

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

Hydrogeology Report No 1989/14

HARVEY LINE
BORE COMPLETION REPORTS

by

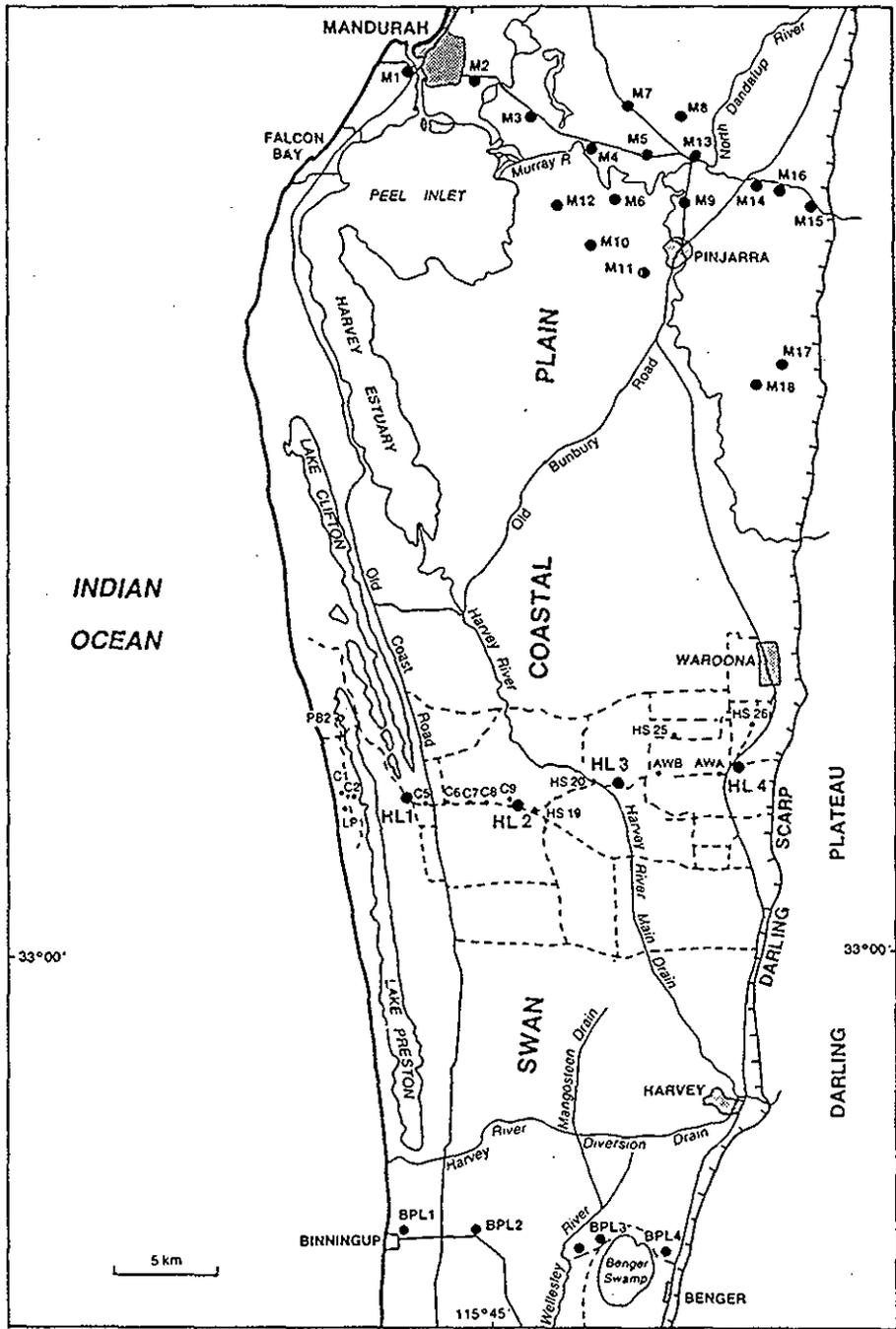
A C DEENEY

NOTE

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Perth, 1989

HL1B1 - 2032-III-B-32
HL1B2 - 2032-III-B-33
HL1B3 - 2032-III-B-34
HL1W - 2032-III-B-38
HL1A - 2032-III-B-39
HL2A1 - 2032-II-C-145
HL2A2 - 2032-II-C-146
HL2A3 - 2032-II-C-147
HL2W - 2032-II-C-148
HL3A1 - 2032-II-C-149
HL3A2 - 2032-II-C-150
HL3A3 - 2032-II-C-151
HL3W - 2032-II-C-152
HL4A1 - 2032-II-B-242
HL4A2 - 2032-II-B-243
HL4B - 2032-II-B-244
HL4W1 - 2032-II-B-245
HL4W2 - 2032-II-B-246



- HL 1 Harvey line bore
- BPL 1 Binningup line bore
- M 1 Mandurah bore
- C 1 Lake Clifton bore
- HS 20 Harvey shallow bore
- AWA Alcoa (Wagerup) A bore
- AWB Alcoa (Wagerup) B bore
- LP 1 Lake Preston No 1 oil well
- PB 2 Preston Beach No 2 bore

Figure 1. Location map

BORE COMPLETION REPORT
HARVEY LINE SITE NO 1 (HL1)

LOCATION AND IDENTIFICATION

OWNER: Geological Survey of Western Australia

GSWA REF: HL1A SI50-2-2032-III-B-39
HL1B1 SI50-2-2032-III-B-32
HL1B2 SI50-2-2032-III-B-33
HL1B3 SI50-2-2032-III-B-34
HL1W SI50-2-2032-III-B-38

LOCATION: Wellington, Loc. 4079, adjacent to the south side of
Preston Beach Road and the east side of the track
running north-south.

Owner: W A Government (Yalgorup National Park).

(Figure 1 - Location map)

AMG REF(Zone 50): Eastings: 3787 Northings: 63572

MAP SHEETS: 1:250000 Pinjarra (SI50-2)
1:100000 Pinjarra (2032)

PURPOSE: HL1A - Exploratory
HL1B - Exploratory and observation
HL W - Water supply bore

STATUS: HL1A - Abandoned
HL1B1 - perforated interval - 117 - 123 m bns - Observation
HL1B2 - perforated interval - 279 - 285 m bns - Observation
HL1B3 - perforated interval - 582 - 588 m bns - Abandoned
HL1W - screened interval - 13 - 19 m bns - Observation

ELEVATION: HL1B1 - top of 25mm GI pipe - 2.325 m AHD
HL1B2 - top of 80mm GI pipe - 2.219 m AHD
HL1W - top of casing - 1.769 m AHD
Natural Surface-concrete base -1.617 m AHD

m bns = metres below natural surface
GI = Galvanised Iron
NB = Nominal Bore
ID = Internal Diameter

BOREHOLE CONSTRUCTION AND DEVELOPMENT

Bore construction diagram (Figure 2)

DRILLED BY: Mines Department Drilling Section, Field Unit A.

RIG: Midway Skytop (Rotary)

MUD: Aquagel, Biopolymer, CMC, Quicktrol

DRILLING COMMENCED:

HL1A - 25. 2.1983

HL1B - 14. 3.1983

HL1W - 16.11.1982

DRILLING COMPLETED:

HL1A 10. 3.1983

HL1B 21. 3.1983

HL1W 17.11.1982

DRILLED DIAMETER:

Bore	Depth Interval (m bns)	Diameter (mm)
HL1A	0 - 62.5	350
HL1B	0 - 62.5	350
	62.5 - 604.5	223
HL1W	0 - 21	172

TOTAL DEPTH:

HL1A - 62.5

HL1B - 604.5

HL1W - 21.0

CASING (Drilling):

HL1A - None

HL1B - 260mm (ID) cemented in to 61.0 m bns

HL1W - None

CASING (Completion):

Bore	Depth Interval (m bns)	ID (mm)
HL1A	-	None
HL1B	0 - 61	260
	0 - 604	154
	0 - 587	80 NB
	0 - 6	25 NB
HL1W	0 - 13.15	105
	13.15 - 19.3	100 NB (Stainless steel screen 0.5mm aperture)

CEMENTING:

HL1A was cemented with 7m³ of slurry.

HL1B - The 260mm sleeve welded steel conductor pipe was cemented in position with 3.5m³ of cement slurry and 3.6m³ of follow-up mud.

The 154mm sleeve welded steel casing was cemented using 15m³ of cement slurry and 11.4m³ of follow-up water.

Cement was drilled out from 524 to 600 m bns.

A cement block was cast around the top of the casing.

OBSERVATION INTERVALS:

Bore/Interval	Depth (m bns)	Formation
HL1B1	117 - 123	Leederville Formation
HL1B2	279 - 285	Cockleshell Gully Formation
HL1B3	582 - 588	Cockleshell Gully Formation
HL1W	13 - 19	Superficial formations

Remarks: Each interval in bore HL1BA was perforated with 3 shots per metre. The 80mm GI pipe was installed with a 6m section of flame-cut slots at approximately 280 m bns and two compressible packers were set at 253 and 554 m bns to seal the annulus between the 80mm pipe and the 154mm casing. HL1B1 is monitored in the 25mm pipe set in the annulus and HL1B2 is monitored in the 80mm pipe. HL1B3 was abandoned after development. HL1W was completed with 6m of 100mm NB, 0.5mm aperture, wire-wound stainless steel screen and the annulus packed with graded sand.

CONSTRUCTION DIFFICULTIES:

Delays occurred during construction for the following reasons:

- (1) Mechanical breakdowns
- (2) HL1A had to be abandoned and cemented off due to the loss of the drill string stabilisers and an artesian flow. HL1B was drilled to replace it.
- (3) Loss and subsequent retrieval of part of airlifting string.
- (4) Packer became unsealed and was resealed.

CONSTRUCTION COMPLETED:

HL1A - 11. 3.1983
HL1B - 5. 4.1983
HL1W - 18.11.1982

DEVELOPMENT:

Artesian Flows occurred from each interval after perforation. Each interval was developed by airlifting and surging until the water cleared and the conductivity was constant. A sample was then taken for chemical analysis. HL1B3 was airlifted for 5 hours at 10m³/d before the other intervals were perforated. All three intervals were then airlifted at 930m³/d for 6 hours before the packers were installed. Combined artesian flow rate was 40m³/d. HL1B1 was then airlifted for 9 hours at 640m³/d and HL1B2 for 10 hours at 30m³/d. HL1W was developed by airlifting and jetting for 6 hours at 290m³/d. Subsequently it was pumped to supply water during the drilling of HL1A and HL1B.

SITE CLEARED: 8. 4.1983

GEOLOGICAL DATA

SAMPLES: Rotary (ditch cuttings) at 3m intervals

SIDEWALL CORES: Using the gamma-ray log, 23 shale/siltstone targets were chosen in HL1B. 21 cores were recovered from the following depths (m bns) 89, 112, 146, 166, 174, 189, 194, 225, 249, 288, 347, 362, 423, 450, 486, 512, 548, 561, 590. No core was recovered from 263 m bns. No core was recovered from 174 m bns at the first attempt. Two cores were recovered from 189 and 561 m bns.

CORING OPERATORS: R Bulner and M A L'Herpiniere

LOGGED BY: J W Hall and A C Deeney

REPOSITORY OF SAMPLES AND CORES: GSWA Core Library

SUMMARY LOG:

Depth Interval (m bns)	Age	Formation	Lithology
0-22.5	Quaternary	Tamala Limestone	Sand, sandy limestone
22.5-188	Early Cretaceous	Leederville Formation	Sandstone, siltstone, Shale
188-605	Early-Mid Jurassic	Cockleshell Gully Formation (Cattamarra Member)	Sandstone, siltstone, Shale

REMARKS: A log of the ditch cuttings is given in Appendix 1.
A sidewall-core log is given in Appendix 2.

GEOPHYSICAL DATA

LOGGING UNIT: GOL No 2 (Temperature log, first gamma-ray log and first Resistivity logs - GOL No 1)

LOGGING OPERATORS: J Collier and T Collins

LOGS RUN: _____

Log Type	Depth(m bns)	Date
Gamma Ray	0- 62.1	16. 3.1983
	0-592.1	20. 3.1983
Neutron-Neutron	1.4-593.5	20. 3 1983
Self Potential	62.5-593.1	20. 3.1983
Short Normal Resistivity(16")	17.5- 62.1	16. 3.1983
	62.5 593.1	20. 3.1983
Long Normal Resistivity (64")	17.5- 62.1	16. 3.1983
	62.5-593.1	20. 3.1983
Caliper	0-593.7	20. 3.1983
Temperature	0-526	20. 3.1986

- REMARKS: (1) Log zeros were taken at the drilling pad surface.
- (2) Apparent resistivities obtained from GOL logs must be multiplied by a factor of 1.25 to give true formation resistivities.
- (3) The temperature log was run approximately 3 years after completion of the bore to allow time for the natural geothermal gradient to be re-established.
- (4) The first Gamma-ray log and the first LN & SN Resistivity logs were run prior to the installation of the conductor pipe.

PALAEONTOLOGICAL DATA

PALAEONTOLOGICAL REPORT:

Palynology of Harvey Line 1B. Pal. Rept. 12/1983 by
J Backhouse (Appendix 3)

SUMMARY OF RESULTS:

Depth (m bns)	Age	Zone	Environment	Formation
89	Valanginian	<u>B.Limbata</u>	non-marine	Leederville
166	to Aptian		(89m-deltaic,	Formation
174	?Hauterivian to Barremian		166&174m lagoonal- fluvial)	
249	Pliensbachian	<u>C.Chateaunovi</u>	non-marine	Cattamarra
347	to Aalenian			Member of
423	?Upper Toarcian			Cockleshell
486				Gully
512				Formation
561				

REMARKS: Sidewall cores from 112, 146, 189, 194, 225, 450 and 548
m bns were not processed for reasons of obvious oxidation or
unsuitable lithology.

Sidewall cores from 288 and 362 m bns were barren of
palynomorphs.

HYDROLOGICAL DATA

SUMMARY:

Bore/Interval	HL1B1	HL1B2	HL1B3	HL1W
Interval (m bns)	117-123	279-285	582-588	13-19
Formation	Leederville Formation	Cockleshell Gully Formation		Superficial formations
Airlift Rate ^a (m ³ /d)	640	30	10	290
Water Level (m btc)	+0.895	+0.560	9.71 ^c	1.100
Water Level (m AHD)	3.220	2.779	-7.75	0.699
Date (W.L.)	5.8.1986	5.8.1986	28.3.1983	5.8.1986
Salinity ^b (TDS mg/L)	2360	2270	30500	716
Conductivity ^b (mS/m@25°C)	439	418	4650	138
Formation				
Resistivity (ohm-m)	16.3	22.5	3.8	-
Formation Factor	6.3	9.4	19.1	-

- REMARKS:
- (a) Approximate final airlift rate
 - (b) Values obtained from chemical analysis (Chemistry Centre of W A) of samples taken at the end of airlifting (Appendix 4).
 - (c) Approximate static water level measured at completion.

m btc = metres below top of casing

G.S.W.A.

