	0.07	0.04	0.11
56	0.9	0.68	0.65	0.62	0.64	0.59	0.72	0.62	0.72	0.74	0.79	0.7	0.86	0.76	0.68
57	0.06	0.08	0.11	0.11	0.15	0.18	0.17	0.16	0.15	0.12	0.1	NA	0.07	0.08	0.11
58	0.92	0.86	0.9	0.9	0.93	0.91	0.98	0.83	0.89	0.74	0.79	0.7	0.8	0.72	0.75
59	0.56	0.54	0.58	0.6	0.68	0.68	0.77	0.62	0.62	0.5	0.52	0.4	0.52	0.44	0.54
60	0.1	0.11	0.13	0.16	0.31	0.36	0.55	0.6	0.7	0.64	0.67	0.6	0.71	0.68	0.64

61	0.88	0.78	0.82	0.81	0.84	0.82	0.89	0.73	0.8	0.66	0.66	0.6	0.66	0.56	0.64
62	0.06	0.05	0.08	0.06	0.06	0.09	0.09	0.05	0.06	0.04	0.03	NA	0.04	NA	NA
63	0.73	0.69	0.74	0.74	0.71	0.68	0.72	0.6	0.68	0.54	0.59	0.5	0.59	0.52	0.54
64	0.51	0.49	0.52	0.54	0.61	0.59	0.72	0.57	0.59	0.5	0.53	0.5	0.54	0.48	0.5
65	1.04	1.02	1.11	1.14	1.16	0.95	1.11	0.91	0.93	0.74	0.78	0.7	0.75	0.68	0.61
66	0.51	0.49	0.53	0.55	0.56	0.5	0.6	0.52	0.53	0.48	0.5	0.4	0.5	0.44	0.46
67	0.72	0.67	0.7	0.69	0.67	0.59	0.68	0.55	0.57	0.48	0.52	0.5	0.54	0.48	0.5
68	0.61	0.57	0.59	0.58	0.51	0.45	0.51	0.44	0.48	0.42	0.45	0.4	0.46	0.4	0.46
69	0.59	0.57	0.58	0.6	0.56	0.55	0.6	0.47	0.53	0.44	0.47	0.4	0.48	0.44	0.46
70	0.76	0.71	0.74	0.75	0.69	0.64	0.68	0.57	0.62	0.52	0.57	0.5	0.59	0.52	0.57
71	0.52	0.44	0.47	0.48	0.56	0.55	0.64	0.55	0.59	0.5	0.53	0.5	0.54	0.48	0.54
72	0.66	0.62	0.66	0.69	0.72	0.64	0.77	0.65	0.68	0.58	0.64	0.5	0.62	0.56	0.57
73	0.63	0.6	0.63	0.65	0.69	0.68	0.72	0.62	0.68	0.56	0.59	0.5	0.59	0.52	0.57
74	0.73	0.7	0.72	0.72	0.69	0.64	0.68	0.55	0.6	0.48	0.55	0.4	0.52	0.48	0.54
75	0.32	0.37	0.37	0.38	0.42	0.45	0.51	0.39	0.41	0.36	0.33	0.3	0.27	0.24	0.36
76	0.59	0.55	0.58	0.6	0.65	0.64	0.72	0.57	0.62	0.54	0.59	0.5	0.59	0.56	0.57
77	0.67	0.66	0.68	0.7	0.64	0.55	0.64	0.49	0.52	0.44	0.48	0.4	0.48	0.44	0.46
78	0.4	0.4	0.42	0.44	0.49	0.5	0.55	0.44	0.47	0.4	0.41	0.4	0.41	0.36	0.46
79	0.66	0.63	0.63	0.64	0.65	0.55	0.64	0.55	0.62	0.54	0.6	0.6	0.64	0.56	0.61
80	0.58	0.55	0.58	0.61	0.65	0.64	0.72	0.62	0.65	0.54	0.57	0.5	0.54	0.52	0.57
81	0.72	0.69	0.71	0.74	0.8	0.77	0.98	0.94	1.01	0.84	0.91	0.8	0.89	0.8	0.93
82	0.77	0.66	0.7	0.69	0.74	0.73	0.81	0.7	0.7	0.6	0.66	0.5	0.59	0.56	0.57
83	0.85	0.77	0.81	0.82	0.86	0.86	0.94	0.81	0.82	0.7	0.71	0.6	0.68	0.6	0.71
84	0.87	0.8	0.85	0.87	0.9	0.91	0.98	0.83	0.89	0.76	0.83	0.7	0.77	0.68	0.75
85	0.63	0.57	0.61	0.64	0.73	0.77	0.85	0.75	0.84	0.7	0.74	0.6	0.7	0.6	0.71
86	0.73	0.74	0.78	0.81	0.86	0.77	0.89	0.73	0.77	0.64	0.66	0.6	0.62	0.56	0.68
87	0.95	0.92	0.94	0.96	0.97	0.91	0.98	0.81	0.86	0.74	0.76	0.7	0.77	0.68	0.75
88	0.76	0.77	0.81	0.86	0.9	0.91	1.02	0.88	0.94	0.82	0.86	0.7	0.77	0.72	0.89
89	0.89	0.73	0.77	0.77	0.8	0.77	0.89	0.78	0.8	0.7	0.72	0.6	0.71	0.64	0.75
90	1	0.79	0.83	0.81	0.84	0.82	0.98	0.86	0.93	0.78	0.83	0.7	0.8	0.72	0.82
91	0.77	0.74	0.78	0.8	0.86	0.82	0.94	0.81	0.83	0.7	0.72	0.6	0.73	0.64	0.71
92	0.7	0.62	0.67	0.69	0.77	0.73	0.85	0.75	0.76	0.66	0.67	0.6	0.68	0.6	0.71
93	0.6	0.7	0.78	0.83	0.86	0.77	0.81	0.65	0.67	0.54	0.57	0.5	0.54	0.48	0.61
94	0.67	0.67	0.69	0.73	0.8	0.77	0.89	0.83	0.86	0.74	0.78	0.7	0.75	0.68	0.82
95	0.7	0.73	0.78	0.83	0.96	0.91	0.98	0.83	0.89	0.74	0.78	0.7	0.75	0.68	0.75
96	0.95	0.92	0.95	0.96	0.94	0.86	0.98	0.83	0.86	0.72	0.74	0.7	0.73	0.68	0.75
97	0.91	0.87	0.92	0.95	0.91	0.86	0.98	0.81	0.88	0.72	0.79	0.7	0.77	0.68	0.71
98	0.69	0.66	0.7	0.72	0.82	0.82	0.89	0.78	0.84	0.72	0.76	0.6	0.71	0.68	0.75

