REPORT ON A STUDY OF LA BELLA-1 CONVENTIONAL CORE,

VIC/P31, OTWAY BASIN

PREPARED BY: S. Horan
Exploration Geologist Otway/Duntroon

1769.REP

DATE: November, 1994

BHP PETROLEUM PTY. LTD.
A.C.N. 006 918 832

TABLE OF CONTENTS

1 INTRODUCTION

This report is based on the detailed examination of conventional core cut in La Bella-1 in the BHP Petroleum operated permit VIC/P30. The study was undertaken by S.Horan at Kestrel Core Store in Glen Waverly, Melbourne (17 March 1994).

La Bella-1 was drilled in January/February 1993 by BHP Petroleum and discovered gas and minor amounts of condensate in two sandstone units from within the Turonian to Coniacian sediment of the Shipwreck Group. These unit are broadly equivalent to the lower gas-bearing unit within the Minerva Field.

One core was cut from 2071.0 to 2098.65 mRT sampling the basal part of the upper gas bearing sandstone and sampled the sealing unit between the two sandstones.

Lithological descriptions and environmental interpretations of cored intervals are followed by a core description sheet and a selection of wireline log data over the cored and adjacent interval. Where possible, depositional environmental inferences by Roger Morgan from palynological data have been incorporated in the environmental interpretations.

The results and conclusions of this study will make a contribution to the better understanding of the regional geological understanding of the Shipwreck Group.

2 SUMMARY

The interval 2071-2098.65 mRT is interpreted to have been deposited in an nearshore marine environment either in a delta front/pro-delta environment or in an outer estuary bay association.

3 LITHOLOGICAL DESCRIPTIONS

SANDSTONE: (2071.0-2071.72 mRT), light grey to minor dark grey, medium to coarse grained, commonly very coarse to granule sized, moderate to well sorted, common light brown siderite cement, minor moderately bioturbated argillaceous sandstone, minor wavy discontinuous wavy clay drapes, trace ? quartz cement, good visual porosity.

BIOTURBATED CONGLOMERATIC SANDSTONE: (2071.72-2074.5 mRT) light to predominantly medium/dark grey, scattered coarse to pebble size quartz grains and cemented quartz aggregates with a dark grey claystone matrix, conglomeratic sandstone is intensely bioturbated, common light brown siderite cement, ?trace horizontal sand filled burrows

ARENACEOUS CLAYSTONE (2074.5-2077.9 mRT), intensely bioturbated medium to dark grey claystone and common to abundant light grey quartzose silt to medium grained sand grains, subangular to subrounded sand grains, trace to minor light brown/yellow siderite cement and nodules, trace horizontal? (sand filled) and vertical burrows,trace carbonaceous specks, trace pyrite cement.

CLAYSTONE (2077.9-2079.4 mRT), intensely bioturbated medium to dark grey claystone with trace fine to medium grained sandstone laminae, sand grains subangular to subrounded and well sorted, trace to common light brown/yellow siderite cement and nodules, trace pyrite cement.

ARENACEOUS CLAYSTONE (2079.4-2080.28 mRT),intensely bioturbated light to dark grey brown claystone with common fine to medium grained subangular to subrounded sand grains, trace very coarse to granule sized quartz from 2080-2080.28 mRT.trace carbonaceous specks.

ARGILLACEOUS SANDSTONE (2080.28-2082.25 mRT) moderately bioturbated off white/light grey to medium grey argillaceous sandstone, fine to predominantly medium grained, trace very coarse to granule/pebbles in upper 30 mm diameter, subangular to subrounded, poorly to moderately sorted, common to abundant medium grey argillaceous matrix, common light brown/yellow siderite cement (pervasive from 2080.2-2080.80 mRT and 2081.65-2081.9 mRT), minor light brown/yellow siderite nodules, trace carbonaceous specks, upper and lower contacts obscured by siderite cement, trace inclined burrows.

CLAYSTONE (2082.25-2087.0 mRT), intensely bioturbated medium to dark grey claystone, common silt to fine grained sand scattered throughout out or as aggregates, minor silt to fine grained lenticular beds with flame structures and bioturbated and burrowed in part, horizontal and vertical burrows both clay and sand filled, horizontal burrows around 2082.5 mRT filled with medium to trace coarse grained sandstone, minor to common light brown/yellow siderite cement and nodules, trace micromicaeous, trace carbonaceous specks.

ARENACEOUS CLAYSTONE (2087-2089 mRT), intensely bioturbated light to medium grey arenaceous claystone, grades to siltstone in part, common silt to very fine/fine grained sand, trace to common light brown/yellow siderite cement and nodules,trace to rare carbonaceous specks which seem to be related to coarser grained sands and silts, trace micromicaeous.

