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SHALLOW STRATIGRAPHIC DRILLING IN
THE MUNMARLARY AREA, ALLIGATOR RIVERS REGION, NT, 1978

by

D.A. WALLACE

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ABSTRACT

Shallow stratigraphic drilling in the Culaly Plain 12 km north of Munmarlary homestead intersected a sequence, possibly more than 2000 m thick, of dolostone, dolomitic schist, and minor pelite belonging to the lower member of the Cahill Formation (Early Proterozoic). Cainozoic laterite, sand, and clay overlie the Lower Proterozoic basement to an average depth of 50 m.

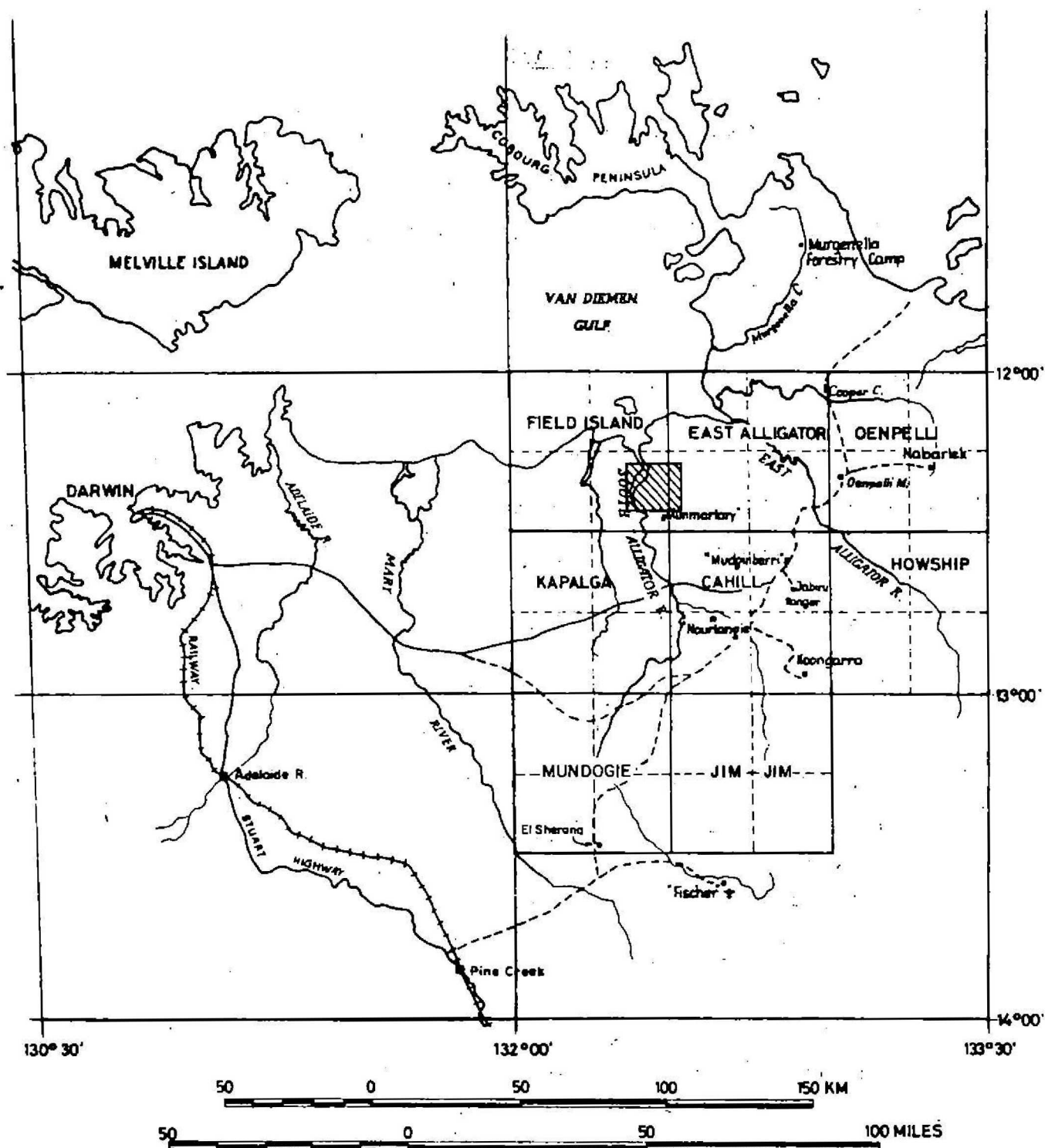
The lithological character, thickness, and metamorphic grade (lower greenschist facies) of the Munmarlary rocks are similar to those of the lower member of the Cahill Formation in the Kapalga area.

The Munmarlary rocks were deposited as a series of silts, marls, and carbonate in a shallow-marine environment to the west of the Nanambu Complex. Stratigraphic correlatives to the east of the Nanambu Complex at Mount Basedow and Jabiru were, in contrast, laid down in a restricted or sabkha type of environment.

When compared to their Mount Basedow and Jabiru correlatives the Munmarlary and Kapalga rocks are:

- (a) characterised by a higher proportion of carbonate (dolomite) relative to terrigenous sediments
- (b) lacking in carbonaceous material and pseudomorphs after evaporite minerals
- (c) of lower metamorphic grade.

No uranium mineralisation was intersected. The apparent restriction of uranium mineralisation to the eastern side of the Nanambu Complex may be related to differences in depositional environment and metamorphism.



LEGEND

FIELD ISLAND

1:100 000 sheet area



Area covered in Fig. 2

Fig. 1 LOCALITY MAP

INTRODUCTION

A programme of shallow stratigraphic drilling in the Alligator Rivers Uranium Field was carried out in 1978 by a BMR drilling crew in the East Alligator and Field Island 1:100 000 Sheet areas (Fig. 1). The crew was led by A. Zoska. Eighteen holes, drilled by a Mayhew 1000 rotary rig, were completed between July and September 1978.

Drilling was confined to an 11-km east-west traverse across the Culaly Plain about 12 km north of Munmarlary homestead and airstrip. The locations of rotary holes described in this report are shown in Fig. 2. Previous rotary percussion and auger drilling carried out in the East Alligator and Field Island 1:100 000 Sheet areas has been described by Needham & others (1975) and Needham (1976).

SYNOPSIS OF GEOLOGY

The East Alligator and Field Island 1:100 000 Sheet areas were mapped at semi-detailed scale between 1971 and 1973 (Needham & Smart, 1972; Needham & Stuart-Smith, 1978). Figure 2 is a geological sketch map of the area covered in this report; Archaean and Proterozoic stratigraphic units covered are shown in Table 1.

In the East Alligator 1:100 000 Sheet area, east of the East Alligator River, Early Proterozoic amphibolite-grade metasediments of the Cahill Formation unconformably mantle an Archaean-Early Proterozoic gneiss dome, the Nanambu Complex. The Cahill Formation is a dominantly quartzofeldspathic, micaceous, metasedimentary succession whose lower member, host to the major uranium deposits of the Alligator Rivers Uranium Field, is distinguished by the presence of dolomitic, calcareous, and carbonaceous sequences (Needham & Stuart-Smith, 1976). The Munmarlary Quartzite, a thin psammitic unit underlying the Cahill

Formation in places, is exposed only as isolated outcrops adjacent to the western margin of the Munmarlary Mass of the Nanambu Complex which it unconformably overlies.

In the Field Island 1:100 000 Sheet area the only Early Proterozoic rocks exposed are isoclinally folded psammitic metasediments of the Mount Hooper Sandstone which crop out as a scattered series of strike ridges and rubbly rises. The Mount Hooper Sandstone is a time-stratigraphic equivalent of the upper member of the Cahill Formation which is overlain further south by chert-nodular and chert-banded siltstone, phyllite, and dolostone of the Koolpin Formation.

The Proterozoic rocks of the East Alligator and Field Island 1:100 000 Sheet areas are mostly covered by a thick blanket of Cainozoic and Mesozoic deposits and extensive recent alluvium of the South Alligator and East Alligator River flood plains.

More detailed descriptions of the regional geology of the area are incorporated in the 1971 (Needham & Smart, 1972) and 1973-76 (Needham & Stuart-Smith, 1978) progress reports of the Alligator River Party.

AIM OF THE DRILLING

Needham & Stuart-Smith (1976) suggested that the South Alligator River flood plain conceals pelitic strata of the Koolpin Formation, then thought to be transitionally equivalent to the Cahill Formation. Later work showed that a thick carbonate sequence under the South Alligator River flood plain was not the Koolpin Formation but probably a correlative of the lower member of the Cahill Formation; the overlying Mount Hooper sandstone was interpreted as a correlative of the upper member of the Cahill Formation (Stuart-Smith, 1977; Needham & others, 1977).