99	0.71	0.69	0.73	0.76	0.81	0.77	0.85	0.7	0.74	0.64	0.64	0.6	0.62	0.56	0.68
100	0.81	0.77	0.83	0.86	0.89	0.82	0.98	0.86	0.84	0.74	0.72	0.6	0.71	0.64	0.82
101	0.85	0.84	0.87	0.9	0.9	0.91	0.98	0.83	0.84	0.7	0.72	0.6	0.71	0.68	0.82
102	0.8	0.77	0.81	0.84	0.85	0.86	0.89	0.75	0.81	0.7	0.71	0.6	0.73	0.64	0.75
103	1.06	1.03	1.09	1.12	1.08	1.05	1.15	1.04	1.12	0.94	1.02	0.9	0.96	0.88	0.79
104	0.83	0.81	0.87	0.9	0.96	0.95	1.06	0.88	0.94	0.78	0.84	0.8	0.82	0.76	0.89
105	0.76	0.74	0.81	0.85	1	1.05	1.15	1.01	1.08	0.9	0.97	0.9	0.95	0.84	0.96
106	0.84	0.81	0.85	0.86	0.95	0.95	1.06	0.91	0.99	0.82	0.86	0.8	0.84	0.76	0.93
107	0.81	0.8	0.83	0.86	0.91	0.82	0.94	0.81	0.86	0.72	0.74	0.6	0.71	0.64	0.79
108	0.83	0.8	0.84	0.88	0.88	0.86	0.94	0.81	0.84	0.72	0.76	0.6	0.75	0.64	0.86
109	0.91	0.88	0.93	0.96	1.02	0.95	1.11	0.91	0.98	0.82	0.86	0.7	0.84	0.72	0.86
110	0.81	0.79	0.84	0.85	0.92	0.91	1.02	0.86	0.91	0.74	0.79	0.7	0.75	0.72	0.89
111	0.76	0.73	0.78	0.79	0.84	0.82	0.94	0.75	0.82	0.7	0.71	0.6	0.7	0.64	0.75
112	0.79	0.76	0.83	0.86	0.88	0.86	0.94	0.81	0.86	0.72	0.76	0.6	0.73	0.64	0.79
113	0.74	0.71	0.78	0.81	0.88	0.86	0.94	0.81	0.84	0.72	0.79	0.7	0.71	0.64	0.86
114	0.83	0.8	0.88	0.89	0.93	0.86	0.98	0.86	0.89	0.74	0.78	0.7	0.77	0.68	0.79
115	0.85	0.82	0.88	0.9	0.97	0.91	1.06	0.91	0.99	0.82	0.88	0.8	0.86	0.76	1
116	0.85	0.83	0.88	0.91	0.91	0.86	0.98	0.83	0.89	0.74	0.79	0.7	0.79	0.68	0.86
117	0.82	0.78	0.84	0.86	0.91	0.86	0.98	0.81	0.88	0.74	0.74	0.6	0.73	0.68	0.79
118	0.89	0.86	0.92	0.92	0.91	0.82	0.98	0.81	0.88	0.74	0.79	0.7	0.79	0.72	0.89
119	0.84	0.81	0.87	0.89	0.9	0.86	0.94	0.81	0.84	0.7	0.78	0.7	0.75	0.68	0.79
120	0.8	0.78	0.82	0.83	0.88	0.86	0.94	0.83	0.86	0.72	0.76	0.7	0.75	0.68	0.86
121	0.57	0.56	0.57	0.57	0.69	0.68	0.81	0.68	0.78	0.6	0.62	0.5	0.59	0.52	0.64
122	0.74	0.7	0.75	0.77	0.82	0.82	0.89	0.78	0.78	0.66	0.67	0.6	0.68	0.6	0.75
123	0.81	0.77	0.83	0.85	0.9	0.86	0.98	0.81	0.84	0.7	0.74	0.6	0.73	0.64	0.75
124	0.82	0.79	0.85	0.88	0.99	1	1.19	1.09	1.18	1.02	1.1	0.9	1.07	0.96	1.04
125	0.76	0.74	0.78	0.79	0.84	0.77	0.89	0.75	0.8	0.68	0.74	0.6	0.71	0.64	0.79
126	0.82	0.79	0.84	0.85	0.87	0.82	0.94	0.81	0.85	0.74	0.78	0.7	0.75	0.68	0.86
127	0.93	0.91	0.95	0.94	0.96	0.91	1.11	0.94	0.99	0.82	0.86	0.8	0.82	0.76	0.96
128	1.04	1.04	1.07	1.07	0.96	0.82	0.94	0.83	0.9	0.76	0.84	0.7	0.82	0.72	0.82
129	0.9	0.9	0.92	0.92	0.86	0.73	0.85	0.73	0.77	0.66	0.69	0.6	0.68	0.6	0.82
130	0.74	0.72	0.76	0.78	0.76	0.73	0.81	0.68	0.73	0.6	0.66	0.6	0.66	0.6	0.82
131	1.53	1.45	1.25	1.12	0.83	0.86	0.77	0.65	0.7	0.58	0.64	0.6	0.61	0.56	0.68
132	1.63	1.54	1.33	1.12	0.81	0.82	0.77	0.62	0.69	0.58	0.6	0.5	0.61	0.56	0.57
133	1.68	1.51	1.33	1.17	0.84	0.86	0.77	0.62	0.68	0.56	0.6	0.5	0.61	0.56	0.57
134	1.81	1.57	1.31	1.13	0.81	0.82	0.89	0.6	0.61	0.5	0.55	0.5	0.55	0.56	0.54
135	0.26	0.27	0.33	0.41	0.61	0.73	0.77	0.65	0.66	0.52	0.52	0.4	0.45	0.36	0.54
136	0.2	0.23	0.3	0.35	0.44	0.5	0.51	0.42	0.4	0.32	0.31	0.3	0.25	0.2	0.36