Bore Hole No. HL1.....

Locality... YALGORUP... NAT... PARK.

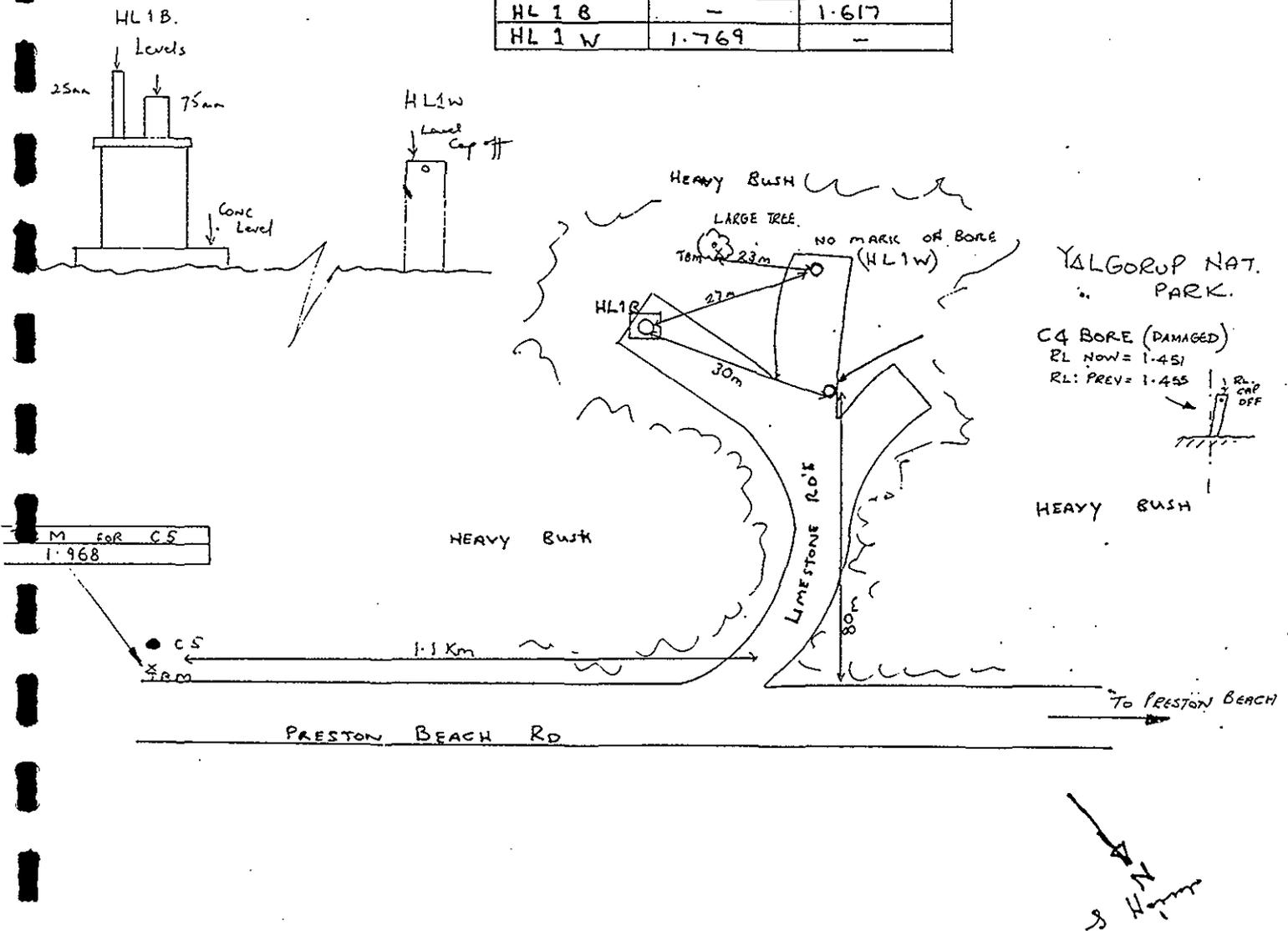
Elevation.....m. above A.H.D.

Surveyor... S HARRAP
C.E. FARRELL... Field Book..... Date. 17-7-85..

Index Plan..... Calculation Folder.....

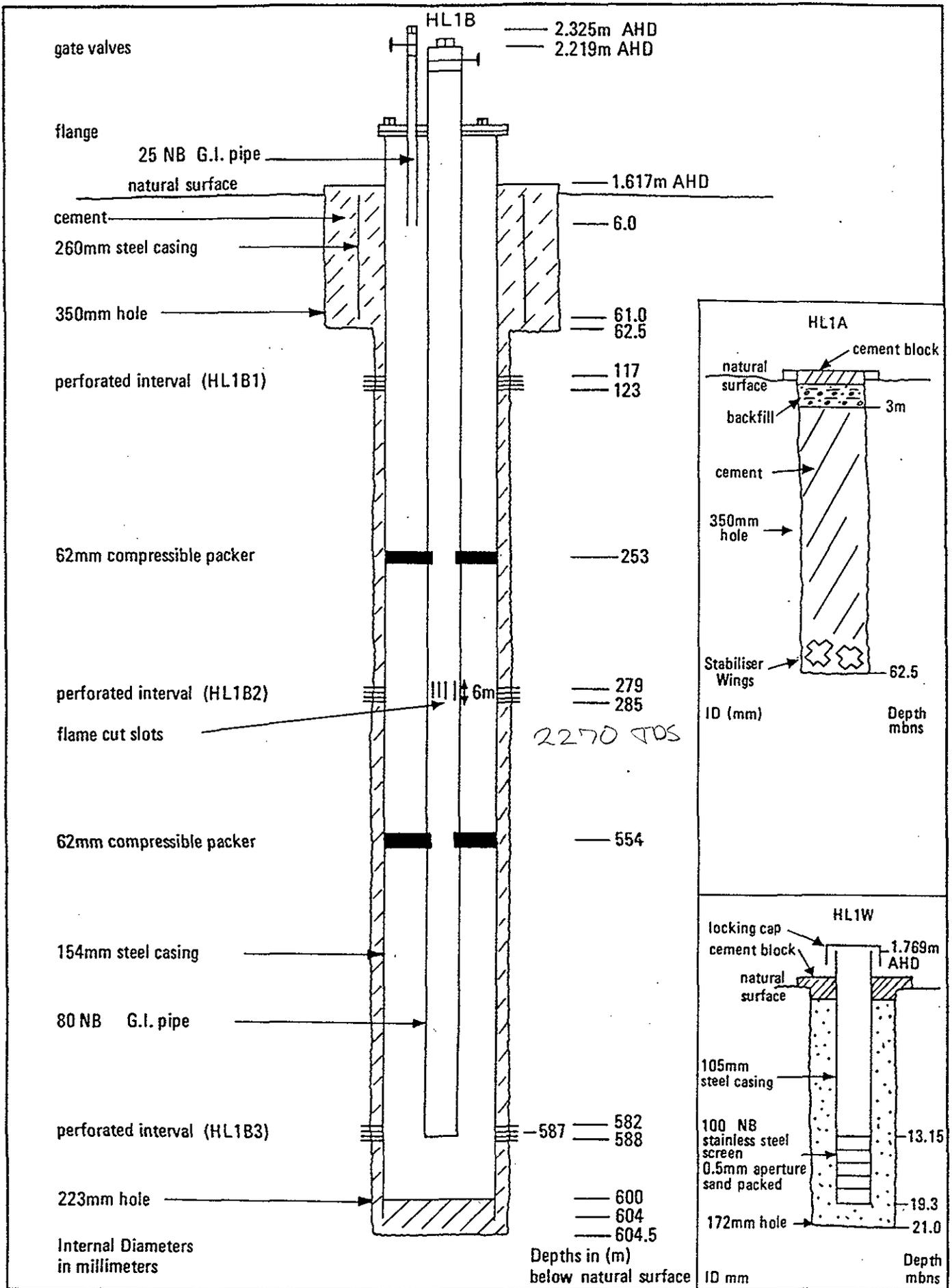
SITE SKETCH

BORE	TOP	CONC BASE	T.B.M.
HL 1 B: 25mm	2.325	-	2.437
HL 1 B: 75mm	2.219	-	
HL 1 B	-	1.617	
HL 1 W	1.769	-	



Checked.....

Date.....

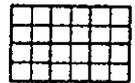


GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

	INITIAL	DATE
COMP	ACD	9/86
DRAWN	ACD	9/86
CHKD		
APVD		

BORE CONSTRUCTION (Not to scale)
 HARVEY LINE SITE 1 (HL1)

MAP INDEX



SI 50-2-2032

TO ACCOMPANY BORE COMPLETION REPORT - HL1

HARVEY LINE BORE HL1B
SLUDGE SAMPLE LOG

Depth (m bns)	Description
0- 3	CALCARENITE; cream, sandy, minor calcilutite, soil, ferruginised material and large shell fragments. Sand consists mainly of quartz, fine to medium grained subangular to subrounded.
3- 9	SAND; cream-grey, orange-brown, medium to coarse grained, subrounded, with minor grey siltstone and large pebbles of cemented calcarenite containing quartz. 6-9m Orange-brown, quartz predominantly very coarse.
9-24	SAND; cream, grey, medium to very coarse grained, subangular to subrounded, consists mainly of quartz with angular shell fragments, minor calcarenite and grey siltstone. Some quartz grains orange stained, percentage of orange stained grains decreases with depth. 15-24 Trace of heavy minerals. 21-24 Minor ferruginised material.
22-54	SAND; grey to dark grey, medium to very coarse grained, angular to subrounded, poorly to moderately sorted mainly quartz sometimes green stained. Minor to trace of grey to dark grey, siltstone, mudstone and clay sometimes greenish-grey (glauconitic?). Samples contaminated from above 36-39m Predominantly fine to medium grained. 42-45m Predominantly fine to medium grained with isolated very fine pebbles.
54-60	CLAY; dark grey, sandy micaceous. 57-60m Minor greenish clay.
60-63	SAND; grey, ranges in grade from medium sand to very fine pebbles, angular to subrounded mainly quartz often green stained.
63-69	CLAY; dark grey, minor green; with rare green tinted, coarse, subangular quartz grains.
69-72	SAND; grey, medium to coarse, well sorted, clayey, with grey silty clay.
72-87	SAND; grey, ranges in grade from medium sand to very fine pebbles, subangular to subrounded, poorly sorted, mainly quartz sometimes green tinted. 72-75m Very clayey with grey silty clay. 75-87m Minor fragments of cream, grey and black calcarenite and black silty sandstone.
87-93	CLAY; dark grey, light grey-green, micaceous, with sand ranging in grade from fine sand to very fine pebbles, angular to subrounded, minor lignite.

- 93-111 SAND, light grey, clayey, ranging in grade from coarse sand to very fine pebbles, angular to sub-rounded, poorly to moderately sorted, mainly quartz (clear and frosted), minor lignite.
105-108m Minor rounded quartz grains which are white and tinted green (?glauconite), minor black silty sandstone.
- 111-118 CLAY: dark grey to grey, sandy, minor black siltstone.
- 118-138 SAND AND CLAY; Sand is grey, grey-green, ranges in grade from fine sand to very fine pebbles, sub-angular to subrounded, poorly to moderately sorted, mainly quartz (clear and frosted), clear quartz often tinted green, minor lignite, minor black siltstone. Clay is grey, dark grey, light grey-green, sandy, micaceous.
- 138-150 SAND; light grey, ranges in grade from medium sand to very fine pebbles, angular to subrounded, poorly sorted, mainly quartz (frosted and green tinted), minor black siltstone, a few fragments of lignite.
- 150-153 CLAY; dark grey to grey, sandy, micaceous.
- 153-162 SAND; as at 150-153m, with minor grey-black sandstone.
- 162-180 CLAY; as at 150-153m, with minor grey-black sandstone.
- 180-195 SAND AND CLAY; as at 118-138m.
- 195-604(5TD) SANDSTONE AND SHALE; Sandstone is grey, silty, weakly cemented, ranges in grade from fine sand to very fine pebbles, angular to subrounded, poorly to moderately sorted, mainly quartz (clear, frosted and milky), minor weathered feldspar, rare pyrite cemented sandstone, rarely micaceous (finer grained sandstones). Shale is grey, dark grey, olive green and brown, rarely orange-brown, silty, slightly sandy, micaceous, sometimes carbonaceous, trace of iron oxide cement in places.
387-474m Sequence includes minor lignite and low grade coal.
480-498m Sequence includes abundant lignite and low-grade coal.
498-513m, 534-546m, 549-552m, 555-588m sequence includes minor lignite and low grade coal.
198-225m, 234-246m, 255-291m, 294-318m, 330-333m, 351-363m, 372-375m, 378-474m, 477-480m, Sandstone predominates.

195-605(cont) 480-513m, 525-558m, 573-605m, percentage of sandstone approximately equivalent to percentage of shale.

J W Hall and A C Deeney

Hydrogeologists

20 March 1983

HARVEY LINE - BORE HL1B

SIDEWALL CORE LOG

<u>DEPTH (mbns)</u>	<u>DESCRIPTION</u>
89	MUDSTONE; dark grey-olive, minor accessory mica and isolated quartz grains, medium to coarse subangular - subrounded, green stained.
112	SHALE; silty, sandy, brown-olive, micaceous, with isolated quartz grains as at 89m.
146	SAND; grey, fine to coarse, subangular to angular (with rare subrounded) quartz, (isolated very coarse sand and fine pebbles, angular to subrounded quartz) micaceous, trace of heavy minerals, some quartz green stained very slightly clayey, poorly-moderately sorted.
166	SHALE; slightly silty, dark grey-olive, slightly micaceous with isolated quartz grains as at 89m.
174	SHALE; silty, dark grey, pyritic, with nodules ranging in grade from fine sand to very fine pebble, micaceous.
189	SAND; light grey, medium sand to very fine pebbles, subrounded to subangular, very poorly sorted, with fine pebbles of subangular to rounded quartz, minor nodules of cemented heavy minerals, minor pyrite, rare micas, very clayey.