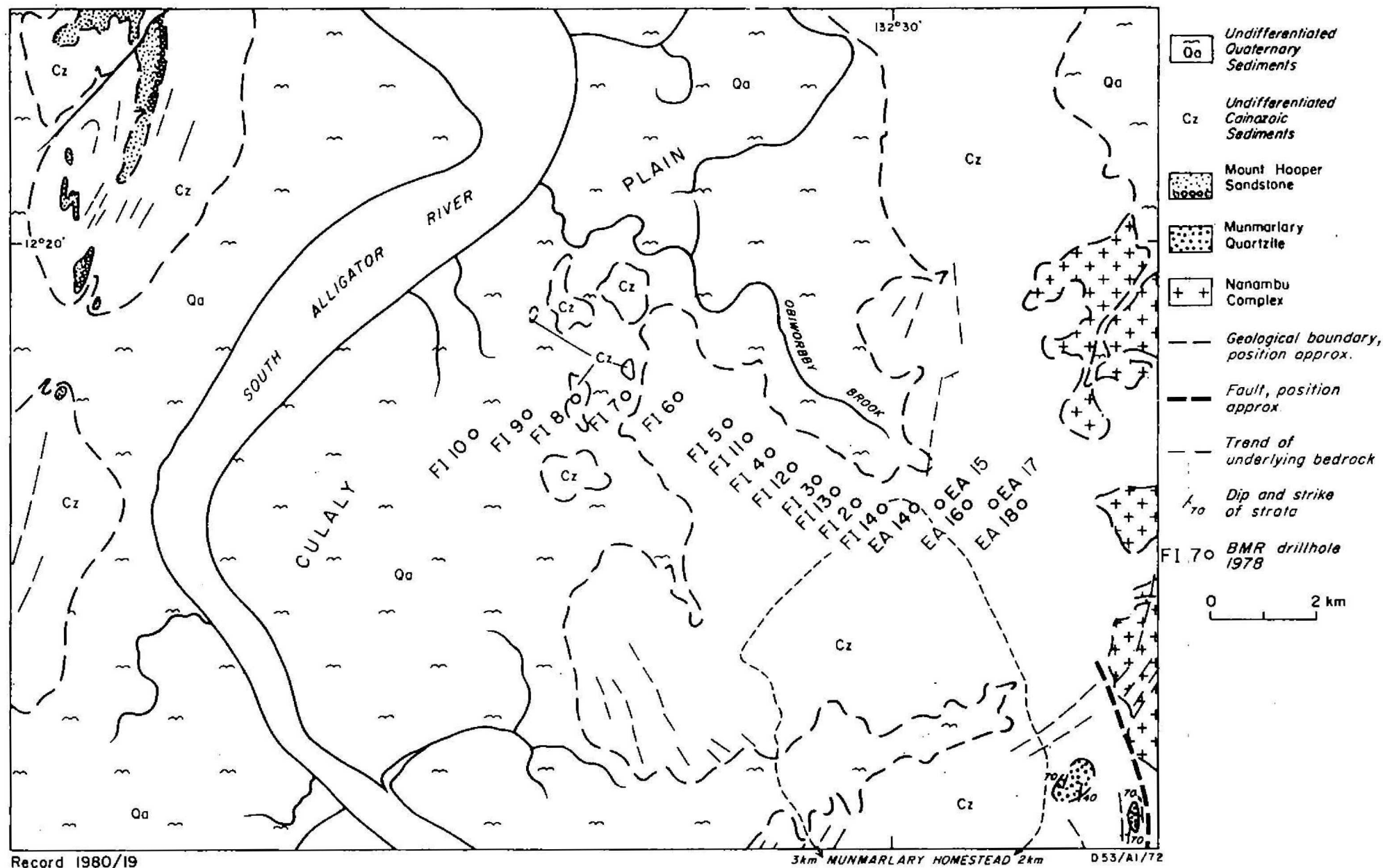


Fig.2 Generalised geology and drillhole locations, Munmarlary area

TABLE 1. ROCK UNITS MENTIONED IN THIS RECORD

UNIT	LITHOLOGY	THICKNESS	RELATIONSHIPS
KOOLPIN FORMATION	Siltstone with chert bands and nodules, phyllite, carbonaceous shale, dolomite, siltstone.	100-300 m	Unconformably overlies Mount Partridge Group
MOUNT HOOPER SANDSTONE	Feldspathic quartzite, quartzite, siltstone, phyllite, chert-pebble conglomerate.	5000 m	Unconformably overlies Cahill Formation, lower member
CAHILL FORMATION, lower member	Dolostone, hematitic quartz-mica schist, feldspathic quartz dolostone, micaceous quartz-dolomite-schist, calcareous mica-quartz schist, feldspathic quartzite.	At least 2000 m	Unconformably overlies Nanambu Complex and in places Munmarlary Quartzite.
MUNMARLARY QUARTZITE	Feldspathic arenite, quartzite, biotite-quartz schist.	200-400 m	Unconformably overlies Nanambu Complex
NANAMBU COMPLEX	Leucocratic gneiss, biotite gneiss, granite, schist.		Basement, containing Archaean granite and gneiss, together with metamorphosed, partly differentiated, Early Proterozoic material

TABLE 2. MUNMARLARY DRILL HOLE DATA 1978

No. of holes	Total depth (m)	Average depth (m)	Max depth (m)	CORE			
				No. of cores	Total length (m)	Average length (m)	Max length (m)
18	1442.8	80.2	150.9	15	12.22	0.87	1.52

The 1978 drilling traverse north of Munmarlary was designed to:

- (a) test the continuity of the lower member of the Cahill Formation below the South Alligator flood plain
- (b) determine its lithology and compare it with its correlatives in other areas
- (c) determine the depositional environment
- (d) define its metamorphic grade
- (e) assess the uranium potential

BMR DRILLING PROGRAM

Of the eighteen holes drilled (Fig. 2), five (EA14-18) were located in the East Alligator 1:100 000 Sheet area and the remainder (FI2-14) in the adjoining Field Island 1:100 000 Sheet area. Holes were drilled to an average depth of 80.2 m with a maximum depth of 150.9 m (Table 2). EA14-18 were spaced at 500-m intervals and FI2-10 at 1-km intervals. Holes FI11-14 were later drilled at 500-m intervals between the series EA14 to FI15. It was originally planned to drill more holes westwards beyond FI10 but this had to be abandoned owing to wet ground.

METHODS

Holes were typically begun with a 7 3/8-inch (18.73-cm) diameter roller bit and cased to 6 m (20 ft). A 4 1/2-inch (11.43-cm)-diameter 'Hawthorne' tungsten bit or roller bit was then used until fresh rock was reached. Fresh rock was cored with $3\frac{15}{16}$ -inch (10-cm)-diameter diamond or tungsten bits yielding 2 1/2-inch (6.35-cm) diameter cores.

Fourteen cores were obtained with an average length of 0.87 m and a maximum length of 1.52 m. Core recovery was mostly 100 percent although some samples were broken. Cuttings were collected initially at

3-m (10-ft) intervals and later at 4.5-m (15-ft) intervals. No geophysical logging was carried out.

DRILLING RESULTS

Drillhole logs for the eighteen holes are given in Appendix I.

Cainozoic

Lower Proterozoic basement rocks in the area of the drill traverse are concealed by unconsolidated to partly consolidated Tertiary and Quaternary sand, silt, clay, and gravel. The thickness of the Cainozoic cover averages 50 m (Fig. 3). A thick Cainozoic weathering profile, ~~is~~ recognised further south by Stuart-Smith (1977), consists of three distinctive zones - ferricrete capping, mottled zone, and pallid zone.

The ferricrete capping (Koolpinyah Surface) is about 5 m of concretionary or pisolitic laterite and ferruginised red silty clay, which includes quartz gravel and fragments of Cretaceous sandstone. A mottled zone of red, yellow, and grey clay usually underlies the laterite surface for several metres before grading into clay of the pallid zone, the most extensive sediment type in the Cainozoic profile. Pallid-zone clays are mostly limonitic, typically yellow, and less commonly white, grey, or brown. Calcareous sandy and silty lenses are present throughout the pallid zone together with angular to rounded fragments of milky quartz; some chips of grey carbonate and plant remains are also present. Thin quartz gravels usually form basal beds overlying the basement rocks.