CLAYSTONE (2089-2093.4 mRT), intensely bioturbated dark grey to black claystone, common silt to very fine sandstone, minor to common light brown/yellow siderite nodules, light brown/yellow siderite cemented bands across core at 2090-2091.25 mRT, trace vertical burrows, trace pyrite, trace carbonaceous specks.

CLAYSTONE (2093.4-2098.1 mRT) intensely bioturbated dark grey to black claystone, common silt to very fine grained sand grains scattered throughout or as lenticular beds, common very coarse to granule (up to 3 mm diameter) quartz grains and subrounded sandstone aggregates (rip ups?) scattered throughout claystone, trace to common light brown/yellow siderite cement and nodules, trace to abundant carbonaceous specks, lenticular laminae made up of carbonaceous and clay, lenticular laminae sometimes have vertical burrows through them, micro-foundering features?

ARGILLACEOUS SANDSTONE (2098.1-2098.65 mRT), light to dark grey, fine to coarse grained, subangular, poorly to moderately sorted, abundant dark grey argillaceous matrix, bioturbated in part, trace light brown/yellow siderite cement and nodules, trace horizontal burrows, bioturbation obscures boundary with overlying claystone.

4 ENVIRONMENTAL INTERPRETATION

The interval 2071-2098.65 mRT is interpreted to have been deposited in an nearshore marine environment either in a delta front/pro-delta environment or in an outer estuary bay association.

Roger Morgan interpreted claystone samples from 2076, 2086.1 and 2096 mRT as having been deposited in nearshore marine environments (Morgan 1993) on the presence of dinoflagallates (7%,7% and 3% respectively of total palynomorphs in each sample) and moderate diversity (7,5 and 6 species respectively in each sample).

The predominance of extensively bioturbated claystones supports a nearshore marine environment. Sand grains are coarse to granule sized and predominantly scattered throughout claystones and rarely as homogenous beds. The lack of sedimentary structures in the homogenous sandstone beds probably indicates deposition by grain flow mechanisms. The scattered sand grains are interpreted to have been deposited in a relatively low energy environment dominated by clay sized particles which have been extensively reworked by bioturbation. Deposition then was most likely from a relatively low energy delta-front/pro-delta environment or in an outer estuary bay association close to a higher energy fluvial environment sourcing the coarse sand and terrestrial debris.

5 REFERENCES

MORGAN,R. 1993: Final Palynology of BHPP La Bella-1, Offshore Otway Basin, Victoria, Australia. June 1993, report for BHP Petroleum (unpubl.).

6 FIGURES

Key to sedimentary structures

Lithology modifier

La Bella-1 Core-1 graphic log (1:25)

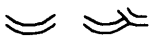
DLL-MSFL-AS-GR-AMS wireline log 1:200

LDT-CNL-GR-AMS wireline logs 1:200.