<u>DEPTH</u>	<u>DESCRIPTION</u>
194	SAND; light grey, fine to very fine, well sorted, subangular to subrounded, micaceous, clayey with rare pyrite and heavy minerals (minor dark grey silty shale).
225	SHALE; silty, brown-olive, micaceous with isolated subrounded very coarse quartz grains, with common subrounded fine pebbles of silicified fine sandstone.
249	SHALE; dark grey-green, very slightly silty, with isolated fine subangular quartz grains, very slightly micaceous.
288	SHALE; as at 249m but very rare quartz.
347	SHALE; dark grey (green), very slightly silty, very slightly micaceous.
362	SHALE; dark grey-green, very slightly silty, micaceous with rare rounded very coarse quartz (milky).
423	SAND; silty, very clayey (sandstone?), micaceous, fine, well sorted, subangular to subrounded.
450	SAND; silty and clayey, light grey, fine sand to very fine pebbles, very poorly sorted, subrounded to angular, quartz clear, frosted and milky.

<u>DEPTH</u>	<u>DESCRIPTION</u>
486	SHALE; dark grey, very slightly silty, micaceous with sand as at 450m but not clayey and mostly clear or frosted quartz.
512	SHALE; dark grey-olive, micaceous silty.
548	SAND; light grey, fine to medium, subangular to subrounded, well sorted, with isolated very coarse subrounded quartz grains, abundant heavy minerals, very slightly clayey in patches.
561	SHALE; very slightly silty, slightly micaceous, dark grey with orange oxidised patches.
590	SHALE and SANDSTONE; Thinly interbedded (<3mm bands). SHALE is dark grey, silty, micaceous and possibly carbonaceous. SANDSTONE is grey, fine grained and micaceous.

J. HALL
GS 252/82
15 March 1983

GE810VDP014

PALYNOLOGY OF HARVEY LINE 1B

MATERIAL AND LOCALITY: Twenty one sidewall cores from Harvey Line 1B, Location SI50-2 2032 (785, 575).

Sample No. 75727.

DEPTH AND LITHOLOGY:

<u>F NO.</u>	<u>DEPTH IN</u>		<u>LITHOLOGY</u>
		<u>M</u>	
F46374	89		Claystone, d.grey, silty
-	112		Claystone - millstone, yellowish brown
-	146		Sst. m-c. gr., with drilling mud
F46375	166		Claystone, d.grey
F46376	174		Ditto
-	189		Sst. c.gr., with drilling mud
-	194		Sst. f.gr., white
-	225		Sst. f.gr., yellowish brown
F46377	249		Claystone m-d.grey, mottled, friable
-	288		Ditto
F46378	347		Ditto
-	362		Ditto
F46379	423		Siltstone/f.gr. Sst
-	450		Sst. m-c.gr.
F46380	486		Claystone, d.grey with sst. bands
F46381	512		Siltstone, m-d.grey
-	548		Sst., m-c.gr.
F46382	561		Shale, d.grey, silty
F46383	590		Siltstone/Shale, cross bedded

REQUESTED BY : J Hall on Requisition No. 30297

REPORT : The following sidewall cores were considered to be unsuitable for palynological treatment and were not processed: 112 m, 146 m, 189 m, 194 m, 225 m, 450 m, 548 m. Samples from 288 m and 362 m were barren of palynomorphs.

The remaining samples yielded assemblages of two distinct ages. Samples from 89 m to 174 m inclusive contained miospore assemblages of Early Cretaceous age, samples below 174 m were dominated by Classopollis pollen grains and are Early Jurassic in age. A distribution chart of miospores identified in each sample from this borehole is attached.

The samples from 166 m and 174 m also contained brackish or freshwater clinoflagellate cysts of the type provisionally assigned to a new genus "Moorodinium". Moorodinium-type cysts are usually associated with the Parmelia Formation (Backhouse, in press) but a number have also been located in sediments thought to belong in the ^{ra}Wambro Group. In this borehole they are associated with miospores with ranges restricted to the B. eneabbensis Zone, and also with miospores not known to range below the overlying B. limbata Zone. This suggests that the Moorodinium-type ~~d~~inoflagellate cysts may be present as a result of reworking from the Parmelia Formation.

The Early Jurassic assemblages appear to belong in Filatoff's C. chateauovi Assemblage sub-zone of Hettangian to Toarcian age.

2.

The environment of deposition for the samples between 249 m and 590 m appears to be non-marine. The samples from 166 m and 174 m may represent a brackish water lagoonal or a non-marine fluviatile environment, and the sample from 89 m probably represents a deltaic back swamp-type environment.

JB

J Backhouse
(Asst Palaeontologist)

JB:KR

July 14, 1983

GE764MVA388

Distribution: A Deeney
10/83
Pal Lab
Harvey Line 1B

Miospore distribution in Harvey Line 1B

Sample depth in metres

590
561
512
486
423
347
249
174
166
89

MIOSPORES

				/	/	<u>Contiguisporites cooksonae</u> (Balme)
					/	<u>Foveosporites canalis</u> Balme
/	/	/	/	/	/	<u>Dictyophyllidites equiexinus</u> Couper
				/	/	<u>Laevigatosporites belfordii</u> Burger
/	/	/	/	/	/	<u>Classopollis chateaunovi</u> Reyre
				/	/	<u>Podocarpidites ellipticus</u> Cookson
/	/	/	/	/	/	<u>Araucariacites australis</u> Cookson
				/		<u>Aequitriradites acusus</u> (Balme)
				/	/	<u>Retitriletes austroclavatidites</u> (Cookson)
/	/			/	/	<u>Baculatisporites comaumensis</u> Cookson
				/		<u>Januasporites</u> sp.
/	/	/	/	/	/	<u>Callialasporites</u> spp
				/	/	<u>Microcachryidites antarcticus</u> Cookson
				/		<u>Nevesisporites dailyi</u> (Dettmann)
				/		<u>Balmeiopsis limbata</u> (Balme)
				/		<u>Staplinisporites caminus</u> (Balme)
				/		<u>Ischyosporites crateris</u> (Balme)
				/		<u>Balmeiopsis</u> sp.
/	/					<u>Cadargasporites baculatus</u> de Jersey and Paten
	/					<u>Nevesisporites vallalus</u> de Jersey and Paten
/	/					<u>Ischyosporites variegatus</u> (Couper)

3. (Lab No. 83W5562-68)

HL 2A3

HL 1B1

Sample	78496	78497		
Lab No. 83W	3566	3567		
pH	7.8	8.5		
Appearance	clear, slight deposit			
Colour (A.P.H.A. units)	20	5		
Odour	nil			
Conductivity (mS/m at 25C)	4500	439		
	me/L	mg/L	me/L	mg/L
Total dissolved solids (180C by calc)	31400		2360	
Total hardness (as CaCO ₃)	5900		800	
Total alkalinity (as CaCO ₃)	102		227	
Calcium, Ca	61.38	1230	9.33	187
Magnesium, Mg	56.91	692	6.66	81
Sodium, Na	415.65	9560	25.65	590
Potassium, K	3.68	144	0.33	13
Carbonate, CO ₃	0.00	<2	0.40	12
Bicarbonate, HCO ₃	2.05	125	4.15	253
Chloride, Cl	510.58	18100	34.41	1220
Sulphate, SO ₄	33.54	1610	2.42	116
Nitrate, NO ₃	0.00	<1	0.00	<1
Silica, SiO ₂	9		18	
Fluoride, F	0.2		0.2	

4. (Lab No. 85W3562-68)

H21B2

Sample 78498
Lab No. 83W 3568
pH 8.3
Appearance clear, slight deposit
Colour (A.P.H.A. units) <5
Odour nil
Conductivity (mS/m at 25C) 418

	me/L	mg/L
Total dissolved solids (180C by calc)		2270
Total hardness (as CaCO ₃)		260
Total alkalinity (as CaCO ₃)		277
Calcium, Ca	2.54	51
Magnesium, Mg	2.63	32
Sodium, Na	33.17	763
Potassium, K	0.66	26
Carbonate, CO ₃	0.10	3
Bicarbonate, HCO ₃	5.44	332
Chloride, Cl	30.75	1090
Sulphate, SO ₄	2.60	125
Nitrate, NO ₃	0.00	<1
Silica, SiO ₂		12
Fluoride, F		1.0



N. PLATELL
CHIEF
WATER SCIENCE LABORATORY



Department of Mines, Western Australia
GOVERNMENT CHEMICAL LABORATORIES
 30 Plain Street, Perth, Western Australia 6000
 Telephone: 325 5544

Director
 Geological Survey of WA
 Mineral House
 66 Adelaide Terrace
 PERTH WA 6000
 Attention : Mr. Jon Hall

Address all correspondence to the Director

OUR REF

YOUR REF

ENQUIRIES TO

25 May, 1983. CM

MATERIAL One water sample from Harvey Line project, marked : "Sample No. 75728
 Bore identity HL1B".

LAB No 83W 1971

FROM WHOM RECEIVED AND DATE Geological Survey of WA on 11 April, 1983.

RESULT OF EXAMINATION.

Sample			HL1B3
Lab No.	83W		75728
pH			1971
Appearance			8.0
Colour (A.P.H.A. units)			clear with a slight brown deposit
Odour			20
Conductivity (mS/m at 25C)			nil
			4650
		me/L	mg/L
Total dissolved solids (180C by calc)			30500
Total hardness (as CaCO ₃)			4400
Total alkalinity (as CaCO ₃)			115
Calcium	Ca	27.74	556
Magnesium	Mg	59.46	723
Sodium	Na	443.48	10200
Potassium	K	6.16	241
Carbonate	CO ₃	0.00	<2
Bicarbonate	HCO ₃	2.30	140
Chloride	Cl	502.12	17800
Sulphate	SO ₄	19.13	918
Nitrate	NO ₃	0.00	<1
Silica	SiO ₂		2

N. Platell
 N. PLATELL
 CHIEF
 WATER SCIENCE LABORATORY

P. Jack
 P. JACK
 CHEMIST & RESEARCH OFFICER



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82
 1983
 DEPARTMENT OF MINES

Director
 Geological Survey of W.A.
 Mineral House
 66 Adelaide Terrace
 PERTH W.A. 6000

Address all correspondence to the Director

OUR REF

YOUR REF

ENQUIRIES TO

8 February, 1983. CM

MATERIAL Three water samples from Harvey Line project, marked as below.

LAB No 82W7893-5

FROM WHOM RECEIVED AND DATE Geological Survey of W.A., on 8 December, 1982.

RESULT OF EXAMINATION

	HL1W		HL2W	
Sample	75288		75289	
Lab No. 82W	7893		7894	
pH	7.9		7.5	
Appearance	clear		very slightly cloudy	
Colour (A.P.H.A. units)	6		14	
Odour	----- nil -----		-----	
Conductivity (mS/m at 25C)	138		87.5	
	me/L	mg/L	me/L	mg/L
Total dissolved solids (180C by calc)	716		479	
Total hardness (as CaCO ₃)	310		280	
Total alkalinity (as CaCO ₃)	252		275	
Calcium, Ca	4.49	90	4.49	90
Magnesium, Mg	1.73	21	1.15	14
Sodium, Na	6.52	150	2.96	68
Potassium, K	0.10	4	0.10	4
Carbonate, CO ₃	0.00	<2	0.00	<2
Bicarbonate, HCO ₃	5.05	308	5.51	336
Chloride, Cl	7.39	262	3.30	117
Sulphate, SO ₄	0.54	26	0.04	2
Nitrate, NO ₃	0.00	<1	0.00	<1
Silica, SiO ₂		9		16
Boron, B		0.08		0.07
Fluoride, F		0.3		0.1

BORE COMPLETION REPORT
HARVEY LINE SITE NO 2 (HL2)

LOCATION AND IDENTIFICATION

OWNER: Geological Survey of Western Australia

GSWA REF: HL2A1 SI50-2-2032-II-C-~~139~~ 145
HL2A2 SI50-2-2032-II-C-~~140~~ 146
HL2A3 SI50-2-2032-II-C-~~141~~ 147
HL2W SI50-2-2032-II-C-~~142~~ 148

LOCATION: Wellington, Loc. 3020, south side between the old and new road alignments. Owner: Waroona Pines Pty Ltd, c/o Tree and Plantation Services, 5/8 Clive Street, West Perth, W A 6005.

(Figure 1 - Location map)

AMG REF (Zone 50): Eastings 3848 Northings 63567

MAP SHEETS: 1:250000 Pinjarra (SI50-2)
1:100000 Pinjarra (2032)

PURPOSE: HL2A - Exploratory and observation
HL2W - Water supply bore

STATUS: HL2A1 - perforated interval - 105-111 m bns - Observation
HL2A2 - perforated interval - 324-330 m bns - Observation
HL2A3 - perforated interval - 786-792 m bns - Abandoned
HL2W - screened interval - 25- 31 m bns - Observation

ELEVATION: HL2A1 - top of 25mm GI pipe - 13.712 m AHD
HL2A2 - top of 80mm GI pipe - 13.843 m AHD
HL2W - top of casing - 13.175 m AHD
Natural Surface - concrete base - 13.155 m AHD

m bns = metres below natural surface
GI = Galvanised Iron
NB = Nominal Bore
ID = Internal Diameter

BOREHOLE CONSTRUCTION AND DEVELOPMENT

Bore construction diagram (Figure 2)

DRILLED BY: Mines Department Drilling Section, Field Unit A

RIG: Midway Skytop (Rotary)

MUD: Aquagel, Biopolymer, CMC

DRILLING COMMENCED:

HL2A 16. 5.1983
HL2W 18.11.1982

DRILLING COMPLETED:

HL2A 28. 5.1983
HL2W 18.11.1982

DRILLED DIAMETER:

Bore	Depth Interval (m bns)	Diameter (mm)
HL2A	0 - 61.5	381
	61.5 - 810	216
HL2W	0 - 31	172

TOTAL DEPTH: HL2A - 810m
HL2W - 31m

CASING (Drilling): HL2A - 260mm (ID) cemented in to 61.5m
HL2W - None

CASING (Completion):

Bore	Depth Interval (m bns)	ID(mm)
HL2A	0 - 61.5	260
	0 - 806	154
	0 - 785	80 NB
	0 - 85	25 NB
HL2W	0 - 24.77	105
	24.77 - 30.88	100 NB (Stainless steel screen 0.5mm aperture)

CEMENTING: HL2A - The 260mm sleeve welded steel conductor pipe was cemented in position with 4m³ of cement slurry and 3.2m³ of follow-up mud. The 154mm sleeve welded steel casing was cemented using 14.5m³ of cement slurry and 15.2m³ of follow-up water. Cement was drilled out from 792 to 800 m bns. A cement block was cast around the top of the casing.

