



BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

Record 1986/19

**BMR STRATIGRAPHIC DRILLING IN THE ROPER GROUP,
NORTHERN TERRITORY, 1985**

by

I P Sweet & M J Jackson

The information contained in this report has been obtained by the Bureau of Mineral Resources, Geology and Geophysics as part of the policy of the Australian Government to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director.



*** R 8 6 0 1 9 0 1 ***

Record 1986/19

BMR STRATIGRAPHIC DRILLING IN THE ROPER GROUP,
NORTHERN TERRITORY, 1985

by

I P Sweet & M J Jackson



CONTENTS

Summary	1
Introduction	2
Aims of the 1985 drilling program	2
Results	3
Urapunga 4	3
Urapunga 5	4
Urapunga 6	4
References	5

TABLES

Table 1	Well information for Urapunga 4	6
Table 2	Well information for Urapunga 5	7
Table 3	Well information for Urapunga 6	8

FIGURES

Fig. 1	Locality map	9
Fig. 2	Stratigraphic column	10
Fig. 3	Summary log for Urapunga 4	11
Fig. 4	Detailed logs for Urapunga 4 (sheets 1-22)	12
Fig. 5	Summary log for Urapunga 5	35
Fig. 6	Detailed logs for Urapunga 5 (sheets 1-25)	36
Fig. 7	Summary log for Urapunga 6	62
Fig. 8	Detailed logs for Urapunga 6 (sheets 1-17)	63
Fig. 9	Summary log for Urapunga 1	81
Fig. 10	Summary log for Urapunga 2	82
Fig. 11	Summary log for Urapunga 3	83
Fig. 12	Key to symbols used in all logs (foldout at back of Record)	84

SUMMARY

In 1985 a contract drilling program was undertaken to drill the Roper Group, the youngest component of the McArthur Basin, in order to obtain fresh core material for stratigraphic, sedimentologic, and hydrocarbon studies. Three fully cored holes were drilled, totalling 1559 m, and an almost complete section of the Roper Group in the Roper Bar area was obtained. This material supplements that from three shallow holes drilled by BMR rigs in 1983.

BMR Urapunga 4 (TD 532 m), which was spudded in the McMinn Formation, intersected a thick section of Velkerri Formation and bottomed in the Corcoran Formation. The Velkerri Formation contains several thick intervals of shale extremely rich in organic matter, and confirms the existence of good hydrocarbon source rocks in the basin. Live oil - probably the oldest in the world - was encountered in the Velkerri Formation at 342.8 m and 346.0 - 347.5 m. Bitumen and oil stains in vuggy intervals in the Moroak Sandstone Member of the McMinn Formation, and in the Bessie Creek Sandstone, indicate that migration of hydrocarbons has also taken place.

BMR Urapunga 5 (TD 604 m) was spudded in the Munyi Member of the Abner Sandstone, was drilled through the Abner Sandstone and Crawford Formation, into the Mainoru Formation. A 73-m thick dolerite sill is present within the Abner Sandstone. Dark grey mudstone intervals are present in the Jalboi Member, particularly between 114 and 127 m, and in the Mainoru Formation, but initial geochemical analyses indicate that these are not significantly organic rich. Porosity and permeability of the sandstones range between 5 and 15 percent and 0.1 and 90 millidarcies respectively.

Coring of the underlying Mainoru Formation was continued in BMR Urapunga 6 (TD 423 m), which was drilled through the Limmen Sandstone into the underlying 'Mantungula Formation' (newly named formation). Neither the Mainoru nor 'Mantungula Formations' have significant source-rock potential, and the Limmen Sandstone has low porosity and permeability.

INTRODUCTION

In 1983 the Proterozoic Basins Research Group of BMR's Division of Continental Geology began a stratigraphic and sedimentologic study of the Roper Group, the youngest part of the Middle Proterozoic sequence in the McArthur Basin (Jackson, Muir & Plumb, in press). The emphasis in the study was to be the hydrocarbon potential of the basin, as a number of encouraging signs had emerged from previous studies in the basin (Peat and others, 1978; Muir and others, 1980). A major problem in undertaking such a study was a lack of subsurface information from a large portion of the basin, particularly the northwestern part. Accordingly, a limited diamond drilling program, using a BMR rig, was undertaken in 1983 and particularly good source rocks were discovered in the Velkerri Formation in BMR Urupunga 3 (Sweet & Plumb, 1984). Other possible source-rock formations and potential reservoirs were not adequately sampled during that program, and another drilling program was planned for the 1985 field season. This was carried out between May - July 1985 using a contract rig, and preliminary results, lithologic logs, and drill data are presented herein. The core descriptions consist of summary logs (Figs 3, 5, and 7), and detailed lithological logs (Figs 4, 6, and 8).

As a drilling report from the 1983 program was not issued, summary logs for BMR Urupunga 1, 2 and 3 are included here (Figs. 9, 10, and 11), but they are not described in detail. Results of initial geochemical analyses (total organic carbon content) on samples from these holes are shown in the summary logs.

AIMS OF THE 1985 DRILLING PROGRAM

The general aim of the program was to obtain fresh samples of as much of the Roper Group as was possible given time, logistic, and funding limitations. More specifically, it was intended to obtain core material from the following units (Fig 2):

- (1) Chambers River Formation and McMinn Formation - sedimentology, source rock and reservoir potential (one hole);
- (2) Velkerri Formation through to Mainoru Formation - source potential in the fine-grained units, and reservoir potential of the several sandy units (one deep hole or two shallower holes);
- (3) Limmen Sandstone and Mantungula Formation (new name) - reservoir and source potential respectively (one hole).

Four possible drill sites were chosen, but lack of vehicle access to the site for one of the holes meant that the Chambers River Formation and the Bukalorkmi Sandstone Member of the McMinn Formation could not be tested. Three holes totalling 1559 m were drilled (Fig. 1), and an almost complete section of the lower half of the Roper Group was obtained (Fig 2), fulfilling objectives (2) and (3) above. Objective (1) was partly assessed by a surface examination of the Chambers River Formation which

indicated that it is largely sandstone and hence an unlikely source-rock unit; and by sampling several BHP exploration drill-holes (drilled through the McMinn Formation in the 1950's in the search for iron deposits - organic-rich potential source rocks were identified during follow-up geochemical analyses). The core from the BHP drilling is stored in a core shed about 1 km south-west of the site of Urapunga 4.

RESULTS

These results and interpretations are based mainly on detailed logging of the core in the field, together with initial laboratory analyses of only a few samples (T.G. Powell, personal communication, 1985). Symbols used on all drill logs are shown in Fig.12. The core is stored at BMR's Core and Cuttings Laboratory, Collie Street, Fyshwick ACT, where it is available for inspection and sampling. A complete photographic record, in the form of colour prints, is held in the Division of Continental Geology at BMR.

URAPUNGA 4 (Figs 3 and 4; Table 1)

The hole was sited near Sherwin Creek (Fig. 1) and spudded into shales between the Moroak Sandstone and Sherwin Creek Ironstone Members of the McMinn Formation. Its main objectives were to test the hydrocarbon source potential of the Velkerri and Corcoran Formations, and the reservoir potential of the Moroak, Bessie Creek and Abner Sandstones. Twenty metres of Kyalla Member of the McMinn Formation were intersected above the Moroak Sandstone Member, and several dark grey mudstone interbeds appear to be rich in organic material. The Moroak Sandstone Member has some porosity, and brownish bitumenous or oily stains were noted at 36 m and 39 - 41 m. The most significant result from the drill hole was undoubtedly the discovery of live oil in the Velkerri Formation at 342.8 m and 346.0 - 347.5 m; (BMR Research Newsletter No 3, September 1985; Jackson & others, in press). Systematic geochemical analyses confirm the excellent source potential of parts of the Velkerri Formation previously demonstrated from Urapunga 3 (Sweet & Plumb, 1984). Organic rich intervals in the middle and lower parts of Urapunga 4 commonly contain between 2 to 8 percent organic carbon (Fig. 3). The Corcoran Formation has some dark grey organic intervals, but visually appears to contain less organic matter than the Velkerri and therefore is unlikely to be such a good hydrocarbon source formation. This is evident from the geochemical analyses, in which maximum values for total organic carbon are less than 0.5 percent. The Bessie Creek Sandstone appears to have limited porosity, except in a thin zone near the top of the formation, where oil staining is present. This zone has a porosity of 7-9 percent and permeability of 13 millidarcies.

Urapunga 4 was abandoned at 532 m while still within the Corcoran Formation because of concern that the presence of hydrocarbons in the open hole may have caused unsafe drilling conditions. The well was plugged with cement (see Table 1 for details).

URAPUNGA 5 (Figs. 5 and 6; Table 2)

Urapunga 5 was planned to continue from the stratigraphic level reached in the bottom of Urapunga 4, but because U 4 was abandoned prematurely difficulties were encountered in siting a hole to give stratigraphic overlap. Unfortunately the site finally chosen was in an area cut by several small faults, and the hole, which was spudded in alluvium, appeared to intersect the Munyi Member of the Abner Sandstone without penetrating any Corcoran Formation. We estimate that between 100 and 200 m of Corcoran Formation may have been missed between the bottom of U 4 and the top of U 5. A complete section of Abner Sandstone was obtained, and all four mapped members are recognisable. A 73 m dolerite sill is present within the Jalboi Member. The Hodgson Sandstone Member, which appeared from outcrops to be a potential reservoir unit, has rather low porosity and permeability, but some thin zones are more porous. The Crawford and Mainoru Formations, although not potential source or reservoir formations, provided valuable material for detailed sedimentological studies.

URAPUNGA 6 (Figs. 7 and 8; Table 3)

Urapunga 6 was sited to intersect the Mainoru Formation at about the same stratigraphic level at which Urapunga 5 was discontinued. However, overlap was not achieved and we estimate that about 20 m of section was missed. Outcrop in a low escarpment near U 6 is sufficient to fill most of the gap, and has enabled us to estimate the thickness of the whole formation. About 306 m of Mainoru Formation was penetrated in U 6, giving a total of 512 m for the formation as a whole, rather more than the 260 - 300 m expected on the basis of the section encountered in Urapunga 1 (Fig. 10), drilled in 1983 in the Mountain Valley area (95 km to the northwest). The 100 m of Limmen Sandstone intersected was both thicker, and of slightly different lithology than had been expected from measured sections within 5 km of the drill site. Only 8.2 m of core from the 'Mantungula Formation', the ultimate target of Urapunga 6, was sampled before a major breakdown of the drill rig caused premature abandonment of the drilling program. The source rock potential of the 'Mantungula Formation' in the Roper Bar area has therefore still not been adequately tested, but logging of a complete section of the formation from a company drill hole 175 km to the south has provided valuable supplementary information. It suggests that the 'Mantungula Formation' is similar to the Mainoru Formation, and is unlikely to be a significant source unit.

REFERENCES

JACKSON, M.J., MUIR, M.D., & PLUMB, K.A., (in press) - Geology of the southern McArthur Basin. Bureau of Mineral Resources, Australia, Bulletin 220.

JACKSON, M.J., POWELL, T.G., SUMMONS, R.J., & SWEET, I.P., (in press) - World's oldest oil? - hydrocarbon shows and petroleum source rocks in 1.4 to 1.7 billion year old sediments, northern Australia. Nature.

MUIR, M.D., ARMSTRONG, K.J., & JACKSON, M.J., 1980 - Precambrian hydrocarbons in the McArthur Basin, N.T. BMR Journal of Australian Geology and Geophysics 5, 301-304.

PEAT, C.J., MUIR, M.D., PLUMB, K.A., McKIRDY, D.M., & NORVICK, M.S., 1978 - Proterozoic microfossils from the Roper Group, Northern Territory, Australia. BMR Journal of Australian Geology and Geophysics 3, 1-18.

SWEET, I.P., PLUMB, K.A., 1984 - The McArthur Basin - a Middle Proterozoic hydrocarbon province? Geological Society of Australia, Abstracts Series, 12, 505-6.

TABLE 1

URAPUNGA 4 - WELL INFORMATION

Well name	:BMR URAPUNGA No 4
Location	1:250 000 Sheet :Urapunga, N.T., SD/53-10
	1:100 000 Sheet :Chapman, 5768
Latitude	:141 32' 17" S
Longitude	:134 17' 29" E
Metric grid reference	:Chapman 237742
Total depth	:532.0 m
Commencement date	:21 May 1985
Completion date	:7 June 1985
Drilled by	:BHF Drilling Pty Ltd
Drilling rig	:Longyear 44
Hole size	:PQ - 0 - 15.5
	:HQ - 15.5 - 42.0
	:NQ - 42.0 - 532.0
Core size	:HQ - 15.5 - 42.0
	:NQ - 42.0 - 532.0
Casing	:PQ - 0 - 15.5
	:HQ - 0 - 42.0
Plugging details	:Packer inserted and hole cemented from 320 m to 370 m
Cost	:\$34 152 for all drilling coring, casing, etc; but positioning & repositioning not included
Logs	:Lithological logs only; no electric or other logs run

TABLE 2

Well name		:BMR Urapunga No 5
Location	1:250 000 Sheet	:Urapunga, N.T., SD/53-10
	1:100 000 Sheet	:Chapman, 5768
	Latitude "	:14 42' 46" S
	Longitude	:134 25' 02" E
	Metric grid reference	:Chapman 373734
Total depth		:604.1 m
Commencement date		:8 June 1985
Completion date		:25 June 1985
Drilled by		:BHF Drilling Pty Ltd
Rig type		:Longyear 44
Hole size		:PQ - 0 - 9.7
		:HQ - 9.7 - 39.6
		:NQ - 39.6 - 604.1
Core		:HQ - 9.7 - 39.6
		:NQ - 39.6 - 604.1
Casing		:PQ - 0 - 9.7
		:HQ - 0 - 39.6
Cost		:\$39 304 for drilling, coring, workover, etc; positioning & repositioning not included

TABLE 3

Well name		:BMR Urapunga No 6
Location	1:250 000 Sheet	:Urapunga, N.T., SD/53-10
	1:100 000 Sheet	:Urapunga, 5868
	Latitude	:14 44' 31" S
	Longitude	:134 32' 01" E
	Metric grid reference	:Urapunga 499702
Total depth		:422.8 m
Commencement date		:26 June 1985
Completion date		:4 July 1985
Drilled by		:BHF Drilling Pty Ltd
Rig type		:Longyear 44
Hole size		:PQ - 0 - 9.0
		:HQ - 9.0 - 15.6
		:NQ - 15.6 - 422.8
Core		:HQ - 9.0 - 15.6
		:NQ - 15.6 - 422.8
Casing		:PQ - 0 - 9.0
		:HQ - 0 - 15.6
Cost		:\$27 386; positioning and final deposition not included