BHP

KEY TO SEDIMENTARY STRUCTURES


homogenous


trough cross bedding

hummocky cross stratification


wave oscillation ripple


current ripple lamination

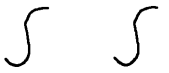
flaser bedding

lenticular bedding


dewatering feature


rip up clasts

scour surface


wavy inclined


dwelling burrow


bioturbation


ophiomorpha burrow

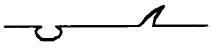

gastropod


shell debris


brachiopod


bivalve


cephalopod


load and flame structure


microfoundering feature


load casts


mud crack

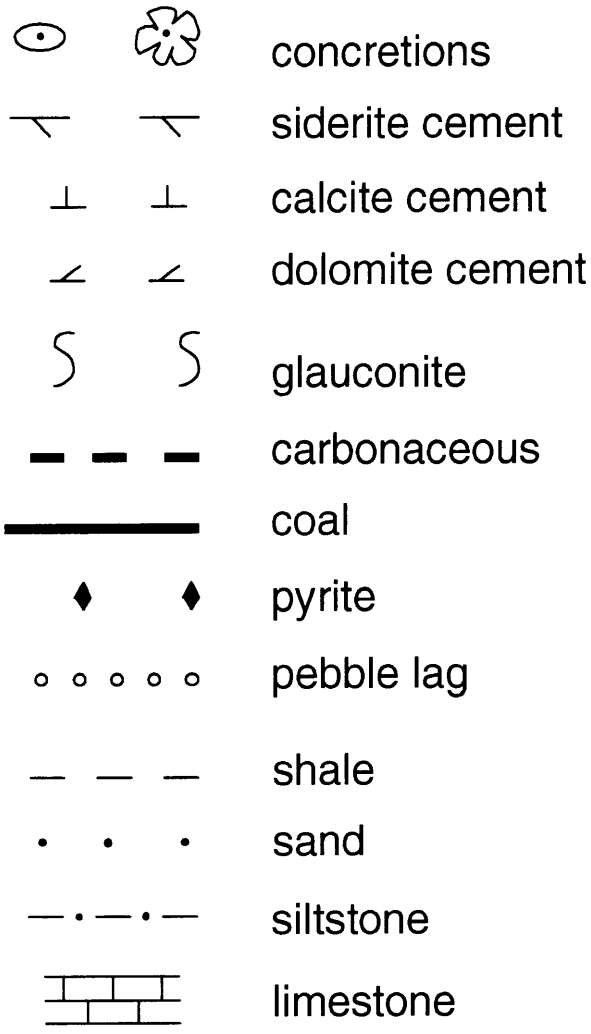

fracture


plant stems


rootlets

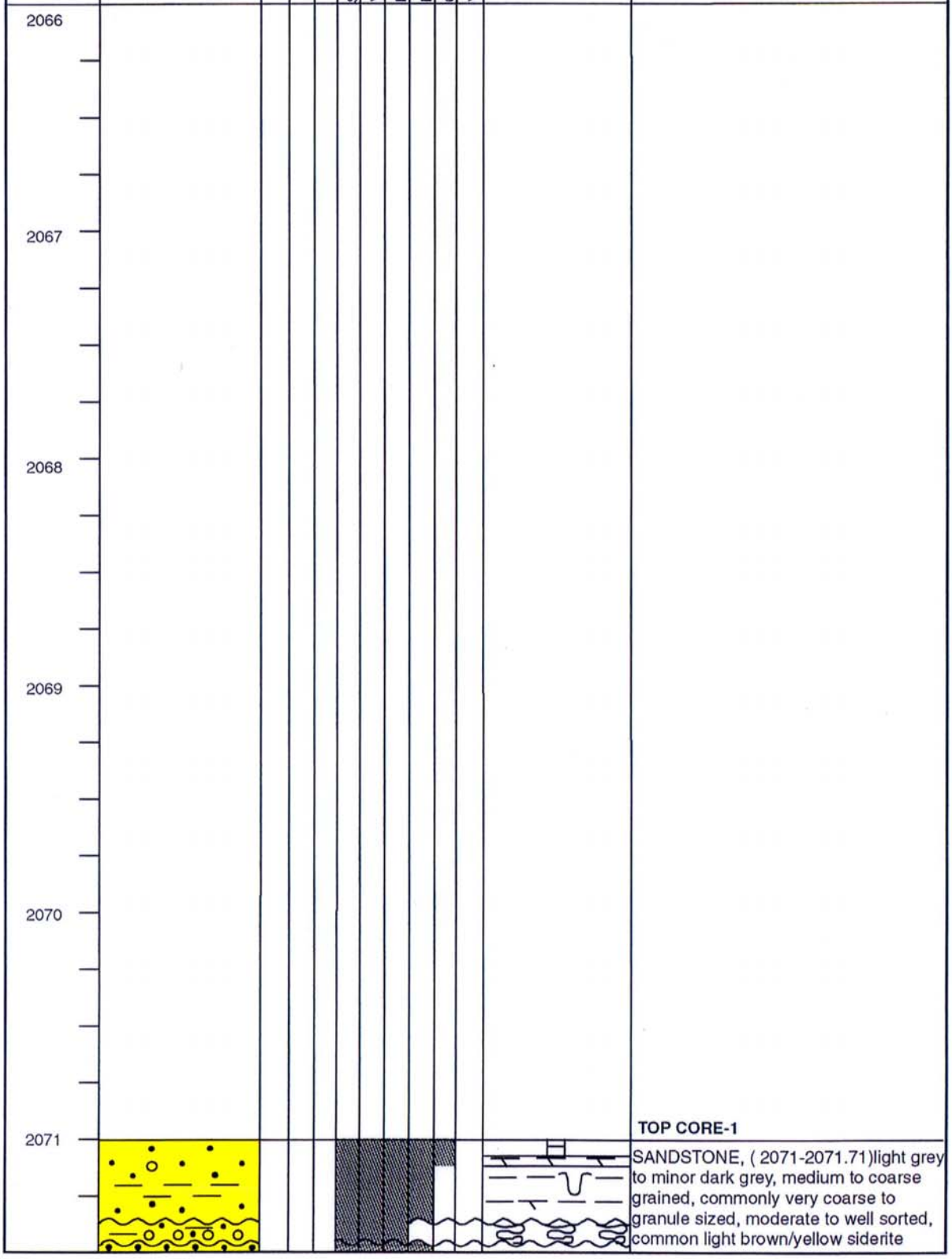
BHP

LITHOLOGY MODIFIER ONLY



CORE DESCRIPTION
LA BELLA-1

PERMIT: VIC / P30	DATE: 17/3/94	CORE NO.: 1	Page: 1/6
AUTHOR: S. Horan	INTERVAL: 2071-2098.65 mRT		
RIG: BYFORD DOLPHIN	CUT:		
K.B.: 25m W.D.:	CORE BARREL & MUD TYPE:		