Lower Proterozoic

Proterozoic rocks form an undulating basement below the Cainozoic sediments of the Culaly Plain. The depth to basement is greatest (up to 146 m) between drill holes FI14 and FI4 and shallowest

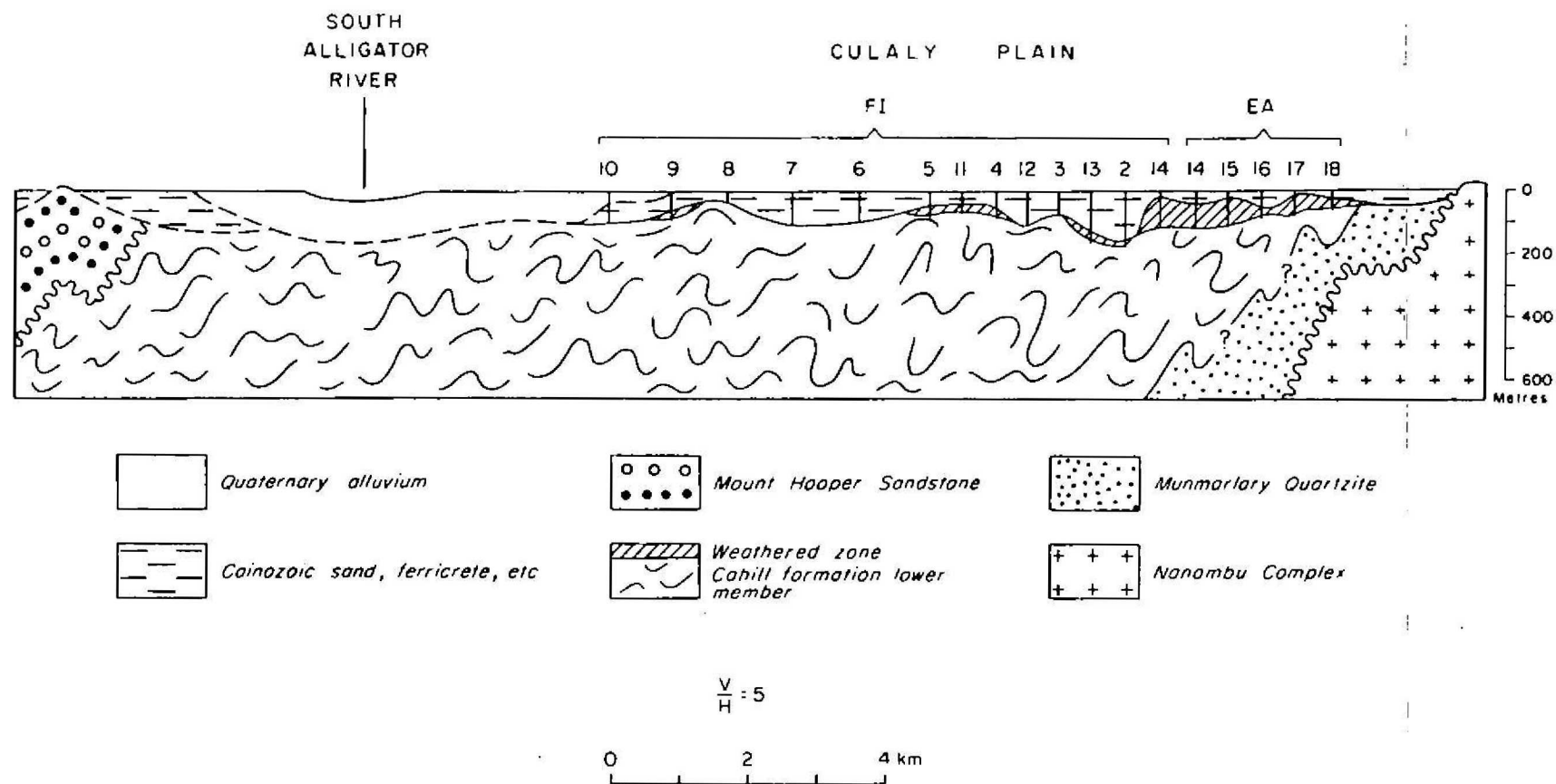


Fig. 3 Schematic cross-section along 1978 Drill Traverse, Munmarlary Area, East Alligator (EA) and Field Island (F1) 1:100,000 sheet areas, showing Projected Positions of Drill Holes EA 14-18 and F1 2-14

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(down to 21 m) above a 'shelf' between FI14 and EA18 about 3 km west of the margin of the Nanambu Complex (Fig. 3).

The basement is weathered to an average depth of 50 m along this shelf, contrasting markedly with a thinner (6 m) weathering profile along the remainder of the section.

Of the fourteen cores recovered, twelve (FI2, 4, 5, 8, 9, 11, 13, 14; EA14, 15, 16, 17) intersected either impure dolostone or dolomitic schist, and two (FI3 and EA18) intersected feldspathic quartzite and quartz-feldspar-biotite schist respectively. These rock types probably all belong to the Cahill Formation. Rock types typical of the Nanambu Complex, Munmarlary Quartzite or Mount Hooper Sandstone were not intersected.

Biotite schist and ferruginous pelitic dolostone are the typical rocks of the deeply weathered 'shelf', and impure dolostone is predominant in the less weathered rocks intersected further to the west. The contrasting weathering profile possibly results from greater susceptibility to weathering, because of the permeable fabric of the older schistose rocks, compared with the more massive and impermeable carbonate.

The carbonate rocks are essentially quartz dolostones containing variable amounts of feldspar and mica, and accessory tourmaline, rutile, sphene, monazite, zircon, and clays (Table 3). The rocks are massive to schistose, depending on the proportion of dolomite to pelitic minerals.

Texturally the dolomitic rocks comprise fine to coarsely granoblastic carbonate which is commonly polygonal. Strained quartz is either disseminated within the carbonate mosaic or is present as

TABLE 3 THIN-SECTION DESCRIPTIONS, CAHILL FORMATION

Drill Hole No.	BMR Number	Descriptions
FI2	78120001	<u>Feldspathic quartz dolostone</u> Coarse granoblastic polygonal carbonate mosaic with scattered grains of K-feldspar, aggregates of quartz and small rare flakes of muscovite. Traces of detrital tourmaline and rutile.
FI3	78120002	<u>Feldspathic quartzite</u> Granoblastic quartz mosaic including xenoblasts of coarser quartz and sericitised feldspar. Rounded detrital grains of tourmaline, microcline and albitic plagioclase.
FI4	78120003	<u>Muscovite-quartz dolostone</u> Well-developed granoblastic polygonal carbonate mosaic with patches of coarser twinned rhombic carbonate and recrystallised quartz. Small disseminated flakes of muscovite.
FI5	78120004	<u>Muscovite-quartz dolomitic schist</u> Schist aggregate of crenulated lepidoblastic muscovite and phlogopite within a banded mosaic of quartz and granoblastic carbonate. 40% pelitic.
FI6	78120005	<u>Muscovite-quartz dolostone</u> Well-developed granoblastic polygonal carbonate mosaic with patches of coarser twinned rhombic carbonate and recrystallised quartz. Small disseminated flakes of muscovite (throughout the fabric).
FI9	78120006	<u>Feldspathic quartz dolostone</u> Finely granoblastic carbonate with bands and xenoblasts of recrystallised quartz and large rounded grains of microcline.
FI9	78120007	<u>Feldspathic quartz dolostone</u> Well developed granoblastic polygonal carbonate mosaic with patches of coarser twinned rhombic carbonate and recrystallised quartz. Small disseminated flakes of muscovite (throughout the fabric).
FI11	7812009	<u>Feldspathic quartz dolostone</u> Coarse granoblastic polygonal carbonate mosaic with scattered K-feldspar, aggregates of quartz and rare small flakes of muscovite. Traces of detrital tourmaline and rutile.