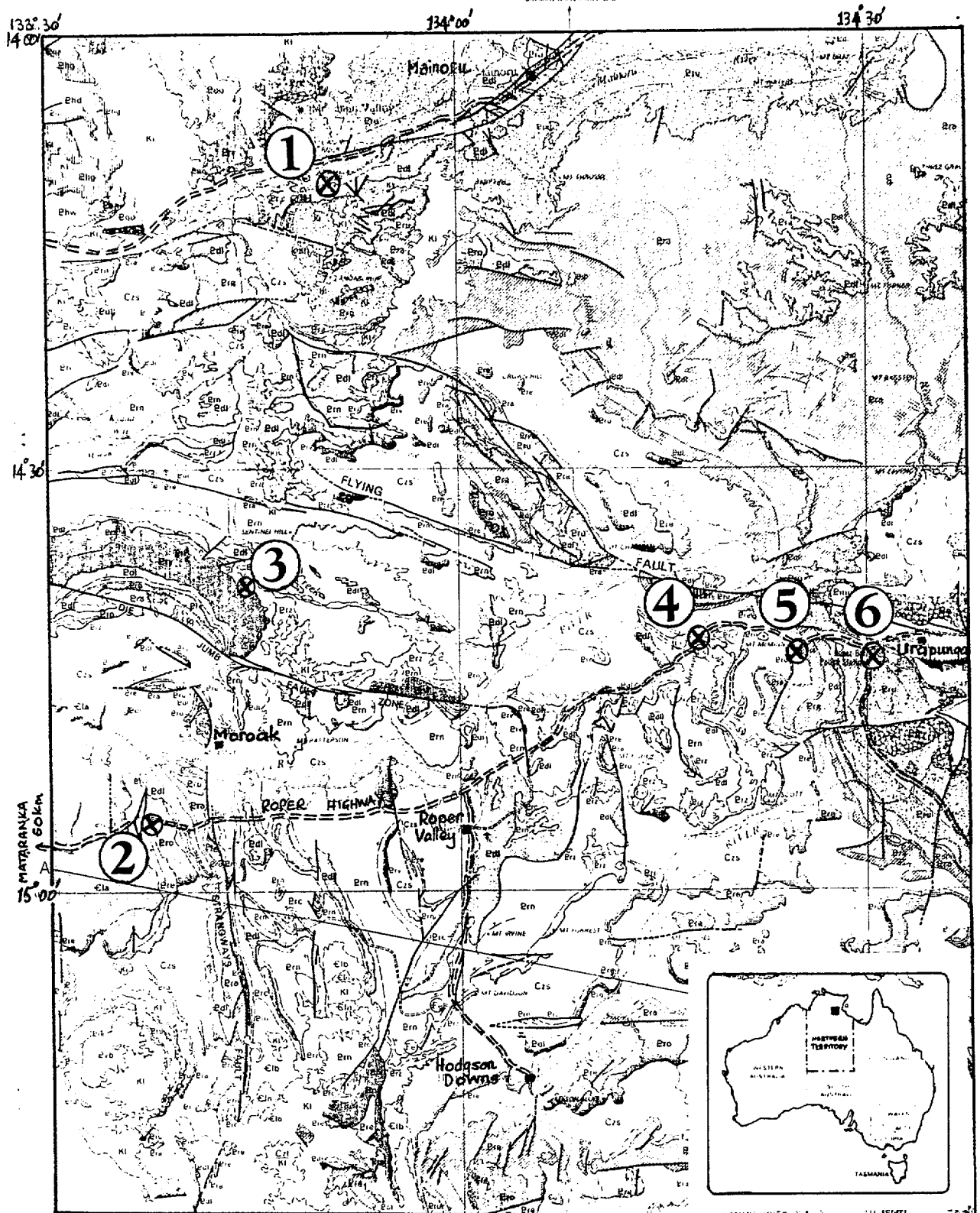


Fig. 1: Locations of BMR Urapunga 1 to 6. Base map is 1:500 000 geological map of the Roper River area, 1965.

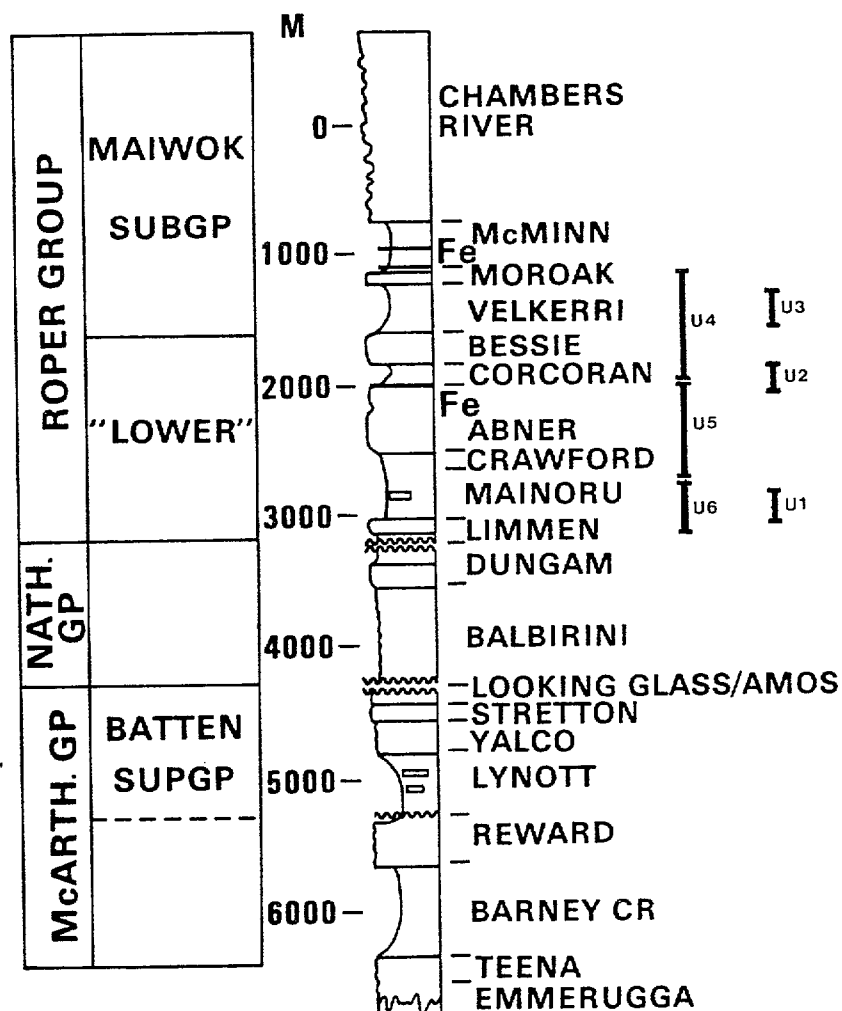


Fig. 2: Stratigraphic column of upper part of McArthur Basin sequence showing intervals intersected by BMR stratigraphic holes Urapunga 1 to 6. A newly identified shaly unit, the 'Mantungula Formation', which occurs below the Limmen Sandstone, is not shown in this figure.

Fig. 3 Summary URAPUNGA 4

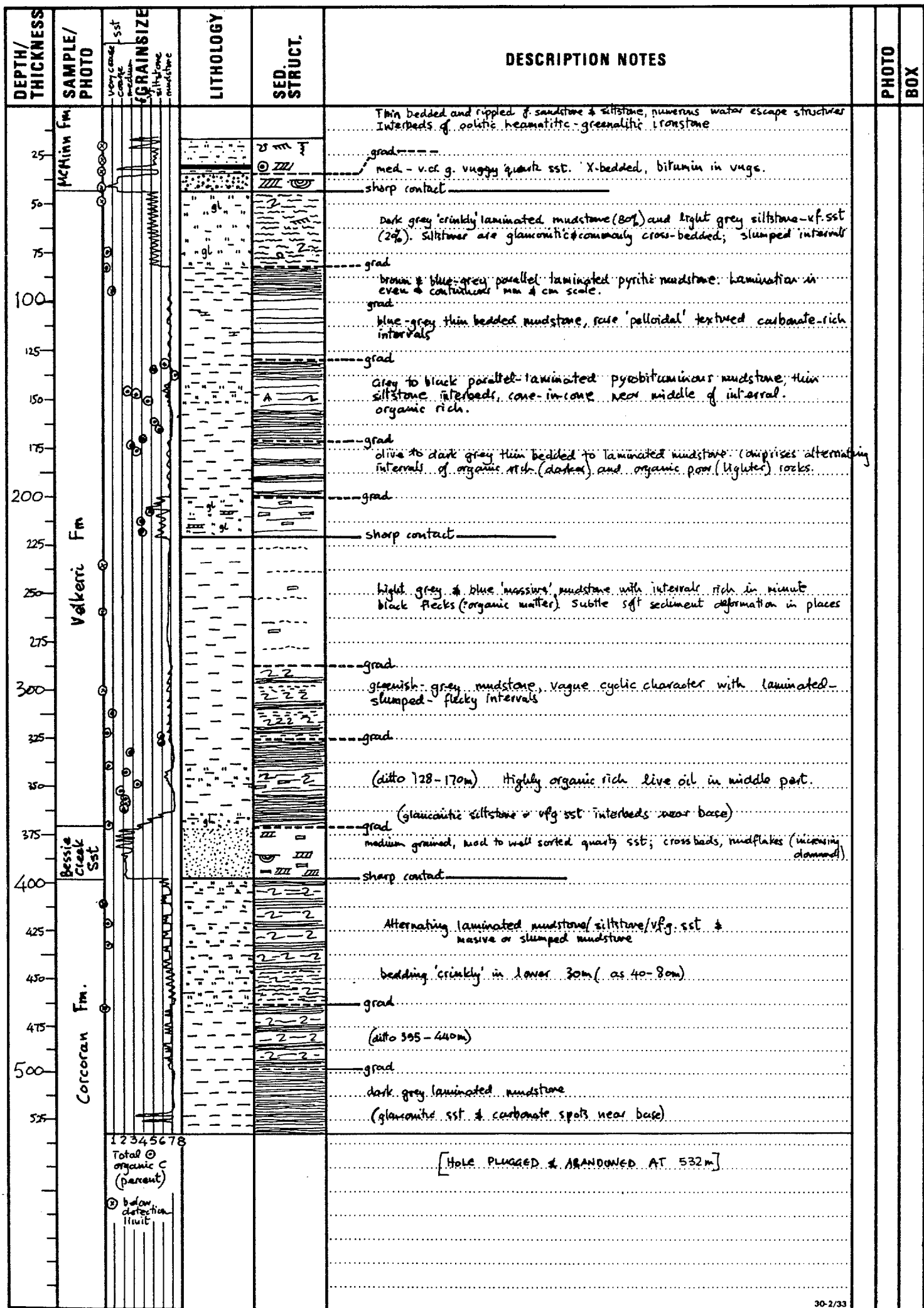


FIG. 4: DETAILED LOGS FOR BMR URAPUNGA 4
(sheets numbered 1 to 22)

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
1					note: smallest interval shown is 10cms;		
2							
3							
4							
5							
6							
7					0-15.5m clay and rock fragments: mostly alluvium		
8							
9							
10							
11							
12							
13							
14							
15					(commenced coring @ 15.5m)		
16				T	15.5 → 20.0: Laminated rhythmites of mudstone and very fine grained sandstone; commonly graded. Mudstones are med. dark grey (N2) to greyish black (N4); sandstones are light grey to very light grey (N7 to N8).		1
17				T	Mostly parallel laminated, but sandier intervals contain low angle cross-bedding. Molar tooth structures (?) common, rare sandy flasers (⊖) and load structures (Ω).		17.7
18							
19						OPG	2
20							20.2
21	Bit I				20.0 → 22.4: Poorly sorted, medium - very coarse grained quartz sandstone. Silica cemented, vuggy in patches - with bitumin & oil staining & fluorescence. Rare intraclasts.	OPG	3
22	Py. Bit I					PP PP OPG	22.2
23				T	22.4 → rhythmites (as 15.5 → 20.0)		
24				T			4
25				T			24.9

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
25	FORMATION				as above	OPG	5
26					(2-3cm thick sandy ripples)		
27					27-20: 10cm thick graded sandstone bed.		
28	MCMINN					TS	6
29							
30					Greenalitic and hematitic oolitic ironstone $\rightarrow$ ferruginous sandstone interbedded with rhythmites (as above)		
31	SHERWIN CREEK IRONSTONE MEMBER					TS	7
32							
33							
34	Bit				green ?greenalitic sandstone, indistinct cross-bedding	PP	8
35							
36					white sandstone		
37	MORDAK SANDSTONE MEMBER				siliceous conglom. sandstone, vuggy, bituminous	TS	9
38					well cemented, vuggy & bituminous		
39							
40	Bit				pyritic & bituminous silica cemented quartz arenite, vuggy porous zones, rare 1cm thick clay layers.	TS	10
41					conglomeratic, pyrite-lined vughs.		
42					gradational contact		
43	FORMATION					HQ	42-30
44							
45							
46	VELKERRI				mostly parallel laminated	TS	12
47							
48							
49	FORMATION				slumping & soft sediment brecciation	TS	13
50					Possible small Bouma-cycles		

GENERAL DESCRIPTION

42.00 $\rightarrow$ 79.00: Interlaminated mudstone (80%) and siltstone - v.f.g. sandstone (20%). Mudstone is mostly medium dark grey with greenish blue in places; siltstone - v.f.g. sst. in white to light grey. Bedding is parallel & continuous in upper 4m, but mostly 'crinkly' in remainder.

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 3 OF 22

LOCATION: SHERWIN CREEK

LOGGED: M.J.J.

DATE: 23/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE { sandstone siltstone mudstone	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
50	↑ 7				20cm sandstone dominant		
51					[continued from above]		14
52					Disseminated pyrite common; glauconite present (especially 50-54m)		
53	9t				Mudstone is commonly slump contorted		
54	↓				Siltstone - v.f.g. sst is cross-laminated, rarely graded		15
55					Rocks are 'spotted' at 46m		
56					Internal cycles not evident		
57					Colour variations shown		
58					Several 1cm thick cross-lamin sandstone laminae		
59					3x 5cm thick slumped beds		
60							
61					sandstone loaded into mudstone		16
62					possible graded beds		
63							
64							
65					60.5 to 62.0: sst content approaches 50%		17
66							
67							
68					ripple laminated sst.		18
69							
70							
71							
72					68 → 72: mostly dark greenish (5GY4/1) v.f.g. glauconitic sst & green mudstone, disseminated pyrite & flakes of ? organic matter		19
73					70 → : lamination not crinkly (due lack of silty interbeds)		
74							
75					72 → 79: mostly dark grey (N3) claystone and greenish grey claystone interlaminated		20

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 4 OF 22

LOCATION: SHERWIN CREEK LOGGED: M. J. J. DATE: 24/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE (mm)	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
75							
76					1cm sst bed		21
77					3cm sst bed		
78					1cm sst bed		
79					load ball of sst isolated in mudstone ----- gradational contact		
80							22
81						OPG	
82							
83							
84							23
85							
86							
87					large nodules, bedding laminations contorted around nodule		24
88							
89							
90							
91						TS	25
92						OPG	
93							
94							
95							26
96					----- gradational		
97							
98							
99							27
100							

GENERAL DESCRIPTION

79 → 95.5 : Brownish grey (5YR4/1) and medium bluish grey (5B5/1) parallel-laminated mudstone. Laminations on mm and cm scale. Rare intervals upto 5cms thick. Laminations regular & even, rocks stripped in places, ? organic flakes. large nodular concentrations of pyrite where shown. Rare slumps & cross-laminae.

GENERAL DESCRIPTION

95.5 → 130.5 : Medium bluish grey (5B5/1) to greenish grey (5G6/1) mudstone. Mainly thin bedded, but with (stipped) laminated intervals.

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 5 OF 22

LOCATION: SHERWIN CREEK

LOGGED: M.J.J

DATE: 24/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
100							
101							
102							28
103							
104					undistinct pelloidal texture & pale spotting of mudstone (.....) present at several levels		
105							29
106							
107					numerous small black flakes (? organic matter)		
108							
109							30
110					distinctly striped (laminated) interval	TS	
111						016	
112							
113							31
114							
115							
116							
117							32
118					gradational change from blue-green to grey mudstone (light olive grey to blackish grey)		
119							
120					sub mm to cm scale lamination evident		33
121						TS	
122							
123							
124					3cm thick nodular carbonate material		34
125							

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
125							34
126							
127							
128					128-130 mostly olive black claystone - faint internal lamination		35
129							
130					----- subtle/gradational		
131							36
132							
133	py				zoned 2cm vein of calcite & pyrite	OPG TS TS	
134						OPG	
135	FORMATION						37
136							
137					pyr + calcite	OPG	
138					1cm zoned vein		
139					1cm tension veins calcite + py		38
140	VELKERI						
141							
142					Calcite calcite calcite		
143					Siltier subfacies		39
144	py						
145						OPG OPG	
146					crosscutting pyr veinlet		40
147					vuggy calcite = pyrite, bitumen in vughs		
148					calcite calcite, pyr, bitumen	OPG	
149					149.2 unusual green layer with chalcidany (? after evaporites)	XR	
150							41

PROJECT: ROPER DRILLHOLE: BMR URAPUNGA 4 SHEET 7 OF 22

LOCATION: SHERWIN CREEK LOGGED: M.J.J DATE: 25/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
150							
151					Calcite		41
152					Cone-in-cone (10cm) pyrite in vughs.		
153	py				calcite, oil in cracks	OPG	
154	py				calcite subtle/gradational		42
155					calcite, oily staining in vughs		
156					calcite, oily staining in vughs	OPG	
157					Thin pyritic cone-in-cone bed.		
158						TS OPG	43
159					calcite		
160					calcite		
161					calcite		
162					calcite, oil staining calcite (cross-cutting)		44
163					calcite		
164					calcite, oil stained vughs calcite	OPG	
165							45
166					calcite, pyrite, oily globules crystal lined cavity with oily, bituminous matter		
167					scalite veins		
168						OPG	
169	py						46
170					calcite + pyrite		
171					subtle/gradational (more distinctly laminated)		47
172							
173						OPG	
174					cross-cutting calcite vein	TS	48

GENERAL DESCRIPTION

154-171: Greyish black (No2)
mudstone, organic rich, subtle
internal parallel lamination.
Numerous calcite veinlets (horizontal)
pyrite aggregates.