137	1.87	1.52	1.28	1.1	0.92	0.91	0.89	0.68	0.67	0.54	0.59	0.5	0.54	0.48	0.61
138	3.11	2.35	1.91	1.54	0.97	0.95	0.85	0.68	0.68	0.56	0.59	0.5	0.54	0.48	0.61
139	1.51	1.1	1.11	1.01	0.85	0.86	0.85	0.65	0.61	0.48	0.5	0.4	0.45	0.4	0.57
140	1.8	1.59	1.42	1.25	1.05	1.09	1.06	0.86	0.89	0.7	0.72	0.6	0.71	0.64	0.89
141	0.22	0.37	0.5	0.62	0.92	0.91	1.23	1.3	1.56	1.42	1.57	1.3	1.46	1.28	1.57
142	1.62	1.6	1.46	1.37	1.14	1.14	1.11	0.86	0.83	0.68	0.69	0.6	0.66	0.6	0.68
143	1.52	1.35	1.36	1.32	1.17	1.27	1.11	0.86	0.85	0.7	0.71	0.6	0.66	0.6	0.79
144	1.28	1.17	1.18	1.11	1.02	1	1.02	0.83	0.84	0.7	0.71	0.6	0.66	0.6	0.79
145	1.06	0.98	0.96	0.88	0.81	0.77	0.85	0.73	0.75	0.62	0.67	0.6	0.62	0.56	0.71
146	1.23	1.1	1.1	1.03	0.96	0.86	1.02	0.81	0.84	0.68	0.69	0.6	0.61	0.56	0.71
147	0.48	0.4	0.5	0.6	0.75	0.73	0.85	0.7	0.72	0.6	0.64	0.5	0.59	0.56	0.71
148	1.07	0.98	1.05	1	0.81	0.77	0.81	0.65	0.68	0.54	0.57	0.5	0.54	0.48	0.61
149	1.04	0.94	0.96	0.92	0.83	0.77	0.89	0.73	0.74	0.64	0.66	0.6	0.62	0.56	0.68
150	1.24	1.2	1.15	1.05	0.93	0.91	0.94	0.75	0.8	0.68	0.69	0.6	0.68	0.6	0.71
151	1.43	1.12	1.05	0.94	0.87	0.82	0.89	0.73	0.77	0.64	0.67	0.6	0.66	0.56	0.64
152	0.37	0.39	0.47	0.52	0.66	0.64	0.77	0.65	0.7	0.58	0.59	0.5	0.59	0.52	0.57
153	0.62	0.66	0.71	0.73	0.74	0.73	0.81	0.65	0.69	0.56	0.6	0.5	0.55	0.52	0.57
154	0.46	0.51	0.6	0.64	0.74	0.73	0.85	0.7	0.74	0.62	0.66	0.5	0.61	0.56	0.61
155	0.7	0.65	0.71	0.74	0.76	0.73	0.85	0.7	0.74	0.6	0.62	0.6	0.57	0.56	0.57
156	1.03	0.83	0.84	0.8	0.81	0.77	0.89	0.81	0.88	0.74	0.83	0.7	0.79	0.72	0.64
157	1.22	0.99	0.96	0.88	0.83	0.77	0.89	0.81	0.84	0.72	0.78	0.7	0.73	0.68	0.64
158	0.81	0.69	0.7	0.69	0.71	0.68	0.85	0.75	0.83	0.74	0.84	0.7	0.82	0.76	0.86
159	0.78	0.73	0.78	0.76	0.83	0.82	0.94	0.81	0.85	0.74	0.78	0.7	0.73	0.68	0.71
160	0.35	0.38	0.46	0.5	0.52	0.5	0.6	0.47	0.43	0.36	0.36	0.3	0.32	0.28	0.39
161	0.52	0.49	0.52	0.54	0.59	0.59	0.68	0.6	0.61	0.5	0.52	0.4	0.5	0.44	0.46
162	0.73	0.59	0.6	0.61	0.69	0.68	0.77	0.68	0.68	0.6	0.66	0.6	0.68	0.6	0.57
163	0.69	0.59	0.62	0.63	0.71	0.68	0.81	0.68	0.73	0.62	0.66	0.6	0.66	0.6	0.57
164	0.64	0.54	0.58	0.58	0.65	0.64	0.72	0.62	0.67	0.58	0.62	0.6	0.61	0.56	0.57
165	0.52	0.37	0.38	0.38	0.49	0.5	0.64	0.57	0.65	0.58	0.64	0.6	0.64	0.56	0.57
166	0.7	0.59	0.61	0.64	0.72	0.68	0.77	0.7	0.74	0.64	0.67	0.6	0.66	0.6	0.57
167	0.39	0.34	0.36	0.36	0.42	0.45	0.51	0.44	0.48	0.44	0.47	0.4	0.46	0.44	0.39
168	0.51	0.45	0.49	0.52	0.55	0.55	0.64	0.55	0.55	0.46	0.5	0.4	0.45	0.4	0.5
169	0.51	0.47	0.53	0.57	0.81	0.86	0.98	0.91	1.02	0.94	1.05	1	1.16	1.04	0.75
170	0.66	0.57	0.61	0.62	0.67	0.68	0.77	0.62	0.61	0.5	0.55	0.5	0.52	0.48	0.46
171	0.97	0.7	0.67	0.68	0.69	0.68	0.77	0.62	0.68	0.58	0.64	0.6	0.66	0.6	0.54
172	0.82	0.68	0.72	0.75	0.82	0.77	0.89	0.75	0.75	0.64	0.66	0.6	0.61	0.56	0.57
173	1.16	0.97	1.04	1.04	1.46	1.05	1.15	0.99	1.03	0.88	0.93	0.8	0.88	0.8	0.68
174	0.38	0.37	0.43	0.45	0.49	0.45	0.51	0.42	0.41	0.32	0.31	0.3	0.29	0.28	0.29