TABLE 3 (contd)

Drill Hole No.	BMR Number	Descriptions
FI12	7812009	<u>Mica-feldspar-quartz dolostone</u> Granoblastic carbonate with scattered xenoblasts of quartz crowded with opaque inclusions. Phlogopite present in thin parallel bands. Trace zircon.
FI13	78120010	<u>Feldspathic quartz-mica dolostone</u> Granoblastic carbonate and lepidoblastic phlogopite with patches of recrystallised quartz and disseminated K-feldspar. Pelitic component about 10%.
FI14	78120011	<u>Feldspathic quartz-mica-dolomite schist</u> Foliated granoblastic carbonate-quartz mosaic with thin bands of lepidoblastic mica. Rare detrital grains.
EA14	78120012	<u>Micaceous feldspar-quartz dolostone</u> Granoblastic polyhedral carbonate prominent twinned dolomite. Scattered K-feldspar contains numerous inclusions of small muscovite flakes. Sodic feldspar partly sericitised. Lepidoblastic small phlogopite and muscovite laths throughout.
EA15	78120013	<u>Quartz-feldspar dolostone</u> Granoblastic mosaic of carbonate, strained quartz and K-feldspar, with traces of phlogopite and sericitised plagioclase.
EA16	78120014	<u>Micaceous feldspar-quartz dolostone</u> Granoblastic carbonate, quartz and K-feldspar, sericitised sodic plagioclase, K-feldspar crowded with tiny flakes of muscovite. Traces of sphene. Accessory tourmaline.
EA17	78120016	<u>Chloritised calcareous quartz-mica-dolomite schist</u> Crowded crenulated biotite flakes within a granoblastic polyhedral carbonate-quartz mosaic; biotite is mostly retrogressively chloritised.
EA18	78120017	<u>Quartz-feldspar-mica schist</u> Bands of alternating fine to coarse recrystallised quartz and crowded small laths of lepidoblastic phlogopite and biotite. Well developed crenulated schistose texture.
EA18	78120018	<u>Quartz-feldspar-mica schist</u> Crowded crenulated biotite flakes within a granoblastic polyhedral carbonate-quartz mosaic. Biotite is mostly retrogressively chloritised.

discrete bands and xenoblasts. Mica is usually lepidoblastic, and feldspars and accessory minerals appear to be predominantly detrital.

XRD analyses (Table 4) of micas and clay minerals indicate a decreasing ferromagnesian mineral content westwards away from the Nanambu Complex and towards the upper part of the succession. Phlogopite and chlorite are characteristic of cores recovered from holes EA14-18, but further west micas and clays are more potassic, as indicated by the presence of muscovite, kaolinite, and illite in most samples. In a sample from EA17 phlogopite has been retrogressively altered to chlorite.

Feldspars from cores EA14-18 also include a higher proportion of albitic plagioclase relative to potassium feldspar (microcline, and possibly also orthoclase) than core from the western section of the traverse.

CONCLUSIONS

Stratigraphy

The Munmarlary drilling traverse, sampling 11 km across the regional strike of the Cahill Formation intersected a folded and metamorphosed sequence of dolostone and dolomitic schist, possibly over 2000 m thick, overlying about 200 m of pelitic schist. The stratigraphic sequence can be summarised as:

- (a) impure dolostone with minor interbedded pelite of a more potassic character (from FI10 southeast to FI14), overlying
- (b) dolostone with up to 50 percent interbedded ferruginous pelite (EA14-17), overlying
- (c) quartz-Na feldspar-K feldspar-biotite schist (EA18).

MINERALOGY OF DRILL CORE SAMPLES DETERMINED BY X-RAY DIFFRACTION

TABLE 4.

Hole	BMR Sample No	QTZ	DOL	Cct	KFsp	PLAG	MUSC	PHLOG	BIOT	CLAYS CHL + MICA	KAOL	ILL	CHL	Rock Type
FI 9	7812006a	XXX	XXXX		XXXX						X	X		feldspathic Qtz dolostone
FI 9	006b	XXXX	XXXX		XXX						X	X		" "
FI 9	007	XXX	XXXX		XXX	XXXX		X			X			" "
FI 8	005	XXX	XXXX				XXXX	X						musc Qtz dolomite schist
FI 5	004	XXXX	XXXX				XXX	?					XX	musc Qtz dolomite schist
FI 11	008	XXX	XXXX		?	XXXX		X					X	feldspathic Qtz dolostone
FI 4	003	XXXX	XXXX				XXX							musc-Qtz-dolomite
FI 12	009	XXXX	XXXX		XX	XXX		XXX			X			mica-fspr-Qtz dolostone
FI 3	002	XXXX			XXX		X				X			feldspathic quartzite
FI 13	010	XX	XXXX		XXX		XX	XXXX						feldspathic-Qtz-mica dolostone
FI 2	001	XXXX	XXXX		XXX	?	XXX				X			feldspathic Qtz dolostone
FI 14	011	XXX	XXXX		XXXX		XXX	XXX					X	feldspathic Qtz-mica dolomite schist
EA 14	012	XXX	XXXX		XXXX	XXX		XXX					X	mic-fspr-Qtz dolostone
EA 15	013	XXX	XXXX		XXXX	XXX		X						Qtz-fspr dolostone
EA 16	014	XXX	XXXX		XXXX	XXX		XXX					X	mic-fspr-Qtz dolostone
EA 17	015	XXX	XXXX	XXX	XXX	XXX		XXXX						calc-Qtz-mica-fspr dolostone
EA 17	016a	XX	XXXX	XXX				X		XXX			XXXX	chloritised calc-Qtz-mica dolomite schist
EA 17	016b	XXXX	XXX	XXXX				X		XXX			XXX	" "
EA 18	017	XX			XXX	XXX		XXXX						Qtz-fspr-mica schist
EA 18	018	XXX			XXX	XXX		XXXX	XXX					" "

XXXX - Most abundant; XXX - Less abundant; XX - Minor amount; X - Trace amount.

Analyst - G.W.R. BARNES.

These rocks overlie the Munmarlary Quartzite, which forms isolated low ridges at the western margin of the Nanambu Complex, and underlie the Mount Hooper Sandstone (correlative of the upper member of the Cahill Formation), which is exposed in steep westerly-dipping ridges further west across the South Alligator River (Fig. 2). The stratigraphic position of the rocks therefore supports previous conclusions that the rocks below the Culaly Plain belong to the lower member of the Cahill Formation (Stuart-Smith, 1977). As the Munmarlary Quartzite was not intersected, the nature of its contact with the Cahill Formation was not ascertained. However, there is a marked contrast between the quartzofeldspathic sediments of the Munmarlary Quartzite and the typically chemical sediments of the lower member of the Cahill Formation.

Further drilling to the west would be required to determine the lithological character of the complete sequence underlying the South Alligator floodplain below the Mount Hooper Sandstone.

Lithology

Compared lithologically with other areas, e.g. Jabiru, Mount Basedow, and Kapalga, the lower member of the Cahill Formation in the Munmarlary and Kapalga areas is characterised by a thick sequence of predominantly dolostone and minor terrigenous sediments.

In the Mount Basedow and Jabiru areas the formation is thinner and dolostone minor (lenses or beds up to 300 m thick) whilst associated pelitic and psammitic rocks are from 300 m (Mount Basedow) to 700 m (Jabiru) thick.

Carbonate from the Jabiru area is in places coarsely crystalline and contains pseudomorphs after evaporitic minerals (Crick & Muir, 1979).

Stromatolites have also been tentatively identified in the Jabiru area (Needham & Stuart-Smith, 1976). In contrast, dolomite from the Munmarlary and Kapalga areas is fine and even-grained and does not contain pseudomorphs after evaporitic minerals or stromatolitic structures (I.H. Crick, personal communication).

Pyritic, carbonaceous, amphibole-mica schist predominates in the Mount Basedow area; the more common terrigenous rocks in the Jabiru area are feldspathic schist, feldspathic quartzite, para-amphibolite and mica-quartz schist. Interbedded carbonaceous material is also present to some extent in these areas as well as localised retrogressive chloritisation of ferromagnesian minerals. No carbonaceous material was identified in Munmarlary drill core, and pervasive chloritisation of biotite was found in only one sample (EA17), at the eastern end of the traverse.

Environment of deposition

Cahill Formation sediments were deposited during the first stage in the development of the Pine Creek Geosyncline, when rifting and subsidence of Archaean basement formed the South Alligator Trough and Kakadu Shelf (Stuart-Smith et al., 1979). The major structures controlling sedimentation in the Munmarlary area at this stage were the Archaean Nanambu High, the South Alligator Hinge Zone, and the South Alligator Trough.

The lithological character and thickness of the lower member of the Cahill Formation in the Munmarlary area indicate that the sediments were deposited as a sequence of silts, marls, and carbonate in a shallow marine environment (South Alligator Trough). The formation is a mixture of chemical and terrigenous sediment, the latter being derived from the Nanambu Complex to the east. Marginal deposits of the South Alligator

Trough are represented in the area by the quartzofeldspathic arenites and minor argillites of the underlying Munmarlary Quartzite.