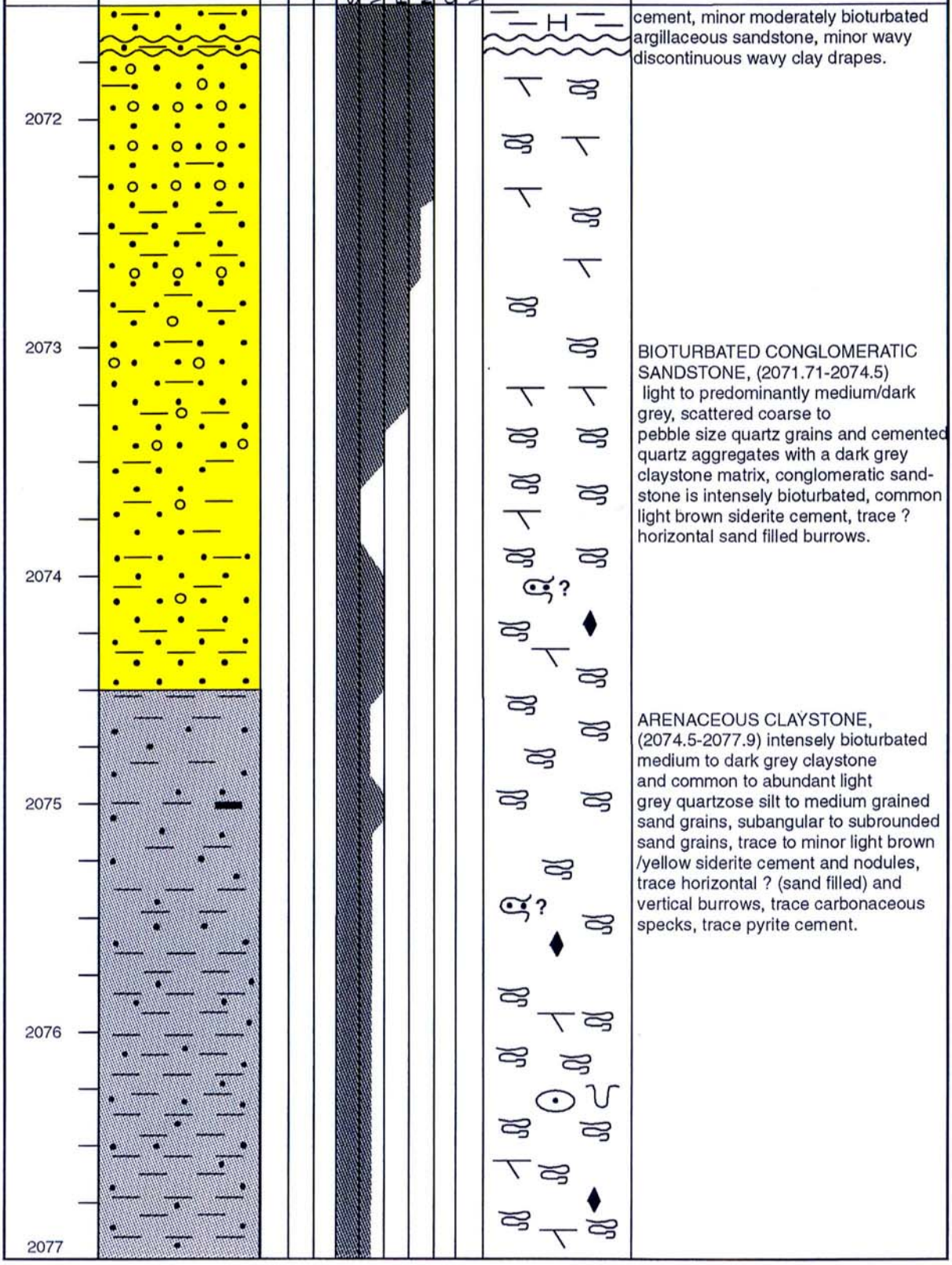


Base drawing No.F988
F1153P1

October 1994

CORE DESCRIPTION
LA BELLA-1

PERMIT: VIC / P30	DATE: 17/3/94	CORE NO.: 1	Page: 2/6
AUTHOR: S. Horan	INTERVAL: 2071-2098.65 mRT		
RIG: BYFORD DOLPHIN	CUT:		
K.B.: 25m	W.D.:	CORE BARREL & MUD TYPE:	



