

LAKES OIL N.L. // (A.B.N. 62 004 247 214)

BUNGA CREEK-2

STRATIGRAPHIC COREHOLE

PEP 155 Vic.

WELL COMPLETION REPORT

by J.N. Mulready

July 2003

LAKES OIL NL Level 11. 500 Collins Street Melbourne 3000

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1.0 SUMMARY

Bunga Creek-2 stratigraphic corehole was designed as a test of the Colquhoun Greensand and Colquhoun Gravel reservoirs at the eastern end of the Lakes Entrance 'field' area. The disappointing results of the Bunga Creek-1 well had raised doubt as to the validity of the interpreted gravity low on the July 2002 Lakes Entrance Falcon airborne gravity/magnetic/scintillometer/topographic survey. Shallow granite basement had been encountered at 364.5 m, indicating the well was located on a basement high, with no Colquhoun Gravel present.

Although Bunga Creek-2 was located within the general limits of the same gravity low, the well was essentially located as a step out from the original field discovery well, Lake Bunga-1, drilled in 1924.

The well spudded on the 26th of February 2003 and a 7" (178 mm) conductor was set at 12.4 m. The well was rotary drilled to 144 m. RT. and 5" (127 mm) casing was then set at a depth of 141 m. RT. After installing the BOP the well drilled ahead in 98 mm hole. Numerous delays resulting from failure of rotating head seals meant that the coring point (318m) was not reached until 13 March 2003.

Coring commenced within the Lakes Entrance Fm at 318 m on March 14^{th} and continued to total depth of 351.2 m, basement metasediments having been encountered at 348.06 m.

Although glauconitic siltstone and silty sandstones were encountered within the Lakes Entrance Formation, once again no significant oil shows were encountered, and no Colquhoun Gravel was present, although a thin (26 cm) band of strongly cemented conglomerate was found to overlay basement.

Subsequently caliper, gamma ray-density and resistivity logs were run from TD to the casing shoe at 141 m, with the gamma ray log continuing to surface. The well was then plugged and abandoned on March 20th, 2003.

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2.0 WELL HISTORY

2.1 GENERAL DATA

Well Name:

Map Reference:

Location:

Elevations:

Petroleum Tenement:

Operator:

Lakes Oil NL (for Petro Tech Pty Ltd) ACN 004 247 214 Level 11, 500 Collins Street Melbourne 3000

Other Participants:

Date Drilling Commenced:

Date Drilling Completed:

Date Rig Released:

Drilling Time to T.D.:

Total Depth:

Status:

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None

26th February 2003.

17th March, 2003

20th March, 2003

20 days (Rig operated daylight hours only)

351.2 m

Plugged and Abandoned

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Bunga Creek-2

Cunninghame Topographic 8522-3-4 Scale 1:25,000

AMG 66 Coordinates 591198 E 5810294 N Latitude: 37[°] 51' 0.4" South Longitude: 148[°] 2' 11.6" East

GL 43.890 RT 44.54

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2.2	RIG DATA	913650 00
	Drilling Contract	Drilltech Pty Ltd Drilling Depot Rd Morwell Victoria 3168
	Rig	Bournedrill THD25VP.
	Rig Carrier	Truck Mounted.
	Weight Indicator	Hydraulic Pressure.
	Power	Truck Engine
	Rotary	Top Drive.
	Pumps	Duplex 5"X 6" double action.
	Tubulars	PQ pipe
	Fishing Tools	None on Site.
	Handling Tools	Hydraulic 48" Rigid wrench.
	Stabilizer	Not applicable.
	Spare Parts	As reasonably required for carrying out the well programme.
	Personnel	Driller plus 2 crew.
	Note: Rig Operated Daylight Hours	Only.

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2.3 DRILLING DATA

The following is the daily operations summary for Bunga Creek -2. It has been compiled from the daily drilling reports. Onsite drilling supervision and wellsite geology services for Lakes Oil N.L. was provided by J. Mulready. Gas detection equipment was supervised by Mr. D. Sisely.

DATE	DRILLING OPERATIONS
25.2.03	Rig arrived on site, rigging up commenced.
26.2.03	24 hrs to 6 p.m. 26.2.03
-	Spudded well 2.20 p.m.
	Drilled 9.7/8" (251 mm) hole to 12.4 metres, ran & cemented 7" (178 mm)
	conductor pipe at 12.4 m
27.2.03	24 hrs to 6 p.m. 27.2.03
	Drilled 6.1/8" (156 mm) hole to 132 metres.
28.2.03	24 hrs to 6 p.m. 28.2.03
	Drilled to 144 m. Ran & cemented 5" (127 mm) casing at 141 m RT
01.03.03	24 hrs to 6 p.m. 1.3.03
	Topped up cement to surface. Installed BOP. Wait on cement.
02.03.03	24 hrs to 6p.m. 2.3.03
	Repaired hydraulic slips, RIH tagged top of cement 8 m off bottom.
·	Drilled out of casing shoe, pressure tested BOP, drilled to 168 m.
03.03.03	24 hrs to 6p.m. 3.3.03
	Nil progress. Rig shut down awaiting parts for repair of hydraulic slips.
	Emptied mud pit ready to mix new KCl polymer mud.
04.03.03	24 hrs to 6p.m. 4.3.03
	Repaired hydraulic slips. Mixed mud. Drilled from 168 to 210 m.
05.02.02	Top drive swivel seal failed - rig shut down awaiting repairs.
05.03.03	24 hrs to 6 p.m. 5.3.03
06.02.02	Rig shut down awaiting repairs:
06.03.03	24 hrs to 6p.m. 6.3.03
	Repairs completed. Drilled to 222 m. Top-drive seal failed again.
07.02.02	Rig shut down awaiting repairs.
07.03.03	24 hrs to 6p.m. 7.3.03
	Repairs completed. Drilled to 246 m. Top-drive seal failed. Replaced. Failed again.
08.03.03	24 hrs to 6p.m. 8.3.03
08.05.05	Repairs completed. Drilled to 270 m. Top-drive seal failed.
	Wait on repairs.
09.03.03	24 hrs to 6p.m. 9.3.03
07.03.03	Repairs completed. Drilled to 282 m. Top-drive seal failed.
	Wait on repairs.
10.03.03	24 hrs to 6p.m. 10.3.03
10.05.05	Repairs completed. Drilled to 282 m. Top-drive seal failed.
	Wait on repairs.
11.03.03	24 hrs to 6p.m. 11.3.03
	Wait on repairs.
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Depth RT (m)