The greater thickness of carbonate and the relative absence of carbonaceous rocks in the lower member of the Cahill Formation on the western side of the Nanambu Complex indicate a substantially different depositional environment in this area compared to other areas. Rather than the restricted or sabkha environment advocated for the lower member of the Cahill Formation elsewhere by Needham & Stuart-Smith (1976) and Crick & Muir (1979), the environment on the western side of the Nanambu Complex was probably deeper and open to the central part of the Pine Creek Geosyncline further west. Such an environment could be envisaged during the early stages of development of the geosyncline, when the Nanambu Complex may have formed the western part of the shallow Kakadu Shelf which was marginal to the deeper central South Alligator Trough.

Metamorphic grade

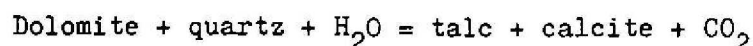
The persistent association of quartz and dolomite throughout the carbonates places these rocks within the field of lower greenschist facies metamorphism.

The main mineral parageneses in the core samples are:

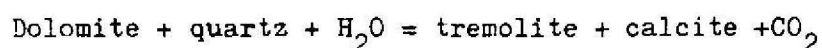
- (a) Quartz + dolomite $\pm$ K-feldspar $\pm$ Na-plagioclase $\pm$ muscovite $\pm$ phlogopite $\pm$ kaolinite $\pm$ illite
- (b) Quartz + dolomite + Na-plagioclase + phlogopite $\pm$ chlorite
- (c) Quartz + K-feldspar + Na-plagioclase + phlogopite

Within the P-T range of greenschist facies, quartz and dolomite are eliminated by either of the following reactions (Fig. 4):

- (1) In the presence of H_2O :



(2) With relatively less H_2O and higher CO_2 :



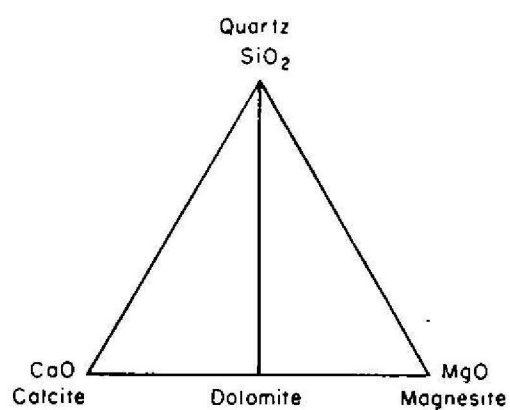
Neither talc nor tremolite were identified in any of the samples, and calcite was present only in EA17, as a primary mineral.

A further indicator of low metamorphic grade is implied by the presence of clay minerals in some of the assemblages, e.g. the reaction kaolinite + quartz = pyrophyllite + H_2O takes place within the range $390^\circ C/2000 \text{ bars } H_2O - 415^\circ C/11\,000 \text{ bars } H_2O$ (Winkler, 1967). This range is close to the lower boundary of greenschist facies metamorphism.

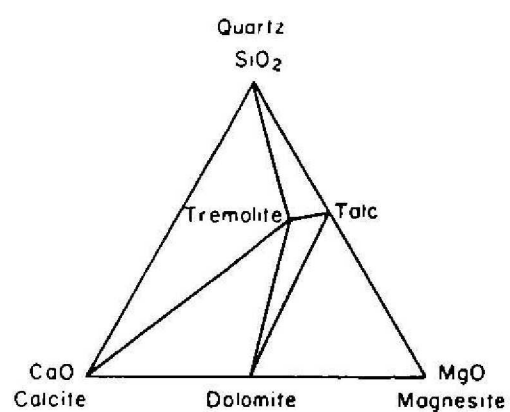
Core from hole EA18 has the mineral assemblage given in (c) above and is the only non-carbonate sample. The absence of cordierite or andalusite indicates that its metamorphic grade is also within the greenschist facies field.

The persistence of greenschist facies metamorphic mineral assemblages close to the Nanambu Complex in the Munmarlary area indicates that the greenschist/amphibolite isograd (Ferguson, 1979) is slightly further east in the Nanambu Complex; this is in contrast to the Kapalga area where the isograd lies within the Cahill Formation about 1300 m west of the Nanambu Complex (Stuart-Smith, 1977).

The mineral assemblages indicate an intermediate grade between low-grade meta-sediments of the Field Island 1:100 000 Sheet area and the amphibolite-facies rocks of the Nanambu Complex. This is consistent with an eastwards gradational increase in metamorphic grade observed elsewhere on the western margin of the Nanambu Complex (Stuart-Smith 1977; Needham & others, 1979).



①



②

Fig. 4 Paragenesis of siliceous carbonate rocks:- ① Prior to metamorphism, ② after metamorphism at conditions of the greenschist facies (From Winkler, 1967).

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Record 1980/19

Uranium potential

In the Alligator Rivers Uranium Field all the major deposits and most of the minor occurrences of uranium are stratabound within the lower member of the Cahill Formation (Needham & Stuart-Smith, 1976). Uranium mineralisation is mainly in breccia zones in carbonaceous, chloritised, amphibolite-grade pelitic rocks adjacent to massive carbonates which have replaced supratidal evaporite deposits (Needham & Roarty, 1979; Crick & Muir, 1979). No uranium mineralisation was intersected, or is known within the Cahill Formation on the western side of the Nanambu Complex. Discoveries to date have been along the eastern margin of the complex, within a belt of Cahill formation downfolded in the complex. This may reflect the difficulties in exploring below the extensive Quaternary deposits of the South Alligator River floodplain on the western side of the Nanambu Complex or, more probably, real differences in the character of the Cahill Formation on the western side of the Nanambu Complex compared with elsewhere in the Alligator Rivers Uranium Field.

The Cahill Formation sequence west of the Nanambu Complex contains only very minor carbonaceous rocks, has a low metamorphic grade, and lacks pervasive chloritisation and evaporite minerals within carbonate - an association considered by some to be relevant to the genesis and location of Alligator Rivers-type uranium deposits (Needham & Roarty, 1979). The lack of uranium mineralisation west of the Nanambu Complex probably reflects differences in the depositional environment, rock types, and metamorphic grade of the Cahill Formation.

ACKNOWLEDGEMENTS

The helpful advice and assistance given by R.S. Needham and P.G. Stuart-Smith is gratefully acknowledged.

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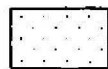
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APPENDIX 1

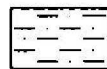
DRILL HOLE GEOLOGICAL LOGS



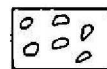
Sand, silt



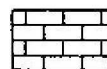
White clay



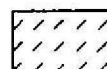
Limonitic clay



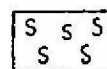
Quartz gravel



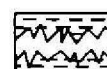
Carbonate



Plant material



Schist



Intervening core the same
as that above and below

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: S. ALLIGATOR RIVER

HOLE NO. BMR EA 14

CO-ORDINATES 12° 17' 10" 132° 30' 27" N.L. 000000

LOCATION: EAST ALLIGATOR 1:100,000 SHEET AREA

DEPTH ft	CHANGES LOG CORRECTED INTERVAL	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Ferruginous nodules, lateritic clay	
20		White silty clay	
30		Unconsolidated white calcareous clay, quartz fragments up to 1 cm	
40		fine buff sand	
50		Sandy white clay	
60		white carbonate clay	
70		limonitic micaceous silty clay	
80		limonitic micaceous silty carbonate clay, rare decayed plant material	
90		limonitic white clay, minor ferruginous silt	
100		limonitic clay, decayed plant material	
110			
120			
130			
140			
150			

HOLE NO. TYPE	EXPLANATION	HEAD OFFICE
BMR EA 14	CORRECTION IN HOLE DURING DRILLING	LOGGED BY DAW
DRAWN BY A. Z. Z. Z.	REFERENCES	DRAWN BY DAW
CHECKED BY		CHECKED BY
COMPLETED		SHEET 1 OF 2
		DRAWING BY

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: SALLIGATOR RIVER

HOLE NO. BMR EA 14

CO-ORDINATES 17°10' 132°30' 27"

D.L. 60000

LOCATION EAST ALLIGATOR 1: 100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		limonitic clay, decayed plant remains	
180			
190		quartz-mica schist, quartz gravel	
200			
210		Sand, milky quartz, mica schist fragments	
220			
230		quartz-mica schist, milky quartz gravel	
240		chloritised mic. feldspar quartz dolomite	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <i>Maynes 1000</i>	CASING IN HOLE DURING DRILLING	LOGGED BY <i>JTW</i>	
DRILLER <i>A. Zosher</i>	REFERENCES	DRAWN BY <i>JTW</i>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET <i>2</i> OF <i>2</i>	
		DRAWING NO.	