LITHOLOGICAL DESCRIPTION

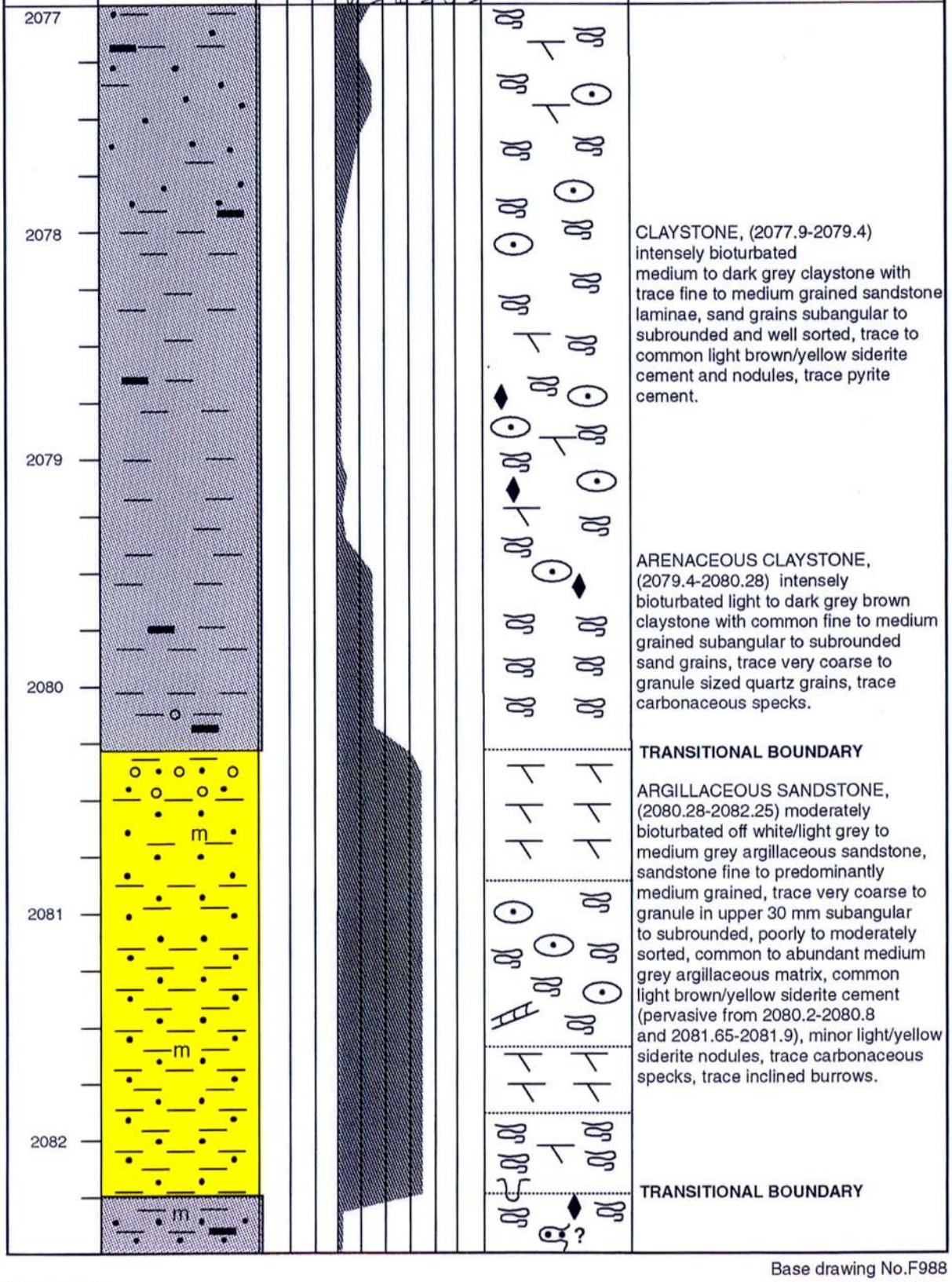
cement, minor moderately bioturbated argillaceous sandstone, minor wavy discontinuous wavy clay drapes.

BIOTURBATED CONGLOMERATIC SANDSTONE, (2071.71-2074.5) light to predominantly medium/dark grey, scattered coarse to pebble size quartz grains and cemented quartz aggregates with a dark grey claystone matrix, conglomeratic sandstone is intensely bioturbated, common light brown siderite cement, trace ? horizontal sand filled burrows.

ARENACEOUS CLAYSTONE, (2074.5-2077.9) intensely bioturbated medium to dark grey claystone and common to abundant light grey quartzose silt to medium grained sand grains, subangular to subrounded sand grains, trace to minor light brown /yellow siderite cement and nodules, trace horizontal ? (sand filled) and vertical burrows, trace carbonaceous specks, trace pyrite cement.

CORE DESCRIPTION
LA BELLA-1

PERMIT: VIC / P30	DATE: 17/3/94	CORE NO.: 1	Page: 3/6
AUTHOR: S. Horan	INTERVAL: 2071-2098.65 mRT		
RIG: BYFORD DOLPHIN	CUT:		
K.B.: 25m	W.D.:	CORE BARREL & MUD TYPE:	



CLAYSTONE, (2077.9-2079.4) intensely bioturbated medium to dark grey claystone with trace fine to medium grained sandstone laminae, sand grains subangular to subrounded and well sorted, trace to common light brown/yellow siderite cement and nodules, trace pyrite cement.