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12.03.03	24 hrs to 6 p.m. 12.3.03
	Repaired rig, RIH, pipe parted. Screwed into fish. POH replaced 2 pipes.
	RIH drilled to 294 m. POH to casing shoe.
13.3.03	24 hrs to 6 p.m. 13.3.03
	RIH. Drilled to 318 m. POH to change bit and clean out drillpipe prior to
	coring.
14.03.03	24 hrs to 6 p.m. 14.3.03
	Mixed mud. RIH. Core from 318 m. to 331 m. (13 m)
15.3.03	24 hrs to 6p.m. 15.3.03
	Cored from 331 m to 345 m (14m).
16.03.03	24 hrs to 6 p.m. 16.3.03
	Cored from 331 m into basement metasediments at 348.2.
17.03.03	24 hrs to 6 p.m. 17.3.03
	Cut basement core from 348.2 m to 351.2 m (3 m). POH.
18.03.03	24 hrs to 6 p.m. 18.3.03
	Ran caliper, gamma density and resistivity logs from TD to casing shoe, then
	gamma to surface.
19.03.03	24 hrs to 6 p.m. 19.3.03
	Wait on crew.
20.03.03	Plugged and abandoned well.
	Plug No.1 from TD to 54m RT
	Plug No.2 - 3 metre surface plug.
	Released rig.

Hole Sizes & Depths:

9-7/8" (251 mm)	Surface to 12.4 m RT		
6.1/8" (156 m	12.4 m RT to 144 m RT		
~4" (98 mm)	144 to TD		
Core size HQ	318m – TD		

Casing & Cementing:

Surface

Size	7 " (178 mm)
Weight	23 lb/ft 33.7 kg/m
Grade	K55
Shoe setting depth	141m

Liner

Size	5" (127 mm)		
Weight	16 kg/m		
Shoe setting depth	59.4 m		

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Deviation Surveys:

None taken

Drilling Fluid:

Spud-144 m	Freshwater gel
144m – TD	KCl/Polymer/PHPA

Water Supply:

Water was trucked from Lakes Entrance

Plugging & Cementing:

Plug 1	54 to TD	
Plug 2	Surface	

2.4 LOGGING AND TESTING

Wellsite Geologist:	J.Mulready
Mudlogging:	Hot wire hydrocarbon detection, depth & drill rate monitoring were provided by D. Sisely.
Ditch Cutting Samples:	Ditch cutting samples were collected at 3 m intervals from surface to 318 m. at which stage coring commenced.
	One set, consisting of approx. 500 gm of unwashed dried cuttings in a calico bag, was submitted to the DNRE.
	One set of washed cuttings was collected in Samplex trays for retention by the Operator.
Coring:	Continuous core was taken between 318 m RT and 351.2 m RT (TD).
Sidewall cores:	None taken.
Testing:	No testing was undertaken.
Wireline Logs:	Caliper, gamma density and resistivity logs were run from TD to casing shoe, then gamma to surface.
Velocity Survey:	No velocity survey was undertaken.

3. GEOLOGY

3.1 **REGIONAL GEOLOGY**

The Gippsland Basin is an early Cretaceous to Cainozoic basin occupying approximately 46,000 square kilometers of the southeastern margin of the Australian continent. The basin is flanked on the north, west and south-west by Palaeozoic rocks and confined between the structural uplifts of the Victorian Highlands in the north and the Bassian Rise in the south. The eastern margin of the basin is open to the Tasman sea. The Gippsland Basin is an east-west trending half-graben feature with 70% of its area beneath Bass Strait and 30% onshore.

With the exception of occasional wildcat drilling in the boom of the 1980's, exploration of the onshore Gippsland Basin has been largely ignored since the 1970's.

The early exploration activities in the onshore portion of the basin were aimed primarily at the Early Cretaceous Strzelecki Group and, later on after successful drilling offshore, at the top of the Latrobe Group "coarse clastics", but a lack of understanding of the stratigraphy and the mechanism of hydrocarbon generation, migration and timing of structures, along with the poor quality of the seismic and well log data, resulted in a downgrading of the hydrocarbon potential of the onshore area.

3.2 PERMIT PEP 155

Lakes Oil N.L. acquired the PEP 135 permit in August 1997. The permit overlies the onshore portion of the Lakes Entrance (Northern) Platform of the Gippsland Basin (see below). It includes the Lakes Entrance oil field, discovered in 1924, which produced approximately 10,000 bbls of biodegraded oil (Approx 14⁰ API) before production ceased in 1956. The reservoir was the Greensand Member of the Oligocene age Lakes Entrance Fm. The Lakes Entrance field has remained the focus of Lakes' exploration effort since taking out the permit.

In 1997 Lakes drilled two wells within the field area :-

Petro Tech-1, located in the central portion of the field near the Lakes Entrance oil shaft, and Hunters Lane-1 located in the western portion of the field. Bailing operations at Hunters Lane-1 produced approximately 1700 litres of oil/oil emulsion before the well was plugged and abandoned.

In July 2002 a Falcon airborne survey was acquired over the Lakes Entrance field area, measuring gravity gradient, magnetics, radiometrics and topograhy. Interpretation of this survey data was used to locate the Bunga-1 well.

Bunga Creek-1 and Bunga Creek-2 marked a return to the task of evaluating the economic potential of the field, this time concentrating at its eastern end.

3.3 EXPLORATION HISTORY

Hydrocarbon exploration commenced in the onshore region of the basin in the 1920s. In 1924 the Lake Bunga-1 well encountered traces of oil, starting a drilling run that ultimately resulted in the drilling of over 60 wells in the Lakes Entrance vicinity. The oil accumulation is found in a stratigraphic trap within a basal glauconitic sand member of the Oligocene age Lakes Entrance Formation. The field produced a total of 10,000 bbls of approximately 14° API gravity oil before production ceased in 1956.

Modern' petroleum exploration in the permit commenced in the early 1960's and continued into the early 1970's, conducted mainly by Woodside and Arco, with eight wells being drilled within the permit. This exploration originally had as its main objective the Strzelecki Group ,with emphasis moving to the Latrobe Group later in this period. Few of these wells, except for North Seaspray-1 & 3, are thought to be located within closure at the Top Latrobe Group level.