175	0.45	0.4	0.45	0.48	0.5	0.45	0.55	0.44	0.43	0.38	0.38	0.3	0.36	0.32	0.29
176	0.44	0.42	0.5	0.57	0.69	0.64	0.77	0.57	0.55	0.44	0.41	0.3	0.36	0.32	0.39
177	0.45	0.42	0.52	0.61	1.05	1.18	1.4	1.27	1.45	1.36	1.62	1.6	1.77	1.64	1.32
178	0.44	0.41	0.47	0.48	0.54	0.5	0.6	0.44	0.47	0.4	0.4	0.3	0.36	0.32	0.29
179	0.58	0.55	0.64	0.69	0.78	0.64	0.81	0.6	0.56	0.44	0.45	0.4	0.38	0.36	0.36
180	0.43	0.44	0.51	0.57	0.69	0.59	0.77	0.62	0.64	0.48	0.43	0.4	0.36	0.32	0.43
181	1.01	0.95	0.94	0.84	0.68	0.45	0.55	0.42	0.42	0.34	0.36	0.3	0.36	0.32	0.29
182	1.1	1	1.03	1.02	1.05	0.91	1.11	0.99	1.12	1.06	1.28	1.2	1.41	1.28	0.89
183	0.51	0.38	0.38	0.38	0.44	0.45	0.51	0.44	0.45	0.4	0.41	0.4	0.46	0.4	0.39
184	2.66	2.74	2.49	2.3	1.73	1.09	1.28	0.86	0.83	0.64	0.62	0.5	0.55	0.48	0.64
185	0.58	0.45	0.46	0.49	0.49	0.45	0.55	0.44	0.45	0.4	0.4	0.4	0.45	0.4	0.32
186	0.57	0.47	0.48	0.48	0.46	0.45	0.51	0.34	0.33	0.28	0.28	0.3	0.29	0.28	0.21
187	0.73	0.6	0.63	0.64	0.59	0.59	0.64	0.42	0.41	0.32	0.33	0.3	0.32	0.32	0.25
188	0.66	0.58	0.59	0.57	0.54	0.55	0.55	0.42	0.4	0.34	0.38	0.3	0.39	0.36	0.29
189	0.74	0.64	0.66	0.66	0.66	0.59	0.68	0.52	0.56	0.46	0.52	0.5	0.54	0.48	0.39
190	0.9	0.59	0.53	0.49	0.5	0.5	0.55	0.47	0.52	0.48	0.55	0.5	0.62	0.56	0.36
191	0.69	0.58	0.57	0.55	0.47	0.45	0.43	0.34	0.32	0.28	0.33	0.3	0.32	0.28	0.21