ARENACEOUS CLAYSTONE, (2079.4-2080.28) intensely bioturbated light to dark grey brown claystone with common fine to medium grained subangular to subrounded sand grains, trace very coarse to granule sized quartz grains, trace carbonaceous specks.

TRANSITIONAL BOUNDARY

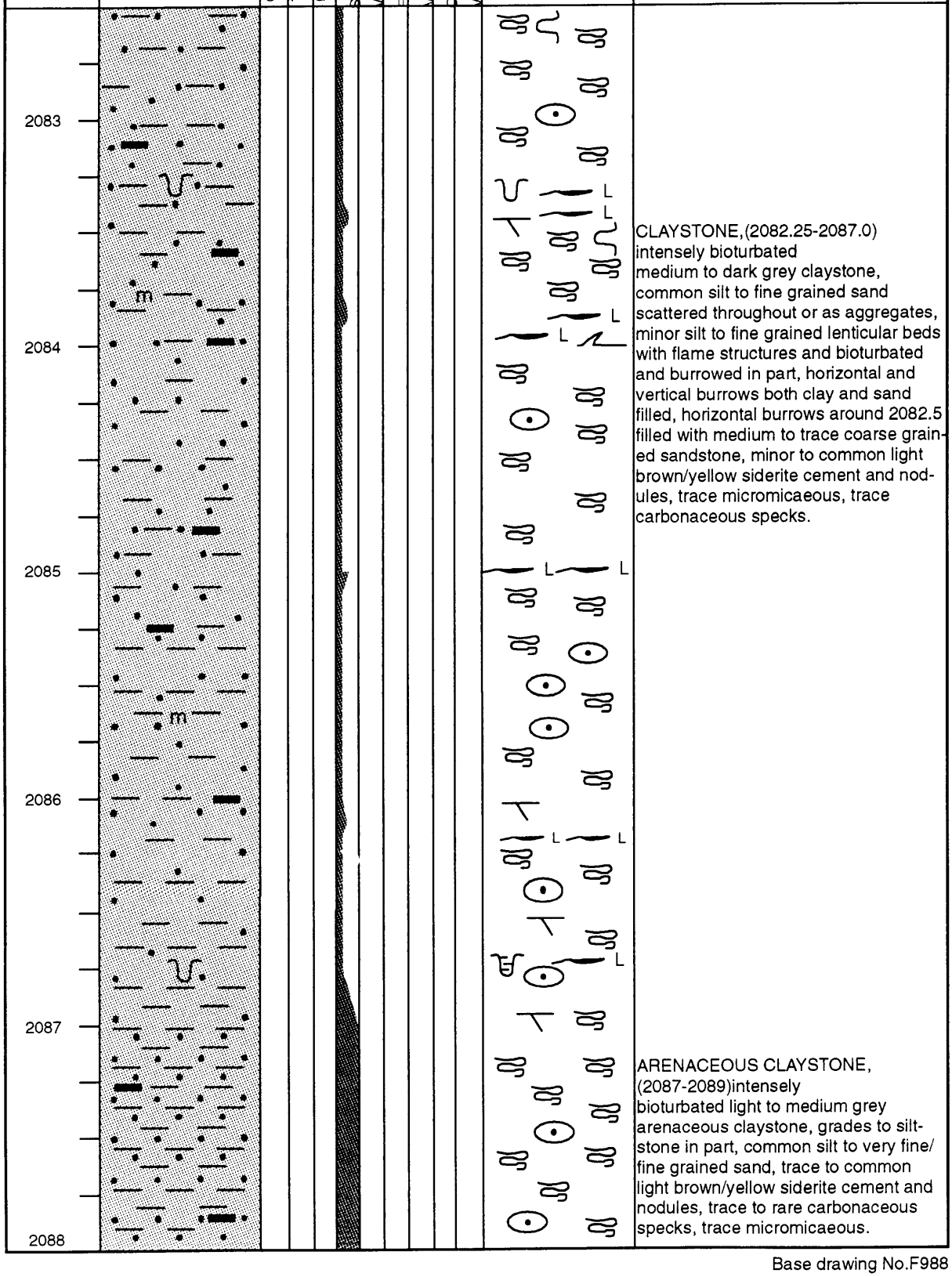
ARGILLACEOUS SANDSTONE, (2080.28-2082.25) moderately bioturbated off white/light grey to medium grey argillaceous sandstone, sandstone fine to predominantly medium grained, trace very coarse to granule in upper 30 mm subangular to subrounded, poorly to moderately sorted, common to abundant medium grey argillaceous matrix, common light brown/yellow siderite cement (pervasive from 2080.2-2080.8 and 2081.65-2081.9), minor light/yellow siderite nodules, trace carbonaceous specks, trace inclined burrows.