Several shallow bores have been drilled in the vicinity of PEP 157 by Victoria Electricity, Coal and Water Resources authorities; however, none of these bores encountered Latrobe Group reservoirs at a significant depth or within closure. During 1985, Hartogen Energy Ltd drilled Burong-1 to test the Top Latrobe at the crest of a northeast trending asymmetrical anticline which is fault controlled to the northwest. While the Latrobe section contained excellent reservoir rock, no significant shows were recorded within this section.

Recently, Lakes Oil has drilled eight wells within their onshore Gippsland permits; PetroTech-1 targeted greensands of the Lakes Entrance Formation but was not tested; Hunters Lane-1 produced oil from the same formation but at a non-economic rate; and Baudin-1 and Investigator-1, both of which targeted Lower Latrobe Formation sands, were unsuccessful, probably due to lack of seal. Within PEP157 the North Seaspray-3, Trifon-1 and Gangell-1 wells were drilled between 2000 and 2001, all targeting Strzelecki Formation sands and producing gas to surface.

3.4 TECTONIC HISTORY

The Gippsland Basin is a rift basin, which originated in the Late Jurassic to Early Cretaceous and consists of alternating half-graben structures along its east-west trend. It is characterised by a deep central basin, flanked by northern and southern terraces. In the onshore area Late Cretaceous movements were accompanied by volcanism. Several phases of positive structural inversion occurred in the Gippsland Basin from Mid-Oligocene to the present time, creating the major hydrocarbon bearing structures seen in the offshore region. The main phase occurred during the Late Miocene, which resulted in inversion of existing features and the creation of anticlinal structures.

3.5 STRUCTURAL ELEMENTS

The onshore area can be tectonically sub-divided into six major areas:

(A) <u>Lakes Entrance Platform (Northern Platform)</u>: This lies immediately south of the Eastern Highlands, where the Palaeozoic Basement gently slopes southwards and is unconformably overlapped by Oligocene - Miocene marine sediments and thin Pliocene - Quartenary continental deposits.

- (B) <u>Latrobe Valley Depression</u>: This lies between the Palaeozoic Eastern Highlands to the north and the Early Cretaceous Balook Block to the south. Over 700 meters of continental Latrobe Valley sediments are present in this area.
- (C) <u>Lake Wellington Depression</u>: This lies to the south of the Lakes Entrance Platform, where over 1200 meters of Eocene to Pliocene sediments unconformably overlie the Early Cretaceous rocks. This trough is offset from the Latrobe Valley Depression to the west, by left lateral displacement on the Yinnar Transfer Fault Zone which occurred during the Tertiary. The boundary also closely coincides with the western limit of marine Tertiary sediments. To the east it merges with the Strzelecki Terrace.
- (D) <u>Baragwanath Anticline:</u> This is the eastern extension of the outcropping Balook High. It is an Early Cretaceous block, which was elevated during Late Miocene time as a result of renewed lateral strike slip wrenching along the Boundary Fault Systems. It separates the Lake Wellington Depression to the north from the Seaspray Depression to the south. On the crest of the structure, thin Miocene strata are succeeded unconformably by a veneer of Pliocene-Pleistocence sediments. On the flanks of the structure, however, the Miocene sediments wedge out towards the crest by onlap at the base and erosion at the top of the sequence.
- (E) <u>Seaspray Depression</u>: This is the onshore extension of the Central Deep. It occupies the southern onshore part of the basin, where the most complete stratigraphic section is present. The permit occupies the northeastern end of the Seaspray Depression.
- (F) South Terrace: Wilson's Promontory is an erosional remnant of a broad shallow basement platform bounding the Gippsland Basin on its southern side. The Southern Terrace represents the edge of this platform. The Chitts Creek Conglomerate onlaps the South Terrace as a mirror image to the Tyers Conglomerate on the North Terrace.

3.6 **REASONS FOR DRILLING**

Bunga Creek-2 stratigraphic corehole was designed as a test of the Colquhoun Greensand and Colquhoun Gravel reservoirs at the eastern end of the Lakes Entrance 'field' area. The validity of an interpreted gravity low on the July 2002 Lakes Entrance Falcon airborne gravity/magnetic/scintillometer/topographic survey had been discredited as a result of the basement high encountered at Bunga Creek-1.

Although Bunga Creek-2 was located within the general limits of the same gravity low, the well was essentially located as a step out from the original field discovery well, Lake Bunga-1, drilled in 1924.

In the event no Colquhoun Gravels were intersected.





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3.7 STRATIGRAPHIC PROGNOSIS

TABLE I

FORMATION	PROGNOSED M RT	ACTUAL m RT	ACTUAL MSS	DIFFERENCE m
Jemmy's Point	Surface	Surface	+61	0
Tambo River Fm	30	18 m	+33	-22
Gippsland Limestone	70	60	+6	-10
Lakes Entrance Fm	260	266	-239	+6
Colquhoun Greensand	380	303	-281	-77
Colquhoun Gravel	405	Not present		Not present
Basement Metamorphics	420	348.06	-304	-72

3.8 STRATIGRAPHY

TABLE II

AGE	FORMATION	DEPTH RT m	ELEVATION M	THICKNESS m
Miocene Oligocene	Jemmy's Point Fm	Surface	+44	18
Miocene Oligocene	Tambo River Fm	18	+26	42
Miocene Oligocene	Gippsland Limestone	.60	-16	206
Miocene Oligocene	Lakes Entrance Fm	266	-222	82
Miocene Oligocene	(Colquhoun Greensand Member)	(303)	-259	(45)
Devonian	Basement Metasediments	348.06	-305	
	Total Depth	351.2	-307	

JEMMY'S POINT FM (Surface to 18 m)

<u>Sand</u>: buff to light brn, consisting of coarse to very coarse grained occasionally pebbly, subrounded to rounded clear, brown, white & rosy & iron stained quartz grains.

Interbedded towards base with

<u>Clay</u>: light brown, soft, adhesive, very silty.

TAMBO RIVER FM (18m to 60 m)

Interbedded

<u>Sandstone</u>: light brown, consisting of very fine to fine grained rounded quartz in a calcareous matrix. No shows.

<u>Limestone</u>: light brown to white consisting of unconsolidated coarse to very coarse coral angular shell fragments, including bryozoa, gasteropods, lamellibranchs, & undifferentiated calcite. Dull yellow mineral fluorescence, no cut.

Marl: grey, soft, silty.