VELKERRI FORMATION

PROJECT: ROPER DRILLHOLE: BMR URAPUNGA 4 SHEET 8 OF 22

LOCATION: SHERWIN CREEK LOGGED: M. J. J. DATE: 25/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
175		very fine sandstone			black organic rich	846	
176							48
177							
178							
179					caliche		49
180					caliche & pyrite		
181							
182							
183							50
184					black organic rich		
185					nebby calcitic layers		
186							51
187							
188							
189							
190							52
191							
192					4cm calcite/pyrite vein		
193							
194							53
195					black organic rich		
196							
197							
198							54
199							
200							

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 9 OF 22

LOCATION: SHERWIN CREEK

LOGGED: M. J. J. DATE: 25/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
200					as above		
201							55
202							
203	gl				202-6 contains base of pale grey upgr. sst with glauconitic laminare		
204							
205							56
206					colour change to light olive grey below		
207					206 → 219 m: olive grey to olive black mudstone- siltstone with 1mm to 1cm interbeds of 'pellicular mudstone' with glauconite and ?chalcedony (upto 5mm in diam). Rocks slightly calcareous in places, still organic rich	TS	
208	gl & cc					TS	57
209							
210					fault		
211							
212							58
213					213-25 → 40 olive grey calcareous interbed incipient nodular texture, pyrite	TS	
214							
215					215-35 } 215-90 } ditto 213-25. 216-12 }		59
216							
217							
218							
219					sharp colour change from olive black to bluish & greenish grey		
220			pale blue				
221							
222							
223							
224							
225							

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 10 OF 22

LOCATION: SHERWIN CREEK

LOGGED: M.J.J.

DATE: 25/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
225							61
226					Caliche		
227							
228							62
229							
230							
231					Caliche		
232							63
233					Caliche vein near vertical		
234							
235					Small calcite vein		
236							64
237							
238							
239					calcite vein		
240							
241							
242							66
243							
244							
245							
246							67
247							
248							
249							
250							68

VELKERRI FORMATION

GENERAL DESCRIPTION

219 → ~285m:

Medium grey (N5) to medium dark grey (N4), with distinct bluish tinge, mudstone. Incompetent, fractures readily. Lacks obvious stratification except intervals with ? organic flakes and intervals with unusual slump/flame-like structures. Rare calcite veins.

one

PROJECT: ROPER DRILLHOLE: BMR URAPUNGA 4 SHEET 11 OF 22
LOCATION: SHERWIN CREEK LOGGED: M. J. J. DATE: 25/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
250							
251							68
252							
253							69
254							
255							
256							
257							70
258							
259							
260							
261							71
262							
263							
264							
265							72
266							
267							
268							
269							73
270							
271							
272							74
273							
274							
275							75

VELKERRI FORMATION

GENERAL DESCRIPTION

as above i.e. light to medium bluish gray (5B 5/1, 5B 7/1) and light gray mudstone, rare darker intervals (few cms thick) rich in flakes of organic matter.
Diffuse flame-like structures
Core incompetent, breaks readily

calcite

calcite

small intraclasts

PROJECT: ROPER DRILLHOLE: BMR URAPUNGA 4 SHEET 12 OF 22

LOCATION: SHERWIN CREEK LOGGED: M.J.J. DATE: 26/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE veg. sst. sh. silty mudst.	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
275							
276					(as above)		75
277							
278							
279							76
280							
281					calcite veining at fault?		
282							
283							77
284							
285					----- subtle facies change		
286					laminae with 12mm spherical chalcidony grains		
287						XR SEM	78
288					joint with pyrite, & oil staining		
289							
290	st					TS	
291	st						79
292	st						
293	st						
294							
295							80
296					sf. st. (1cm thick)		
297					cm thick graded laminae		
298							81
299							
300							

GENERAL DESCRIPTION

285 → 323.5m

Greenish grey, dark greenish grey,
dark grey mudstone with silty
laminae (with crinkly bases)Indistinct cyclic character of
laminated : ?slumped : flakey
intervals.

Glauconitic siltstone ~ 290m → 293

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 13 OF 22

LOCATION: SHERWIN CREEK LOGGED: M. J. J. DATE: 26/5/95

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE sandstone siltstone mudstone	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
300							
301					(as above, continued)		
302							82
303					sharp eroded top of black mudstone bed.	OPG	
304							
305					organic flecks/flakes in. some laminated intervals sharp erosional contact		83
306							
307					intraclasts		
308							
309							84
310					increased dips. of core ? due slumping		
311					sharp bed contacts		
312						OPG	
313					upward injection of sediment		85
314							
315					distinctly laminated.		
316							
317	py py				thin pyritic v.f.g. sandstone interbeds		86
318					slumped & brecciated organic rich interval		
319							
320					gradual change from green to grey	OPG	
321							87
322	py						
323							
324					distinct colour change to dark greys		88
325						OPG	

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 14 OF 22

LOCATION: SHERWIN CREEK LOGGED: M.J.J. DATE: 26/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE var. graded. M fine siltst mudst	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
325							88
326							
327							
328	py						89
329							
330							
331							
332							90
333							
334							
335							
336							91
337							
338							
339							92
340							
341							
342							
343							93
344							
345							
346							
347							94
348							
349							
350							95

DESCRIPTION NOTES

GENERAL DESCRIPTION

323.5 → ~ 335.5m

dark grey to brownish black
organic-rich (petroliferous) mudstone.
Laminated, rare slumps,
graded units (turbidites?),
richly pyritic.

subtle lamination

subtle change, paler colours
more siltstones

337m on core much harder.

GENERAL DESCRIPTION

335.5 - ~ 353 :

olive black to brownish black
mudstone with grey thin silty
interbeds. Bedding disrupted -
slumps, swirls, contorted mostly;
rarely plane laminated.
Contains intervals with live oil

Live oil

fault

Interval containing live
oil, bagged, not logged

fault

laminated interval with slumping
brecciation

PROJECT: ROPER DRILLHOLE: BMR URAPUNGA 4 SHEET 15 OF 21

LOCATION: SHERWIN CREEK LOGGED: M.J.J. DATE: 27/5/81

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
350			grey		(as above)		
351						OPG	95
352					subtle change		
353							
354					GENERAL DESCRIPTION		
355					352.5 - 363.5:	OPG	96
356			black		Uniform olive black sulphidic mudstone. Laminated, 1cm thick graded beds, indistinct slump/flame like structures.	OPG	
357						OPG	
358							97
359					unusual, angular contact in laminations		
360						OPG	
361							
362			black			TS	98
363					colour change black to grey.		
364			green				
365					GENERAL DESCRIPTION		
366					363.5 - 371m		99
367					Green and grey mudstone with numerous wedges and interbeds of v.f.g. sandstone. Flat pebble intraclast breccias, incipient brecciation and injection & local structures.		
368							
369						OPG	100
370							
371					very fine grained lithic sandstone, wedge of glauconitic sandstone	TS	
372					gradational contact into continuous sandstone from 372.5m		
373					372.5 →		101
374					Well sorted, quartz cemented sandstone, thin laminae of v.c. sst. Two x 5cm zones lacking cement, with oil staining.	PP TS	
375					pyritic patch, 1cm across		

DEPTH/ THICKNESS	SAMPLE/ PHOTO	FORAMINIFERA	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
		cc sandst m silty mud					
375			L. grey		375 - 380m : Uniform sst.; m. grained, with scattered coarse grains and laminae; minor plane and cross-bedding; scattered sandsize pyrite blebs		102
376							
377					Irregular fractures		
378			L. grey		Minor normal fault; 1-2cm displacement		
379					Vague plane- and cross- bedding		
380			m. grey				103
381			L. grey		380 - 386m (approx.): Slightly coarser-grained, more consistently cross-bedded sst.		
382			L-m grey		Coarser bed- grades back to m. sst. over 10cm		
383					Irregular m. grey patches due to uneven distribution of pigments. 1cm mudflake (most are much smaller)		
384					10cm-scale cross-beds		104
385							
386					Major bedding plane or large, distorted mudflake		
387			alternating l. and m. grey in 2-10mm lam		386 - 397.5 (base of Bessie Cr. Sst): Sandstone similar to above but mudflakes (ie shale clasts/ripup clasts) much more common		105
388							
389							
390			m. grey mudflakes		2cm pyrite bleb		
391					Sharp based bed with mudflakes; coarser, poorly sorted 10cm mudflake-rich layer		106
392							
393					Very well sorted saccharoidal ssts.		
394			L-m. grey		Prominent 2cm m. grey band		107
395					Thick cross-bed with scattered large (2-4cm) mudflakes in foresets		
396					3 sharp-based laminae, each 5mm thick; finest sst. or silt. with mudst. matrix. 2 x 10cm, sharp-based cross-beds with mudflake-rich basal foresets		
397					Transition over 10cm: Pale greenish-grey, bleached? mudstone interbedded on 1cm-scale with m. sst.		
398			L. greenish grey-dark grey		398.1 - 399.65m: Variably bleached, micro-laminated mudst-siltst. with some crinkly lam and micro-slumps (< 5mm scale)		
399			dk grey		399.65 - 400.0m: Laminated mudst. with peculiar pyrite intracr. bed at 399.95m. Boudin-like lens 2cm thick at 399.6m		108
400							

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 17 OF 22

LOCATION: Sherwin Creek

LOGGED: I.P.S.

DATE: 28/5/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE siltst. mudst.	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
400			" " "	" " "	Facies A: 399.8 - 403.3		
401	py		" " "	" " "	Very finely inter laminated (1-10mm) light grey siltstone and dark grey mudstone (claystone); slumped beds 1-10cm thick common; scattered fine ripple lamination in some siltstones		108
402	py		Alternating m.l. and dk grey	" " "			
403	py		" " "	" " "			
404			" " "	" " "	Facies B: 403.3 - 405.3		109
405			" " "	" " "	Similar to Facies A, but mudstone dominated, and thin-bedded, not laminated; structure at 403.95m looks like intraclast bed rather than soft-sediment slumping		
406	py		dk grey	" " "	Facies C: 405.3 - 407.8		
407			" " "	" " "	405.63: 3cm diam. unidentifed nodule		110
408			" " "	" " "	407.8 - 408.5: Facies A		
409	py		" " "	" " "	408.5 - 409.8: Facies C		
410	py		" " "	" " "	409.8 - 415.0: Facies A		
411			" " "	" " "			111
412	py		" " "	" " "	Much of this interval is siltstone dominated, and lamination is very faint		
413			" " "	" " "			
414			" " "	" " "			112
415	py		" " "	" " "	415.0 - 416.3: Facies A with extremely faint lamination		
416			" " "	" " "	416.3 - 417.9: Facies C		
417			" " "	" " "			
418			" " "	" " "	Facies A, 10cm		113
419			" " "	" " "	Facies C, 20cm		
420			" " "	" " "	Facies A		
421			" " "	" " "	418.75 - 421: Facies C - occasional faint lamination		
422			" " "	" " "	Facies A		114
423			" " "	" " "	Facies C		
424			" " "	" " "	Facies A: some slumping or intraclasts		
425			" " "	" " "	Facies C: lower boundary gradational down into Facies A over 20cm		

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE siltstone mudstone	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
425				SSSS	424.8 - 426.9m: Facies C		
426							
427			1-m grey		Thin laminated interval 427.1 - 427.6m: No core recovered		115
428				SSS	Facies A		
429	py						
430	py				427.6 - 431.9m: Facies A; lamination decreases at base		116
431	py		1-m grey				
432							
433	py		dk grey		431.9 - 433.0m: Very faintly laminated, dark grey, slightly fetid-smelling claystone		
434			m grey	SSS	433.0 - 435.1m: Finely laminated, dark-coloured pyritic mudstone 434.1: 5cm contorted band		117
435					1cm rippled siltstone		
436	py		sudden change to light greenish grey		435.1 - 436m: Similar to Facies C, but contains graded beds: - sharp-based siltstone → structureless greenish-grey mudstone		
437	py				Gradual downwards increase in white-l grey siltstone. Some beds graded (Sst → dk grey mudstone); others sharp-topped with ripple lamination; mudstones are crinkly laminated		
438	py				10cm band with intracryst texture; algal-like banding; dolomite?	IS	118
439					10cm siltstone-rich interval		
440	py		greenish grey		Very faintly laminated mudstone		
441	py				Thin siltstone unit; vertically fractured		
442	ch				440.6 - 441.9m: Crinkly and graded siltstone/mudstone laminae; cm-scale siltstones with vertical fractures at 440.85, 440.95		119
443	py		Mostly grey some greenish grey		12cm bed with cone-in-cone and specks of chalcopyrite? limestone		
444	py				Fine crinkly laminated siltstone and mudstone		
445					20cm bed with graded siltstone → mudstone couplets to 2cm thick		
446			T-dk grey		444.9 - 447m: Mixture of crinkly and graded bedding; latter predominates		120
447							
448					At 447.1m a sharp change into dark grey C-type facies; scattered discontinuous, crinkly, and slumped laminae		
449	py			SSSS			121
450	py			SSS			

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE siltstone mudstone	LITNOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
450	py			ss - ss			121
451			dk grey	sss -	To 452.4m - continuation of Facies C, with scattered slump laminae evident.		
452				sss -			
453			fin. grey and greenish		452.4 - 454.75m: Facies A - finer than Facies A above; little siltstone; laminae composed l. grey and greenish grey, and dark grey to black mudstone (latter organic-rich).		122
454			grey		One or two white siltstone laminae near base of interval.		
455	py				454.75 - 455.3: Facies C.		
456	py			ss A ss	455.3 - 455.9: Laminated, crinkly, minor graded, and slumped mudstone.		
457			dk grey		455.9 - 457.45: Facies C.		123
458			" " "		2cm cone-in-cone band overlain by 2cm siltstone.		
459			" " "		Crinkly and finely graded siltstone-mudstone (Facies A variant?).		
460				ss -	459.7 - 459.5: Facies C.		
461	py			ss -	459.5 - 461.0: Facies C, with slumps, and some Facies A lamination in places.		124
462	py			ss -	461.0 - 461.9: Facies A - lamination fine, and fairly faint.		
463				ss -	461.9 - 462.45: Facies C.		
464				ss -	462.45 - 463.3: Facies A.		
465	py			ss -	463.3 - 463.75: Facies C.		
466					463.75 - 466.0: A mixture of Facies A and Facies C.	096	125
467					466.0 - 473.0 (approx): Facies A, but lamination not as fine as in some intervals above.		
468							126
469				sss -			
470							
471							
472							127
473					473		
474			grey, black and greyish green		Facies A continues, but at 473 get an increase in the number of laminae; colours are more sharply defined, and there is a higher proportion of black lamination.		128
475							