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: S. ALLIGATOR RIVER REMARKS: _____
 HOLE NO. DMR EA 15 CO-ORDINATES: 2° 17' 14" N 131° 30' 43" W N.L. GROUP: _____
 LOCATION: EAST ALLIGATOR 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		white silty clay, decayed organic material	
20			
30			
40		white clay, gray carbonate chips	
50			
60		mottled red/yellow calcareous clay	
70			
80			
90			
100		limonitic clay, clear angular to rounded quartz	
110			
120		limonitic white clay, fine fragments mica schist, milky quartz	
130			
140			
150			

↑ CAINOZOIC
L. PROT. ↓

DRILL NO. _____ TYPE <u>Mayfield 1000</u>	EXPLANATION CASSING IN HOLE DURING DRILLING	HEAD OFFICE LOGGED BY <u>D.K.U.</u> DRAWN BY <u>C.H.H.</u> CHECKED BY _____
DRILLER <u>A. Rowe</u> COMMENCED _____ COMPLETED _____	REFERENCES	SHEET <u>1</u> OF <u>3</u> DRAWING NO. _____

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR EA 15 CO-ORDINATES 12° 17' N 132° 30' W S.L. SQUAD
 LOCATION EAST ALLIGATOR 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORING INTERVALS	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		limonitic white clay, mica schist, milky quartz	
180			
190			
200		micaceous limonitic sandy clay, mica schist, milky quartz	
210			
220			
230			
240			
250		limonitic sandy clay, grey carbonate chips	
260			
270			
280		sand, angular to rounded quartz	
290			
300		limonitic clay, grey carbonate chips, quartz	
310		quartz mica schist, angular quartz, saccharoidal quartz	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Hand</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>DMF</u>	
DRILLER <u>DMF</u>	REFERENCES	DRAWN BY <u>DMF</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET <u>2</u> OF <u>3</u>	
		DRAWING NO.	

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE No. BMR EA 15 CO-ORDINATES 12° 17' 14" 132° 38' 43" R.L. GROUND
 LOCATION EAST ALLIGATOR 1,100,000 SHEET AREA

DEPTH	GEOPH. LOG	COMED INTERVALS	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
ft				
330	0 S		quartz mica schist, quartz	
340	0 S			
350	0 S			
	SEES		siliceous carbonate, chloritised mica quartz schist, quartz vein. Foliation 50° to core normal.	

DRILL No.	EXPLANATION	HEAD OFFICE	
TYPE <u>Auger</u>	CASING IN HOLE DURING DRILLING	LOGGED BY .....	.....
DRILLER <u>W. J. ...</u>	REFERENCES	DRAWN BY .....	.....
COMMENCED		CHECKED BY .....	.....
COMPLETED		SHEET	OF
		DRAWING No. ....	.....

GEOLOGICAL LOG OF DRILL HOLE

PROJECT SALLIGATOR RIVER REMARKS
 HOLE NO. BMR EA 16 CO-ORDINATES 12° 17' 14" N 132° 31' 0" W A.L. GROUND
 LOCATION EAST ALLIGATOR 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Fe-oxide pisolites, laterized clay	
20		Sandy white clay	
30		white clay	
40		white clay, decayed plant material	
50		white clay, saccharoidal quartz	
60			
70			
80		white clay	
90		Silty white clay, quartz fragments	
100		calcareous white clay, decayed plant material	
110		limonitic clay	
120		quartzose limonitic clay	
130			
140			
150			

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>WATER</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>...</u>	
DRILLER <u>...</u>	REFERENCES	DRAWN BY <u>...</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET <u>...</u> OF <u>...</u>	
		DRAWING NO.	

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: S. ALLIGATOR RIVER REMARKS:
 HOLE NO. BMR EA 16 CO-ORDINATES: 12° 17' 14" N 132° 31' 0" W R.L. SURFACE
 LOCATION: EAST ALLIGATOR 1: 100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		quartzose limonitic clay	
180			
190			
200		limonitic quartz-mica schist, clear quartz fragments	
210			
220			
230			
240		quartz, mica schist gravel massive micaceous silicified dolomite	
250			

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Auger</u>	CARRIED IN HOLE DURING DRILLING	LOGGED BY <u>...</u>	
DRILLER <u>R. Becker</u>	REFERENCES	DRAWN BY <u>...</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET	OF
		DRAWING NO.	

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT: S ALLIGATOR RIVER

HOLE NO: BMR EA 17 CO-ORDINATES: 12° 17' 10" N 152° 31' 47" E L. GROUP

LOCATION: EAST ALLIGATOR 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORRELATION	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10	⊙ ⊙	Fe oxidized pisolites, white clay	
20	⊙ ⊙	limonitic clay, micaceous sand, quartz	
30	⊙ ⊙		
40	⊙ ⊙	limonitic clay, angular quartz	
50	⊙ ⊙		
60	⊙ ⊙	limonitic clay pellets	
70	⊙ ⊙		
80	⊙ ⊙	chloritized mica schist	
90	⊙ ⊙		
100	⊙ ⊙		
110	⊙ ⊙	Sandy chloritized mica schist, angular quartz	
120	⊙ ⊙		
130	⊙ ⊙		
140	⊙ ⊙		
150	⊙ ⊙	fine micaceous sand	

DRILL NO. TYPE 11/14/14-1001	EXPLANATION CARDS IN HOLE DURING DRILLING	HEAD OFFICE	
DRILLER: A. Z. F. (S)	REFERENCES	LOGGED BY: [Signature]	DRAWN BY: [Signature]
COMMENCED: [Date]		CHECKED BY: [Signature]	
COMPLETED: [Date]		SHEET: [] OF []	DRAWING NO. []

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE No. BMR EA 17 CO-ORDINATES 12° 17' 10" N 152° 31' 47" W R.L. GROUND
 LOCATION EAST ALLIGATOR 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		fine micaceous sand	
180		weathered chloritized mica schist, small quartz fragments	
190		chloritized mica schist, grey crystalline carbonate chips	
200		chloritized schist, quartz	
210		calc. chloritized mica dolomite schist	
220			

DRILL No.	EXPLANATION	HEAD OFFICE	
TYPE <u>Handwritten</u>	CASING IN HOLE DURING DRILLING	LOGGED BY .....	.....
DRILLER <u>Handwritten</u>	REFERENCES	DRAWN BY .....	.....
COMMENCED		CHECKED BY .....	.....
COMPLETED		SHEET	OF
		DRAWING No .....	.....

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. OMR EA 18 CO-ORDINATES 12° 17' 19" 132° 3' 15" M.L. SURROUND
 LOCATION EAST ALLIGATOR 1:100,000 SHEET AREA

DEPTH	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10	② ② ② ②	Fe oxide pellets	
20		Soft white clay	
30			
40			
50			
60		White clay, angular quartz	
70			
80		mottled red/yellow clay, angular quartz	
90		mottled red/yellow clay, chloritized	
100		weathered schist.	
110			
200			
210			
220		Quartz-mica schist	

L. PROT. CAIN 02010

DRILL NO.	EXPLANATION	HEAD OFFICE
TYPE <u>Hand</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>...</u>
DRILLER <u>...</u>	REFERENCES	DRAWN BY <u>...</u>
COMMENCED		CHECKED BY
COMPLETED		SHEET <u>...</u> OF <u>...</u>
		DRAWING NO.

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. AMR F.I. 2 CO-ORDINATES 12° 17' 34" 132° 29' 57" N.L. 000000
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
0			
10		Ferricrete, limonitic clay	
20			
30		white clay	
40			
50			
60			
70			
80		mottled red/yellow clay	
90			
100			
110			
120			
130		Buff sandy clay	
140			
150		white clay	
160			
170		Quartzose white clay	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Auger, M.S.</u>	CASING IN HOLE DURING DRILLING	LOGGED BY .....	.....
DRAWN <u>P. J. Jones</u>	REFERENCES	DRAWN BY .....	.....
COMMENCED		CHECKED BY .....	.....
COMPLETED		SHEET	OF 3
		DRAWING BY .....	.....

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR FI 2 CO-ORDINATES 12° 17' 34" 132° 29' 37" R.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORING INTERVAL	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		Quartzose white clay	
180		White clay, decayed plant material	
190			
200			
210			
220			
230			
240			
250			
260			
270		limonitic white clay, quartzose in part	
280			
290			
300			
310			
320			
330			
340			
350			
360			
370			
380			
390			

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>1/2" (1/2" DIAMETER)</u>	CASING IN HOLE DURING DRILLING	LOGGED BY	
DRILLER <u>J. J. JONES</u>	REFERENCES	DRAWN BY	
COMMENCED		CHECKED BY	
COMPLETED		SHEET	OF
		DRAWING NO.	