Coal: Thin bed at around 44 m. Black, soft.

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GIPPSLAND LIMESTONE (60m to 266 m)

60m to 183 m

<u>Limestone</u>: light grey to cream, consisting of unconsolidated coarse to very coarse coral and shell fragments, commonly also medium grained over middle and lower portion of section. Shells include bryozoa, gasteropods, lamellibranchs, echinoid spines & undifferentiated calcite. Dull yellow mineral fluorescence.

183-266 m

<u>Limestone</u>: light grey to cream, consisiting of predominantly fine to medium grained coral and shell fragments, including bryozoa, gasteropods, lamellibranchs, echinoid spines & undifferentiated calcite. Dull yellow mineral fluorescence.

Occasional interbeds of

<u>Marl</u>: grey green, soft, dispersive, probably partially dispersing into the mud system. <u>Sandstone</u>: from 246 m.grey green, very fine grained, well sorted, subrounded in an

<u>Sandstone:</u> from 246 m.grey green, very fine grained, well sorted, subrounded in an argillaceoues calcareous matrix. Tight, no shows. Also minor

Siltstone: grey green, soft, very argillaceous, calcareous, grades to marl.

LAKE ENTRANCE FORMATION (266-303)

<u>Sandstone/Siltstone</u>: grey green, brown, very fine grained, silty, subrounded, micaceous, calcareous, very argillaceous, slightly glauconitic, soft, tight grades to sandy calcareous siltstone. Tight, no shows.

Also very minor

Limestone: consisting of light grey, clear and brown shell fragments with occasional foraminifera.

Traces of pyrite, and black glauconite? pellets @ 291-297 m

COLQUHOUN GREENSAND MEMBER

303-346.3

<u>Sandstone</u>: grey brown, massive, soft, very fine grained, very silty, well sorted, consisting of quartz, fine mica, glauconite and occasional black carbonaceous specks in a soft, argillaceous, calcareous matrix. Occasional to abundant mollusc fossils throughout. Strong gold mineral fluorescence from shells. No cut.

346.3-348.06

<u>Sandstone</u>: grey green, brown, indurated, consisting of rounded Fe stained quartz in a hard, calcareous argillaceous matrix. Numerous shell fragments. Tight No shows.

<u>Limestone</u>: as thin interbeds up to 24 cm. Grey black, hard, sandy with crystalline calcerous cement, glauconitic

<u>Conclomerate</u>: at base of section. Consists of metamorhic pebbles (> core diameter in part) generally sub-parallel to flat bedding. Matrix consists of indurated sandstone As in previous sub-unit

METAMORPHIC BASEMENT (348.06 ->)

Slate and Quartzite

Refer Appendix I.

3.9 HYDROCARBON SHOWS

Only traces of methane were observed throughout the drilling of Bunga Creek-2 (refer Gas log & Strip Log Enclosure 2).

Strong gold mineral fluorescence was associated with mollusc fragments within the Greensand Member, but no cut was associated with this.

4. DISCUSSION & CONCLUSIONS

The Lakes Entrance oilfield has no seismic coverage and well control is limited because of the sparse and in some cases dubious data available for wells pre 1950.

The Lakes Entrance oil shaft was logged in detail, and there are three recent vintage wells in the field, viz. Woodside Lakes Entrance-1 (1966), Lakes Oil Petro Tech-1 (1997) and Lakes Oil Hunters Lane -1 (1997).

After the drilling of the latter two wells it was concluded that:

- (a) the Colquhoun Greensand had limited reservoir quality, and was effectively acting as a thief zone for oil migrating up the basement unconformity.
- (b) the underlying Colquhoun Gravel might offer better reservoir potential if it could be intersected within the oil window.

The Falcon airborne gravity/magnetic/scintillometer & topographic survey was flown in July 2002, with the intent of identifying depocentres within the field, (gravity lows), in the hope that they would be associated with well developed sections of the Colquhoun Gravel.

In the event the gravity interpretation proved to be flawed, with granodiorite basement being intersected approximately 40 m high to prognosis at 365.4 m (304 m BSL) at Bunga Creek-1, and metamorhic basement even higher in Bunga Creek-2 at 348 m (307 m BSL).

No Colquhoun gravels were intersected. This implies the presence of a fault, downthrown to the south, between Bunga Creek nos 1 & 2 and Lake Bunga-1 to the south.

5.0 COMPLETION

Bunga Creek-2 was plugged and abandoned in accordance with DNRE and Southern Rural Water requirements on 25 November 2002.

Appendix 1 Petrographic Descriptions & Density Rpt.



Petrographic descriptions and density measurements of two metasedimentary basement samples, Bunga Creek-2, Lakes Entrance area, Gippsland

GEOTRACK REPORT #870B



A report prepared for Lakes Oil, N.L., Melbourne

Report prepared by:

I. R. Duddy

July 2003

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Petrographic descriptions and density measurements of two metasedimentary basement samples, Bunga Creek-2, Lakes Entrance area, Gippsland

GEOTRACK REPORT #870B

EXECUTIVE SUMMARY

Introduction and Objectives

Two metasediment basement samples, a fine-grained "quartzite" and a "slate" supplied by Lakes Oil N.L from 351 m (RT) in the Bunga Creek-2 borehole, Lakes Entrance area, Gippsland, for density measurement and petrographic description.

Key Conclusions

- Densities of 2.78 g/cc and 2.68 g/cc were determined for sample of slate (GC870-2A) and quartzite (GC870-2b), respectively, obtained from the basement core from the Bunga Creek-2 borehole.
- 3. On the basis of the optical petrography sample GC870-2A is classified as a SLATE and sample GC870-2B is regarded as a QUARTZITE, consistent with Palaeozoic metasedimentary basement.

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Petrographic descriptions and density measurements of two metasedimentary basement samples, Bunga Creek-2, Lakes Entrance area, Gippsland

GEOTRACK REPORT #870B

1. Introduction

1.1 Sample details and methods

This report comprises density measurements and petrographic descriptions of two metasediment basement samples, a fine-grained "quartzite" and a "slate" supplied by Lakes Oil N.L from 351 m (RT) in the Bunga Creek-2 borehole, Lakes Entrance area, Gippsland.

The density of each sample, designated GC870-2A ("slate") and GC870-2B ("quartzite") was measured using heavy liquids progressively diluted with known volumes of ethanol calibrated with glass density standards that encompass the density of the unknown samples.