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 20 OF 22

LOCATION: Sherwin Creek

LOGGED: IPS

DATE: 3/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE siltstone mudstone	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
475	Black & greyish green				475.7: fracture filled with white ?calcite		
476	Greenish grey with white to l. grey				to 477.5: Facies A - siltstone bands increase downwards		
477					to 477.5m, then die out over about 1cm; siltstone laminae are slightly crinkly		
478	Greenish				477.5 - 479.65: Structureless to faintly laminated mudstone; similar to Facies C, but lacks the black flecks		
479	grey						
480					← A few siltstone laminae, otherwise as before		
481					479.65 - 482.0m. Structureless to faintly laminated mudstone		
482					← Interval containing mm-scale white spots (dolomite or contact mineral)		
483							
484	Greenish						
485					Slightly stronger lamination, but distorted		
486	grey				486.1 - 487: Scattered siltstone laminae to 1cm in greenish grey mudstone		
487	gr. grey to m. grey				← 2 or 3 siltstone laminae and thin beds		
488					487.4 → Facies C		
489					488.1 - 505m: Poor core recovery; little apparent variation in lithology; is virtually all m.-dk grey, structureless or vaguely laminated shale/mudstone - f. siltstone; rare bands of white, coarser siltstone, up to about 1cm thick, are present		
490							
491							
492							
493							
494							
495							
496							
497							
498							
499							
500							

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
500							
501							
502					502:0m		
503					502 - 505m: 0.8m. of core recovered. Still m. dk grey structureless to faintly laminated mudstone and siltstone		
504							
505							
506	dk greenish to greenish black			Δ	505 - 510.6m: Faint, subtly laminated interval consisting of fine siltstone/mudstone grading into mudstone/clayst.; grading is on mm. scale; no change at colour boundary at 506.35		
507	pale green and grayish green			Δ	506.35: Sharp colour change		
508				Δ			
509	greenish black			Δ	Faint grading as before, but laminae blacker		
510					510.3 - Several mm to 0.5cm-scale white siltstone laminae		
511					510.6 - 514.0: Uniform greyish-green mudstone with rare white siltstone laminae		
512							
513	SR 42				10cm grayish-red interval; lithology unchanged		
514	Greyish green and greenish grey				514 - 517m: Greenish gray mudstone dominant in upper part, but proportion of siltstone gradually increases downwards, constituting about 50% from 515.5 - 517m. Some lam-bed borders on v. fine sandstone		
515							
516							
517					517 - 518m: Sudden change to mudstone-dominated interval		
518					518 - 519m: Facies C		
519							
520					519 - 526m: Mudstone, but with moderate proportion of siltstone down to about 521m; below that is mudstone, in which a slight increase in black ?organic-rich flecks gives a darker grey, less greenish colour.		
521	greenish grey						
522							
523							
524							
525							

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 4 SHEET 22 OF 22

LOCATION: Sherwin Creek

LOGGED: I.P.S.

DATE: 5/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE or texture mudstone	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
525					See previous page - continuation of mudstone		
526					3 x 2cm laminated v.f. glauconitic sandstone interbeds		
527					Thin, white ? calcite lamina		
528					Slumped or brecciated green and black mudstone		
529					Mudstone continues to bottom of hole, punctuated only by spotty intervals		
530					529-3m : 30mm band of granular white ? dolomite spots - grades upwards		
					529.9m : Spots occur over ~10cm		
					530-3.5m		
531							
532					532m Total depth		
					Hole plugged and abandoned		

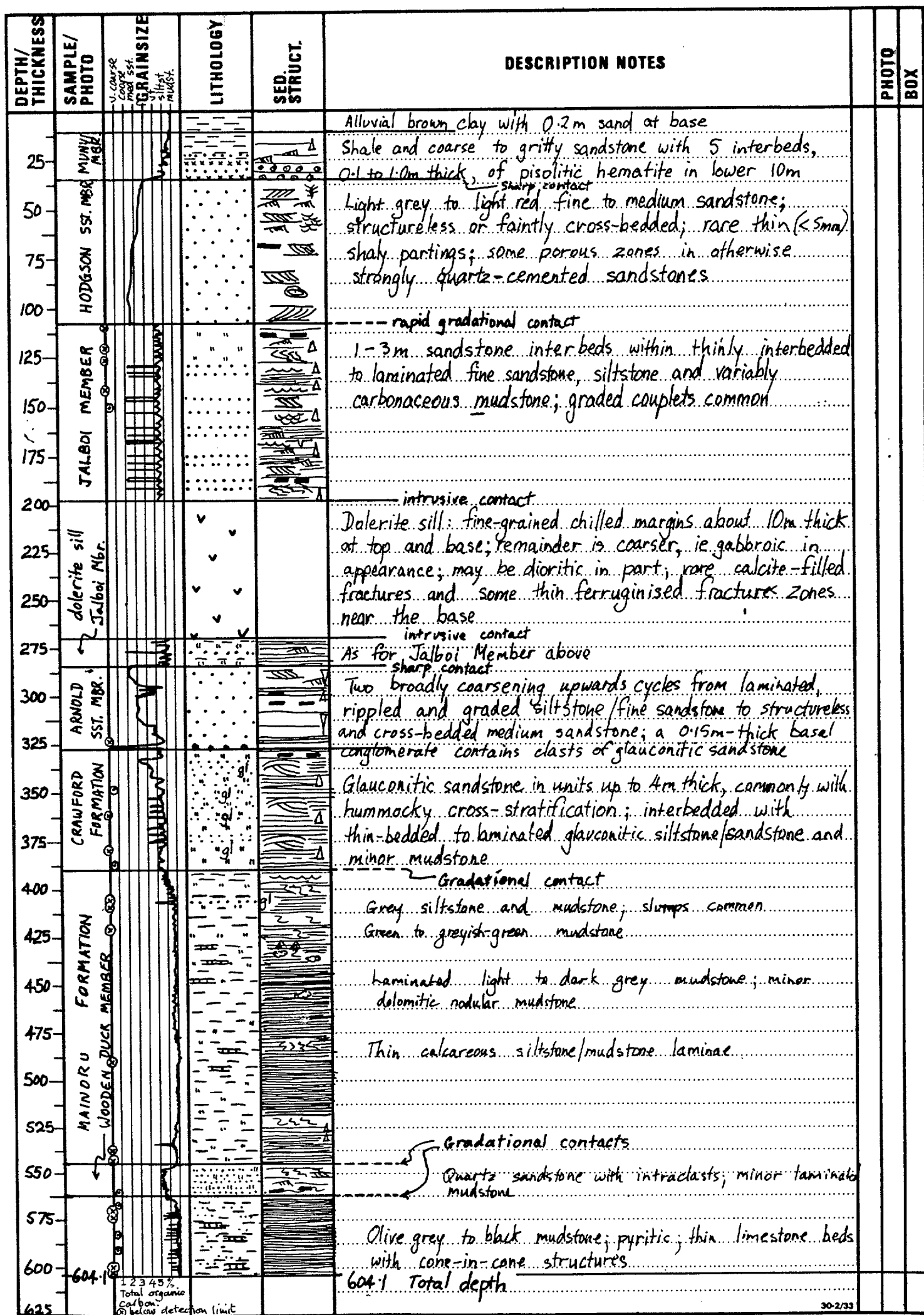


FIG. 6: DETAILED LOGS FOR BMR URAPUNGA 5
(sheets 1 to 25)

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 1 OF 25

LOCATION: Hells Gate Creek

LOGGED: I.P.S.

DATE: 8/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
0							
1							
2							
3							
4							
5					0-10m. Brown clay (black clayey soil)		
6							
7							
8							
9							
10					0.2m (approx.) pinkish sand or sandstone		
11					10.7m - started coring (HQ)		
12					Stiff, l. green to buff clay with yellowish brown patches (highly weathered bedrock)		
13	grey, reddish				Fragments of hard siliceous sandstone 12.1-13.7m: Light grey clay or completely altered shale; micaceous		1
14	grey				13.7-14.2m: No core recovered		
15					10cm of reddish brown, v.f. ferruginous sandstone		2
16					14.8-15m of indurated, fresh, grey m. sandstone, weathered patches		
17	greyish red				14.8-16.8: Weathered shale and siltstone - most is greyish purple, but is cut by reddish brown, and l. green & grey clay		
18					16.8-19.3m: Massive micaceous siltstone with scattered coarse sand grains; ferruginous patches		3
19					30cm interval with 2 sandstones separated by 5cm of greenish grey shale		
20							4
21	greyish red				20.75-23.1m: Mainly siltstone, with laminae (<1cm) of medium sandstone (a 10cm bed at 22.5m), and faintly graded v. fine sandstone → mudstone		
22							
23					Bedding is flaser-like		5
24					Sandstone contains thin, shaly laminae and scattered mudflakes ← 20cm breccia, probably tectonic - i.e. a fault		
25					Continued alternation of greyish-red siltstone and sandstone, most ssts. are sharp-topped, but a few are slightly graded		

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
25							6
26	hematite purple				Oolitic (1mm diam.) iron oxide (hematite) bed 10cm siltstone bed above 0.2m ironstone bed		
27					26.25 - 30.5m: Quartz and mica-rich siltstone with scattered sand grains and interbeds of (mostly) m. sandstone; irregular oxidation of Fe to limonite		7
28							
29					29.0 - 30.15m: Very broken-up and oxidized core; appears brecciated; includes chocolate siltstone and white sandstone	TS	8
30					← v. coarse sst. & grit		
31					Grit interbeds in m.-c. sandstone; several thin chocolate siltstone shale interbeds also (< 1cm)		
32					Interbedded medium to gritty, even pebbly sandstone, mostly oxidised, but one greyish-green bed at 31.5m		
33					32.1 - 32.4m: Poorly sorted m.-v.c. sandst. with dendritic limonite staining		9
34					32.5 - 32.65m: V.c. sand grains floating in hematite 'matrix'		
35					33.5 - 34.5m: Ironstone; quartz content increases upwards		
36					← Above erosion surface: breccia - sandstone fragments; siltstone, and ironstone interval with scattered sand grains		10
37					10cm cross-bed - first one seen		
38	pinkish grey				Sandstones f-m, quartz-cemented; reddish, oxidised siltstone i.b. ? gypsum pseudomorph		
39					Cross-beds in 0.1-0.2m sets; style not obvious		11
40					Similar cross-beds; sst. is poorly sorted	TS PP ↑ HQ ↓ NQ	
41					0.4m no core		12
42							
43	brown				Darker coloured sst. than above; seems to be due mainly to amount of iron staining of cement, not to grainsize variations		
44					Virtually no bedding structure	TS PP	
45	grey				Increase in grainsize and occurrence of cross-beds are related - ie change in facies		13
46					Ripples show up as streaky fine Fe-staining		
47							
48					Full cycle of thin beds: plane- or cross-bedded at base, rippled at top; darker, more Fe-stained at base	PP	14
49	brown						
50					Brown sandstone is slightly more porous		

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 3 OF 25

LOCATION: Hell's Gate Creek

LOGGED: I.P.S.

DATE: 9/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
50					Finely colour-laminated fine sandstone		14
51					Sharp-based bed with 10cm cross-bed above		
52					50-75m: Light coloured (off-white to purplish)		15
53					f-m sandstone with rare shaly partings and	TS PP	
54					thin coarser intervals; most sand is f-m, with		
55					probable secondary made in m-c range;		
56					predominantly quartz cements		
57					Coarser, less well sorted, probably bimodal sandstone		16
58	dk purple white				Core looks slightly porous over ~ last 5m		
59							
60					0.2m of better sorted coarse sandstone		17
61							
62					Thin shaly partings - over 2cm are several v. fine wavy laminae		
63					Water-escape structures - vague, irregular inclined laminae; some of these probably interpreted above as ripple marks	TS PP	18
64					64-66m: No cross-beds recognised; some coarse laminae		
65							
66					66.3-66.7m: Coarser, browner interval		
67							
68					67.5-69.5m: Uniform interval, l. brown colour; looks slightly porous	TS PP	19
69							
70					Shaly parting		
71							20
72					Chocolate-reddish brown 5mm shaly partings		
73					72.3-72.75m: V. light grey (unacidised), well sorted, m. qtz sst		
73					72.75m: Dark reddish brown m-c sst with rare cross-beds		21
75							

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
75							
76					75.8 - 77.4 m: Uniform m. sandstone	PP	21
77							
78			reddish brown		78.45 m Sharp-based 0.25 m cross-beds; rip-up clasts at base and slight fining-upwards tendency		22
79							
80					75 - 100 m: Very uniform facies - m-c sandstone, cement whiter than grains, but still looks siliceous rather than clayey; occasional sharp-based cross-beds	IS PP	
81							
82							23
83							
84					Thin clayey partings		
85							
86					Liesegang rings and a pseudo-pebble of white ?qtz grains	PP	24
87					86.3 m: 0.1 m v. light-coloured sandstone		
88							
89			dk reddish brown to l. pinkish grey		Much wavy ferruginous lamination outlines water escape (dish-type) structures		
90					2 shaly partings about 5 mm each		25
91					1 green clay seam, possibly a stylolite	PP	
92							
93					? Possibly a more porous sandstone; coarser laminae and thin layers in foresets are apparently more porous		26
94			m to dk reddish brown				
95							
96					Green thin (1-2 mm) clay seam	PP	
97							27
98							
99							
100							28

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
100					Poorly sorted laminae of m-c sandstone in a background of m. sandst.; may be some f. grains		
101							
102							
103							
104			mauve/red to l. grey				
105					More consistently c. grained with matrix of possibly fine sandst.; scattered white spots appear to be ? clay grains which have been squashed during compaction.		
106					Looks porous in places		
107							
108			reddish-br.				
109			white to reddish grey				
109.2					5cm band of dk grey silt/mudstone on top of a single 3cm ripple mark; desiccation cracks infilled with m-c sandstone		
109.25-109.95					2 sandst. beds with mudflakes; sharp, c. grained base is slightly loaded into 5mm mudst. lamina		
109.95-110.5					Interbedded pale greenish sandstone and reddish-brown ferruginous siltstone		
110					Reddish brown, irregular, oxidised patches in otherwise fresh rocks. L. coloured sandst. with pale green incipient brecciation/intracasts		
110.5-113.8					15-20cm of cong./intracast breccia; contains rounded sst. clasts to 3-4cm		
112					Interbedded sandy siltstone and f-m sandstone on a 1-10cm scale; irregular oxidised patches; some loading of sandst. into siltst.		
113					Basal 0.25m is micaceous silty sandstone, 'greywacke'-like		
113.8-116.3					Alternating f-m, well sorted, grey to olive green, laminated and occasionally ripple-marked sandstone, and dark grey to black siltstone/mudstone; many graded couplets of these; some sandstones have both sharp tops and bases		
116.3-116.95					Micaceous 'greywacke' with 10cm of alternating finer facies in middle; minor glauconite in latter		
116.95-118.2					Laminated facies		
118.2-119.6					Sandy, micaceous siltstone, slightly finer than the 'greywacke'; top is slumped, remainder is homogeneous		
119.6-120.1					Laminated siltstone containing curved sandstone 'intracast' at base		
120.1-120.15					Same lithology as 118.2-119.6		
120.15-120.5							
120.5-123.0					Laminated facies - roughly equal proportions of sandstone and siltstone/mudstone; sandstone intracast at 120.7m		
121.2-121.4					Glauconite rich from		
123.0-123.6					Laminated facies with fewer sandstone interbeds		
123.6-123.9					'Greywacke' facies; 5cm white, m. sandstone beneath it		
123.9-124.0					Laminated facies; finer, fewer sandstones		