OBSERVATION INTERVALS:

Bore/Interval	depth (m bns)	Formation
HL2A1	105-111	Leederville Formation
HL2A2	324-330	Cockleshell Gully Formation
HL2A3	786-792	Cockleshell Gully Formation
HL2W	25-31	Superficial formations and Leederville Formation

Remarks: Each interval in bore HL2A was perforated with 3 shots per metre. The 80mm GI pipe was installed with a ^{9m} 19m section of flame-cut slots at approximately 345 m bns and two compressible packers were set at 185 and 385 m bns to seal the annulus between the 80mm pipe and the 154mm casing. HL2A1 is monitored in the 25mm pipe set in the annulus and HL2A2 is monitored in the 80mm pipe. HL2A3 was abandoned after development. HL2W was completed with 6m of 100mm NB, 0.5mm aperture, wire-wound stainless steel screen and the annulus packed with graded sand.

CONSTRUCTION DIFFICULTIES:

Delays occurred during construction for the following reasons

- (1) Mechanical breakdowns
- (2) Bore blocked at about 747m bns after perforation of the three intervals. Drill string with 150mm bit run to bottom of hole to clear.
- (3) Annulus outside 154mm casing found to be open to about 125 m bns. This was sealed with pea gravel and 1.5m³ cement slurry.

CONSTRUCTION COMPLETED: HL2A - 3. 6.1983
HL2W - 19.11.1982

DEVELOPMENT: Each interval was developed by airlifting and surging until the water cleared and the conductivity was constant. A sample was then taken for chemical analysis.

HL2A3 was airlifted for 8 hours at 100m³/d before the other intervals were perforated. All three intervals were then airlifted at 1270m³/d for 6 hours before the packers were installed.

HL2A1 was then airlifted for 14 hours at 360m³/d and HL2A2 for 12 hours at 930m³/d.

HL2W was developed by airlifting and jetting for 4 hours at 460m³/d. Subsequently it was pumped to supply water during the drilling of HL2A.

SITE CLEARED: 16. 6.1983

GEOLOGICAL DATA

SAMPLES: Rotary (ditch cuttings) at 3m intervals

SIDEWALL CORES: Using the gamma-ray log, 21 shale/siltstone targets were chosen in HL2A. 16 cores were recovered from the following depths (m bns) 97.5, 115.5, 146, 233.5, 254.5, 268.25, 305.5, 473, 584, 594, 606.5, 697.5, 708.5, 734.5, 755.5, 801. No cores were recovered from the following depths (m bns) 62, 212.5, 384, 539.5, 685.

CORING OPERATORS: R Bulner and M A L'Herpinier

LOGGED BY: A C Deeney

REPOSITORY OF SAMPLES AND CORES: GSWA Core Library

SUMMARY LOG:

Depth Interval (m bns)	Age	Formation	Lithology
0 - 18	Quaternary	Guildford Formation	Sand, clayey sand, clay
18 - 26	Quaternary	Jandakot Beds	Sand, silt, clay, fossiliferous
26 - 203	Early Cretaceous	Leederville Formation	Sandstone, siltstone shale
203 - 241	Early-Mid Jurassic	Cockleshell Gully Formation (Cattamarra Member)	Sandstone, siltstone shale
241-810	Early-Mid Jurassic	Cockleshell Gully Formation (Eneabba Member)	Sandstone, siltstone shale

REMARKS: A log of the ditch cuttings is given in Appendix 1
A sidewall-core log is given in Appendix 2.

GEOPHYSICAL DATA

LOGGING UNIT: GO1 No 2 (Temperature log - GO 1 No 1)

LOGGING OPERATORS: J Collier and J Watt

LOGS RUN:

Log Type	Depth (m bns)	Date
Gamma Ray	0 - 808.0	28. 5.1983
Neutron-Neutron	1.4 - 809.4	28. 5.1983
Self Potential	61.5 - 809.2	28. 5.1983
Short Normal		
Resistivity (16")	61.5 - 809.2	28. 5.1983
Long Normal		
Resistivity (64")	61.5 - 809.2	28. 5.1983
Temperature	0 - 794.2	8. 4.1986

- REMARKS: (1) Log zeros were taken at the drilling pad surface.
- (2) Apparent resistivities obtained from GO1 logs must be multiplied by a factor of 1.25 to give true formation resistivities.
- (3) The temperature log was run approximately 3 years after completion of the bore to allow time for the natural geothermal gradient to be re-established.

PALAEONTOLOGICAL DATA

PALAEONTOLOGICAL REPORT:

Palynology of Harvey Line 2A. Pal. Rept. 15/1983 by
J Backhouse (Appendix 3)

SUMMARY OF RESULTS:

Depth	Age	Zone	Environment	Formation
97.5	Barremian		lacustrine or restricted marine	Leederville Formation
115.5	?Barremian		non-marine	Leederville Formation
146	Barremian	<u>B Limbata</u>	lacustrine or restricted marine	Leederville Formation

REMARKS:

Sidewall cores from 305.5, 584, 697.5, 708.5, 734.5 and 755.5 m bns were not processed for reasons of obvious oxidation or unsuitable lithology.

Sidewall cores from 233.5, 254.5, 268.25, 473, 594, 606.5, and 801 m bns were barren of palynomorphs.

The palynomorph assemblages from 97.5 and 115.5 m bns were of low diversity and lacking zone-diagnostic species.

HYDROLOGICAL DATA

SUMMARY:

Bore/Interval	HL2A1	HL2A2	HL2A3	HL2W
Interval (m bns)	105-111	324-330	786-792	25-31
Formation	Leederville Formation	Cockleshell Gully Formation	Superficial fms & Leederville Fm	
Airlift Rate ^a (m ³ /d)	930	360	100	460
Water Level (m btc)	5.600	7.230	20.09 ^c	1.790
Water Level (m AHD)	8.112	6.613	-6.39	11.385
Date (W.L.)	5.8.1986	5.8.1986	2.6.1983	5.8.1986
Salinity ^b (TDS mg/L)	1390	3550	31400	479
Conductivity ^b (mS/m@25°C)	271	644	4500	87.5
Formation				
Resistivity (ohm-m)	37.5	23.8	2.5	-
Formation factor	8.8	15.3	13.8	-

REMARKS:

- (a) Approximate final airlift rate.
- (b) Values obtained from chemical analyses (Chemistry Centre of W A) of samples taken at the end of airlifting (Appendix 4).
- (c) Approximate static water level measured at completion.

m btc = metres below top of casing

G.S.W.A.

Bore Hole No.. HL2.....

Locality... 10 Km... N.W. OF.. YARLOOP

Elevation.....m. above A.H.D.

C E FARRELL

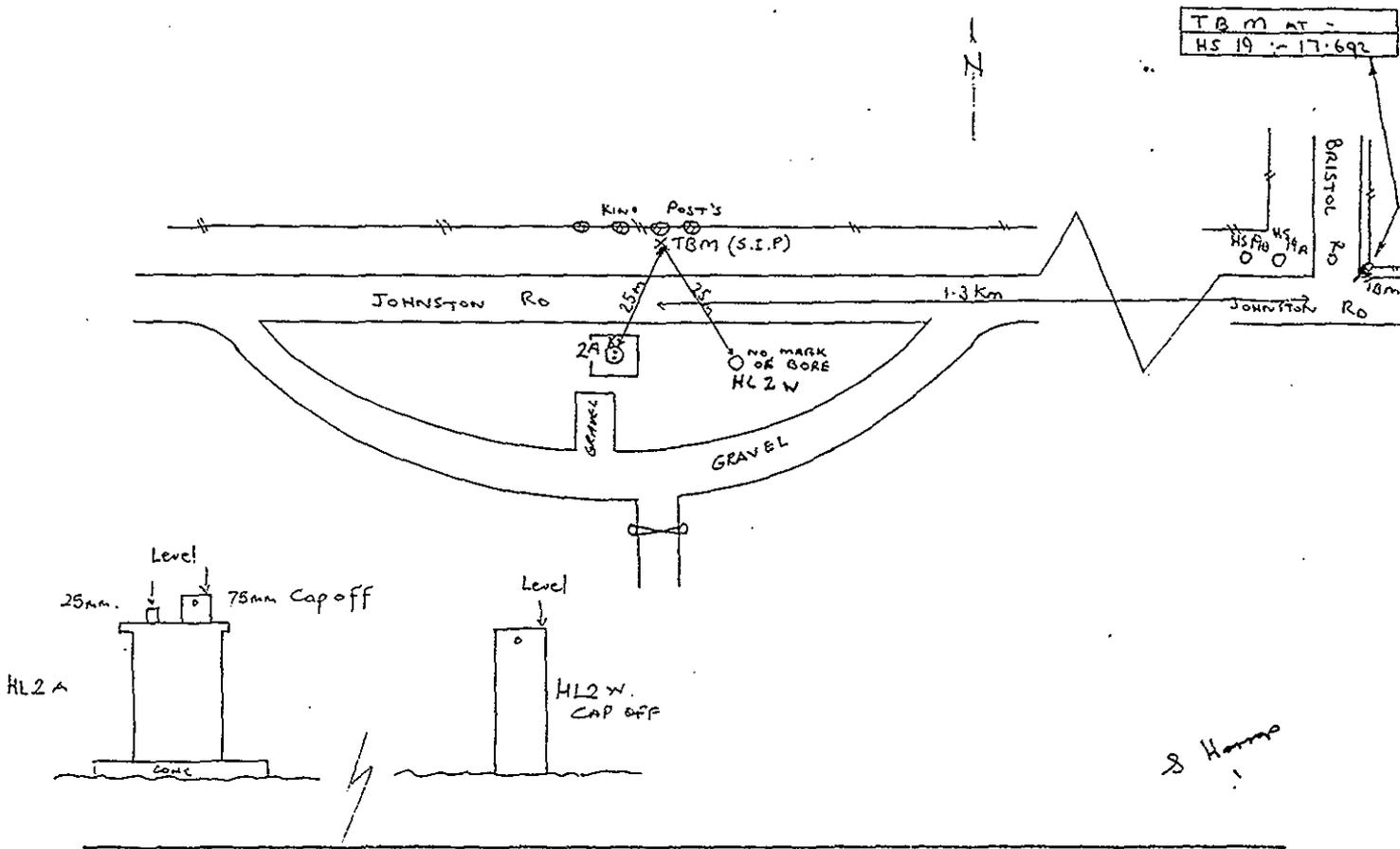
Surveyor.. S. HARRAP... Field Book... 18..... Date.. 17.7.85.....

Index Plan..... Calculation Folder.....

SITE SKETCH

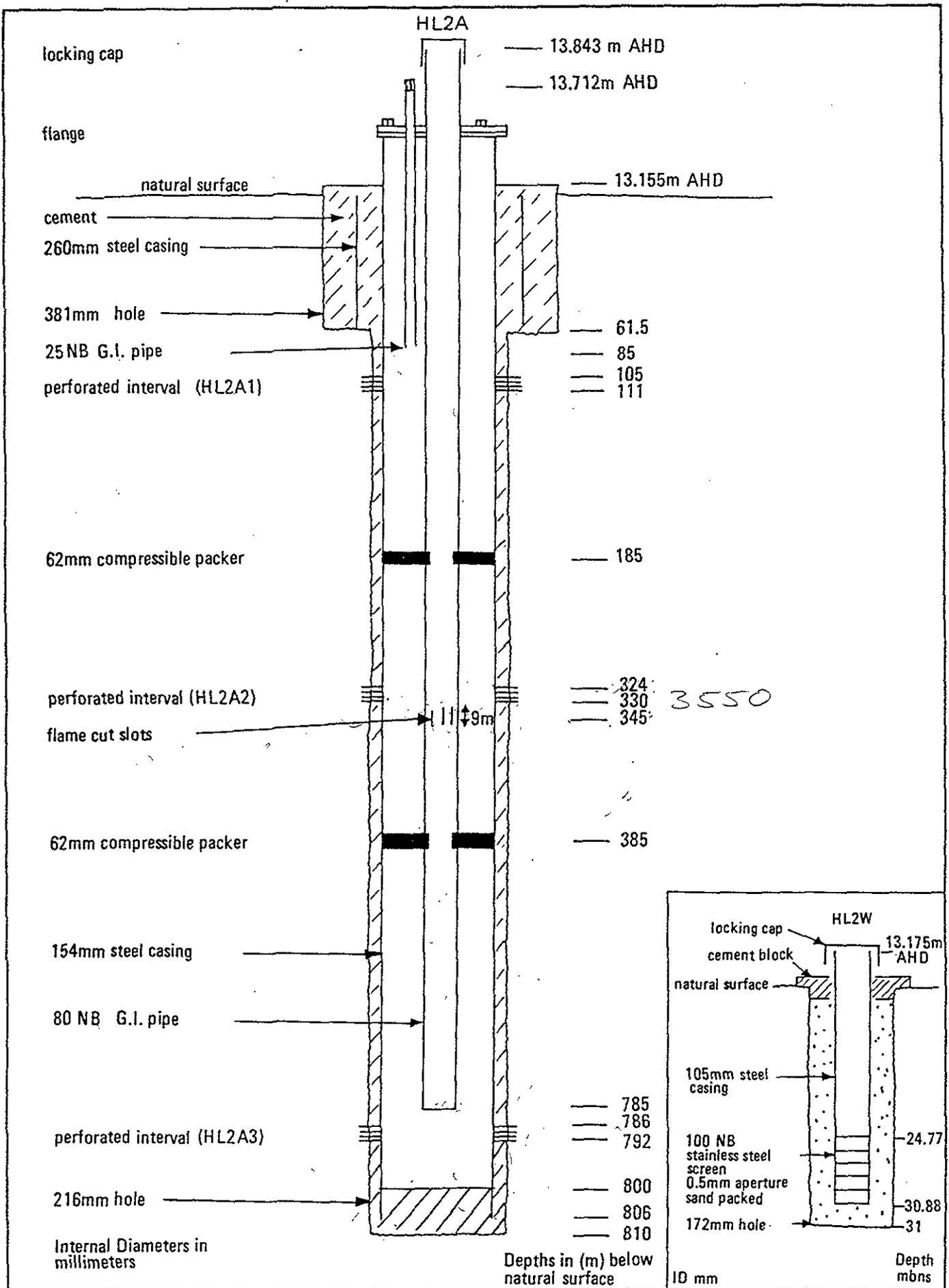
BORE	TOP	CONC BASE	T B M
HL2 W:110mm	13.175	-	12.723
HL2 A:75mm	13.843	-	
HL2 A:25mm	13.712	-	
HL2A	-	13.155	*

Yellow Chalk Mark



Checked.....

Date.....