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMA FI 2 CO-ORDINATES 17° 17' 34" N 132° 29' 37" W N.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
410			
420			
430			
440		Sandy limonitic white clay	
450			
460			
470			
480		felspathic quartz dolomite	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Aug. machine</u>	CASING IN HOLE DURING DRILLING	LOGGED BY	
DRILLER <u>W. J. J. J.</u>	REFERENCES	DRAWN BY <u>W. J. J.</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET	OF
		DRAWING IN	

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE No. BMR F13 CO-ORDINATES 12° 17' 57" N 152° 29' 04" W D.L. GROUP
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORE INTERVALS	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Ferricrete	
20		White sandy clay	
30			
40			
50		Coarse clayey sand, clear angular quartz	
60			
70			
80		mottled red/yellow clay, clear angular quartz increasing with depth.	
90			
100			
110			
120			
130			
140			
150		Quartz gravel	

DRILL No.	EXPLANATION	HEAD OFFICE	
TYPE <u>Hand</u>	CUTTINGS IN HOLE DURING DRILLING	LOGGED BY .....	.....
DRILLER <u>.....</u>	REFERENCES	DRAWN BY .....	.....
COMMENCED		CHECKED BY .....	.....
COMPLETED		SHEET	OF
		DRAWING No. ....	.....

GEOLOGICAL LOG OF DRILL HOLE

PROJECT SALIGATA RIVER REMARKS
 HOLE NO. BMR F13 CO-ORDINATES 12° 17' 37" 132° 29' N N.L. GROUP
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CASES INTERNAL	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		limonitic clay, clear angular quartz	
180			
190			
200		Quartz gravel	
210		micaceous quartz dolomite	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Hand auger</u>	CASES IN HOLE DURING DRILLING	LOGGED BY <u>...</u>	
DRILLER <u>...</u>	REFERENCES	DRAWN BY <u>...</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET <u>1</u> OF <u>1</u>	
		DRAWING NO.	

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR F.I. 4 CO-ORDINATES 12° 17' 53" N 152° 28' 43" W D.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	CHARGE LOG CORRECTION	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Fe-oxide pisolites white clay, clear/pink quartz, ferrihydrate	
20			
30			
40		Coarse sandy clay, clear quartz	
50			
60		Deoxygenated vegetation	
70			
80		limonite white clay, quartz	
90		Coarse sandy clay, large quartz pebbles	
100		weathered limonitic quartz-mica schist	
110		gray calcareous clay, quartz	
120		Sandy gravel of milky quartz, quartz-mica schist.	
130		quartz-veined mica and olivine schist	
140			
150			

L. PROT. CRINOID

SHEET NO. TYPE <u>Major Inverse</u> DRILLER <u>L. Z. Zeller</u> COMMENCED COMPLETED	EXPLANATION CHARGE IN HOLE DURING DRILLING REFERENCES	HEAD OFFICE LOGGED BY DRAWN BY CHECKED BY SHEET NO. OF DRAWING NO.
---	---	---

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR F15 CO-ORDINATES 12° 18' 09" N 132° 28' 17" W S.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Fe oxidised red silty clay	
20		mottled red/yellow clay	
30			
40			
50		limonitic white clay, angular quartz	
60			
70			
80		limonitic white clay	
90			
100			
110		white clay	
120			
130		Grey clay, angular quartz	
140			
150		Grey clay, milky quartz, mica schist	

L.P. NOT CRINOZOIC

DRILL NO.	EXPLANATION	HEAD OFFICE
TYPE <u>Handy 1000 RSC</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>[Signature]</u>
DRILLER <u>H. H. [Signature]</u>	REFERENCES	DRAWN BY <u>[Signature]</u>
COMMENCED		CHECKED BY
COMPLETED		SHEET OF
		DRAWING NO.

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. B.M.R. FIS CO-ORDINATES 12° 18' 09" N 122° 32' 17" W P.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORRELATION INTERVALS	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		Gray clay, milky quartz, mica schist, decayed organic material	
180			
190		Fine gravel of clear and milky quartz, mica schist	
200		Strongly crumulated mica carbonate schist	

DRILL NO. TYPE <u>Auger</u> ...	EXPLANATION CASING IN HOLE DURING DRILLING	HEAD OFFICE LOGGED BY <u>...</u> DRAWN BY <u>...</u> CHECKED BY <u>...</u>
DRILLER <u>H. J. ...</u> COMMENCED COMPLETED	REFERENCES	SHEET <u>1</u> OF <u>2</u> DRAWING NO.

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER

REMARKS

HOLE NO. BMR FI 6CO-ORDINATES 12° 18' 29" N 132° 37' 43" WLOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORE INTERVAL	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10	② ② ③ ②	Fe oxidized pisolites	
20		limonitic clay	
30		Sandy limonitic clay	
40	② ② ② ② ② ②	Fe oxidized Pisolites, white clay, sand, pellets of manganiiferous Cretaceous sandstone	
50	② ②		
60			
70		white clay, fragments of Cretaceous sandstone, rounded quartz	
80			
90			
100		mottled red/yellow sandy white clay	
110			
120			
130			
140		white clay, minor rounded quartz	
150			

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Handy</u>	CORES IN HOLE DURING DRILLING	LOGGED BY <u>H. J. ...</u>	
DRILLER <u>H. J. ...</u>	REFERENCES	DRAWN BY <u>H. J. ...</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET	
		DRAWING NO.	

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIANTDA RIVER REMARKS
 HOLE NO. B.M.R. FI 6 CO-ORDINATES 2° 18' 29" N 131° 27' 43" E S.L. GROUP
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170 180 190 200		While clay becoming strongly limonitic with depth	

DRILL NO. TYPE <u>Auger and water</u>	EXPLANATION CAUSE IN HOLE DURING DRILLING	HEAD OFFICE	
DRILLER <u>A. J. ...</u>	REFERENCES	LOGGED BY <u>...</u>	
COMMENCED		DRAWN BY <u>...</u>	
COMPLETED		CHECKED BY	
		SHEET <u>2</u> OF <u>2</u>	
		DRAWN IN	

GEOLOGICAL LOG OF DRILL HOLE

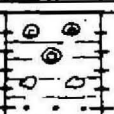
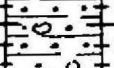
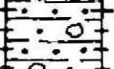
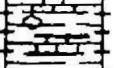
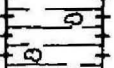
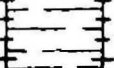
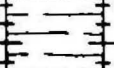
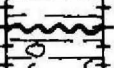
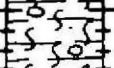
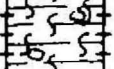
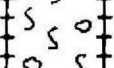
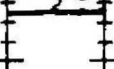
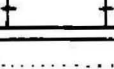
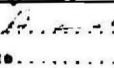
PROJECT: S. ALLIGATOR RIVER REMARKS: _____
 HOLE NO: BMR FI 7 CO-ORDINATES: 12° 18' 29" N 122° 27' 10" W S. L. BOUNDS: _____
 LOCATION: FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORE INTERVAL	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Pisolitic dark gray humic clay	
20		yellow/white clay	
30			
40			
50			
60			
70		Buff silty clay	
80			
90		white clay, decayed plant material	
100			
110			
120		fine buff sandy clay	
130			
140			
150			
160			
170			
180			
190			
200		white weathered chloritised mica schist	

DRILL NO. _____	EXPLANATION	HEAD OFFICE
TYPE <u>Core</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>...</u>
DRILLER <u>A. F. ...</u>	REFERENCES	DRAWN BY <u>...</u>
COMMENCED _____		CHECKED BY _____
COMPLETED _____		SHEET <u>1</u> OF <u>1</u>
		DRAWING NO. _____

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR PI 8 CO-ORDINATES 12° 18' 29" 132° 26' 37" S. L. SOUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Fe pisolites, red clay, manganoferous Coconino sandstone, angular quartz	
20		Pink sandy clay, quartz	
30		white clay, angular quartz, dark gray carbonate	
40		limonitic clay, angular quartz	
50		Buff limonitic white clay	
60		Clayey gravel of clean and pink quartz, weathered mica schist	
70		mica schist / quartz gravel	
80		Quartz dolomite	
90			
100			
110			
120			
130			
140			
150			

L. PROT. CRINOIDIC

DRILL NO. <u>1000</u>	EXPLANATION CASSIN IN HOLE DURING DRILLING	HEAD OFFICE LOGGED BY <u>...</u>
DRILLER <u>...</u>	REFERENCES	DRAWN BY <u>...</u>
COMMENCED <u>...</u>		CHECKED BY <u>...</u>
COMPLETED <u>...</u>		SHEET <u>...</u> OF <u>...</u>
		DRAWING No. <u>...</u>

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BHR F1.9 CO-ORDINATES 13° 18' 16" 132° 26' 04" S.E. 2000
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORE INTERVALS	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Humic black clay	
20			
30			
40		Sandy humic black clay, angular to rounded quartz	
50			
60			
70		Coarse clayey gravel of angular to rounded quartz pebbles	
80			
90			
100			
110		limonitic white clay, lenses of decaying plant material	
120			
130			
140			
150			

DRILL NO. TYPE <u>1 1/2" DIAMETER</u>	EXPLANATION CASING IN HOLE DURING DRILLING	HEAD OFFICE	
DRILLER <u>J. J. J.</u>	REFERENCES	LOGGED BY <u>J. J. J.</u>	
COMMENCED		DRAWN BY <u>J. J. J.</u>	
COMPLETED		CHECKED BY	
		SHEET <u>1</u> OF <u>1</u>	
		DRAWING No.	