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
125				SSS	125 - 126.3m: Dark grey, clayey, micaceous siltstone		
126					126.3 - 126.9m: As above, with 3 x 2cm, medium, well sorted sandstones, one with glauconite		
127	9				127.1 - 128.75m: Several white to l. grey, m, quartz-cemented sandstones; scattered pale green grains - don't look like glauconite		35
128				-	128.75 - 129.4m: Laminated facies		
129	9				30cm: l. grey glauconitic sandstone with ripple marks		
130	9				129.6 - 130.7m: Laminated facies; sandstones quite glauconitic		
131	white to l. green oxidised to red brown				130.7 - 132.0m: Thin-bedded facies - lower part oxidised; dominated by f-m glauconitic sandstone, some with ripple lamination, and l. green clay-rich mudstone	TS	36
132					132 - 132.6m: M-c. Speckly quartz sandstone; some glauconitic		
133	9				132.6 - 133.4m: Laminated facies; colours rather oxidised		
134	l. grey - brown				133.4 - 135.9m: Thick beds of well sorted, slightly oxidised, m. sandst. Rather fractured; distinctive dish structures		
135					Sandstone bed containing fractures filled with green ? clay		37
136	grey & reddish brown				135.9 - 137.75m: Laminated facies - thin graded beds evident; Above 136.9m l. green spots in otherwise oxidised colours; below is mostly reduced, with streaky reddish brown		
137					137.75 - 137.9m: Thin cross-bed of m. sandstone		
138					137.9 - 138.6m: Laminated facies - dark gray, ie reduced (not oxidised)		
139	dk grey				138.6 - 139.4m: 'Greywacke' facies		38
140	red - grey brown				139.4 - 139.65m: Laminated facies		
141	dk grey l. green				139.65 - 139.85m: Greywacke facies 2cm of c-vc sandstone, with sharp irregular base, within lam facies	TS	
142	reddish brown				139.85 - 142.65m: Laminated facies with sandstones (mostly graded) ranging to coarse graded; 15cm greywacke from 141.7m		
143					Don. sandstone interbed with ball & pillow		39
144					142.65 - 146.1m: Rather uniform sandstone - lacks internal structures; markedly coarser at top; 30cm of finely laminated, cross-bedded sst. at base		
145	l. green - grayish brown						
146	py				146.1 - 146.5m: Laminated facies	TS	40
147	reddish brown				146.75 - 150.0+m: Laminated facies continued: minor variations in proportions of sandstone - siltstone		
148	dk grey						
149					< 10cm white, m-c sandstone		
150					Reverse grading: f → c sandstone filling small scour	TS	41

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED STRUCT.	DESCRIPTION NOTES	PHOTO BOX
150	reddish brown				150.0-152.05m: Very finely laminated facies - reduced colours except where shown	41
151	reddish brown					
152	dk grey to greenish red				151.75m: A m. sandst. intraclast in v.f. white sandst. lamina 0.2m 'greywacke' bed	
153	dk grey				152.3-152.7m: Laminated facies; oxidised to various degrees	
154	l. grey brown				152.7-153.5m: M, matrix-rich sandstone; sandier than the 'normal' greywackes	42
155	reddish brown-grey				153.5-154.8m: A thick, relatively structureless m. sst. bed; mostly oxidised except for a thin green (glauconite?) lamina at top	
156					154.8-155.6m: Laminated facies	
157	greyish red to brownish grey				Structureless sandstone; vertical fractures containing greenish clay	
158					156.3-158.4m: Laminated facies; graded couplets and sharp-topped sandstone laminae	43
159	"					
160					158.4-160.8m: Well sorted m. sandstones with scattered brown and white grains; quartz cemented; several partings and thin beds (< 2cm) of brown siltstone/mudstone separate the sandst. beds	
161						44
162					160.8-162.1m: Laminated facies	
163					162.1-164.1m: Sandstone with numerous circular holes to 5mm; ? removal of mudflakes or solution of pyrite; below 162.9m is structureless, m, well sorted quartz sandstone with faint iron staining	45
164	greyish red				164.1-165.5m: Laminated facies	
165						
166					165.5-168.2m: C, moderately sorted sandstone with silica cement; several thin mudstone intervals; excellent dish structures at 167.6m; well sorted sst. at base	46
167						
168	greyish purple dusky red				168.2-170.0m: Laminated facies; c-v.c. sands as thin as one ripple thick (0-5mm); colour in the mudstones is increasingly oxidised towards top of the interval	
169	blackish brown					
170					170.3-170.9m: Laminated facies	
171						
172	greyish red				172.15-173.4m: Laminated facies; grading mostly in finer sandstones/c. siltstones; f-m sandstones are sharp-topped	47
173					172.7-173.4m: Spotted interval - faint at top, strong in lower 0.3m; consists of an Fe-rich mineral?	
174						
175						

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
175	Greenish with grey- brown spots				175.0 - 176.4m: Laminated facies - some actually thin-bedded; spotted throughout; sandstones mostly sharp-topped	Ts PP	48
176							
177					176.4 - 178.1m: M., well-sorted sandstone; little cross-bedding or other structures; very pale green c. sand-size clay grains scattered around 178.4m		
178					178.1 - 178.5m: Laminated at top, then sandy siltstone - similar to 'greywacke' facies		
179	All spotted				178.5 - 179.85m: Laminated facies: several thicker beds near base, and apparent thinning-upwards tendency		49
180	grey-br to purple						
181							
182	greenish brown				181.75 - 182.55m: Laminated facies - dominated by thin sandstone beds in upper part, equal sandst./siltst. in remainder		
183					182.7 - 183.05m: Spotted sandy siltstone, some greywacke		
184	↑ greenish grey				183.05 - 183.5m: Laminated facies - graded couplets in places		50
185	↓ purplish grey				183.5 - 184.1m: Spotted sandy siltstone		
186					184.1 - 187.0m: Massive m-c sandstone; no cross-bedding; the only discontinuity is the line of mudflakes at 186.6m		
187	greenish patches						
188	green				187.0 - 187.7m: Laminated facies		51
189	greyish purple				187.7 - 188.1m: M-c, well-sorted sandstone; mudfl. in lower Xb		
190					188.1 - 188.9m: Laminated sandstone/siltstone merging down into siltst. with very subordinate f. sandstone		
191	dk grey brown				188.9 - 189.45m: Slump - bedding is concordant at base, increasing to vertical in middle of interval		
192					189.45 - 190.0m: Fairly structureless m-c sandstone as before		
193					190.4 - 190.85m: Greywacke facies; single sandstone lamina near base		52
194	dk grey brown and l. green				190.85 - 191.5m: Thin-bedded to laminated facies, sandst. dominant		
195					Thin vein of contact-affected clay, or igneous vein 1cm thick		
196					191.7 - 192.2m: Laminated facies - sandstone dominant		
197	green spots 1-2cm				192.35 - 193.5m: Laminated facies - sandstone dominant		
198					193.2m - odd structure - ? a pseudomorph		
199					193.75 - 194.3m: Laminated facies, again sandstone dominant	PP	53
200					Spotting evident in some beds		
					194.5 - 197.0m: Laminated facies		
					197.0 - 197.25m: Graded greywacke bed - actually f.sst → v.f. sst/siltst		54
					Siltstone becomes dark green near contact		
					198.1m: Sediment-dolerite contact		
					Very fine to fine-grained dolerite away from oxidised contact		

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 9 OF 25

LOCATION: Hell's Gate Creek

LOGGED: IPS

DATE: 11/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
200			✓				
201			✓				
202			✓		Progressive downward increase in grain size evident all the way to 211m.		55
203			✓				
204			✓				
205			✓				56
206			✓				
207			 ✓		Calcite filled fracture		
208			✓				
209			✓				
210			✓				57
211			✓		211m: Pink feldspar, grey plagioclase, and mafics visible. Possible potash feldspar (pink) suggests dioritic, rather than gabbroic, composition		
212			Some core lost;				
213			patchy				
214			recovery				
215			✓				58
216			✓				
217			✓				
218			✓		Uniform diorite/gabbro; quite coarse-grained		
219			✓				59
220			✓				
221			✓				
222			✓				
223			✓				60
224			 ✓		Calcite veins; mafic minerals are coarser grained (up to 10mm long) on either side of vein		
225			✓				

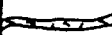
PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 10 OF 25

LOCATION: Hell's Gate Creek

LOGGED: I.P.S.

DATE: 12/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT	DESCRIPTION NOTES	PHOTO	BOX
225			✓				
226			✓				
227			✓		Massive, coarse-grained diorite/gabbro continues for whole 25m		61
228			✓				
229			✓				
230			✓		228-231m: Minor fractures		62
231			✓				
232			✓				
233			✓				
234			✓				63
235			✓				
236			✓				
237			✓				
238					Calcite vein		64
239			✓				
240			✓				
241			✓				
242			✓				65
243			✓				
244			✓				
245			✓				66
246			✓				
247					5cm vein of finer grained rock similar to the surrounding material		
248			✓				
249			✓				67
250			✓				

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET II OF 25

LOCATION: Hell's Gate Creek

LOGGED: I.P.S. DATE: 13/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
250			✓				
251			✓				
252			✓		5 black veins each ~1mm thick		
253			✓		Several subvertical fractures		68
254			✓		Coarse diorite/gabbro continues		
255			✓		5mm-thick black vein or shear zone		
256			✓		As above, steeply-dipping		69
257			✓				
258			✓		Coarse-grained		
259			✓		Pink leucocratic vein, 1-2cm thick, with fragments of		
260			✓		dolerite 'floating' in it		70
261			✓		Fining-downwards tendency from about 260m		
262			✓				
263			✓				
264			✓				71
265			✓				
266			Fe		Thin (~1mm) reddish oxidised zones along fractures		
267			Fe		increase downwards		72
268			Fe				
269			Fe				
270			Fe		Oxidation becomes pervasive from about 270m, and rock		
271			Fe		takes on a very dark reddish-black colour; dolerite(?) becomes		73
272	blotchy greyish purple				very fine-grained within 0.5m of the contact		
273					271.4 Reddish-black and dk green dolerite right to contact		
274	l. green greyish red & m. green				10cm of thin-bedded and laminated f. sandst. and siltst.		
275					271.6-274.1m: Massive, m. sandstone; Fe-rich parting at 272.55m		74
					272.6-272.8m: More porous interval with stylolites		
					5cm siltstone interbed at 273.25m		
					Rip-up clasts at base of bed		
					274.1m →: Laminated facies; contact spotted throughout		

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED STRUCT	DESCRIPTION NOTES	PHOTO	BOX
275					→ 275.6m: Lam. facies (contin.) - Sandstones are fine-gr., rippled; 2 thin c.-vc. sst., one with eroded top - Strong contact spotting		74
276							
277	Py				276.1 - 277.1m: M. gr., well sorted, structureless sandstone		
278	1 grey & reddish grey purplish red patches				277.1 - 278.4m: Laminated facies - vc. sst 2cm thick at 277.6m, other sandst. laminae are f. gr.; 15cm 'greywacke' at 276.15-280		75
279					278.4 - 279.8m: M. sandst. containing a slump or ball & pillow str. 0.15m graded greywacke bed		
280	1 grey & purple blotches Alternating dk brown grey & grey-green + white to l. grey sandstones				279.0m - 279.5m: Sand-dominated lam.-thin b. facies with a truncated wave ripple mark		
281					280.2 - 281.3m: Thin-bedded to laminated facies; thin sandstones at 281.7m (2cm, v.c. sandstones); extensive contact-spotting, and hematite staining and alteration along joints & veins	TS	76
282							
283	Mostly brownish grey						
284					Possible wave-rippled tops of thin sandstone beds 2 of 5-6cm, plane-bedded sandstones		
285					First clearly cross-bedded sandstone		
286	blotchy brownish				284.8 - 292m and below: Thick-bedded, structureless, c. sandstone; Becomes finer and thinner bedded downwards		77
287	gray				Possible vague cross-bedding		
288					3cm brownish-grey siltstone bed		
289							
290	As above				290-292m: Sandstone looks more porous	TS PP	78
291					291.02m: Thin clay parting		
292					2 thin siltstones with a 1cm rippled sandstone bed between		
293	Some green patches				293.1 - 294.6m: M. sandstones with scattered clay pellets and holes - visible secondary porosity; several thin siltstone beds	PP	79
294							
295					294.6 - 296.4m: Laminated and thin-bedded facies: Greyish-brown micaceous siltstone & shale interbedded with thin, m. sandst, often with curved (large wave-rippled?) tops; basal 30cm is fining-up, v.f. sandst → siltstone		
296	brownish grey to brown						
297					296.4 - 300m: Massive, white to l. grey and v. light purplish grey m → f. sandstone; virtually no bedding-planes recognised	PP	80
298							
299					Scattered secondary porosity		
300							81

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
300					Vaguely bedded siltstone		
301					To 300.8m: siltstone with m.gr. sandstone interbeds; possible mudcracks		81
302					300.9m: Thin v.c. sandstone; sharp base		
303					Very uniform sandstone; some faint grainsize variation between f. & med.	TS PP	
304							82
305					Well developed mudcracks!		
306					304.85 - 306.7m: Thinly interbedded to laminated sandstone and siltstone		
307	pale greyish purple						
308					306.7 - 314.5m: Massive, almost structureless, well cemented quartz sandstone; mostly medium with scattered fine grains.	PP	83
309	almost white				at first, fine with scattered medium lower down		
310							
311							
312					312.2m: Sharp-based, coarse sandstone which fines upwards		84
313					Stylolites or thin veins with clay		
314					Stronger lamination	TS PP	
315	greyish purple				314.5m: First distinct shaly parting since 307.25m		
316	white				314.5 - 318.3m: Mostly fine sandstone, scattered m. grains		85
317							
318							
319	4 colours see description				319.2m: Scattered coarse grains near base		
320					Colours: F. sandst. - l. grey, some l. green; Siltst. - reddish grey, oxidised to reddish brown		86
321	green/red-brown				321m: Good mudcracks in greenish mud	PP	
322	black - dk grey				320.9 - 322m: Thin-bedded, ripple-laminated, interbedded with, and sometimes in graded beds with, dk grey-black siltstone		
323	dk grey - black				322.15 - 322.8m: Similar to previous f. interval, but with many sandstone dykes (molar tooth) or mudcracks	PP XRD OPG	87
324					322.8 - 323.05m: Graded greywacke - micaceous sandy siltst		
325					Below 323.05m: Predominantly black siltstone with minor sandstone; 324.8m - coarse sandstone with sharp tops		

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
325					325.4 m: 2 c - vc lithic sandst. - grains of sandst/fltzt and a greenish clay	TS	
326					325.4 - 326.3 m: Predominantly siltstone with vague v.f. sandst. and some sharper sst. laminae with mudcracks 1/8" molar tooth	OPG	
327					326.55 - 326.8 m: 25cm grit → c sandstone, polymict at base 15cm pebble to cobble congl. containing clasts of lam. glauconitic sandst which fines up rapidly to coarse sandstone		88
328							
329					327.05 - 331.7 m: Laminated v.f. - f. sandstone, ripple-marked, some graded; i.b. with dark grey micaceous siltstone; ssts. very glauconitic - grains mostly rounded flat clasts much coarser than the quartz grains.		
330							
331					Ripples - not sure if wave or current		89
332					15cm intraclast breccia; internal lamination looks stylolitic		
333					Several black siltstone laminae		
334					f. sandst. with m. glauconite grains		
335					v.f. glauconitic sandstone with numerous black laminae near the base		90
336					Green intraclasts		
337					334.9 - 335.45 m: v.f. glauconitic sandst. with thin black laminae		
338					Green intraclasts		
339					m. sandst. with black, irregular laminae		
340					336.7 - 337.35 m: Sharp-based bed of v.f. - f. sandst.; glauconitic, less laminae and coarser grained upwards		
341							
342					338.2 - 340.0 m: v. uniform, pale green glauconitic sandst; laminae fade downwards		91
343							
344					v.f. sandst. / dk grey siltstone; graded and sharp boundaries		
345					Plane-bedded sandstone		
346					341.35 - 345.2 m: Thick hummocky cross-stratified v.f. - f. sandstone; slightly glauconitic; dark flakes, and v. thin laminae of ? mica/siltstone throughout; unusual wave ripples or disrupted laminae near base		92
347							
348					345.55 - 347.1 m: Disrupted bed - slump laminae & breccia; fairly homogeneous at base and top as though completely slurried		
349							
350					347.6 - 350.2 m: Alternating v.f., laminated, glauconitic sandstone and dark grey, f. micaceous siltstone; both graded and sharp topped sandstones	OPG	
					Wave ripples &/or small HCS occur throughout; some black, bituminous-looking flakes		94