The petrography of each sample was described from polished thin sections using an optical petrographic microscope. The descriptions are illustrated with several digital images.

1.2 Report structure

The main conclusions of the report are presented in the Executive Summary. Section 1 of this report provides a brief summary of the samples analysed, the methods used and the report structure. Details of the density determinations are provided in Section 2. The petrographic description for each sample, including digital photomicrograph images, is presented in Section 3. $\begin{array}{c} Pe913650 _ colour \not = 0 4 \\ 913650 027 \\ 2 \end{array}$



Figure 1.1: Locations of Bunga Creek-2 (samples GC870-2A & -2B together with the Bunga Creek-1borehole and abandoned quarry (sample RD59-32) from which granite samples were analysed in Geotrack Report #870.



2. Density determinations for Bunga Creek-2 metasediments

The density of each sample was measured using heavy liquids progressively diluted with known volumes of ethanol until the sample sank. The liquid density was calibrated with glass density standards that encompassed the density of the unknown samples.

	сс	Comments
Volume of liquid of density 2.605 g/cc	300.00	2.605 g/cc standard just floats
Volume of TBE density 2.96 g/cc added	310.00	Sample GC 870-2A just floats
Total volume	610.00	
Calculated density of "SLATE" sample 870-2A	-	2.78 g/cc
Volume of ethanol of density 0.791 g/cc added	35.00	Sample 870-2B just floats
Total volume	645.00	
Calculated density of "QUARTZITE sample		
870-2A	-	2.68 g/cc

Note:

Each sample weighed around 50 g.



3. Petrographic descriptions

Brief petrographic descriptions were requested for two metasediment core samples of presumed Paleozoic ages recovered from the Bunga Creek-2 borehole (Lakes Oil N.L. (AMG Ref. 591198 E 5810294 N), from the Lakes Entrance area, and these were carried out by Dr. Ian Duddy.

3.1 GC 870-2A: "Slate " Bunga Creek-2 Borehole, 351 metres (RT).

<u>Texture:</u> Fine-grained metasediment with well-developed slatey cleavage defined by metamorphic muscovite. Original siltstone or fine sandstone laminae now consist of amalgamated polycrystalline quartz layers. No visible porosity.

Mineralogy: Muscovite (major), polycrystalline quartz, plagioclase, minor pyrite.

Rock name: Slate

Images: Representative thin-section photomicrographs shown in Figures. 3.1 to 3.3.

3.3 GC 870-2B: "Quartzite" Bunga Creek-2 Borehole, 351 metres (RT).

- <u>Texture:</u> Medium to coarse grained metasediment with sandy texture, some obvious slatey cleavage defined by metamorphic muscovite transitional to slate. Grains of what may be original detrital plagioclase typically 0.3 to 0.6 mm in diameter. Much of the quartz is polycrystalline with clear evidence of growth and amalgamation, so original grainsize is not obvious. No visible porosity.
- <u>Mineralogy:</u> Polycrystalline quartz (major), muscovite, plagioclase, minor pyrite, zircon.

Rock name: Quartzite

Images: Representative thin-section photomicrographs shown in Figures 3.4 to 3.7.



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Figure 3.1: SLATE, Bunga Creek-2. Both images crossed polars. Width of EACH field of view = 0.76 mm

LEFT: Polycrystalline metamorphic quartz and altered ?feldspar grains in finer grained quartz and muscovite matrix.

RIGHT: Slatey cleavage with well-developed muscovite and polycrystalline metamorphic quartz.



Figure 3.2: SLATE, Bunga Creek-2. Both images crossed polars. Width of EACH field of view = 0.76 mm

LEFT: Polycrystalline metamorphic quartz layer presumably developed from an original quartz sand or silt laminae.

RIGHT: Plagioclase grain, Polycrystalline metamorphic quartz with slatey cleavage defined by muscovite.



SLATE, Bunga Creek-2. Both images crossed polars. Left width of field of Figure 3.3: view = 0.76 mm; Right width of field of view = 0.38 mm. LEFT: Polycrystalline metamorphic quartz layer presumably developed from an original quartz sand or silt laminae. RIGHT: Well-developed muscovite in slatey cleavage.

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Figure 3.4: QUARTZITE, Bunga Creek-2. Both images crossed polars. Width of EACH field of view = 0.76 mm
 LEFT: Large feldspar (~0.5 mm long) and polycrystalline metamorphic quartz. Note alignment of muscovite in feldspar with that in matrix.
 RIGHT: Well-developed polycrystalline metamorphic quartz.



Figure 3.5: QUARTZITE, Bunga Creek-2. Both images crossed polars. Width of EACH field of view = 0.76 mmLEFT: Plagioclase grain, fine grained metamorphic quartz and muscovite within slatey cleavage cutting quartzite.

RIGHT: Quartz-rich field showing range in grainsize of polycrystalline quartz.



Figure 3.6: QUARTZITE, Bunga Creek-2. Both images crossed polars. Width of EACH field of view = 0.76 mm LEFT: Slatey cleavage layer defined by muscovite with polycrystalline quartz

RIGHT: Large plagioclase grain with minor muscovite alteration.





Figure 3.7: QUARTZITE, Bunga Creek-2. Both images crossed polars. Width of EACH field of view = 0.38 mmLEFT: Detail of boundary between large quartz and matrix of muscovite and fine-grained quartz. RIGHT: Detail of matrix consisting of muscovite and fine-grained quartz.

Appendix 2

Appendix 2 Borehole Co-ordination Data



AUSTEC SURVEYING CONSULTANTS ACN 006 347 100

TITLE & ENGINEERING SURVEYORS :: LAND DEVELOPMENT CONSULTANTS

Ref 03300.C01 24/06/03

Lakes Oil N.L. P.O. Box 300 Collins Street West Melbourne, 8007.

Att:Mr J. MulreadyRe:Wellsite SurveysLocation:Bayview Road, BairnsdaleAndBunga Creek, Lakes Entrance.

Further to your request we have completed the co-ordination of the bore holes at Bairnsdale and Lakes Entrance.