TRANSITIONAL BOUNDARY

Base drawing No.F988

CORE DESCRIPTION
LA BELLA-1

PERMIT: VIC / P30	DATE: 17/3/94	CORE NO.: 1	Page: 4/6
AUTHOR: S. Horan	INTERVAL: 2071-2098.65 mRT		
RIG: BYFORD DOLPHIN	CUT:		
K.B.: 25m	W.D.:	CORE BARREL & MUD TYPE:	



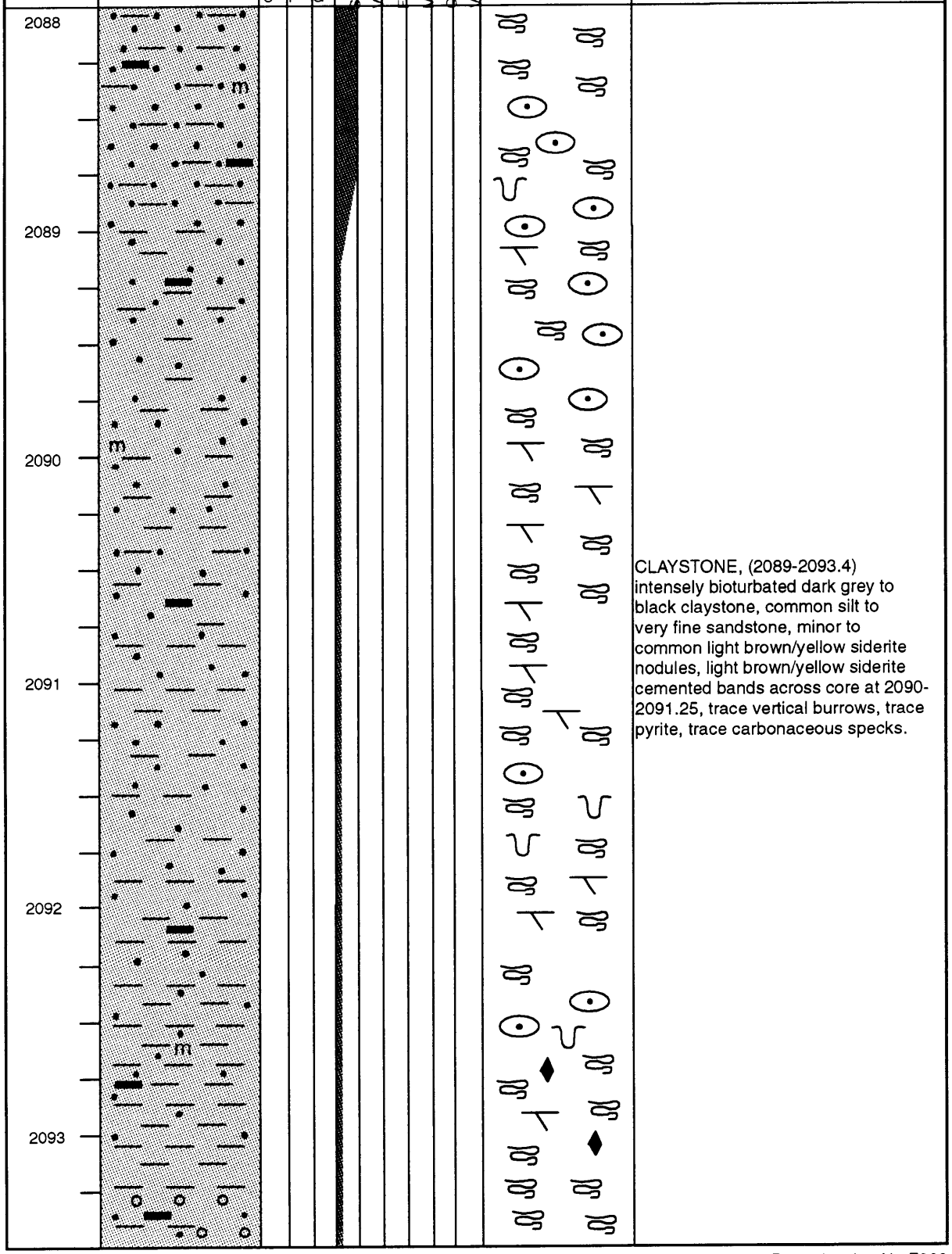
LITHOLOGICAL DESCRIPTION

CLAYSTONE,(2082.25-2087.0) intensely bioturbated medium to dark grey claystone, common silt to fine grained sand scattered throughout or as aggregates, minor silt to fine grained lenticular beds with flame structures and bioturbated and burrowed in part, horizontal and vertical burrows both clay and sand filled, horizontal burrows around 2082.5 filled with medium to trace coarse grained sandstone, minor to common light brown/yellow siderite cement and nodules, trace micromicaeous, trace carbonaceous specks.

ARENACEOUS CLAYSTONE, (2087-2089)intensely bioturbated light to medium grey arenaceous claystone, grades to siltstone in part, common silt to very fine/ fine grained sand, trace to common light brown/yellow siderite cement and nodules, trace to rare carbonaceous specks, trace micromicaeous.