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
350						TS	94
351	g1				350.2 - 358.4m: Thick series of graded couplets of f-m sandstone and siltstone; scattered m.gr. glauconite pellets		
352							
353	g1					TS	95
354							
355					3 thin graded beds		
356					Slumped silty bed		
357					Graded and sharp-topped beds		96
358							
359	g1				Laminated sandstone with two intraclasts of more silicified glauconitic sandstone		
360					358.4 - 361.5m: Continuation of laminated, graded facies	096	97
361							
362					30cm f-m sandstone with HCS		
363	g1				361.9 - 363.0m: Numerous thin beds of m. glauc. sandstone and f. black laminated siltstone		
364							98
365					363.8 - 365.3m: Continuation of graded and sharp-topped f-m sandstone and siltstone		
366					365.3 - 365.7m: Siltst. & v.f. sandst. with large water-escape struct.		
367	g1				Laminated glauconitic sandstone with m. glauc.		
368					Laminated, graded facies		
369	g1				367.4 - 368.0m: Faintly laminated f. sandst. with m. glauc.		99
370					368.0 - 368.9m: Laminated v.f. sandstone/v.c. siltstone		
371					368.9 - 369.5m: F. sandstone with sparse glauconite, HCS		
372					Odd structures - intraclasts or diagenetic structures		
373					370.9 - 371.65m: Graded and sharp-topped v.f. sandst./siltst.		100
374					Single thicker sandst. bed		
375					371.9 - 375.1m: Graded & sharp-topped sandst./siltst. facies		
376					Wave ripples or small HCS v. common in virtually all the sandstone beds		101
377							
378							
379							
380							
381							
382							
383							
384							
385							
386							
387							
388							
389							
390							
391							
392							
393							
394							
395							
396							
397							
398							
399							
400							
401							
402							
403							
404							
405							
406							
407							
408							
409							
410							
411							
412							
413							
414							
415							
416							
417							
418							
419							
420							
421							
422							
423							
424							
425							
426							
427							
428							
429							
430							
431							
432							
433							
434							
435							
436							
437							
438							
439							
440							
441							
442							
443							
444							
445							
446							
447							
448							
449							
450							
451							
452							
453							
454							
455							
456							
457							
458							
459							
460							
461							
462							
463							
464							
465							
466							
467							
468							
469							
470							
471							
472							
473							
474							
475							
476							
477							
478							
479							
480							
481							
482							
483							
484							
485							
486							
487							
488							
489							
490							
491							
492							
493							
494							
495							
496							
497							
498							
499							
500							

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 16 OF 25

LOCATION: Hell's Gate Creek

LOGGED: IPS

DATE: 15/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
375					Graded bed with intraclasts of grey sandstone 1-2cm across		
376	Lg				F-m glauconitic sandst; high-angle cutoffs, but may be HCS		101
377					Very fine - fine sandstone, graded, sharp topped, and siltstone		
378	Cg				- v. thin, crinkly lamination common in latter		
379					Thin graded sandstone bed		
380					3 thin beds of m. glauconitic sandstone		
381					378.45 - 379.75m: Thick bed of f. sandstone with HCS and thin	OPG	102
382					unidentified flakes or intraclasts		
383					379.75 - 381.3m: Laminated and thin-bedded interval; crinkly		
384					lam. again common		
385					381.3 - 382.1m: Fine sandstone with vague lamination		
386					Crinkly laminated siltstone		
387					382.6 - 383.2m:		103
388					383.6 - 384.9m: Slumped siltstone beds with sharp base cutting		
389					laminae in bed below at 45°		
390					384.9 - 387.2m: Very fine glauconitic sandstone with vague		
391					fine lamination and HCS		104
392					Odd intraclasts or diagenetic structures	TS PP OPG	
393					387.5 - 388.0m: Very fine, crinkly laminated sandstones		
394					388.7 - 390.3m: V.f. - f. sandstone with some graded sst-silt		
395					couplets; crinkly lamination and possible wave ripple marks		105
396					390.3 - 392.0m: Laminated siltstone/sandstone interval;		
397					siltstone dominated; scattered wave ripples		?
398					392.0 - 392.45m: Uniform dark grey siltstone bed		106
399					392.45 - 394.0m: Siltstone dominated laminated interval;		
400					slumped beds in basal 0.3m		107
					390.4 - 403.7m		
					Interbedded light grey siltstone - v.f.g. sst		
					(N7-N8) and medium grey claystone (N5);		
					mostly sub-cm scale lamination, including		
					graded units and non-graded, sharply-		
					defined beds. Thicker siltstone units are		
					commonly X-stratified, loaded and 'channel'		
					based. Thin slumped units. Sand lentils		
					siltstones patchily calcareous, interval richly		
					glauconitic		108

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
400					(as above)		
401	st				glauconitic mudstone		109
402	st						
403							
404	st				richly glauconitic vfg. sst.		
405					GENERAL DESCRIPTION 403.7 → 414.7m Interbedded pale grey siltstone and dark grey mudstone, richly glauconitic. Beds mm to about 3cm thick. Low angle cross-strat. in places otherwise parallel laminated (graded and some-graded). Slumped intervals up to 1m thick.		110
406	st						
407	st						
408							
409	st						111
410					32cm slump/slurry bed with massive base and gradational top		
411							
412							
413					1m slump/slurry bed, diffuse massive base		112
414					412.6, erosion surface, 10cm calving, capped by glauconitic mudstone		
415	st				subtle facies change		
416					GENERAL DESCRIPTION 414.7 → ~440.5m Dominantly dusky green to greyish green mudstone (~80%) but with interbeds of light grey siltstone & vfg. sst. Mostly laminated, but incipiently brecciated and slumped intervals. Rare ripple, lentils, cut & fill, pale brown nodular patches (?dolomitic)		113
417	st						
418	st						
419							
420							114
421							
422							
423					erosion		
424					pale brown 1cm thick bed ? dolomitic		
425	st				erosion		115

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA.5 SHEET 18 OF 25

LOCATION: HELL'S GATE CREEK

LOGGED: M.J.J.

DATE: 21/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO BOX
425					fault gouge (affect on strat. not known) (as above)	
426	gl					
427						116
428					unusual pale grey clay t. 1mm nodules (? origin) dusky green to	
429					concretionary with pyrite spherules & nodules (upto 3mm) greyish green (543/2 - 565/2)	
430						
431						117
432	gl				coarsened nodular dolomitic siltstone	
433	gl				thin (flem) glauconitic vfg. sst laminae	
434	ps					
435	gl				mostly light olive grey (545/2 - 546/2)	118
436						
437						
438					broken core: 50% recovery	
439	↑ pyrgl ↓ gl				dark greenish grey to medium bluish grey (546/1 - 548/1)	119
440					440-3: intraclastic glauconitic, pyritic dolomitic mudstone	
441	↑ gl ↓ py				subtle facies change - increase in content of sst/filler to ~50:50	
442						
443	gl				micaceous glauconitic siltstone	120
444					incipient slump, in massive mudstone	
445	gl					
446	gl					
447	gl					121
448	gl				minute authigenic ? dolomite concretions in both siltstone & mudstone columns	
449						
450	gl				(as below)	122

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 19 OF 25

LOCATION: HELL'S GATE CREEK LOGGED: M.J.J. DATE: 21/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
450							
451							122
452							
453							
454							123
455							
456							
457							
458							124
459							
460							
461							
462							125
463							
464							
465							
466							126
467							
468							
469							127
470							
471							
472					fault		
473					coarser grained sulphides in dolomitic layer		
474					fault		128
475					fault		

DESCRIPTION NOTES

GENERAL DESCRIPTION

440.5 → ~490m

Laminated sequence (mm to <1cm thick) of:

① medium dark grey to dark grey (N4-N3) mudstone (~70%)

② light grey to medium grey (N7-N6) siltstone grading to vfg. sandstone. Glauconitic & in places calcareous (beds up to ~3cm thick)

③ light olive grey, nobby/nodular laminae (mm-scale) of ?dolomitic mudstone (~5%). Glauconitic throughout.

Laminae commonly with sharp bases, sharp or graded tops; loading common. Lenticles of cross-laminated vfg. sst.

Disseminated sulphides present throughout coarser aggregates associated with ③.

No obvious cycles or rhythms or subdivisions

MAINORU FORMATION

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA5 SHEET 200F.25

LOCATION: HELL'S GATE CREEK LOGGED: M. J. J. DATE: 21/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
475							
476				AAA	2cm. cone-in-cone		
477	9 ²				slumping along syn-sed. fault or sulphides		129
478	9 ¹						
479	9 ²				slightly more dolomitic below here		
480							
481							130
482	9 ¹			ZZZ	roll-over soft sed. slumping sharp contact - note increased dip of laminae above ? part of slump		
483				AA			
484				AA	incipient cone-in-cone		
485					very subtle facies change about here, dolomitic beds increase vfg. sandstone/siltstone. dolomitic		131
486							
487							
488							
489							132
490							
491							
492							133
493							
494							
495							
496							134
497							
498							
499							135
500							

as above

GENERAL DESCRIPTION

485 →

As above mostly distinctly thin laminated calcareous siltstone and mudstone; greenish grey (5G4/1) to greenish black (5G2/1) with intervals richer in dolomitic nodular laminae up to ~5mm thick. Only rare glauconitic siltstone/vfg. sst beds present. Bedding few mm to sub mm - stripped appearance. No obvious cycles, rhythms or subdivisions.

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
500							135
501							
502					as above - continued		
503					- all rock types appear to be slightly calcareous. Beds parallel laminated, mostly sharp bed contacts, but occasionally graded; dolomite beds have irregular knobby bed contacts.		136
504					disseminated sulphides common.		
505					glaucanite present, but rare.		
506							
507	gl						137
508							
509							
510							
511	gl				tiny lentils of glaucanite sst.		138
512							
513					5cm thick dolomite bed, indistinct contortions.		
514							
515					chalcoppyite		139
516	gl				glaucanite in situ.		
517					slumped, non-dolomite.		
518					ditto above		
519					incipient sediment brecciation		140
520	gl				subtle facies change, increase in bed thickness especially siltst/v.f. sst beds & dolomite layers, also more slumps.		
521					slump contorted unit with incipiently slumped margins		141
522							
523							
524					uncoated slumped unit		
525					vfg sst 50%		142

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 22 OF 25

LOCATION: HELL'S GATE CREEK LOGGED: M. J. J. DATE: 23/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
525					as above - continued		
526	gl						142
527	gl						
528	gl				mostly mudstone		
529							
530	gl				several graded beds (5-6cm thick) glaucon. v.f. sst grading up to mudstone		143
531					change back to thin laminated mudstone (minor sst)		
532							
533					mostly 1-5mm (stripped) laminated mudstones sharp, even, planar contacts. (green to black) rare siltst. - vfg. sst. beds.		144
534							
535							
536					rippled beds, sandy at base more dolomitic upwards (few cm thick)		
537					subtle change; thick sandstone beds present within laminated mudstones.	090	145
538					4 glauconitic beds with intraclasts of mudstone (aminiter)		
539	gl						
540	gl						
541							146
542	gl				pyritic sulphide-rich interval	090	
543							
544							
545							147
546	gl						
547	gl						
548							
549							148
550					(see below)		

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 5 SHEET 23 OF 25

LOCATION: HELL'S

GATE

CREEK LOGGED: M.J.J

DATE: 24/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
550							
551	q						
552	q						
553	q						
554							
555							
556							
557							
558							
559	py						
560							
561	py						
562							
563							
564							
565							
566	py						
567							
568							
569							
570							
571							
572							
573							
574							
575							

GENERAL DESCRIPTION

545 → 562:

strongly cemented quartz sst, very fine grained. Beds 10cm, or ~1m thick with sharp bases, clasts of dk grey siltstone at tops. Glauconite present in some beds. Vague cross-strat & water escape structures. Intervals of laminated mudstone in upper & lower 4m.

as above but thin bedded sst & mudstone (beds 5-12cm thick)

large intraclasts of mudstone

gradational contact

GENERAL DESCRIPTION

562 - 604m:

Olive grey to black mm-scale laminated mudstone, richly sulphidic, organic rich (fakay). Rare 1mm thick laminae of glauconitic siltstone to 569, common below 569 and up to about 3mm thick (10 per decimetre)

rare syn-sed. faulting

2cm olive bed

lighter olive grey

Gene. core loss

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA5 SHEET 24 OF 25

LOCATION: HELL'S GATE CREEK LOGGED: M.J.J. DATE: 24/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
575					as above		155
576							
577							
578							156
579							
580							
581							
582							157
583					GENERAL DESCRIPTION 562 - 604 m: (End of hole) Laminated sequence of: ① olive black mudstone with pyrite framboids, ② black mudstone with flakey organic matter & ③ discontinuous pale grey vfg. sst laminae which are commonly glauconitic, calcareous rarely micaceous. Rocks are richly sulphidic. Laminations mostly ~1mm thick planar and parallel, rarely 1cm thick, not obviously graded. Thin sharply-defined medium dark grey limestone beds, commonly with cone-in-cone structures		
584							
585							
586							158
587							
588							
589							
590							159
591							
592							
593							
594					subtle increase in proportion of pale grey vfg sst below about here		160
595							
596							
597					6cm limestone bed, incipient c-u-c in middle of bed		161
598							
599							
600					5cm thick vfg sst bed		162

LOCATION: HELL'S GATE CREEK LOGGED: M. J. J. DATE: 24/6/85.

30-2/23

62

FIG. 8: DETAILED LOGS FOR BMR URAPUNGA 6
(sheets 1 to 17)

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 6 SHEET 1 OF 17

LOCATION: ROPER BAR STORE

LOGGED: M.J.J.

DATE: 28/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
1							
2							
3							
4							
5					alluvium, colluvium & weathered rock.		
6							
7							
8							
9					commenced coring at 9.7m		
10					2 very rich glauconite bands		
11							1
12					syn-sed faulting & incipient intraclastic compaction		
13					minimal water escape structures		2
14							
15							
16					richly glauconitic sst		3
17					fine-med. g. sandy greensand & silty greensand, comp-bedded, carbonated, intraclastic breccia		
18					10.5. vein of glauconite		
19							
20					mostly glauconitic siltstone		4
21					below 21m beds not so rich in glauconite.		
22					incision or incipient intraclastic brecciation.		
23					silty interbeds contain flecks of organic matter, porolitherean shells.		5
24							
25					no core recovery		

DESCRIPTION NOTES

PHOTO

BOX

GENERAL DESCRIPTION

9.7 → 79.5m Interbedded light green/gray, f.g., strongly cemented glauconitic quartz sandstone and dark greenish gray siltstone.

Sandstone beds: 1-10cm thick, commonly cross-bedded, sharp erosional bases, sharp or gradational (commonly ripple-form) tops. Dewatering & sandstone dykes common, incipient intraclastic.

Siltstone beds: few mm to few cm thick with streaky discontinuous internal lamination, commonly glauconitic. Synsed faulting, loading, injection, dewatering structures common, causing disruption to bedding continuity.

MAINORU FORMATION

? Bit

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO BOX
25			gl		2-5mm med greensand. 30cm thick graded bed.	5
26			gl		25-35m: bedding most 1-2cm thick graded unit (more lenticular)	6
27			gl		dk green glauconite infilling, erosion surface with 5cm relief	
28			gl			7
29			gl			
30			gl			
31			gl			
32			gl			8
33			gl		several 1mm thick glauconite laminae (fresh black-green glauconite) sharp bed contacts. erosion (5cm relief)	
34			gl			
35			gl		erosion surface loads	
36			gl		Bedding from about 27m onwards is noticeably discontinuous & disrupted. Broken up by slanting, loading, and incipient intraclasting	9
37			gl			
38			gl			
39			gl		4. separate beds of glauc. sst, sharp contacts.	
40			gl		several erosion surfaces cut into siltstone overlain by black-green glauconite grains	10
41			gl			
42			gl		several glaucous sst beds	
43			gl			
44			gl		upto 5cm relief on erosion surfaces.	11
45			gl			
46			gl			
47			gl		5 glauc. sst beds (1, 1, 2, 2, 4 cm thick) sharp active bases	
48			gl			12
49			gl			
50			gl			

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 6 SHEET 3 OF 17

LOCATION: ROPER BAR STORE

LOGGED: M.J.J.