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

	INITIAL	DATE
COMP	ACD	9/86
DRAWN	ACD	9/86
CHKD		
APVD		

BORE CONSTRUCTION (Not to scale)
 HARVEY LINE SITE 2 (HL2)

TO ACCOMPANY BORE COMPLETION REPORT - HL2

MAP INDEX

SI 50-2-2032

HARVEY LINE BORE HL2A

SLUDGE SAMPLE LOG

Depth (m bns)	Description
0- 3	CLAY; brown sandy to very sandy. Sand, fine to coarse, subrounded mainly quartz, minor weathered feldspar.
3- 6	SAND; coffee brown, silty, partially cemented (coffee rock), fine to very coarse, subrounded, poorly sorted, mainly quartz, often coated with iron oxide, minor weathered feldspar, trace of heavy minerals.
6-12	SAND; similar to 3-6m interval, but grey-brown, slightly clayey, grains coated with iron oxide are less abundant. Sample contaminated by material from gravel pad?
12-18	SAND; light grey, medium to very coarse, moderately sorted, subrounded to well rounded, mainly quartz often frosted, minor weathered feldspar, trace of heavy minerals.
18-27	SAND; light grey, medium to very coarse, moderately sorted, subrounded to well rounded, mainly quartz, often frosted, common shell fragments up to 1cm and shell debris (mainly gastropods and bivalves), minor to trace dark grey mudstone fragments of very coarse sand grade, trace of heavy minerals.
27-60	SAND; light grey, silty, fine to coarse, moderately sorted, subrounded to rounded, mainly quartz, minor weathered feldspar, trace of heavy minerals. 27-33m minor - trace, grey mudstone fragments. Sample contaminated with calcareous material from above.
60-63	NO SAMPLE
63- 69	CLAY; dark grey, silty, sandy, micaceous. Arenaceous material ranges in grade from fine sand to very fine pebbles subangular, mainly quartz, minor weathered feldspar, fragments of lignite, pyrite cemented sand and ?glauconitic sandy limestone, up to 2cm. 66-69m interval very sandy.
69-72	SAND, grey, slightly silty and clayey, ranges in grade from fine sand to very fine pebbles, subangular, poorly sorted, mainly quartz, minor weathered feldspar, fragments of lignite, pyrite cemented sand and ?glauconitic sandy limestone.

72-75 CLAY, similar to 63-69m interval, but very sandy.

75-81 LIMESTONE AND SAND, limestone is grey, sandy, ? glauconitic, well cemented. Sand is grey, grey-green, slightly silty, clayey, ranges in grade from fine sand to very fine pebbles, poorly sorted, subangular, mainly quartz, minor weathered feldspar, fragments of lignite and pyrite cemented sand.

81-84 SAND; similar to 69-72 m interval.

84-87 CLAY, dark grey, micaceous, slightly silty and sandy.

87-90 SAND; similar to 69-72m interval.

90-93 CLAY; similar to 63-69m interval.

93-102 SAND; light grey ? glauconitic, slightly silty and clayey, fine sand to very fine pebbles, subangular, poorly sorted, mainly quartz sometimes green stained, minor weathered feldspar. 99-102m interval very clayey with common fragments of lignite.

102-108 CLAY; dark grey micaceous, silty, very slightly sandy.

108-111 SAND; similar to 93-102m interval.

111-114 SAND AND LIMESTONE, Sand similar to 93-102m interval. Limestone is dark grey-green, sandy, ? glauconitic. Sequence includes a few fragments of granitic rock.

114-120 SAND; similar to 93-102m interval with a few fragments of dark grey-green sandy limestone, lignite and pyrite cemented sand.

120-123 CLAY; dark grey, micaceous, silty and sandy.

123-132 SAND; similar to 93-102m interval.

132-141 CLAY; dark grey, micaceous, silty, sandy, with fragments of lignite, dark grey-green sandy limestone and light grey sandy limestone.

141-195 CLAY; dark grey, micaceous, silty, very slightly sandy. 156-168m sandy with fragments of light grey sandy limestone.

195-198 SAND; grey, silty and clayey, ranges in grade from fine sand to very fine pebbles, poorly sorted, subangular, mainly quartz trace of black carbonaceous material, minor lignite and pyrite cemented sandstone.

198-207 CLAY; dark grey, micaceous, silty slightly sandy.

207-216 SAND; similar to 195-198m interval, no lignite

216-219 CLAY; similar to 198-207m interval

219-246 SAND; similar to 195-198m interval, no lignite, 222-228m Very clayey.

246-810 (TD)
(465-468m no sample)

SANDSTONE, SILTSTONE, SHALE; Sandstone is light grey-green and light grey, rarely orange-brown, slightly clayey to clayey, weakly cemented, ranges in grade from fine sand to very fine pebbles, poorly to moderately sorted, subangular, mainly quartz, minor weathered feldspar.
Siltstone is light grey-green, orange-brown, brick-red, brown, purple, white, generally variegated, moderately cemented, trace of mica to micaceous, slightly sandy, slightly clayey.
Shale is grey, usually variegated (colours similar to siltstone), silty, micaceous, weakly cemented.
246-258m Percentage of sandstone approximately equivalent to percentage of siltstone and shale.
258-264m Sandstone predominates.
273-288m Percentage of sandstone approximately equivalent to percentage of siltstone and shale.
288-300m, 309-381m, 387-432m, Sandstone predominates.
432-477m Percentage of sandstone approximately equivalent to percentage of siltstone and shale.
477-576m Sandstone predominates.
576-600m Percentage of sandstone approximately equivalent to percentage of siltstone and shale.
600-660m Sandstone predominates.
660-678m Percentage of sandstone approximately equivalent to percentage of siltstone and shale.
678-756m, 765-810m Sandstone predominates.

A C Deeney
Hydrogeologist
28 May 1983

HARVEY LINE - BORE HL2A

SIDEWALL CORE LOG

<u>DEPTH</u> (mbns)	<u>RECOVERY</u> (mm)	<u>DESCRIPTION</u>
62	trace	SAND; grey-orange, silty, slightly clayey, weakly cemented?, fine to very coarse grained, poorly sorted, subangular, mainly quartz, minor weathered feldspar.
97.5	42	SAND; grey-green and black, silty, weakly cemented, very fine to medium grained, well sorted, subangular, common black carbonaceous material often in 1 mm bands, glauconite?, mainly quartz, minor weathered feldspar.
115.5	40	SAND; light grey-green, silty, clayey, weakly cemented, very fine sand to very fine gravel, poorly sorted, subangular, mainly quartz, minor weathered feldspar, common black carbonaceous material.
146	44	CLAY; dark grey, micaceous, slightly silty.
233.5	20	SAND; light grey-green, silty, slightly clayey, weakly cemented, very fine sand to very fine gravel, poorly sorted, subangular, mainly quartz, minor weathered feldspar, minor black carbonaceous material, chloritic?
254.5	43	CLAY; green-grey, orange-brown, purple, white, variegated, silty, trace of mica.
268.25	42	CLAY; dark grey, variegated, silty, micaceous.
305.5	30	SILTSTONE; light grey-green, and orange-brown, clayey, slightly sandy, micaceous, moderately cemented.

.... /2

DEPTH (mbns)	RECOVERY (mm)	DESCRIPTION
473	42	SILTSTONE; <i>dark grey, Variegated, slightly clayey, trace of mica, weakly cemented.</i>
584	20	SANDSTONE; light grey-green and orange-brown, clayey, very fine to coarse grained, moderately sorted, subangular, mainly quartz, minor weathered feldspar, chloritic? weakly cemented.
594	40	SANDSTONE: light green, slightly clayey, very fine to medium grained, well sorted, subangular, mainly quartz, minor weathered feldspar, chloritic? weakly cemented.
606.5	35	SILTSTONE; light green-grey, clayey, sandy. Sand is very fine to medium grained, subangular, mainly quartz, minor weathered feldspar, weakly cemented.
697.5	25	SANDSTONE; light grey-green and white, clayey, very fine sand to very fine gravel, poorly sorted, subangular, mainly quartz, minor weathered feldspar, weakly cemented, chloritic?
708.5	30	SANDSTONE; light grey, clayey, very fine to coarse, poorly sorted, subangular, mainly quartz, minor weathered feldspar, weakly cemented.
734.5	24	SANDSTONE; light grey-green, clayey, fine to very coarse, subangular, moderately sorted, mainly quartz, minor weathered feldspar, weakly cemented.
755.5	10	SANDSTONE; light grey, clayey, fine to coarse grained, subangular, moderately sorted, mainly quartz, minor weathered feldspar, weakly cemented, sample consists mainly of wallcake.

DEPTH (mbns)	RECOVERY (mm)	DESCRIPTION
801	22	CLAY; dark grey, variegated, silty, micaceous.

A C Deeney

ACD:KR
GS 253/82
August 8, 1983
GE8100AC227

PALAEOLOGY REPORT NO. 15/1983

Date 15.8.1983

PALYNOLOGY OF HARVEY LINE 2A

MATERIAL AND LITHOLOGY : Sixteen sidewall cores.
 Location : Pinjarra 2032 (1:100 000)
 849,568. Sample No 79741.

DEPTH AND LITHOLOGY :

<u>F No.</u>	<u>Depth in m</u>	<u>Lithology</u>
F46400	97.5	Siltstone - f. gr. sst., carbonaceous.
F46401	115.5	Sst. f-c.gr., carb. fragments.
F46402	146	Shale/Claystone, d.grey.
	233.6	Sst. f-c.gr., white, carb. fragments.
	254.5	Claystone, pale greenish-grey.
	268.25	Claystone, green, grey and brown.
	305.5	Claystone, red and yellow.
	473	Claystone green, grey and brown.
	584	Sst., m.gr. white.
	594	Sst., f.gr. greenish/grey.
	606.5	Sst., white with millstone band.
	697.5	Sst., white.
	708.5	Ditto
	734.5	Ditto
	755.5	Drilling mud
	801	Claystone, red

SUBMITTED BY : A Deeney on Requisition No 33203.

REPORT : The following sidewall cores were not processed:
 305.5 m, 584 m, 697.5 m, 708.5 m, 734.5 m and 755.5 m. Of
 the remaining samples only the three highest yielded

2. (Lab No. 83W3562-68)

	HL2A1	HL2A2
Sample	78494	78495
Lab No. 83W	3564	3565
pH	8.4	8.1
Appearance	clear, slight deposit	
Colour (A.P.H.A. units)	5	5
Odour	nil	
Conductivity (mS/m at 25C)	271	644

	me/L		mg/L	
Total dissolved solids (180C by calc)	1390		3550	
Total hardness (as CaCO ₃)	350		280	
Total alkalinity (as CaCO ₃)	195		217	
Calcium, Ca	3.39	68	2.94	59
Magnesium, Mg	3.70	45	2.63	32
Sodium, Na	17.13	394	53.91	1240
Potassium, K	0.41	16	0.66	26
Carbonate, CO ₃	0.30	9	0.00	<2
Bicarbonate, HCO ₃	3.61	220	4.34	265
Chloride, Cl	19.15	679	51.90	1840
Sulphate, SO ₄	1.15	55	4.23	203
Nitrate, NO ₃	0.00	<1	0.00	<1
Silica, SiO ₂	13		13	
Fluoride, F	0.2		1.3	

3. (Lab No. 83W5562-68)

H2 2A3

H2 1B1

Sample	78496		78497	
Lab No. 83W	3566		3567	
pH	7.8		8.5	
Appearance	clear, slight deposit			
Colour (A.P.H.A. units)	20		5	
Odour	nil			
Conductivity (mS/m at 25C)	4500		439	
	me/L	mg/L	me/L	mg/L
Total dissolved solids (180C by calc)	31400		2360	
Total hardness (as CaCO ₃)	5900		800	
Total alkalinity (as CaCO ₃)	102		227	
Calcium, Ca	61.38	1230	9.33	187
Magnesium, Mg	56.91	692	6.66	81
Sodium, Na	415.65	9560	25.65	590
Potassium, K	3.68	144	0.33	13
Carbonate, CO ₃	0.00	<2	0.40	12
Bicarbonate, HCO ₃	2.05	125	4.15	253
Chloride, Cl	510.58	18100	34.41	1220
Sulphate, SO ₄	33.54	1610	2.42	116
Nitrate, NO ₃	0.00	<1	0.00	<1
Silica, SiO ₂		9		18
Fluoride, F		0.2		0.2

Department of Mines, Western Australia
GOVERNMENT CHEMICAL LABORATORIES

30 Plain Street, Perth, Western Australia 6000
 Telephone: 325 5544



Director
 Geological Survey of W.A.
 Mineral House
 66 Adelaide Terrace
 PERTH W.A. 6000

Address all correspondence to the Director

OUR REF

YOUR REF

ENQUIRIES TO:

8 February, 1983. CM

MATERIAL Three water samples from Harvey Line project, marked as below.

LAB No 82W7893-5

FROM WHOM RECEIVED AND DATE: Geological Survey of W.A., on 8 December, 1982.

RESULT OF EXAMINATION.

	HL1W	HL2W
Sample	75288	75289
Lab No. 82W	7893	7894
pH	7.9	7.5
Appearance	clear	very slightly cloudy
Colour (A.P.H.A. units)	6	14
Odour	----- nil -----	
Conductivity (mS/m at 25C)	138	87.5

	me/L	mg/L	me/L	mg/L
Total dissolved solids (180C by calc)		716		479
Total hardness (as CaCO ₃)		310		280
Total alkalinity (as CaCO ₃)		252		275
Calcium, Ca	4.49	90	4.49	90
Magnesium, Mg	1.73	21	1.15	14
Sodium, Na	6.52	150	2.96	68
Potassium, K	0.10	4	0.10	4
Carbonate, CO ₃	0.00	<2	0.00	<2
Bicarbonate, HCO ₃	5.05	308	5.51	336
Chloride, Cl	7.39	262	3.30	117
Sulphate, SO ₄	0.54	26	0.04	2
Nitrate, NO ₃	0.00	<1	0.00	<1
Silica, SiO ₂		9		16
Boron, B		0.08		0.07
Fluoride, F		0.3		0.1

BORE COMPLETION REPORT
HARVEY LINE SITE NO 3 (HL3)

LOCATION AND IDENTIFICATION

OWNER: Geological Survey of Western Australia

GSWA REF: HL3A1 SI50-2-2032-II-C-~~143~~ 149
HL3A2 SI50-2-2032-II-C-~~144~~ 150
HL3A3 SI50-2-2032-II-C-~~145~~ 151
HL3W SI50-2-2032-II-C-~~146~~ 152

LOCATION: Wellington Loc. 247, northeast corner.
Owner: Mr L M Tyler, PO Box 188, Waroona WA 6215

(Figure 1 - Location map)

AMG REF (Zone 50): Eastings 3905 Northings 63580

MAP SHEETS: 1:250000 Pinjarra (SI50-2)
1:100000 Pinjarra (2032)

PURPOSE: HL3A - Exploratory and observation
HL3W - Water supply bore

STATUS: HL3A1 - perforated interval- 61- 66 m bns - Observation
HL3A2 - perforated interval-241-247 m bns - Observation
HL3A3 - perforated interval-568-574 m bns - Abandoned
HL3W - screened interval - 23-29 m bns - Observation

ELEVATION: HL3A1 - top of 25mm GI pipe - 13.301 m AHD
HL3A2 - top of 80mm GI pipe - 13.240 m AHD
HL3W - top of casing - 13.049 m AHD
Natural surface - concrete base - 12.794 m AHD

m bns = metres below natural surface
GI = Galvanised Iron
NB = Nominal Bore
ID = Internal Diameter

BOREHOLE CONSTRUCTION AND DEVELOPMENT

Bore construction diagram (Figure 2)

DRILLED BY: Mines Department Drilling Section, Field Unit A.