Drill core MCDD0005 – Eu*, Ce* & Pr* anomalies

ID	Depth	Ce/Ce*	Eu/Eu*	Pr/Pr*
1	165.2	0.90476190	1	1.041322314
2	166.3	0.91851852	1.018519	1.058823529
3	167.3	0.92307692	0.990099	1.046153846
4	167.9	0.92727273	0.948052	1.027027027
5	169.9	0.92086331	1.006536	1.022556391
6	170.7	0.91056911	0.932203	1.008695652
7	171.8	0.92810458	0.919786	1.038961039
8	172.8	0.88721805	1.04	1.023622047
9	173.9	0.91823899	1.012346	1.02739726
10	175.3	0.90090090	1.081081	1.025641026
11	176.3	0.92617450	1.036145	1.048951049
12	177.5	0.91525424	1.0625	1.061946903
13	179.1	0.91851852	1.076923	1.037593985
14	180.6	0.89719626	1.149425	1.06122449

15	181.6	0.93617021	1.037736	0.963855422
16	182.8	0.93233083	0.964912	1.016949153
17	184.2	0.92307692	0.917874	1.039106145
18	185.1	0.91549296	1.292517	1.045454545
19	185.9	0.93846154	0.890244	1.022900763
20	187.2	0.91304348	0.929936	1.030769231
21	188	0.95238095	0.886486	1.023809524
22	189.6	0.91228070	0.977099	1.027522936
23	190.8	0.92045455	0.906077	1.060240964
24	192.3	0.91124260	0.947977	1.070063694
25	194	0.94845361	0.951049	1.00990099
26	195	0.96453901	0.905882	1.041666667
27	196.3	0.93478261	0.870056	1.039548023
28	197.6	0.97021277	0.873362	1.052631579
29	198.4	0.93658537	0.855721	1.050505051
30	199.5	0.94174757	0.836957	1.026455026
31	200.9	0.94674556	0.916667	1.049382716
32	201.6	0.94047619	0.849741	1.05
33	202.8	0.94736842	0.88	1.041420118
34	203.9	0.93406593	0.900524	1.034090909
35	204.9	0.91578947	0.836735	1.051428571
36	206.6	0.93877551	0.879518	1.060402685
37	207.9	0.96385542	0.806283	1.052023121
38	209.3	0.92307692	0.850829	1.00621118
39	210.5	0.93670886	0.956522	1.047619048
40	211.4	0.94366197	0.941935	1.051851852
41	212.6	0.94666667	0.944785	1.020408163
42	213.9	0.94039735	0.950617	1.026666667
43	214.9	0.90123457	0.890244	1.04
44	216	0.93333333	0.911243	1.03030303
45	217	0.92307692	0.866242	1.043478261
46	218.8	0.94444444	0.880597	1.056338028
47	220.7	0.91472868	0.847458	1.009009009
48	221.9	1.00000000	1.166667	1.058823529
49	222.9	0.94736842	0.9	1.043478261
50	224	0.98734177	1	1.048780488
51	224.9	1.00000000	1.16129	1.111111111
52	225.5	1.00000000	1.12	1