 Jones Bay-1
 E 559212.975 N 5809565.222 RL 2.200
 PSF
 0.99964318

 Patties Pies-1
 E 559321.145 N 5810466.907 RL 2.280
 PSF
 0.99964334

 Datum:
 Parish of Broadlands PM 35
 Parish of Bairnsdale StMarys Spire
 Parish of Bairnsdale StMarys Spire

Bunga Creek-1	E 589376.388 N 5809860.128 RL 60.600 PSF	0.99969839
Bunga Creek-2	E 591192.088 N 5810294.796 RL 43.890 PSF	0.99970242
Datum:	Parish of Colquhoun PM's 32 & 33	

• The above co-ords have been deduced from ground survey work to an estimated accuracy of +/-0.02m.

• The co-ords are to the centre line at ground level of the bores, except for "Jones Bay-1" This bore has not yet been drilled. The co-ords are to the centre of the northern edge of a dirt ramp, at a distance of 7.45m on Magnetic Brg of about 7⁰ from a steel (GI) stake placed on site.

Yours Faithfully,

mun Bourde

Bruce Bowden. Licensed Surveyor

Email: austec@net-tech.com.au Telephone (03) 5152 1197 Fax (03) 5152 2501 Mobile 0408 521 197

Appendix 3

Appendix 3 Cuttings Descriptions
DEPTH m	ROP min/m	Gas Units	DESCRIPTION
0-3	3.3	Not	Sand : Buff-lt brn, unconsol.consisting of clear, lt brn, brn, rosy and wh c-vcg srded-rded qtz grains
		operative	Clay passing into suspension.
3-6	5.7	Not	Gravel & Sand: Unconsolidated, buff – It brn a/a but grading to gravel
	-	operative	
6-9	3.0	0	Sand: buff-lt brn, unconsol. a/a pred. c-vcg
9-12	2.7	0	Sand: buff-lt brn, unconsol, cons. Of clear, lt brn –orange and wh pred m-cg srded –rded qtz grns,
12-15	2.0	0	Clay: Lt bm, soft, adhesive, v.silty
			Ran conductor pipe to 12.4 m
15-18	2.0	0	50% Clay a/a
			50% Pebbles of sang clr & rose gtz
18-21	1.3	0	Limestone: It brn, v.sdy with shell frags, Tr pyr, Tr Glauc.
21-24	2.0	0	Sandstone: It brn, vf-fg, well sort. rded, v. calc.
24-27	1.3	0	Sandstone: It brm, vf-fg, well sort. rded, v. calc.
27-30	1.7	0	Limestone: It brn, wh, cons of angular shell frags corals, bryozoa, minor brachiopods, lamellibranchs,
			gasteropods & undiff. calcite
			Extremely dull gold mineral fluor.
30-33	1.7	0	50%Limestone a/a
			50%Marl gy, soft, slty
33-36	1.7	0	40%Limestone a/a
			60%Marl a/a
36-39	2.09	0	Marl a/a Tr Lst a/a
39-42	2.0	0	30% Limestone a/a
			70% Marl a/a
42-45	1.7	0	60% Limestone a/a
			30% Marl a/a grding to calc siltst.
			10% Coal Blk
45-48	1.3	0	80% Limestone a/a

BUNGA CREEK-2 CUTTINGS DESCRIPTIONS Wellsite Geologist: J. Mulready. Well spudded 26.2.03

20% Sandstone: It gv vfg Comm Tr coal		80% Limestone a/a 20% Sandstone: It gy vfg Comm Tr coal	50% Limestone a/a shell frags to 8 mm 50% Marl gy, soft, sdy	90% Limestone: It gy, wh, cons of angular shell frags corals, bryozoa, minor brachiopods, lamellibranchs, gasteropods & undiff. calcite Extremely dull mineral fluor. 10% Marl gy, soft, sdy	90% Limestone a/a 10% Marl gy, soft, sdy	Limestone: a/a	Limestone: a/a Mud check – Vis 34 Wt 9.3 lb/gal out	Limestone: a/a	Limestone: a/a	Limestone: a/a larger frgs to vcg	Limestone: It gy, wh, cons of angular shell frags corals, corals, bryozoa, minor brachiopods, lamellibranchs,	gasteropods & undiff. calcite. Extremely dull mineral fluor	Limestone: It gy, cream, cons of angular shell corals, bryozoa, minor brachiopods, lamellibranchs, gasteropods & undiff. calcite. Extremely dull mineral fluor.	Limestone: a/a	Limestone: a/a	Limestone: a/a c-vcg	Limestone: a/a	Limestone: a/a	Limestone: a/a Mud check – Vis 37 Wt 8.9+. lb/gal after circln.	Limestone: a/a	Limestone: a/a	Limestone: a/a
	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	1
	1.3	1.3	1.0	1.7	1.7	1.3	2.0	2.3	3.3	2.0	1.3		1.3	2.0	2.7	2.3	3.3	2.7	2.7	1.7	2	1.7
	48-51	51-54	54-57	57-60	60-63	63-66	69-99	69-72	72-75	75-78	78-81		81-84	84-87	87-90	90-93	93-96	66-96	99-102	102-105	105-108	108-111

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Limestone: a/a	Limestone: It gy, cons of angular shell frags corals, bryozoa, minor brachiopods, lamellibranchs, gasteropods	& UNUIL CARCINE EXUCINELY UNIT INNERAL INVOL Timestone: 2/3	Limestone: a/a	Limestone: a/a Mud check - Vis 41 Wt 8.9+ lb/gal out		Limestone: a/a	Ran casing to 141 m	Limestone: a/a	Limestone: It gy[-grn, wh, cons of angular shell frags corals, bryozoa, minor brachiopods, lamellibranchs,	gasteropods & undiff. calcite. Extremely dull mineral fluor	Limestone: a/a Mud check - Vis 31 Wt 9.3 lb/gal out Ran 5.5" csg Shut down for rig repairs	Limestone: a/a	Switched to KCl polymer mud system. Mud check – Vis 37 Wt 8.5 lb/gal out No discernable trip gas.	Limestone: It gy-grn, wh, cream, cons of angular shell frags corals, bryozoa, minor brachiopods,	lamellibranchs, gasteropods & undiff. calcite.	Extremely dull mineral fluor	Limestone: a/a	Limestone: a/a Tr gy grn marl, soft, dispersive.	Limestone: a/a common Tr gy grn marl, soft, dispersive									
1	. 0	0	0	0	0			0	0	1		0	0	0	0	1	1	1		1	1		2			. 0	0	1
1.7	2.3	2.3	3.9	1.7	1.7	26	3.3	3	3	3		0.9	1.3	1.3	0.75	3	3.7	3.3		3.3	1.7		2.3			2.0	3.0	3.7
111-114 1	14-117 2	117-120 2	120-123 3	123-126 1	126-129 1	120-132			138-141 3	141-144 3		144-147 0	47-150 1	150-153	153-156 0	156-159 3	159-162 3	162-165 3		165-168 3	168-171 1		171-174 2			174-177 2	177-180 3	180-183 3