RIG: Midway Skytop (Rotary)

MUD: Aquagel, Biopolymer, CMC

DRILLING COMMENCED:

HL3A 8. 4.1983
HL3W 22.11.1982

DRILLING COMPLETED:

HL3A 28. 4.1983
HL3W 22.11.1982

DRILLED DIAMETER:

Bore	Depth Interval (m bns)	Diameter (mm)
HL3A	0-55	350
	55-602.5	216
HL3W	0-30	172

TOTAL DEPTH: HL3A - 602.5
HL3W - 30

CASING (Drilling): HL3A - 260mm (ID) cemented in to 55m
HL3W - None

CASING (Completion):

Bore	Depth Interval (m bns)	ID (mm)
HL3A	0 - 55	260
	0 - 579	154
	0 - 599	80 NB
	0 - 6	25 NB
HL3W	0 - 1.5	154
	0 - 23.27	100 NB PVC
	23.27 - 29.41	100 NB (Stainless steel screen 0.5mm aperture)

CEMENTING:

HL3A - The 260mm sleeve welded steel conductor pipe was cemented in position with 4m³ of cement slurry and 3m³ of follow-up mud. The 154mm sleeve welded steel casing was cemented using 14m³ of cement slurry and 10.8m³ of follow-up water.

Cement was drilled out from 357 to 602 m bns.

A cement block was cast around the top of the casing.

OBSERVATION INTERVALS:

Bore/Interval	Depth (m bns)	Formation
HL3A1	61-66	Leederville Formation
HL3A2	241-247	Cockleshell Gully Formation
HL3A3	568-574	Cockleshell Gully Formation
HL3W	23-29	Leederville Formation

Remarks: Each interval in bore HL3A was perforated with 3 shots per metre. The 80mm GI pipe was installed with a 19m section of flame-cut slots at approximately 250 m bns and two compressible packers were set at 200 and 400 m bns to seal the annulus between the 80mm pipe and the 154mm casing. HL3A1 is monitored in the 25mm pipe set in the annulus and HL3A2 is monitored in the 80mm pipe. HL3A3 was abandoned after development. HL3W was completed with 6m of 100mm NB, 0.5mm aperture, wire-wound stainless steel screen and the annulus packed with graded sand.

CONSTRUCTION DIFFICULTIES:

Delays occurred during construction for the following reasons:

- (1) Mechanical breakdowns
- (2) Due to obstructions in the bore (initially at 379m bns) caused by formation collapse and/or swelling of clays and/or small steps in bore walls due to differing competancies together with slight inclination of bore, it was not possible to run the logging tools to TD. After two runs, each followed by reaming of the bore to TD, a full suite of logs was obtained to 486 m bns (Caliper to 379m bns) and sidewall cores were taken. Casing was run in to 384m bns after the first logging run. The bore was then cased and cemented to 579m bns. After drilling out the cement to TD, gamma-ray and neutron logs were run to TD and sidewall cores taken from the bottom uncased section of the bore.

CONSTRUCTION COMPLETED: HL3A - 11. 5.1983
HL3W - 24.11.1982

DEVELOPMENT: Each interval was developed by airlifting and surging. In the case of HL3A1 and HL3A3 this continued until the water cleared and the conductivity was constant. Samples were then taken for chemical analysis. The yield from HL3A2 was insufficient to to fully develop this interval. HL3A3 was airlifted for 13 hours at 1270m³/d before the other intervals were perforated. All three intervals were then airlifted at 1300m³/d for 4 hours before the packers were installed. HL3A1 was then airlifted for 7 hours at 50m³/d and HL3A2 for 23 hours at less than 1m³/d. HL3W was developed by airlifting and jetting for 4 hours at 110m³/d. Subsequently it was pumped to supply water during the drilling of HL3A, HL4A and HL4B.

SITE CLEARED: 16. 5.1983

GEOLOGICAL DATA

SAMPLES: Rotary (ditch cuttings) at 3m intervals

SIDEWALL CORES: Using the gamma-ray log, 26 shale/siltstone targets and 1 sandstone target, located in an interval under consideration for perforation were chosen in HL3A. 27 cores were recovered from the following depths (m bns) 61, 66, 78.5, 97.5, 130.5, 145, 150.5, 182, 193, 193.5, 204, 228.5, 257, 271, 292, 321.5, 358, 397.5, 437, 456, 483.5, 582.5, 583, 593, 593.5, 594, 598.6.

CORING OPERATORS: R Bulner and M A L'Herpiniere

LOGGED BY: A.C. Deeney

REPOSITORY OF SAMPLES AND CORES: GSWA Core Library

SUMMARY LOG:

Depth Interval (m bns)	Age	Formation	Lithology
0-10.5	Quaternary	Guildford Formation ^{Gg}	Clay, sandy clay, sand.
10.5-21	Quaternary	Jandakot Beds ^{Ta}	Sand, silt, clay, fossiliferous.
21 - 204	Early Cretaceous	Leederville Formation	Siltstone, sandstone, shale
204 - 602.5	Early-Mid Jurassic	Cockleshell Gully Formation (Eneabba Member)	Sandstone, siltstone, shale

REMARKS: A log of the ditch cuttings is given in Appendix 1
A sidewall-core log is given in Appendix 2

GEOPHYSICAL DATA

LOGGING UNIT: GO1 No 2 (Temperature Log - GO1 No 1)

LOGGING OPERATOR: J Collier

LOGS RUN: _____

Log Type	Depth (m bns)	Date
Gamma Ray	0 - 410.6	28. 4.1983
	0 - 485.1	3. 5.1983
	0 - 597.4	6. 5.1983
Neutron-Neutron	1.4 - 412	28. 4.1983
	1.4 - 486.5	3. 5.1983
	1.4 - 598.8	6. 5.1983
Self Potential	55.5 - 378.5	29. 4.1983
	381 - 485.8	3. 5.1983
Short Normal Resistivity (16")	55.5 - 378.5	29. 4.1983
	381 - 485.8	3. 5.1983
Long Normal Resistivity (64")	55.5 - 378.5	29. 4.1983
	381 - 485.8	3. 5.1983
Caliper	0 - 381	29. 4.1983
Temperature	0 - 603.6	8. 4.1986
Dipmeter Survey	0 - 588	10. 6.1986

REMARKS:

- (1) Log zeros were taken at the drilling pad surface.
- (2) Apparent resistivities obtained from GO1 logs must be multiplied by a factor of 1.25 to give true formation resistivities.
- (3) The temperature log was run approximately 3 years after completion of the bore to allow time for the natural geothermal gradient to be re-established.
- (4) The gamma-ray and neutron logs run on 6. 5.1983 were run in casing from 0-579 m bns.
- (5) Depth errors may exist in the case of the caliper and temperature logs.
- (6) The dipmeter survey showed that the bottom of the bore was 7m southeast of the top of the bore.

PALAEONTOLOGICAL DATA

PALAEONTOLOGICAL REPORT: Palynology of Harvey Line 3A. Pal.
Rept.19/1983

SUMMARY OF RESULTS:

Depth (m bns)	Age	Zone	Environment	Formation
61,78.5, 130.5,145, 182,193.5	mid Neocomian to earliest Aptian	<u>B.Limbata</u>	non-marine (182 and 193.5m backswamp)	Leederville Formation

REMARKS: Sidewall cores from 97.5, 150.5, 193, 204, 228.5, 257, 271, 292, 321.5, 358, 397.5, 437, 456, 483.5, 582.5, 583, 593, 593.5, 594 and 598.6m bns were not processed for reasons of obvious oxidation or unsuitable lithology.

The sidewall core from 66m bns was barren of palynomorphs.

HYDROLOGICAL DATA

SUMMARY:

Bore/Interval	HL3A1	HL3A2	HL3A3	HL3W
Interval (m bns)	61-66	241-247	568-574	23-29
Formation	Leederville Formation	Cockleshell Gully Formation	Gully Formation	Leederville Formation
Airlift rate ^a (m ³ /d)	50	<1 ^c	1270	110
Water Level (m btc)	+0.620	0.060	8.45 ^d	0.415
Water Level (m AHD)	13.921	13.18	4.73	12.634
Date (W.L.)	5.8.1986	5.8.1986	10.5.1983	5.8.1986
Salinity ^b (TDS mg/L)	1560	11700 ^c	32500	2310
Conductivity ^b (mg/m@25°C)	290	1900 ^c	4330	420
Formation				
Resistivity (ohm-m)	23.8	6.3	<2 ^e	-
Formation Factor	6.2	11.9	-	-

REMARKS:

- (a) Approximate final airlift rate.
- (b) Values obtained from chemical analyses (Chemistry Centre of WA) of samples taken at the end of airlifting (Appendix 4).
- (c) Insufficient supply to fully develop the interval. Water sample probably is representative of formation water.
- (d) Approximate static water level measured at completion.
- (e) Formation resistivity could not be accurately determined and hence a formation factor was not calculated.

m btc = metres below top of casing.

G.S.W.A.

Bore Hole No. HL3.....

Locality... S.W. OF WAROONA.....

Elevation.....m. above A.H.D.

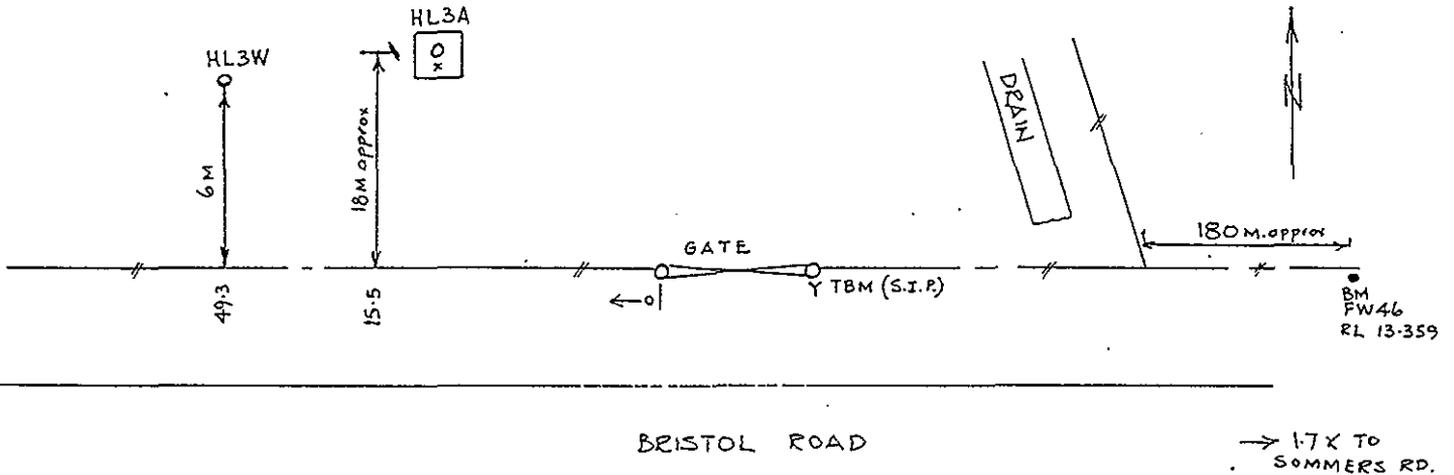
Surveyor... C.E. FARRELL
S. HARRAP..... Field Book... 18..... Date... 15.7.85.....

Index Plan..... Calculation Folder.....

SITE SKETCH

BORE	TOP	CONC. BASE	T.B.M
HL 3A	-	12.794*	12.727
HL 3A : 75mm	13.240	-	
HL 3A : 25mm	13.301	-	
HL 3W	13.049	NIL	

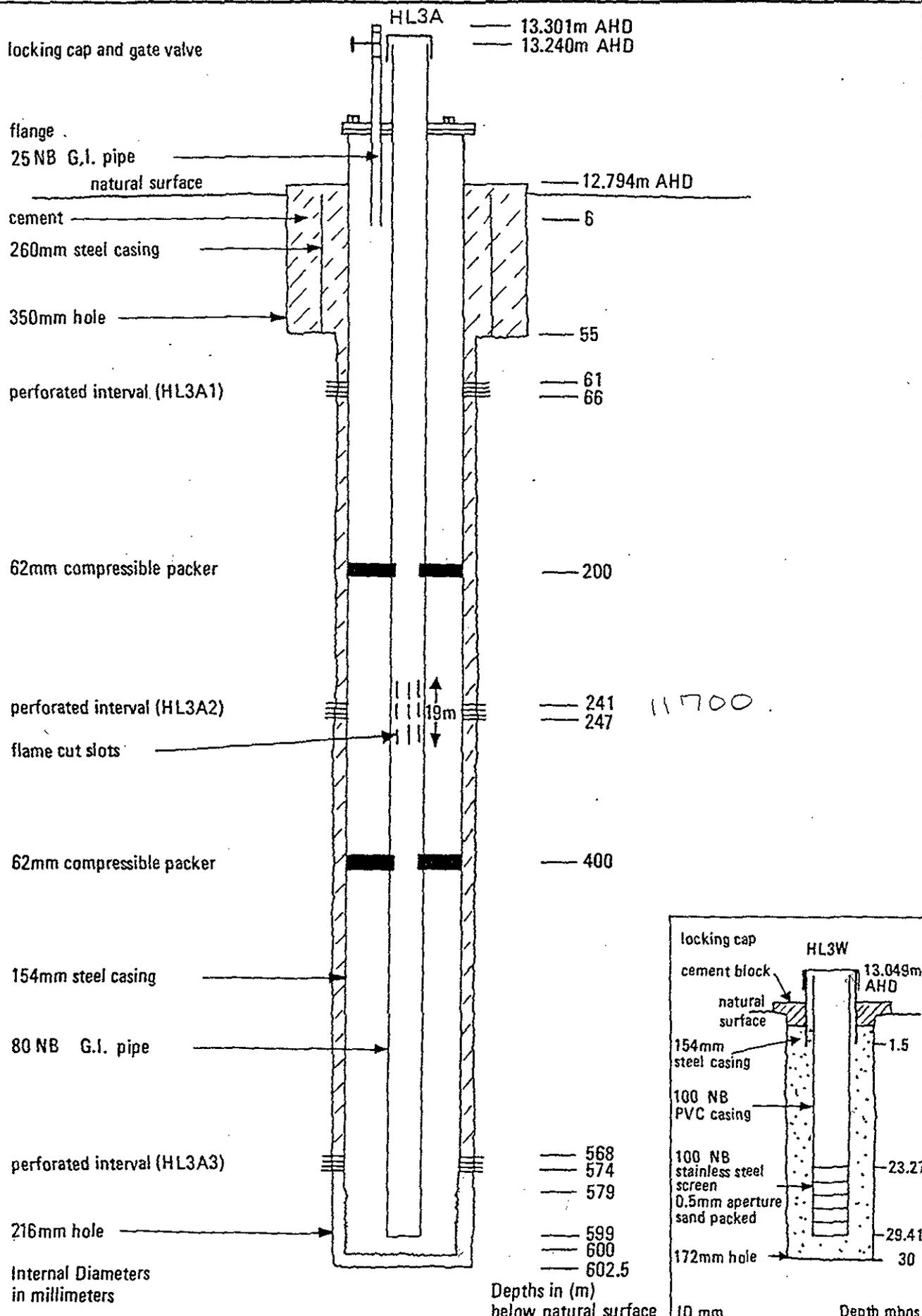
Marked with yellow chalk.