DATE: 28/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
50							
51					AS ABOVE CONTINUED		12
52							
53					Vfg. osts: are light grey to medium light grey, commonly glauconitic, clayey in place. Also contain grey streaks (? organic matter).		
54					siltst: dark grey (streaky) to dark green grey 50-40% organic rich in places		13
55					beds (on to siltstone, commonly graded, sharp eroded bases. Common soft sediment brecciation, downward, load structures, sst injection		
56					large load structures & cut & fill		
57					common small eroded scars filled with glauconite		14
58							
59					siltstone streaky from about 54m onwards - possibly due to increased organic content [== symbol]		
60					note: there does not appear to be much glauconite below about 60m.		15
61							
62					beds mostly 1-5cm, grading visible in some beds		
63							
64							
65							16
66							
67					67-68m mainly siltstone		
68							
69							17
70							
71							
72							18
73							
74							
75							19

DEPTH/ THICKNESS	Coloured Grey Green Red-brown Purple	GRAINSIZE - vgs sst - med - coarse - silt - mudst	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
75					continued from above		
76					mostly siltstone (80%) with thin sandy beds		19
77							
78							
79			gl. opy		gradational facies change		20
80					slumping, developing to breccias		
81							
82							
83					flat pebble intraclast breccia sharp contact soft sed., slump & breccia		21
84					water escape structures, several cm's long		
85					gradational A-B contact		
86					large intraclast of ② in facies ③ sharp erosional contact		
87					sharp erosional contact. Seen of ③ on thick cycle of ②		22
88					See enlargement gradational contact		
89					angular "blocks" of ③ desiccation cracks filled with irregular carbonate patches		
90					lithologies & colours diffuse intermixed		
91					② sharp contact, sandy base to		23
92							
93					very irregular patches of ③ in ① & ②		
94							24
95							
96					carbonates are clearly in places		
97					97-100: facies poorly defined, numerous water escape structures, rip-ups, intraclasting		
98							25
99					? cavity infills of carbonate		
100							

GENERAL DESCRIPTION

79.5 →

Distinctly cyclic sequence of three facies:

A Mostly v.f.g. chloritic and calcareous sst with
sub-mm thick green clay layers (discontinuous
wavy flame like); micaceous
Grayish green (10 G 4/2) to pale gray (10 G 4/2).

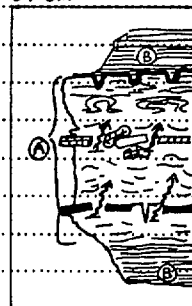
B Graded beds/laminae of v.f.g. sst → siltstone
Gray or redbrown in colour. More distinctly &
continuously laminated than A.

C white-cream intraclastic/brecciated carbonate
rock, commonly discontinuous

Dewatering of A common, sharp erosional
contact B/A.

slumping, intraclast brecciation, carbonate
spotting

87-6m



PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 6 SHEET 5 OF 17

LOCATION: ROPER BAR STORE

LOGGED: M.J.J.

DATE: 29/6/85

DEPTH/ THICKNESS	COLOUR	GRAIN SIZE	LITHOLOGY	SED STRUCT	DESCRIPTION NOTES	PHOTO BOX
100	grey green red-brown purple	very fine mud				
101					note: 90-107m is mostly red-brown with pale grey-white - carbonates are enclosed in green siltstones. (white not shown as carbonates)	
102					deep desiccation cracks	26
103					AS ABOVE CONTINUED	
104						
105					carbonate has a distinctly nodular habit	27
106						
107					Interval 103-118m dominated by facies B & C, cycles not well defined.	
108						
109						28
110						
111						
112						
113					mostly red-brown disintegrated laminar of silt-sandstone.	29
114						
115					carbonate cherty nodular fenestral textures	
116						
117						30
118					118m → cycles more clearly defined	
119					sharp contact capped by grey laminated sandstones	
120					sharp, grey ① or green ② mostly facies ① - discontinuous laminae, grades down into well laminated grey ②	
121					sharp	31
122					sharp	
123					123m → carbonates beds are spotty and brownish - dolomitic	
124						32
125						

DEPTH/ THICKNESS	COLOR	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
125					sharp contact, erosion		
126					as above, but distinction of facies becomes less obvious		32
127					sharp contact; gray facies B on green facies A		
128					sharp contact,		33
129							
130							
131							
132					limestone vugs; alternating limestone & green siltstone, mostly intraclastic breccia.		34
133					sharp contact; intraclasts of green mudstone		
134					erosion surface capped by intraclast breccia		
135					red siltstone breccia in red silty matrix		
136							35
137							
138							
139							
140							36
141							
142							
143							
144							37
145					several erosion surfaces; cycles not clear		
146							
147					several closely-spaced erosion surfaces; cycles not clear		38
148							
149							
150							39

134.5 →

Distinct cycles with prominent karst surfaces and deep jagged cracks. Facies A & B not distinguishable; sequence mostly red-brown siltstone and pale green siltstone, and limestone. Extensive incipient intracasting due to dewatering and karst erosion. Karst surfaces are overlain by breccias and grade up into laminated siltstone

DEPTH	COLOUR	GRAIN SIZE	LITHOLOGY	SED STRUCT	DESCRIPTION/NOTES	PHOTO	BOX
150			" "				
151			" "		continued from above		39
152			" "		134.5 → 167m mostly red-brown brecciated siltstone, thin intervals of white to green laminated siltstone; distinctly cyclic with prominent karst surfaces with deep cracks. Breccias commonly have 'fitted' textures (i.e. little separation subsequent to brecciation). Rare limestone/calc. siltstone intervals		
153			" "				
154			" "				40
155			" "				
156			" "				
157			" "		several poorly defined karst surfaces		
158			" "				41
159			" "		molar tooth injection in laminated siltstone		
160			" "				
161			" "				
162			" "				42
163			" "				
164			" "				
165			" "				
166			" "				43
167			" "		167 → 205 ↓ brecciation becomes diffuse		
168			" "				
169			" "				44
170			" "				
171			" "				
172			" "				
173			" "				45
174			" "				
175			" "				

DEPTH/ THICKNESS	Colour Log discon- tinued	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
175	All red- brown except for rare green mottles (g).		"	△△△△△△			46
176			"	△△△△△△			
177			"	△△△△△△			
178			"	△△△△△△			
179			"	△△△△△△	167- 205m		
180			"	△△△△△△	Grayish red (10R 4/2) to dark reddish brown (10R 3/4) siltstone, rare intervals of green laminated siltstone. Extensively brecciated, either distinctive breccia with filled textures or very diffuse intraclastic breccia. Rare green mottles		47
181			"	△△△△△△			
182			"	△△△△△△			
183			"	△△△△△△			
184			"	△△△△△△			48
185			"	△△△△△△			
186			"	△△△△△△			
187			"	△△△△△△			
188			"	△△△△△△			49
189			"	△△△△△△			
190			"	△△△△△△			
191			"	△△△△△△			
192			"	△△△△△△	rounded intraclasts angular intraclasts capping a thin laminated interval		50
193			"	△△△△△△			
194			"	△△△△△△			
195			"	△△△△△△			51
196			"	△△△△△△	single green mottle @ 196m		
197			"	△△△△△△			
198			"	△△△△△△			52
199			"	△△△△△△			
200			"	△△△△△△			

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
200					200.0 - 204.4m: Scattered darker greyish-red clasts of siltstone in matrix of similar composition; clasts are tabular, 1-3cm across; < 1cm thick		52
201	SR 4/2				201.9m: A single 2mm mudstone lamina		
202	10R 4/2				202.2m: Scattered clasts suggest partial brecciation of a shaly bed		53
203					2cm clayey sandstone with irregular colour boundaries; green mudstone intraclasts		
204	light green lam.				Jigsaw breccia more common (fitted texture)		
205	SR 4/2				204.4m: Transition over 10cm into bedded rocks		
206					204.4 - 204.9m: Very poorly sorted sandst. with coarse intraclasts		
207	5-10R 4/2				204.9 - 207.9m: Crudely fining-upwards cycle; Sharp base, with rip-up clasts; above are angular clasts of yellowish to brown rocks in a ferruginous sandy matrix; sorting improves upwards		54
208							
209					207.9 - 209.0m: Sharp-based cycle begins with 15cm sandst. a'lain by lam. & thin-bedded siltst. & sandst.; some 1-cm scale graded coarsets		
210	mostly grey-red with 1 grey				209.0 - 210.7m: Cycle, possibly with sub-cycles; some bedding is wavy to irregular		55
211					210.7 - 211.5m: Thin-bedded and laminated siltstone dominates		
212					211.5 - 214.8m: Mostly thin-bedded, well sorted sandstones		
213					Broken-up beds of laminated shale injected by sandstone at 212.25m & 212.5m		
214	dk grey red				Gradual increase downwards in the proportion of sandstone		
215	Sst.-wh. Silt.-black to pale green				Very hematitic at 213.9m		56
216					214.1 - 214.65m: Sharp-based cycle, from sandst. to sandst./siltstone		
217					214.65 - 216.1m: Thinly interbedded sandstone and siltstone with desiccation &/or molar tooth structures at many bed boundaries		
218					Green to reddish-grey shale lamina at 215.5m		
219	greyish red greyish green				F-m, lam. sandstone		
220	5Y 6/4 red/green				217.3 - 218.5m: Thinly interbedded l. green/white v.f. sandstone and greyish-green siltstone/mudstone; structures prominent in lower half		57
221					218.5 - 219.0m: 2 beds - upper one is sharply bounded, yellowish, fossilitic - carbonate or phosphate; lower bed has very irregular laminae		
222					219.05 - 219.75m: V. finely laminated shale with dewatering structures and mm-scale carbonate spots increasing upwards		
223					219.75 - 220.2m: Sandst. dominated sst./silt. interval with 10cm ferruginous sandst. at top; Carbonate nodules & spots at 220.4m		
224	olive grey to dark greenish grey				220.2 - 222.0m: Mainly laminated mudstone		58
225					222.0 - 222.8m: Interbedded mudst., siltst., v.f. sandst		
					222.8 - 225+m: Thin bedded sandstones (1-3cm thick) in a predominantly greenish grey mudstone sequence; 2 x km pebble conglomerates at 223, 223.2m with carbonate cement; 2 calcretes		
					Some sandstones form flaser-like laminae < 1cm thick		59

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO BOX
225	Medium - light grey to medium grey sandstones and olive-black shales				225.0 - 226.35m: Mudstone with thin sandstones, as before.	59
226					3. yellowish-brown ?dolocrete bands; one is confined to a sandst. lamina.	
227						60
228					226.35 - 234.0m: V. light grey, laminated to thin-bedded siltstone to fine sandstone, interbedded in a dominantly greenish grey to olive black mudstone sequence; numerous thin (<1cm to 3cm) 1. yellowish brown dolocretes common.	
229						
230						
231					15cm-thick complex laminated and granular dolocrete with disseminated galena	61
232						
233						
234					234m onwards: Noticeable decrease in number of dolocretes; sequence similar to that above; sandstones ~10-20% of sequence.	
235	Mainoru Formation				Dolocretised molar-tooth structure.	62
236						
237						
238						
239					Intraclast or edgewise breccia appears dolocretised.	63
240						
241						
242						
243						64
244						
245	Pb					
246					10cm intraclast band has been ?dolocretised; coarse galena	
247						65
248					Dolocrete: a complex array of irregular laminae over 10cm. Odd granular structure (?replacive), surrounded by carbonate.	
249					248.1: Dolocretised intraclasts and molar-tooth structure.	
250						

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 6 SHEET 11 OF 17

LOCATION: 1 km S/E ROPER BAR STORE LOGGED: I.P.S. DATE: 30/6/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE mudst	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
250							
251	m. to dk grey to olive bl. (mudst)				Spotted interval suggests incipient dolocretisation.		66
252	m-l. grey (sandst)				250.0m - (approx) 254.0m: Dk grey/olive black mudstone with rare interbeds of fine sandstone and various types of dolocrete (thin laminae, nodules, and sub-mm spots)		
253					254.0 - 255.0m: Crinkly and very fine wavy laminated mudstone		
254							
255	orange brown						
256	red-orange (100 g/b)						67
257					256.9m: Thin calccrete with intraclast-like texture		
258					Small fault - displacement of 2cm		
259	m. red bl. 100 g/b				2cm dolocrete at top of a 5cm shale band 2 red-brown bands have dolocrete-like texture but are ferruginous 1cm porous band at 258.9 looks oily? any hydrocarbons?		68
260							
261	red brown to red				258.5 - 263.3m: Mudstone with very vague lamination and rare fine sandstones	Facies X	
262					Between the 2 cut & fill structures are 1.5mm sandstone laminae with sub-mm mudstone partings		
263							69
264					263.3 - 271.0m: Clearly laminated, interbedded mudstone and c.sst/v.f. sandstone with a profusion of structures - mostly molar-tooth, but some dewatering and slumps also	Facies Y	
265					Between 265 and 268m only 1.8m of very broken core recovered		
266							
267							70
268							
269							
270					2 x 5cm v.f. sandstones, lower one with slumps/dewatering struct.		
271							
272					271m - 276.5m: Thinly interbedded mudstone & v.f. sandst. Sandstones: l. grey, <1cm to a few cm thick, faintly curved bases, some rippled tops, no internal lam.; sharp-based & sharp to diffuse tops into:	Facies Z	71
273					Mudstones: Dk grey, 1 - several cm beds - generally thicker than sandstones; scattered molar tooth but little else		
274							72
275							

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
275					275.0 - 276.5m: Facies Z continued - thinly interbedded v.f. sandstone and dark-coloured mudstones (no dolocretes in Z).		
276	L. grey						72
277	& m-dk grey				276.5 - 281.1m: Facies Y		
278							
279							
280							73
281					281.1 - 281.35m: Facies Z - 4 thin sandstones with faintly graded tops		
282					281.35 - 281.4m: Facies Y; unusual breccia - long flat pebbles stacked or squeezed together; slightly dolocretised		
283	Pb				281.9 - 283.15m: Facies Z - shale dominated; dolocrete at 282.1 is unusual		
284					283.15m: ? Dolocrete with a sharp, faintly erosive base		74
285					283.15 - 285.6m: Facies Y		
286					285.6 - 286.0m: V.f. sandstone with wispy, discontinuous mudst. laminae		
287	Calcrete gen yell-grey 5Y 7/2				286.0 - 289.5m: Facies Y - numerous dolocretes		75
288	Ch Pb				0.15m of Facies Z: Cut & fill with shale above basal contact, then 2-3 graded beds		
289							
290					289.65 - 289.8m: Facies Z		
291					290.1, 290.5m: Dolocretes with upper layers laminated to nodular, and disseminated spots below		76
292					290.5 - 292.0m: Facies X - more uniform, less laminated than above; still thin-bedded to laminated, but no colour contrast		
293	olive green to olive black 10R 4/6				292.0 - 292.3m: Siltstone with laminae of mudst. & sandst. in centre		
294	increases down- wards				292.3 - 292.9m: Mudstone - laminated & structureless, much dewatering		
295					292.9 - 294.0m: Ferruginous siltstone ferrug. ost. at base		
296					294.0 - 294.6m: Laminated greenish mudstone; 20cm desicc. crack at top		77
297					294.6 - 295.1m: Facies Z scattered pyrite		
298					295.1 - 296.15m: Facies Y &/or Z; thin bedded, no calcretes, no dewatering; desicc. cracks or molar tooth, faint ripple lam.		
299	5YR 5/6				296.15 - 300.0m: Facies Y - mm-scale lamination in many places; the dolocretes at 298.45 and 299.5m are sharp-based detrital in texture, and may be reworked dolocretes; there is a higher proportion of siltstone and v.f. sandstone in the last few decimetres		78
300							

PROJECT: ROPER

DRILLHOLE: BMR URAPUNGA 6 SHEET 13 OF 17

LOCATION: 1 km S/E ROPER BAR STORE LOGGED: I. P. S.