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183-186	6.3	1	90% Limestone: a/a
			10% Marl: gy grn, soft dispersive - probably partially dispersing into mud
			Carbide lag test:- Lag time 2 min from bottom, 19 units gas.
186-189	2.0	1	60% Limestone: a/a
			40% Marl: a/a
189-192	4.3	1	Limestone: a/a
192-195	3.0	1	60% Limestone: a/a
			40% Marl : a/a
195-198	5.7	1	60% Limestone: a/a
			40% Marl: a/a
198-201	3.0	1	80% Limestone: a/a but pred. coral, bryozoa.
			20% Marl: a/a
201-204	4.0	1	40% Limestone: a/a
			60% Marl: a/a
204-207	3.3	1	50% Limestone: a/a
			50% Marl: a/a
207-210	8.0	1	40% Limestone: a/a
			60% Marl : a/a
210-213	4.6	1	95% Limestone a/a
		£	5% Marl a/a Resumed drilling after 1-1/2day shutdown. 2 units trip gas
213-216	9.3	2	30% Limestone a/a
216-219	9.3	1	40% Limestone: a/a
			60% Marl : a/a
219-222	14.7	1	30% Limestone: a/a
			70% Marl: a/a Mud check – Vis 35 Wt 8.5+ lb/gal out
222-225	7.0	1	Marl a/a
			Tr Limestone a/a Resumed drilling after 1 day shutdown
225-228	12.7	2	50% Limestone: a/a
			50% Marl: a/a
228-231	7.3	1	95% Limestone a/a

		-	
+67-167	1	I	70% Linesone: aa 70% Marl: a/
234-237	8.7	1	60% Limestone: a/a
			40% Marl : a/a
237-240	12.3	1	Limestone: a/a
			Tr Marl a/a
240-243	9.3	1	Limestone: a/a
			Tr Marl a/a
243-246	12.3	1	Limestone: It gy, wh, orange brn, cons. of unconsol. shell frags-bryozoa & coral & calcite.
			Dull yellow min fluor. Mud chec k – Vis 41 Wt 8.6 lb/gal out
246-249	13	1	50% Limestone: a/a
			40% Sstone: gy grn vfg, srded, well sted, arg.calc. Grades to calc. slst Tight No shows. Tr pyr
			Commenced drilling after dilution of mud to reduce pressure on top drive. No trip gas.
			Marl now likely to be dispersed
249-252	14.7	1	.90% Limestonea/a
			10% Sstone: a/a
252-255	8	1	60% Limestonea/a
			40% Sstone : a/a
255-258	10	1	40% Limestone: a/a
			20% Sstone: a/a
			40% Marl: gy grn, soft dispersive.
258-261	5.3	1	Limestone: a/a
261-264	7	1	Poor sample
			90% Limestone : a/a
			10% Slstone: gy grn soft v.arg., calc. Grades to marl. Tr sst a/a Tr pyr
			Carbide check returned in 14 minutes, 31 units. Lag = 3.5 mins
			Mud Check Vis 34 Wt 8.6
264-267	8.3	1	Poor Sample
			90% Limestone : a/a
			10% Sitlstone/marl: a/a
267-270	13		Poor Sample

			90% Siltstone/marl: a/a 10% Limestone : a/a
270-273	47.7	1	Marl: gy gm, soft, slty. (good returns) (Drilling with major reduction in WOB and rotary speed in order to preserve seal integrity).
273-276	27.7	2	Sstone: gy grn, brn, vfg, srded, mic.,calc, v.arg. sl glauc, soft, tight, no shows grades to Calc. Sltstone in part
276-279	24.7	1	Sstone: grding to sltstone a/a No shows
			Mud check: Vis.35 Wt 8.6 lb/gal WL 9cc pH 8.5, Cl 15000 ppm
279-282	21	2	Setone: grding to sltstone a/a No shows
282-285	22	1	Sstone: grding to sltstone a/a No shows
285-288	30	e	Sstone: grding to sltstone a/a No shows Last seal failed. Rig shut down till 12.3.03
288-291	16.7	2	Almost no sample – rotary speed increased
			30% Limestone: (cavings ?)cons. of It gy, clr and brn shell frags
			70% Sstone: grding to sltstone a/a No shows
			Mud check: Vis.35 Wt 8.5 lb/gal Chlorides 16500 ppm
291-294	6.0	2	40% Limestone : a/a Occ forams
			30% a/a No shows
			30% Glauconite? pellets: black, srded, firm
			Comm tr pyr.
294-297	9.3	1	30% Limestone: a/a
			60% Sstone/Sltsone: a/a
			10% Glauconite? pellets: a/a Comm tr pyr. Trip gas 4 units
297-300	18	3	Poor sample, polymer still un-sheered
			Sstone: gy brn, arg., slty grding to sltst
300-303	7.3	1	Sstone: gy brn a/a v arg.
303-306	19.7	1	Sstone: a/a Tr pyr.Tr pyr
306-309	3.3	-	20% Limestone: a/a
			80% Sstone: a/a
			Carbide check 138 units after 22 mins. Lag time 5 mins
309-312	14.7	2	Poor sample Setonor and
			סאטוור. צע צווו, טווו, עוצ, אועכט, ווווני,למול, עמוצ. או למוט, אטוו, ווצווו, ווט אוטשא צומעכא וע כמול. אוואטוול ווו אמונ

312-315 14.0 315-315 14.0 315-318 10 315-318 10 318-320 11 320-322 11 322-325 21 325-328 26.6 325-325 21 325-325 21 325-325 21 325-325 21 325-325 21 325-325 21 326-333 42.6 339-342 16 345-345 11.3 345-345 11.3 345-345 11.3 348-351 170
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Appendix 4 Core Descriptions/Gas Log