C.E. Farrell
& Harrap

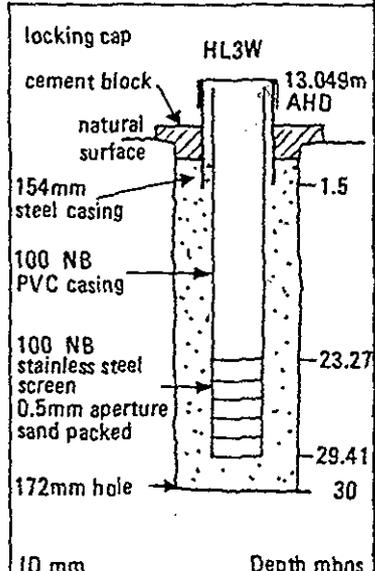
Checked.....

Date.....



Internal Diameters
in millimeters

Depths in (m)
below natural surface



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

	INITIAL	DATE
COMP	ACD	9/86
DRAWN	ACD	9/86
CHKD		
APVD		

BORE CONSTRUCTION (Not to scale)
HARVEY LINE SITE 3 (HL3)

TO ACCOMPANY BORE COMPLETION REPORT - HL3

MAP INDEX

SI 50-2-3032

HARVEY LINE BORE HL3A

SLUDGE SAMPLE LOG

Depth (m bns)	Description
0- 9	CLAY; grey-brown and black; very sandy. Arenaceous material fine to very coarse, subrounded, mainly quartz, often frosted, minor weathered feldspar.
9-12	CLAY; green, grey and black, very sandy. Arenaceous material, similar to 0-9m interval.
12-15	SAND; green, grey and dark grey, clayey, common shell fragments, mainly bivalves and gastropods, up to 2cm. Sand is fine to very coarse, moderately sorted, subrounded to rounded, mainly quartz often frosted, minor weathered feldspar.
15-18	CLAY; green-grey, and dark grey, sandy, common shell fragments, mainly bivalves and gastropods up to 2cm. Arenaceous material similar to 12-15m interval.
18-21	CLAY; grey-green and dark grey, very sandy, common shell fragments, mainly bivalves and gastropods up to 2 cm. Arenaceous material similar to 12-15m interval. Few fragments of hard, dark grey calcareous mudstone.
21-24	CLAY; grey-green and dark grey, very sandy, micaceous. Common shell fragments, mainly bivalves and gastropods up to 2cm. A few fragments of cream lime cemented sandstone and hard dark grey calcareous mudstone.
21- 24 cont.	Arenaceous material, fine sand to very fine pebbles, subrounded to rounded, mainly quartz, minor weathered feldspar. Sample contaminated from above.
24- 57	CLAY; dark grey-green, olive green and black, micaceous, ?glauconitic slightly silty and sandy, often stiff, common fragments of black lignite and low grade coal, minor fragments of pyrite cemented sand. Sand is fine to medium, subangular to angular, mainly quartz, minor weathered feldspar. A few larger quartz grains occur up to very fine pebble grade.

57- 60 SAND; dark grey, silty, clayey, fine to very coarse, poorly sorted, subangular to angular, mainly quartz, sometimes green stained, minor weathered feldspar, with fragments of well cemented sandstone (pyrite and carbonate). Clay is grey, micaceous, soft.

60-63 CLAY; dark grey, silty, micaceous, slightly sandy. Arenaceous material similar to 57-60m interval.

63-69 SAND; dark grey, clayey, fine sand to very fine pebbles poorly sorted, subangular to subrounded, mainly quartz, often green stained. Clay is micaceous. Abundant fragments of dark grey and cream, carbonate cemented sand also fragments of pyrite cemented sand.

69-72 CLAY; as at 60-63m interval.

72-75 SAND; as at 57-60m interval.

75-78 CLAY; as at 60-63m interval.

78-81 SAND; as at 63-69m interval, but carbonate cemented sand perhaps more abundant.

81- 84 CLAY; as at 60-63 interval.

84- 90 SAND; as at 57-60m interval.

90- 93 CLAY; as at 60-63m interval.

93- 96 SAND; as at 57-60m interval but fewer fragments of cemented sand.

96-102 CLAY; as at 60-63m interval but grey, yellow-grey and light green, greater percentage of sand.

102-111 SAND; dark grey, silty, clayey, fine sand to very fine pebbles, poorly sorted, subangular to angular, mainly quartz sometimes blue minor weathered feldspar. Clay is micaceous. Contains occasional fragments of pyrite cemented sand.

111-114 LIMESTONE; light grey-green, sandy, glauconitic, with minor clay.

114-123 SAND; similar to 102-111m interval with traces of low grade coal.

123-126 LIMESTONE; as at 111-114m interval.

126-129 SAND; as at 102-111m interval with fragments of limestone and dark grey siltstone.

129-135 CLAY; dark grey, micaceous, sandy.

135-138 SAND; as at 102-111m interval.

138-141 CLAY; as at 129-135n interval.

141-150 CLAY; grey, green, purple-red, silty, sandy, micaceous. Arenaceous material, ranges in grade from fine sand to very fine pebbles, mainly quartz, minor weathered feldspar rare fragments of pyrite cemented sandstone, calcareous mudstone and siltstone. 144-150m very sandy and gravelly.

150-153 SAND; light grey, silty, clayey (purple and light grey) angular to subrounded, poorly sorted, fine sand to very fine pebbles, mainly quartz, sometimes pink, minor weathered feldspar, rare fragments of pyrite cemented sand and dark grey-green calcareous mudstone. Minor-common fragments of siltstone.

153-159 CLAY; as at 141-150m interval.

159-162 SAND; as at 150-153m interval.

162-168 CLAY; as at 144-150m interval but predominantly purple.

168-171 SAND; as at 150-153m interval.

171-210 CLAY; as at 141-150m interval but with varying amounts of sand. Sand content increases with depth.

210-603(TD)
602.5 SANDSTONE, SILTSTONE, SHALE; Sandstone is light grey and light green-grey, slightly silty, slightly clayey, weakly cemented, ranges in grade from fine sand to 7mm pebbles, poorly to moderately sorted, subangular, mainly quartz, minor weathered feldspar, rare fragments of pyrite cemented sandstone, trace of mica (finer grained sandstones). Siltstone is grey, blue-grey, dark grey, green, yellow, purple, red-brown, slightly clayey, sandy, generally micaceous, weakly cemented. Shale is variegated (colours similar to siltstone), silty, slightly sandy, micaceous, weakly cemented. 210-312m percentage of sandstone similar to percentage of siltstone and shale.

210-603(cont.)

324-344m, 363-378m, 381-393m 411-435m, 447-459m, 465-480m, Sandstone predominates.
480-507m percentage of sandstone similar to percentage of siltstone and shale.
507-513m, 534-603m, Sandstone predominates.

A C Deeney

Hydrogeologist

28 April 1983

HARVEY LINE - BORE HL3A

SIDEWALL CORE LOG

DEPTH (mbns)	RECOVERY (mm)	DESCRIPTION
61	43	SANDSTONE; grey and dark grey, slightly clayey, micaceous. Weakly cemented, very fine to fine grained, well sorted, subangular, mainly quartz, exhibits small scale cross-bedding (bed thickness 1-2 mm), common black carbonaceous material.
66	44	CLAY; dark grey, silty, slightly sandy, micaceous. Sand ranges in grade from very fine to coarse, is subangular and consists mainly of quartz with minor weathered feldspar.
78.5	42	CLAY; dark grey, silty, slightly sandy, micaceous. Sand ranges in grade from very fine to coarse, is subangular and consists mainly of quartz with minor weathered feldspar.
97.5	43	CLAY; yellow-green and light green, silty, sandy. Arenaceous material ranges in grade from very fine sand to very fine gravel, is subangular and consists mainly of quartz with minor weathered feldspar.
130.5	40	CLAY; dark grey, silty, micaceous.
145	44	CLAY; dark grey, silty micaceous.
150.5	24	SANDSTONE; light grey, light green and purple, variegated, silty, clayey, fine to very coarse, poorly sorted, subangular, mainly quartz, minor weathered feldspar, weakly cemented. A few grains of quartz up 6 mm occur.

DEPTH (mbns)	RECOVERY (mm)	DESCRIPTION
182	46	CLAY; light grey-green, silty, very sandy. Arenaceous material ranges in grade from very fine to medium sand, is subangular and consists mainly of quartz.
193	25	SANDSTONE; light grey-green, slightly clayey, fine to coarse, subangular, moderately sorted, mainly quartz, minor weathered feldspar, moderately cemented.
193.5	44	SANDSTONE; dark grey-green, silty, slightly clayey, micaceous, moderately cemented, very fine to coarse grained, subangular to subrounded, poorly sorted, mainly quartz, minor weathered feldspar, trace of black carbonaceous material.
204	37	CLAY; light grey-green, purple, yellow, variegated, silty, slightly sandy. Arenaceous material ranges in grade from very fine to very coarse sand, is subangular and consists mainly of quartz.
228.5	27	SILTSTONE; light grey-green, sandy, slightly clayey, moderately cemented. Arenaceous material ranges in grade from very fine to fine sand, is subangular, mainly quartz.
257	35	SANDSTONE; light grey-green, silty, micaceous, moderately cemented, very fine to fine grained, subangular, moderately sorted, mainly quartz, minor weathered feldspar, with a few coarse grains of quartz.
271	36	SILTSTONE; purple, mottled light grey-green, sandy, clayey, weakly cemented. Arenaceous material ranges in grade from very fine to fine sand and consists mainly of quartz.

DEPTH (mbns)	RECOVERY (mm)	DESCRIPTION
292	30	SILTSTONE; purple-red, brown, yellow, variegated, sandy, slightly clayey, micaceous moderately cemented. Arenaceous material ranges in grade from very fine to fine sand with occasional coarse to very coarse, subangular, grains of quartz.
321.5	43	CLAY; purple, light grey-green, yellow, variegated, slightly silty.
358	41	CLAY; light grey-green, purple, yellow, brown, variegated, silty, sandy. Sand is very fine to fine grained, subangular, and consists mainly of quartz.
397.5	43	SILTSTONE; purple, light grey-green, yellow, brown, variegated, clayey, slightly sandy, weakly cemented. Sand is very fine to fine grained, subangular, and consists mainly of quartz.
437	38	CLAY; purple, yellow, brown, light grey-green, variegated, silty, slightly sandy. Sand is very fine to fine grained, subangular, and consists mainly of quartz.
456	32	SANDSTONE; grey, slightly silty, very fine to very coarse, subangular to subrounded, poorly sorted, weakly cemented, mainly quartz, minor weathered feldspar.
483.5	45	SILTSTONE; light grey, variegated, sandy, clayey, weakly cemented. Sand is very fine to fine, subangular, mainly quartz.
582.5	27	SANDSTONE; light grey, slightly silty, fine to very coarse, subrounded, moderately sorted, very weakly cemented, mainly quartz, minor weathered feldspar.

DEPTH (mbns)	RECOVERY (mm)	DESCRIPTION
583	30	SANDSTONE; light grey, slightly silty, fine to very coarse, subrounded, moderately sorted, very weakly cemented, mainly quartz, minor weathered feldspar.
593	30	SANDSTONE; light green-grey, slightly clayey, weakly cemented, very fine to medium grained, well sorted, subangular to subrounded, mainly quartz, minor weathered feldspar, trace dark green mafic mineral, trace of mica.
593.5	30	SANDSTONE; light grey-green, slightly clayey, moderately cemented, predominantly very fine to medium with a few larger grains of quartz (up to very fine pebble grade), poorly sorted, subangular to subrounded, mainly quartz, minor weathered feldspar, trace of dark green mafic mineral, trace of mica.
594	40	SANDSTONE; light grey, slightly clayey, moderately cemented, very fine to very coarse, subangular, poorly sorted, mainly quartz, minor weathered feldspar, trace of mica.
598.6	15	SANDSTONE; light grey, slightly silty, very weakly cemented, fine to very coarse, subangular, moderately sorted, mainly quartz, minor weathered feldspar.

A C Deeney

ACD:KR
GS 254/82
August 8, 1983
GE8100AC227

PALYNOLOGY OF HARVEY LINE 3A

MATERIAL AND LOCALITY: Twenty-seven sidewall cores from
Harvey Line 3A borehole, location: Pinjarra 2032
(1:100 000) 907 580. Sample No. 79742.

DEPTH AND LITHOLOGY:

<u>F. No.</u>	<u>Depth in m</u>	<u>Lithology</u>
F46411	61	Siltstone, l. grey, carbonaceous lamina
--	66	Claystone, m-d. grey, sl. gritty
F46412	78.5	Ditto
--	97.5	Claystone, greenish grey, with drilling mud
F46413	130.5	Shale, d. grey, carbonaceous
F46414	145	Claystone, silty, m. grey, sl. bedded
--	150.5	Sst., red and grey
F46415	182	Sst., f. gr. l. grey
--	193	Sst. f-c. gr., l. grey
F46416	193.5	Sst. f-c. gr., clayey, m-d. grey
--	204	Claystone, red and grey
--	228.5	Ditto
--	257	Ditto
--	271	Ditto
--	292	Ditto
--	321.5	Ditto
--	358	Ditto
--	397.5	Ditto
--	437	Ditto
--	456	Sst., red
--	483.5	Claystone, purple and yellow
--	582.5	Sst., white
--	583	Ditto
--	593	Ditto
--	593.5	Ditto
--	594	Ditto
--	598.6	Ditto

SUBMITTED BY: A Deeney on Requisition No. 33204

REPORT: Most samples were unsuitable for palynological preparation and were not processed. Of these samples which were processed only the sample from 66 m proved to be barren of palynomorphs. The distribution of miospores in the remaining productive samples is set out in the accompanying chart. Microplankton were not encountered in any sample.