53	227.8	1.00000000	0.75	1
54	229.1	0.94117647	0.884615	1.020408163
55	229.9	1.00000000	1.166667	1
56	232	0.87741935	0.867647	1
57	232.6	0.94117647	1.125	1.157894737
58	233.7	0.94505495	0.95288	1.022727273
59	236.1	0.94736842	0.937931	1.01754386
60	237.3	0.95652174	0.837209	0.962962963
61	238.8	0.91764706	0.947977	1.031446541
62	240	0.71428571	1.2	1.454545455
63	242.2	0.93877551	0.951049	1.034965035
64	243.1	0.95145631	0.887218	1.009708738
65	244.5	0.94883721	0.837004	1.027777778
66	245.8	0.94230769	0.862069	1.019230769
67	246.9	0.94366197	0.874074	1.029411765
68	247.5	0.95000000	0.882353	1.026086957
69	248.6	0.97435897	0.948276	0.991452991
70	249.7	0.94666667	0.934307	1.01369863
71	251.5	0.88888889	0.916667	1.02173913
72	252.5	0.93939394	0.85906	1.007633588
73	254.5	0.95238095	0.964539	1.008
74	255.5	0.96551724	0.934307	1.014084507
75	256.8	1.07246377	0.967742	0.986666667
76	258.3	0.94017094	0.934307	1.008695652
77	259.8	0.97777778	0.859375	1
78	261.6	0.97560976	0.961538	1
79	262.6	0.97674419	0.852713	0.992125984
80	264.2	0.94827586	0.934307	1
81	266.8	0.96503497	0.865169	0.993006993
82	268.5	0.89795918	0.941935	1.037037037
83	269.7	0.92771084	0.955556	1.018867925
84	271.7	0.93023256	0.968085	1.017964072
85	273.4	0.91935484	0.974684	1.008264463
86	274.6	0.98013245	0.88	1.006451613
87	276.2	0.97354497	0.933333	1
88	277.3	0.98089172	0.947917	0.993865031
89	279.1	0.87951807	0.911243	1.026666667
90	280.6	0.86338798	0.901099	1.0375

91	281.3	0.95483871	0.911111	1.012987013
92	282.8	0.90510949	0.901235	1.022900763
93	284.9	1.01449275	0.922156	1.019607843
94	286.6	0.98529412	0.911243	0.985714286
95	288	0.98648649	0.938144	1
96	289.6	0.96842105	0.895833	1.010638298
97	290.6	0.95081967	0.910053	1.010989011
98	292.1	0.94964029	0.959064	1.014492754
99	293.9	0.95833333	0.927711	1.006896552
100	295	0.93902439	0.877005	1.018404908
101	296.2	0.97674419	0.968085	1
102	297.9	0.95652174	0.988506	1.00621118
103	299.5	0.95813953	0.941704	1.013953488
104	301.4	0.95294118	0.940594	1.01754386
105	302.7	0.94267516	0.976744	1.018867925
106	304.9	0.95857988	0.945274	1.017964072
107	306.2	0.97560976	0.886486	1
108	307.4	0.95808383	0.945055	1
109	308.9	0.95652174	0.892019	1.010869565
110	310.4	0.95757576	0.938144	1.024390244
111	311.2	0.94805195	0.921348	1.026315789
112	312.8	0.93827160	0.945055	1.024691358
113	314.3	0.93421053	0.945055	1.026315789
114	315.5	0.93567251	0.900524	1.041420118
115	317.4	0.94797688	0.896552	1.023255814
116	318.5	0.95953757	0.910053	1.011494253
117	319.3	0.93975904	0.910053	1.024390244
118	323.6	0.95027624	0.867725	1.033707865
119	325	0.94736842	0.934783	1.023529412
120	326.7	0.96296296	0.945055	1.01863354
121	329.1	0.98245614	0.906667	1.008849558
122	330.1	0.93959732	0.959064	1.020408163
123	331.7	0.93902439	0.914894	1.024691358
124	332.9	0.94610778	0.917431	1.017964072
125	334.2	0.96103896	0.890173	1.019607843
126	353.4	0.95180723	0.906077	1.024390244
127	336.8	0.96808511	0.879227	1.027027027
128	340.8	0.98578199	0.863158	1.014218009

129	341.7	0.98901099	0.853801	1.010989011
130	344.9	0.96000000	0.929936	1.013333333
131	488.75	1.043165468	1.075	
132	490.25	1.040540541	1.037975	0.972762646
133	490.83	1.003322259	1.068323	1
134	491.9	1.006410256	0.964706	0.992537313
135	492.83	0.915254237	1.057971	0.97037037
136	493.3	0.92	1.052632	0.970588235
137	495.3	0.965079365	1.005525	1.034482759
138	495.62	0.93625498	1.043956	0.977099237
139	496.66	0.839694656	1.011765	0.982005141
140	498.08	0.98757764	1.033175	1.052132701
141	499	1.027777778	0.846512	1
142	500.05	1.038961039	1.013333	1.01010101
143	501.14	0.9375	1.114035	0.983164983
144	502.68	0.951219512	0.980392	1.018726592
145	503.8	0.97029703	0.927711	1.035087719
146	505.55	0.944206009	0.868687	1.032258065
147	506.6	0.816326531	0.9125	1.03286385
148	507.5	0.924528302	0.950617	1
149	508.6	0.94	0.895349	1.060606061
150	509.2	1.0041841	0.973262	1.032258065
151	510.7	0.903225806	0.931818	1.022222222
152	510.6	0.928571429	0.895105	1.019417476
153	512	0.992481203	0.941935	1.032967033
154	512.9	0.962264151	0.918239	1.021582734
155	514.28	0.921985816	0.906832	1.043478261
156	515.8	0.887700535	0.905882	1.021582734
157	516.9	0.908256881	0.895349	1.030674847
158	517.9	0.913907285	0.871795	1.026737968
159	519.36	0.935897436	0.926554	1.014492754
160	520.8	0.938271605	0.892857	1.046979866
161	523	0.942307692	0.929134	1.045454545
162	524	0.887218045	0.931507	1.009708738
163	525.2	0.900763359	0.894737	1
164	526.65	0.885245902	0.934307	1.016393443
165	527	0.822222222	0.884956	1.035714286
166	527.65	0.900763359	0.912752	1.013333333