Depth	Core Description
318.0-319.98 (1.98 m)	Siltstone: bm mic. soft calc
319.9-346.30	Sandstone: grn-brn, massive, soft, vfg, srded, mic., glauc., pyritic, silty-arg. Black glauc pellets common. Common
(26.4 m)	shells frags (esp molluscs) throughout. Gold mineral fluor from shells. No cut.
	Interbeds of v. hard It gy limestone: crystalline, sdy, glauc, mic, grades to calc cemented sst.
	323.63-323.86 (23 cm)
	327.20-327.35 (15 cm)
	331.30-331.40 (10 cm)
	332.90-333.14 (24 cm)
	337.71-333.84 (13 cm)
	341.00-341.06 (6 cm)
	345.79-345.85(6 cm)
346.30-347.45	Sandstone: -gy grn, brn indurated cons of rded Fe stained qtz in a hard calc arg mtx
(1.15 m)	Numerous shell frags No shows.
347.45-347.55	Limestone: gy-blk, crystalline, hard, sdy, glauc, grades to calc cemented sst.
(0.10m)	
347.55-347.80	Sandstone: gy grn, fossiliferous, indurated a/a No shows
(0.25 m)	
347.80-348.06	Conglomerate : with metamorphic pebbles > core diameter in part, generally sub-parallel to flat bedding. Pebbles set
(0.26 m)	in matx of indurated Sandstone a/a Tight. No shows
348.06 - 351	Metamorphic Basement: – grn gy phyllite/slate? hard dense, lt gy grn. Strongly sheared, dip ~50deg.
	Bands of qtzite 349.2-349.4 m Occ calcite veins showing slickenslides. Cross fracture @349.65 m
TD 351 m	

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BUNGA CREEK-2 CORE DESCRIPTIONS /GAS LOG

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This is Page Number 913650_046X

This is an enclosure indicator page.

The page that follows this page is an uncatalogued fold-out with page number:

913650_046Y

and is enclosed within the document **PE913650** at this page.



BUNGA 2 CALIBRATED DENSITY LOG -FULL HOLE DIAMETER AND TOOL STAND-OFF COMPENSATION AMDEL PITS STANDARDS - CALIBRATED TO 2.2 t/m3 MAXIMUM (UNCASED SECTION: 140.6 M TO TD)



Pe913650 - colour ØØ8913650 046Y

This is an enclosure indicator page. The enclosure PE613617 is enclosed within the container PE913650 at this location in this document.

The enclosure PE613617 has the following characteristics: ITEM_BARCODE = PE613617 CONTAINER_BARCODE = PE913650 NAME = Bunga Creek-2 SP-Resistivity Log BASIN = GIPPSLAND ONSHORE? = YDATA_TYPE = WELL DATA_SUB_TYPE = WELL_LOG DESCRIPTION = Bunga Creek-2 SP-Resistivity Log. 1:500. By Auslog for Lakes Oil NL. March 2003 REMARKS = DATE_WRITTEN = 18-MAR-2003 DATE_PROCESSED = DATE_RECEIVED = 15-JUL-2003 RECEIVED_FROM = Lakes Oil NL WELL_NAME = Bunga Creek-2 CONTRACTOR = AUTHOR = ORIGINATOR = Lakes Oil NL $TOP_DEPTH = 135$ $BOTTOM_DEPTH = 349$ ROW_CREATED_BY = DH00_SW

(Inserted by DNRE - Vic Govt Mines Dept)

This is an enclosure indicator page. The enclosure PE613618 is enclosed within the container PE913650 at this location in this document.

The enclosure PE613618 has the following characteristics: ITEM_BARCODE = PE613618 CONTAINER_BARCODE = PE913650 NAME = Bunga Creek-2 Density-Caliper-GR Log BASIN = GIPPSLAND ONSHORE? = YDATA_TYPE = WELL DATA_SUB_TYPE = WELL_LOG DESCRIPTION = Bunga Creek-2 Dual Density-Caliper-Gamma Ray Log (Preliminary). 1:500. By Auslog for Lakes Oil NL. March 2003 REMARKS = DATE_WRITTEN = 18-MAR-2003 DATE_PROCESSED = DATE_RECEIVED = 15-JUL-2003 RECEIVED_FROM = Lakes Oil NL WELL_NAME = Bunga Creek-2 CONTRACTOR =AUTHOR = ORIGINATOR = Lakes Oil NL $TOP_DEPTH = 0$ $BOTTOM_DEPTH = 350$ ROW_CREATED_BY = DH00_SW (Inserted by DNRE - Vic Govt Mines Dept)

This is an enclosure indicator page. The enclosure PE613619 is enclosed within the container PE913650 at this location in this document.

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The enclosure PE613619 has the following characteristics: ITEM_BARCODE = PE613619 CONTAINER_BARCODE = PE913650 NAME = Bunga Creek-2 Density-Caliper-GR Log BASIN = GIPPSLAND ONSHORE? = YDATA_TYPE = WELL DATA_SUB_TYPE = WELL_LOG DESCRIPTION = Bunga Creek-2 Dual Density-Caliper-Gamma Ray Log (Preliminary). 1:200. By Auslog for Lakes Oil NL. March 2003 REMARKS = DATE_WRITTEN = 18-MAR-2003 DATE_PROCESSED = DATE_RECEIVED = 15-JUL-2003 RECEIVED_FROM = Lakes Oil NL WELL_NAME = Bunga Creek-2 CONTRACTOR = AUTHOR = ORIGINATOR = Lakes Oil NL $TOP_DEPTH = 0$ $BOTTOM_DEPTH = 350$ ROW_CREATED_BY = DH00_SW

(Inserted by DNRE - Vic Govt Mines Dept)

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This is an enclosure indicator page. The enclosure PE613620 is enclosed within the container PE913650 at this location in this document.

ITEM_BARCODE = CONTAINER_BARCODE = NAME =	PE913650 Bunga Creek-2 SP-Resistivity Log. 1:200 GIPPSLAND Y WELL
	—
DESCRIPTION =	Bunga Creek-2 SP-Resistivity Log.
	1:200. By Auslog for Lakes Oil NL.
	March 2003
REMARKS =	
DATE_WRITTEN =	18-MAR-2003
DATE_PROCESSED =	
DATE_RECEIVED =	15-JUL-2003
RECEIVED_FROM =	Lakes Oil NL
	Bunga Creek-2
CONTRACTOR =	Danga or oon 1
AUTHOR =	
	Lakes Oil NL
TOP_DEPTH =	135
BOTTOM_DEPTH =	349
ROW_CREATED_BY =	DH00_SW

(Inserted by DNRE - Vic Govt Mines Dept)

913650 051