CORE DESCRIPTION
LA BELLA-1

PERMIT: VIC / P30	DATE: 17/3/94	CORE NO.: 1	Page: 5/6
AUTHOR: S. Horan	INTERVAL: 2071-2098.65 mRT		
RIG: BYFORD DOLPHIN	CUT:		
K.B.: 25m	W.D.:	CORE BARREL & MUD TYPE:	



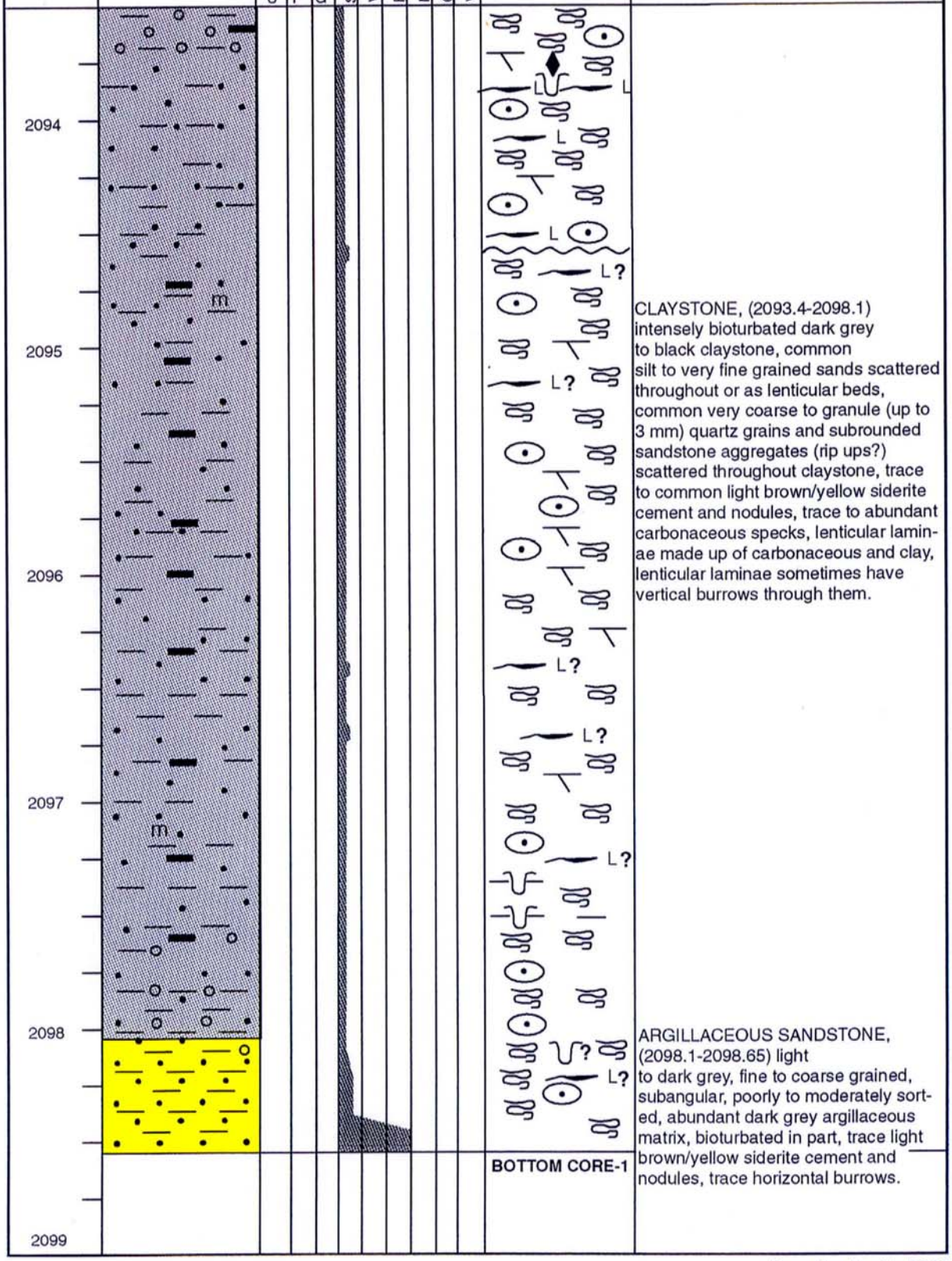
Base drawing No.F988
F1153P5

October 1994

BHP

CORE DESCRIPTION
LA BELLA-1

PERMIT: VIC / P30	DATE: 17/3/94	CORE NO.: 1	Page: 6/6
AUTHOR: S. Horan	INTERVAL: 2071-2098.65 mRT		
RIG: BYFORD DOLPHIN	CUT:		
K.B.: 25m	W.D.:	CORE BARREL & MUD TYPE:	



Base drawing No.F988

October 1994

F1153P6