167	528.6	0.906666667	0.967742	0.991869919
168	529.5	0.9	0.92437	1.028571429
169	531.17	0.903846154	0.960894	1.010309278
170	532.8	0.897637795	0.944444	1.019230769
171	534.3	0.853658537	0.931507	1.025210084
172	535	0.883116883	0.900585	0.971014493
173	537.45	0.881818182	0.804598	1.006993007
174	538.1	0.913580247	0.9	1.034825871
175	539.1	0.888888889	0.857143	1.048780488
176	540.7	0.893617021	0.876712	1.022727273
177	541.45	0.865979381	0.963265	1.01010101
178	544.5	0.901098901	0.877193	1.009708738
179	544.8	0.901639344	0.805031	1.056179775
180	546.8	0.936170213	0.808219	1.032258065
181	547.9	0.974358974	0.731707	1.00990099
182	548.9	0.938967136	0.842593	1.05027933
183	549.67	0.853932584	0.947368	1.01980198
184	550.5	1.06407767	0.724252	1
185	550.9	0.865384615	0.865385	0.988095238
186	551.1	0.895238095	0.927835	0.978723404
187	551.72	0.882352941	0.95935	1.010526316
188	553.38	0.928	1.009174	1.016129032
189	554.25	0.914285714	0.880597	1.026086957
190	554.63	0.825174825	0.952381	1.015384615
191	555.39	0.920634921	1	0.981481481

Drill core MCDD0003 - Eu*, Ce* & Pr* anomalies

ID	Depth	Eu/Eu*	Ce/Ce*	Pr/Pr*
1	8.67	0.937931034	0.979166667	0.99047619
2	9.35	0.964912281	0.96	1
3	10.68	1	0.954545455	1.02222222
4	11.55	0.93220339	0.954545455	1.02222222
5	12.7	0.853333333	0.957264957	1.01694915
6	13.7	0.973333333	0.96	1
7	15.05	0.888888889	0.946564885	0.99212598
8	16.35	0.968553459	0.975206612	1
9	17.72	0.847457627	0.969072165	0.98989899
10	8.67	1.047619048	0.953488372	1.01149425
11	20.44	0.900662252	0.953846154	1
12	21.34	0.929936306	0.955223881	1.03816794
13	22.55	0.937931034	0.941176471	1.00854701
14	23.9	1.028037383	0.87012987	0.98333333
15	24.95	0.954248366	0.932432432	1.02816901
16	25.78	0.934782609	0.921212121	1
17	26.12	0.877192982	0.884057971	1
18	28.1	0.970414201	0.895522388	1.02985075
19	29	0.95959596	0.901734104	1.01796407
20	30.18	0.863157895	0.910344828	1.04
21	31.1	0.937931034	0.863905325	1.00729927
22	32.15	0.909090909	0.906077348	1.03333333
23	33.21	0.914285714	0.871428571	0.95384615
24	34.12	0.97826087	0.95412844	1.04854369
25	35.6	0.967741935	0.904761905	0.98148148
26	36.4	1.058823529	0.95	1
27	38.4	0.854166667	0.948148148	1.01333333
28	39.35	0.891089109	0.920353982	1.01923077
29	40.65	0.75739645	0.899082569	0.99099099
30	41.75	0.785714286	0.906976744	1.04545455
31	42.69	0.967741935	0.864864865	1.01098901
32	43.7	0.947368421	0.931506849	1.01449275
33	44.76	0.93989071	0.86631016	0.98765432
34	45.85	0.866242038	0.863636364	1.00689655
35	46.65	0.937931034	0.869109948	0.98684211