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLEGATA RIVER REMARKS
 HOLE NO. BMR F19 CO-ORDINATES 20° 18' 16" N 132° 26' 04" W R.L. GROUP
 LOCATION FIELD 184 AND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORDED INTERVAL	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170			
180			
190			
200		limonitic white clay, quartzose in part	
210			
220			
230			
240			
250			
260		limonitic white clay, angular quartz, mica Schist	
270			
280		yellow dolomite, weathered dark mica Schist	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Hand</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>...</u>	
DRILLER <u>...</u>	REFERENCES	DRAWN BY <u>...</u>	
COMMENCED		CHECKED BY <u>...</u>	
COMPLETED		SHEET <u>...</u> OF <u>...</u>	
		DRAWING NO.	

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR FI 10 CO-ORDINATES 12° 18' 06" N 132° 26' 30" W R.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORRELATION	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			
110			
120			
130			
140			
150			
		Dark gray/black limnic clay becoming lighter in color with depth	
		Angular to rounded quartz Black organic concretions	
		Greenish white clay, angular quartz	
		limonitic white clay, angular quartz, organic concretions	
DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE	CASING IN HOLE DURING DRILLING	LOGGED BY	
DRILLER	REFERENCES	DRAWN BY	
COMMENCED		CHECKED BY	
COMPLETED		SHEET	
		DRAWING NO.	

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR FI 10 CO-ORDINATES 2°18'06" 132°26'30" A.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG CORRELATION	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170		limonitic white clay, angular quartz	
180		limonitic white clay, quartz, strongly weathered schist	
190			
200		buff sandy clay	
210			
220			

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Hand auger</u>	CASING IN HOLE DURING DRILLING	LOGGED BY .....	.....
DRILLER <u>J. E. Jones</u>	REFERENCES	DRAWN BY .....	.....
COMMENCED		CHECKED BY .....	.....
COMPLETED		SHEET	OF
		DRAWING NO. ....	.....

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER

REMARKS

HOLE NO. BMR FI 11 CO-ORDINATES 12° 18' 02" N 152° 22' 30" W S.L. GROUNDLOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Fe oxidized pisolites	
20		B-1/1 sandy clay	
30			
40			
50			
60			
70			
80			
90			
100			
110			
120		mottled red/yellow clay	
130		limonitic sandy clay, quartz	
140		gravel of angular quartz, mica schist, gray carbonate, massive white dolomite	
150			

L. PRST. CRINOIDAL

DRILL NO.	EXPLANATION	HEAD OFFICE
TYPE <u>Auger</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>...</u>
DRILLER <u>...</u>	REFERENCES	DRAWN BY <u>...</u>
COMMENCED		CHECKED BY
COMPLETED		SHEET <u>...</u> OF <u>...</u>
		DRAWING NO.

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR R. RIVER REMARKS
 HOLE NO. OMR FI 12 CO-ORDINATES 12° 17' 43" 133° 28' 46" S.E. GROUP
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft.	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10		Fe oxide pisolites	
20			
30			
40		white clay	
50			
60			
70			
80			
90			
100		limonitic white clay, angular quartz	
350		quartz gravel	
360			
370			
380			
390		calcareous, micaceous silicified dolomite	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>of Log</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>.....</u>	
DRILLER <u>.....</u>	REFERENCES	DRAWN BY <u>.....</u>	
COMMENCED		CHECKED BY <u>.....</u>	
COMPLETED		SHEET <u>.....</u> OF <u>.....</u>	
		DRAWING No.	

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVERHOLE No. AMR FI 13 CO-ORDINATES 12° 17' 46" N 132° 29' 26" W R.L. 00000LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
0	⊙ ⊙		
10	⊙ ⊙	Fa oxidized pisolites, limonitic white clay	
20		White clay	
30			
40			
50		limonitic white clay	
60			
70			
80			
90			
100		mottled red/yellow sandy clay	
110			
120			
130		Coarse buff sandy clay, quartzose in part	
140			
150			

DRILL No.	EXPLANATION	HEAD OFFICE	
TYPE <u>Open</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>...</u>	
DRILLER <u>...</u>	REFERENCES	DRAWN BY <u>...</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET	OF
		DRAWING No.	

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR FI 13 CO-ORDINATES 12° 17' 26" 152° 29' 26" R.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170			
180			
190			
200		Buff / white sandy clay quartzose in part	
210			
220			
230			
240		saccharoidal quartz pebbles	
250			
260			
270			
280			
290			
300			
310		limonitic quartzose white clay	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>WY</u>	CAMMS IN HOLE DURING DRILLING	LOGGED BY <u>.....</u>	.....
DRILLER <u>.....</u>	REFERENCES	DRAWN BY <u>.....</u>	.....
COMMENCED		CHECKED BY <u>.....</u>	.....
COMPLETED		SHEET <u>.....</u> OF <u>.....</u>	.....
		DRAWING NO. ....	.....

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
HOLE NO. BMR FI 13 CO-ORDINATES 12° 17' 26" 132° 29' 56" ELEV. GROUND
LOCATION FIELD ISLAND 1:100,000 SHEET AREA

100-101004

GEOLOGICAL LOG OF DRILL HOLE

PROJECT S. ALLIGATOR RIVER REMARKS
 HOLE NO. BMR FILL CO-ORINATED 2° 17' 17" 133° 29' 53" S.E. CORNER
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
10	⊙ ⊙	Fe oxidized pisolites	
20	⊙ ⊙	Sandy white clay	
30	⊙ ⊙	limonitic white clay, rounded quartz fragments	
40	⊙ ⊙		
50	⊙ ⊙	clayey quartz gravel, limonitic schist fragments	
60	⊙ ⊙		
70	⊙ ⊙		
80	⊙ ⊙		
90	⊙ ⊙	Clayey quartz gravel	
100	⊙ ⊙		
110	⊙ ⊙		
120	⊙ ⊙	buff clayey sand	
130	⊙ ⊙		
140	⊙ ⊙		
150	⊙ ⊙	fine clayey sand, quartz	

DRILL NO.	EXPLANATION	HEAD OFFICE
TYPE <u>Auger</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>.....</u>
DRILLER <u>.....</u>	REFERENCES	DRAWN BY <u>.....</u>
COMMENCED		CHECKED BY
COMPLETED		SHEET <u>.....</u> OF <u>.....</u>
		DRAWING No.

GEOLOGICAL LOG OF DRILL HOLE

PROJECT SALLIGATOR RIVER HOLE NO. BMA FI 14 CO-ORDINATES 7° 17' 17" N 132° 29' 53" W R.L. GROUND
 LOCATION FIELD ISLAND 1:100,000 SHEET AREA

DEPTH ft	GRAPHIC LOG	DESCRIPTION OF CORE AND CUTTINGS	REMARKS
170			
180			
300		Slightly limmitic clayey sand	
310			
320			
330			
340			
350		Dark coloured quartz banded mica dolomite schist. Strongly crystalline, micaceous, slightly pyritised	

DRILL NO.	EXPLANATION	HEAD OFFICE	
TYPE <u>Auger</u>	CASING IN HOLE DURING DRILLING	LOGGED BY <u>[Signature]</u>	
DRILLER <u>[Signature]</u>	REFERENCES	DRAWN BY <u>[Signature]</u>	
COMMENCED		CHECKED BY	
COMPLETED		SHEET <u>1</u> OF <u>1</u>	
		DRAWING NO.	