DATE: 2/7/85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
300	yellow brown						78
301	FORMATION				300.0 - 305.25 m: Facies Y: Laminated to thin-bedded mudst. and v.f. sandstone; slumps & molar-tooth common; Sandsts. have sharp, slightly loaded bases and sharp to slightly diffuse tops; dewatering common in the mudstones		79
302					302.05 m		
303					At 302.05 m. is a thin lens of bitumen or other hydrocarbon		
304		olive grey to olive black					
305	MAINORU						80
306		increase in grey green			305.25 - 306.5 m: Dull greyish-green mudstone & slst. v.f. sandst. similar to Facies Y but virtually no colour banding		
307					Below 306.5 m is a marked increase in dk red irregular blotches and streaks; thin carbonate vein at 306.8 m		
308					306.5 - 311.0 m: Thin-bedded and laminated mudstone and f. sandstone in ~ equal proportions		
309	blotchy l. green & greyish red (SA 4/2)						81
310					Several large, irregular, subvertical cracks - ? desiccation or dewatering		
311					311.15 m: Sharp-based bed with ferruginous intraclasts 1-2 cm dia		
312					2 thin sandstones with small brown intraclasts		
313	SANDSTONE				Upper limit of 8 m-thick transition zone		82
314					312.5 - 313.0 m: First thick sandstone; vaguely laminated, 2 intraclast horizons	XRD	
315					313.0 - 316.3 m: Thin fining-up cycles - sharp-based, with dk red intraclasts in lighter red-greyish f. - v.f. sandstone		
316							
317	LIMMEN				316.3 - 317.2: Thick, plane-bedded sandst. with red slst. clasts throughout. base is sharp, with faint desiccation cracks	XRD TS	83
318					317.2 - 319.0 m: Several thin-m. sandstone beds, some with silty tops		
319		1- med red			319.0 - 319.7 m: Structureless, well sorted and cemented, sandstone with mica flakes; brown shaly parting separates similar bed below		
320		SA 5/4					
321	mottled 1-med red				Faint cross-bedding		84
322					321.1 - 325 m: F. gr. well sorted, uniform sandstone with faint ripple lamination throughout; faulted below 323.4 m - quartz veins and qtz-lined vugs	TS PP	
323							
324							
325							85

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
325					325.0 - 326.7m: Almost structureless f. sandstone beds separated by thin micaceous partings.		85
326	L. to mod. grey						
327					326.7 - 330.0m: Very uniform sandstone; few partings.		
328							86
329							
330					Vertical fracture with reddish Fe oxide staining at its margins		
331	SR 4/2 ch				330.0 - 331.3m: Several thin, ripple-laminated beds with silty partings and laminae	PP	
332					Shear zone		
333	mostly v. l. green				331.3 - 334.85m: Structureless f. sandstone with shear zone and fractures		87
334							
335							
336							88
337	Green, SR 4/2 & 56 2/1				336.45 - 337.35m: Interbedded f. sandst. and red siltst. - mudstone on a 5-10cm scale		
338	SYR 6/1						
339					337.35 - 341.95m: Sandstone virtually unchanged except for presence of faint ripple marks		
340					Fracture with pale green clay filling		89
341							
342					5cm dark green micaceous siltstone bed		
343					342.0 - 342.6m: Faint lamination - ? large cross-bed		
344					342.6 - 350.0m: Sandstone is thinner bedded - more partings, scattered v. f. mudflakes; silty, and with ball & pillow structure common in lower part		90
345					Fracture with quartz, hematite, and ? dolomite lining	PP	
346							
347					Oxidised ferruginous breccia - assume tectonic		91
348							
349							
350							92

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
350					350.2m: Truncated wave-ripple marks on top of sandst. bed		
351					350.0 - 353.15m: Continuation of thinner-bedded sandsts. with slumped siltstones; ripple marks common; slumped beds have flat bases & planed-off tops		92
352							
353					Interbedded sandstone and siltstone with slightly eroded or loaded top		
354					353.15 - 355.1m: Single very thick bed with only colour variations - yellowish brown (10YR 6/2 to 10YR 5/4) to greyish red further down		93
355					5mm green micaceous (sericitic) parting		
356					Quartz-filled fracture Whispy siltstone laminae		
357					Dolomite-filled fracture		
358	dk red & green				NB Sandstone from 317 - 408.5m is very uniform - well sorted f. sandstone, mostly thick-bedded, lacking structures, i.e. with thin-m. bedded, rippled, cross-bedded, loaded & mudflaked sst., sericitic-looking partings predominate		
359							94
360							
361					Steep, irregular, ?stylitic laminae or prolated cross-bedding		
362							
363	l. red				362.05 - 363.25m: This bed is plane-bedded at base, overlain by cross-bed, then wintly siltstone laminae in top. Som then 5mm parting		95
364					Faint greenish laminae are probably ripple marks		
365	red green						
366					Slightly f.u. cycle; all rippled		96
367							
368							
369					367.4 - 375.0m: Very uniform fine sandstone with few partings; some cross-bedding & mudflakes		
370							97
371							
372	pale greenish grey						
373							
374							
375							98

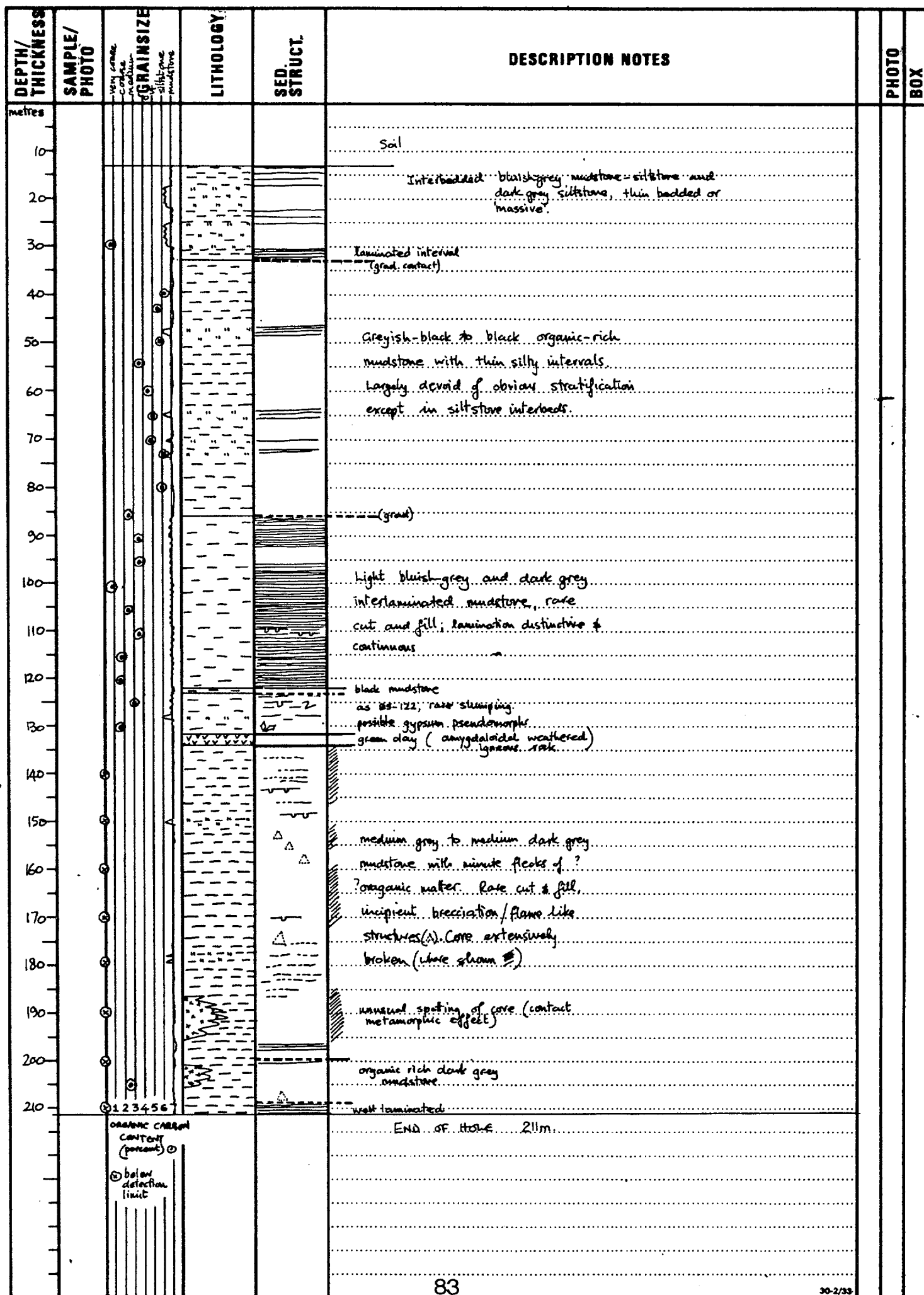
DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
375					To 376 m: As before		
376					376-377.5 m: Variably rippled-marked f. sandstone		
377	pale greenish grey				377.5 m: Sharp contact with intraclast cgl. (clasts are pale yellow sandst. and red mudstone)	TS	99
378					377.5-378.0 m: Very micaceous sandstone/siltstone; load casts; some may be completely destratified by loading & liquifaction		
379					micaceous parting		
380							
381							100
382							
383							
384							
385					Partings: These are generally pale green, sericitic-looking mica; quite coarse-grained & probably recrystallised from clay or v. fine mica; some < 1mm; others up to 5mm		101
386	greenish grey ssy gl						
387							
388					377.5-400+ m: Very uniform sequence of v.f. f. grained, pale green and off-white sandstone; some faint ripples, widely spaced partings, and rare very faint cross-bedding	TS PP	102
389							
390							
391							
392					Faint concentration of wrinkly micaceous partings outlines possible cross-bed		103
393							
394							
395					Slightly erosive, sharp-based bed contains rip-ups from underlying sandstone and mudstone in 1 cm of coarse sandstone		104
396	1 cm orange brown						
397							
398					396.9-398.8 m: Thick bed - base not erosive; basal 15-20 cm coarsens up to f. sandst., then faint medium streaks above; ripple laminated and rapid fining-up at top		
399					F. sandstone with faint medium stringers		105
400							

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAIN SIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO BOX
400						
401					Several thin interbeds of sandstone and greyish green slt/mudstone.	105
402					Green mudstone intraclasts.	
403					Ball and pillow OR prolapsed cross-bedding; 5cm micac. slt. at top	106
404					403.15 - 404.8m: Thick sandstone bed is loaded or slumped at top; grades down into ripple-marked sandstone.	
405					404.8m: 10cm highly micaceous interval; f. up bed over 5cm. Very uniform sandstone.	
406						
407						107
408						
409					408.4 - 410.5m: Three thick beds which are gritty to pebbly at the base and contain numerous c.-v.c. streaks; cross-bedded.	TS PP
410	L. grey to greenish grey (SG 61)				410.5 - 411.05m: Fine sandstone facies (as above) sandst. in middle coarsens up over 2-3cm.	108
411					411.05 - 411.9m: Seven cross-beds - most are coarser at base, and some begin with fine pebble conglomerate.	
412					20cm greenish grey micaceous slt. with very thin, v.f. sst. interbed.	TS
413					412.15 - 414.6m: Numerous thin cross-beds which are coarsest in their basal parts; mostly m. sandstone at base of formation.	TS X20
414	Py Py				Pyrite in 2 subvertical fractures.	109
415	dk green grey (SG 41) grey-blackish red (SR 4/2 to 2/2) only SG 41				Sharp base: 5cm of relief? Loading or erosion.	
416					414.6 - 416.5m (approx): bicoloured rocks - mudstones greyish red with some greenish laminae; coarse siltstone to v.f. sandst - greenish grey; Red beds fade out by 416.5m; lenticle of coaly-looking material at 415.6m. Sandstones are sharp-based; desicc. or dewatering.	
417					5cm breccia band - in situ brecciation?	
418					416.5 - 422.8m: Mostly grey mudstone with rare sandst. - sharp, erosive bases.	110
419						
420						
421					More slight fracturing.	111
422						
423					422.8m: Bottom of hole.	

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES (logged I.H. Crick)	PHOTO	BOX
25					Interbedded dark grey siltstone, light grey calcareous siltstone and very fine grained quartz sandstone		
50					(50.10 to 50.60 medium-grained carbonate bed)		
75					(51.6 to 57.6 core brecciated - fault?)		
100				T	Dark gray to greenish gray siltstone interbedded with fine grained quartz arenite and calcarenite. Graded bedding and cross-bedding. Deformed sandstone dykes common.		
125				T			
150					Greenish-gray & reddish brown siltstone interbedded with light gray calcareous siltstone and very fine grained calcareous sandstone (containing intraclasts)		
175							
200					Greenish-gray to reddish brown siltstone with off-white fine grained carbonate beds (20cm thick) containing intraclasts		
225					Red-brown siltstone (extensively fractured core little visible)		
250					(as above) with quartz sandstone beds with intraclasts		
275					off-white medium-coarse quartz arenite with green siltstone clasts		
280					End of Hole 269.20m		

DEPTH/ THICKNESS	SAMPLE/ PHOTO	GRAINSIZE	LITHOLOGY	SED. STRUCI.	DESCRIPTION NOTES (logged by I.H. Crick)	PHOTO BOX
25 50 75 94	Carcoran Formation	v. cr. s. cr. silt. med. v. cr. s. cr. silt. med.			med. & light grey siltstone; numerous red-brown iron-stained fractures Grey to greenish grey siltstone interbedded with v.f.g. quartz arenite and calcarenite. Bedding 0.2 to 10cm thick. Rare crossbedding visible. Rocks are contact metamorphosed (andalusite porphyroblasts) between 8-84m. Thin dolerite intrusions. Fine & coarse grained dolerite END OF HOLE 94m.	
		Total organic Carbon ③ - below detection limit				

Fig. 11 Summary URAPUNGA 3



12 Key to symbols used on logs

GRAINSIZE	LITHOLOGY	SED. STRUCT.	DESCRIPTION NOTES	PHOTO	BOX
			Conglomerate, conglomeratic or pebbly sandstone		
			medium to very coarse grained sandstone		
			Fine to very fine grained sandstone		
			Siltstone		
			Mudstone		
			Limestone		
			Dolostone		
			Ironstone		
			Dolerite		
			Dolcrete		
			Unusual composition (type indicated)		
			Medium to thick continuous parallel bedding		
			Thin continuous bedding (line broken if discontinuous)		
			Lamination, continuous		
			Lamination, discontinuous		
			'Crinkly' lamination		
			Boudin-like discontinuous (nodular) bedding		
			Minute flecks/flakes of organic matter in massive unit		
			Planar cross-bedding		
			Trough cross-bedding		
			Hummocky cross-bedding		
			Asymmetrical (current) ripple		
			Symmetrical (wave) ripple		
			Lenticle or microchannel of sand		
			Sharp contact, erosion, scouring		
			Desiccation crack		
			Deep cracks and incipient brecciation		
			Molar tooth structure		
			Water escape 'tube' (sandstone dyke)		
			Complex water escape (dish-like) structure		
			Load cast/structure		
			Soft sediment contortion, slumping		
			Incipient intraclast brecciation - bedding disruption		
			Transported intraclasts		
			Breccia with jigsaw (or fitted) outlines to clasts		
			Diffuse breccia, vague clast outlines		
			Oolite, pisolite		
			Crystal-lined vug or cavity		
			Crystal (mineral type shown) (eg gypsum)		
			Cone-in-cone structure		
			Nodule (type shown)		
			Dendrite		
			Leisegang rings		
			Stylolite		
			Spotted or pelloidal textured interval		
			Fining-up cycle (or graded unit)		
			Coarsening-up cycle		
			Calcite veinlet		