36	47.75	0.967213115	0.912280702	1.02666667
37	48.52	0.964912281	0.911392405	1.05797101
38	49.73	0.984615385	0.887573964	1.01408451
39	51.62	1.049180328	0.838235294	0.98113208
40	52.45	0.945054945	0.877192982	1.01282051
41	53.42	1.012345679	0.9	1.01694915
42	54.55	0.885057471	0.942028986	1.03649635
43	55.7	0.80952381	0.886075949	1.03496503
44	56.3	0.854460094	0.879518072	1.00636943
45	57.44	0.986013986	0.945812808	1.03286385
46	58.55	0.938967136	0.831050228	1
47	59.63	0.888888889	0.795454545	0.96969697
48	60.2	0.847457627	0.942528736	1.04444444
49	61.03	0.918367347	0.952380952	1.06024096
50	62.33	0.9375	0.941176471	1.01886792
51	63.65	0.888888889	0.962962963	1.01694915
52	64.72	0.884955752	0.825	0.98591549
53	65.05	0.914285714	0.93877551	1.07692308
54	65.99	0.891304348	1.03125	1
55	66.93	0.911392405	0.967741935	1.04761905
56	68.68	0.86746988	0.945454545	1.01639344
57	69.75	0.93220339	0.873015873	0.99047619
58	70.6	0.98630137	0.86	0.96103896
59	71.65	0.941935484	0.956989247	1.05555556
60	73.01	0.991596639	0.929824561	1
61	74.79	1.157894737	0.943396226	1
62	76.21	1.165644172	0.948905109	1.06995885
63	77.2	1.007874016	0.93877551	1.05109489
64	78.11	1.130434783	0.94972067	1.03571429
65	78.95	1.122807018	0.957983193	1
66	81.12	1.142857143	0.929032258	1.02702703
67	82.01	1.204819277	0.921348315	1.04878049
68	82.61	1.135135135	0.921465969	1.03370787
69	83.59	1.153846154	0.928229665	1.03664921
70	84.16	1.153846154	0.927272727	1.04568528
71	85.21	1.19760479	0.945205479	1.01449275
72	86.31	1.159574468	0.937238494	1.03773585
73	86.79	1.118181818	0.929824561	1.01408451

74	89.22	1.075268817	0.96875	1.02777778
75	91.01	1.191256831	0.954248366	1.01986755
76	91.6	1.214285714	0.943589744	1.02083333
77	92.29	1.128440367	0.948979592	1.02617801
78	93.46	1.182662539	1.073634204	0.95260664
79	94.71	1.191011236	0.930232558	1.0245614
80	95.16	1.19047619	0.936329588	1.01176471
81	96.12	1.238095238	0.931818182	1.03370787
82	97.09	1.204081633	0.937142857	1.03488372
83	218.33	0.88372093	0.844444444	0.88372093
84	219.3	1.054794521	0.970414201	1.05660377
85	220.65	1.08974359	1.007751938	0.97810219
86	222.21	1.119047619	1.045454545	0.96
87	223.47	1.112426036	1.039106145	1.04
88	223.75	1.068181818	1.033333333	1.02247191
89	224.3	1.096774194	1.046153846	1.03589744
90	225.1	1.074285714	1.012820513	1.16296296
91	227.95	0.985507246	0.979381443	1.05357143
92	235.1	1.171428571	1	0.95652174
93	255.9	0.995305164	1.047619048	0.96803653
94	257.69	1.100478469	1.031055901	0.90697674
95	259.83	0.948207171	1.02970297	1.03780069
96	260.9	1.037288136	0.980810235	1.0657277
97	262.13	1.16	1.021671827	1.01547988
98	263.05	1.089361702	1.025641026	1.04761905
99	264.91	1.064935065	1.026819923	1.02661597
100	265.9	1.071942446	1.035502959	1.00869565
101	266.75	1.103896104	1.016129032	1.02949062
102	268.35	1.16967509	1.037267081	0.99697885
103	269.78	1.36	1.018181818	0.97095436
104	271.21	1.071942446	1.004716981	1.05134474
105	272.37	1.168141593	1.041474654	0.94957983
111	274.54	1.186046512	1.027586207	1.00996678
112	276	1.177865613	1.029411765	1.03303303
113	281.91	1.132867133	1.022988506	1.02005731
114	284.25	1.175384615	0.98405467	1.02884615
115	290.71	1.159090909	1.021406728	1.02719033
116	294.5	1.094972067	0.970149254	1.07258065

117	297.57	1.184357542	1.030674847	0.94972067
118	298.33	1.142857143	1.026217228	1.00363636
119	299.1	1.179012346	1.022727273	0.93069307
120	301.34	1.203084833	0.977412731	1.03375527
121	303.11	1.185714286	1.023569024	0.99363057
122	304.9	1.176029963	1.025270758	0.98639456
123	306.53	1.144781145	1.038869258	0.96732026
124	309.25	1.186046512	1.015503876	0.98168498
125	310.79	1.169354839	1.028368794	1.00348432
126	311.17	1.129251701	1.032258065	0.9968652
127	335.16	1.160409556	1.035460993	0.94230769
128	335.96	1.157024793	1.049180328	0.95849057
129	337.9	1.219123506	1.011583012	0.99628253
130	339.08	1.158576052	1.048543689	1.03255814
131	339.94	1.186046512	1.033962264	0.98932384
132	341.56	1.184466019	1.027027027	1.0183727
133	343.18	1.159090909	1.032258065	1.00940439
134	344.25	1.145985401	1.040935673	1.02325581
135	345.4	1.186046512	1.04109589	1
136	347.81	1.247706422	1.022026432	0.98734177
137	348.62	1.14893617	1.019607843	1.01935484
138	350.1	1.095588235	1.029411765	1.04624277
139	350.91	1.097902098	1.040431267	1.03448276
140	352.71	1.116959064	1.02617801	1.01728395
141	353.46	1.05785124	1.033492823	0.97272727
142	355.11	1.078066914	1.034246575	0.99672131
143	357.29	1.042372881	1.030042918	0.95967742