Assemblages from all the productive samples (61 m - 193.5 m) are considered to belong in the *Balmeiopsis limbata* Miospore Zone, of mid Neocomian - earliest Aptian age.

The sample from 182 m has a very restricted diversity, suggesting a back swamp type of environment of deposition. The 193.5 m assemblage is somewhat similar, and contains a high proportion of *D. equiexinus* and *M. florida*, but is generally more diverse than the 182 m sample. The four higher samples all contain generally diverse, non-marine assemblages of miospores.


J Backhouse
(Asst. Palaeontologist)

DISTRIBUTION:
A Deeney
10/83
Pal. Lab. File
Harvey Line 3A

JB:RMW

Attach.

<u>Depth</u>					<u>Miospore Species</u>
193.5 m	182 m	145 m	130.5 m	78.5 m	
/					<i>Ischyosporites crateris</i> Balme
/	/				<i>Nevesisporites dailyi</i> (Dettmann)
/	/	/	/	/	<i>Dictyophyllidites equiexinus</i> Couper
/					<i>Foveosporites canalis</i> Balme
/	/	/	/	/	<i>Classopollis</i> sp.
/	/	/			<i>Murospora florida</i> (Balme)
/					<i>Januasporites multispinus</i> sp. nov.
/	/	/	/	/	<i>Contignisporites cooksonae</i> (Balme)
/	/				<i>Matonisporites crassiangulatus</i> Balme
/	/				<i>Laevigatosporites belfordii</i> Burger
/					<i>Neoraistrickia</i> sp. Cf. <i>N. levidensis</i> (Balme)
/					<i>Cicatricosisporites australiensis</i> Cookson
/	/	/	/		<i>Baculatisporites comaumensis</i> Cookson
	/	/	/	/	<i>Araucariacites australis</i> Cookson
	/	/	/		<i>Retitriletes eminulus</i> (Dettmann)
	/				<i>Aequitriradites acusus</i> (Balme)
	/	/			<i>Osmundacidites dubius</i> Burger
	/				<i>Cyathidites concavus</i> Balme
	/				<i>Callialasporites</i> spp.
	/	/			<i>Microcachryidites antarcticus</i> Cookson
	/	/			<i>Retitriletes circolumenus</i> (Dettmann)
	/				<i>Triletes tuberculiformis</i> Cookson
	/				<i>Gleicheniidites senonicus</i> Ross
	/				<i>Reticuloidosporites arcus</i> Balme
	/				<i>Retitriletes watherooensis</i> Backhouse
	/				<i>R. clavatoides</i> (Couper)
	/				<i>Staplinisporites telatus</i> (Balme)
				?	<i>Balmeiopsis limbata</i> (Balme)



Department of Mines, Western Australia
GOVERNMENT CHEMICAL LABORATORIES
30 Plain Street, Perth, Western Australia 6000
Telephone: 325 5544

Director
Geological Survey of W.A.
Mineral House
66 Adelaide Terrace
PERTH WA 6000
Attention: Mr. A.C. Deeney.

Address all correspondence to the Director

OUR REF

YOUR REF

ENQUIRIES TO

4 August, 1983. CM

MATERIAL Seven samples of water from the Harvey Line Project, marked "GS 78492-98".

LAB No 83W3562-68

FROM WHOM RECEIVED AND DATE Geological Survey of W.A. on 14 June, 1983.

RESULT OF EXAMINATION

HL3A1

HL3A2

Sample	HL3A1		HL3A2	
	me/L	mg/L	me/L	mg/L
78492				
78493				
Lab No. 83W	3562		3563	
pH	8.5		7.3	
Appearance	clear, slight deposit			
Colour (A.P.H.A. units)	<5		10	
Odour	nil			
Conductivity (mS/m at 25C)	290		1900	
Total dissolved solids (180C by calc)	1560		11700	
Total hardness (as CaCO ₃)	320		1700	
Total alkalinity (as CaCO ₃)	230		98	
Calcium, Ca	2.50	50	32.34	648
Magnesium, Mg	3.87	47	0.99	12
Sodium, Na	20.04	461	166.96	3840
Potassium, K	0.49	19	1.28	50
Carbonate, CO ₃	0.10	3	0.00	<2
Bicarbonate, HCO ₃	4.51	275	1.95	119
Chloride, Cl	21.13	749	189.28	6710
Sulphate, SO ₄	1.73	83	8.71	418
Nitrate, NO ₃	0.02	1	0.00	<1
Silica, SiO ₂		13		3
Fluoride, F		0.2		0.2

A. Deeney



GOVERNMENT CHEMICAL LABORATORIES

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Telephone: 325 5544

Address all correspondence to the Director

Director
Geological Survey of W.A.
Mineral House
66 Adelaide Terrace
PERTH 6000

OUR REF

YOUR REF File 254/82

ENQUIRIES TO

30 June 1983 SD

Attention: A.C. Deeney

MATERIAL One water sample from Harvey Lime - Yarloop, marked "Sample No. 75865, Bore Identity HL3A".

LAB NO 83W2669

FROM WHOM RECEIVED AND DATE

Geological Survey of W.A. on 12 May 1983.

RESULT OF EXAMINATION

HL3A3

Sample	GSWA 75865	
Lab No. 83W	2669	
pH	7.2	
Appearance	clear, slight deposit	
Colour (A.P.H.A. units)	20	
Odour	nil	
Conductivity (mS/m at 25C)	4330	
	me/L	mg/L
Total dissolved solids (180C by calc)		32500
Total hardness (as CaCO ₃)		8800
Total alkalinity (as CaCO ₃)		33
Calcium, Ca	158.68	3180
Magnesium, Mg	16.86	205
Sodium, Na	394.35	9070
Potassium, K	0.87	34
Carbonate, CO ₃	0.00	<2
Bicarbonate, HCO ₃	0.66	40
Chloride, Cl	538.79	19100
Sulphate, SO ₄	18.96	910
Nitrate, NO ₃	0.00	<1
Silica, SiO ₂		15
Fluoride, F		0.2

N. Platell

N. PLATELL
CHIEF
WATER SCIENCE LABORATORY

2.

(Lab No. 82W7893-5)

HL3W

Sample	75290
Lab No. 82W	7895
pH	7.6
Appearance	clear with a slight brown deposit
Colour (A.P.H.A. units)	6
Odour	nil
Conductivity (mS/m at 25C)	420

	me/L	mg/L
Total dissolved solids (180C by calc)		2310
Total hardness (as CaCO ₃)		700
Total alkalinity (as CaCO ₃)		307
Calcium, Ca	5.19	104
Magnesium, Mg	8.72	106
Sodium, Na	27.22	626
Potassium, K	0.26	10
Carbonate, CO ₃	0.00	<2
Bicarbonate, HCO ₃	6.15	375
Chloride, Cl	31.59	1120
Sulphate, SO ₄	2.90	139
Nitrate, NO ₃	0.00	<1
Silica, SiO ₂		15
Fluoride, F		0.2

N. Platell

N. PLATELL
CHIEF
WATER DIVISION

BORE COMPLETION REPORT
HARVEY LINE SITE NO 4 (HL4)

LOCATION AND IDENTIFICATION

OWNER: Geological Survey of Western Australia

GSWA REF: HL4A1 SI50-2-2032-II-B-~~236~~ 242
HL4A2 SI50-2-2032-II-B-~~237~~ 243
HL4B SI50-2-2032-II-B-~~238~~ 244
HL4W1 SI50-2-2032-II-B-~~239~~ 245
HL4W2 SI50-2-2032-II-B-~~240~~ 246

LOCATION: Murray Loc. 621, northside, 150 metres east of the South Western Highway. Owner: Mr M Wills, Operations Manager (Wagerup), Alcoa Australia, PO Box 84, Waroona, WA 6215

(Figure 1 - Location map)

AMG REF (Zone 50): Eastings 3977 Northings 63592

MAP SHEETS: 1:250000 Pinjarra (SI50-2)
1:100000 Pinjarra (2032)

PURPOSE: HL4A - Exploratory and observation
HL4B - Exploratory and observation
HL4W1 - Water supply bore
HL4W2 - Water supply bore

STATUS: HL4A1 - perforated interval-273-282 m bns-Observation
HL4A2 - perforated interval-459-465 m bns-Observation
HL4B - perforated interval- 38-48 m bns -Observation
HL4W1 - screened interval - 18-24 m bns -Abandoned
HL4W2 - screened interval - 14-50 m bns -Abandoned

ELEVATION: HL4A1 - top of 25mm GI pipe - 33.464 m AHD
HL4A2 - top of 80mm GI pipe - 33.672 m AHD
HL4B - top of casing - 33.471 m AHD
Natural Surface - concrete base - 33.042 m AHD

m bns = metres below natural surface
GI = Galvanised Iron
NB = Nominal Bore
ID = Internal Diameter

BOREHOLE CONSTRUCTION AND DEVELOPMENT

Bore construction diagram (Figure 2)

DRILLED BY: Mines Department Drilling Section, Field Unit A

RIG: Midway Skytop (Rotary)

MUD: Aquagel, Biopolymer, CMC

DRILLING COMMENCED:

HL4A 14. 3.1984
 HL4B 14.12.1984
 HL4W1 24.11.1982
 HL4W2 29.11.1982

DRILLING COMPLETED:

HL4A 16. 4.1984
 HL4B 17.12.1984
 HL4W1 25.11.1982
 HL4W2 29.11.1982

DRILLED DIAMETER:

Bore	Depth Interval (m bns)	Diameter (mm)
HL4A	0 - 55	350
	55 - 600	216
HL4B	0 - 50	216
HL4W1	0 - 50	172
HL4W2	0 - 50	172

TOTAL DEPTH: HL4A - 600
 HL4B - 50
 HL4W1 - 25
 HL4W2 - 50

CASING (Drilling): HL4A - 260mm (ID) cemented in to 55 m bns
 HL4B - None
 HL4W1 - None
 HL4W2 - None

CASING (Completion):

Bore	Depth Interval (m bns)	ID (mm)
HL4A	0 - 55	260
	0 - 599	154
	0 - 596.6	80 NB
	0 - 78.3	25 NB
HL4B	0 - 38.24	100 (CL.6PVC)
	38.24 - 48.0	50 (GI Screen 0.5mm aperture)
HL4W1	- Casing removed	---
HL4W2	0 - 14	100 NB (PVC)
	14 - 50	100 NB (PVC slotted - 1mm slots)

CEMENTING: HL4A - The 260mm sleeve welded steel conductor pipe was cemented in position with 3.5m³ of cement slurry and 3m³ of follow-up mud. The 154mm sleeve welded steel casing was cemented using 19m³ of cement slurry and 12m³ of follow-up water. Cement was drilled out from 356 to 599m bns. A cement block was cast around the top of the casing. HL4B was tremi-cemented from 0-30m bns with 1.5m³ of cement slurry.

OBSERVATION INTERVALS:

Bore/Interval	Depth (m bns)	Formation
HL4A1	273-282	Cockleshell Gully Formation
HL4A2	459-465	Cockleshell Gully Formation
HL4B	38- 48	Leederville Formation
HL4W1	18- 24	Superficial formations and
HL4W2	14- 50	Leederville Formation

Remarks: Each interval in bore HL4A was perforated with 3 shots per metre. The 80mm GI pipe was installed with two 6mm sections of flame-cut slots at approximately 465 and 595m bns and a compressible packer was set at 370m bns to seal the annulus between the 80mm pipe and the 154mm casing. HL4A1 is monitored in the 25mm pipe set in the annulus and HL4A2 is monitored in the 80mm pipe. HL4B was completed with 100mm Class 6 PVC coupled to 50mm NB galvanised iron screen (0.5mm aperture). The annulus was packed with graded sand in the observation interval. HL4W2 was completed with 36m of 100mm NB slotted PVC (1.0mm aperture) and the annulus packed with graded sand.

CONSTRUCTION DIFFICULTIES:

Delays occurred during construction for the following reasons.

- (1) Mechanical breakdowns.
- (2) The 154mm casing string parted during installation. It was successfully retrieved and re-inserted.
- (3) Work at the site ceased on 16. 4.1984 when HL4A had been cased and cemented. The rig was moved to another job. Work restarted on 6.12.1984. The construction and development of HL4A was then completed and HL4B drilled and cased. Work was again interrupted on 19.12.1984. Development and testing of HL4B was carried out when work restarted on 19.4.1985.

CONSTRUCTION COMPLETED: HL4A -13.12.1984
HL4B -19.12.1984
HL4W1- 2.12.1982
HL4W2- 2.12.1982

DEVELOPMENT: Each interval in HL4A and bore HL4B was developed by airlifting and surging. In the case of HL4A1 this continued until the water cleared and the conductivity was constant. Samples were then taken for chemical analysis. The yields from HL4A2 and HL4B were insufficient to allow full development of these intervals. Both intervals in HL4A were airlifted together at 350m³/d for 5 hours before the packer was installed. HL4A2 was then airlifted for 4 hours at less than 1m³/d and HL4A1 for 2 hours at 350m³/d. HL4B was developed by airlifting and surging for 2 hours at less than 1m³/d. Airlifting was discontinued because of the very low yield. Airlifting of HL4W1 and then HL4W2 produced very low yields (<1m³/d), insufficient for drilling water supplies and both bores were abandoned.

SITE CLEARED: 22. 4.1985

GEOLOGICAL DATA

SAMPLES: Rotary (ditch cuttings) at 3m intervals

SIDEWALL CORES: Using the gamma-ray logs, 15 shale/siltstone targets and 7 sandstone targets located in intervals under consideration for perforation, were chosen in HL4A and 4 shale/siltstone targets in HL4B. Cores were recovered from all targets in both bores. The depths (m bns) are as follows. HL4A:56, 58, 65, 81, 112, 173.5, 233, 285, 292, 324.5, 347, 410, 460, 509, 547, 563, 568, 571, 583.5, 584, 585, 586.5; HL4B: 11, 19, 35.5, 48.

CORING OPERATORS: R Bulner and M A L'Herpinier

LOGGED BY: A C Deeney

REPOSITORY OF SAMPLES AND CORES: GSWA Core Library

SUMMARY LOG:

Depth Interval (m bns)	Age	Formation	Lithology
0 - 15.5	Quaternary	Guildford Formation	Clay, sandy clay, sand
15.5 - 20	Quaternary	Yoganup Formation	Sandy clay, clay, sand
20 - 57	Early Cretaceous	Leederville Formation	Siltstone, sandstone shale
57 - 600	Early-Mid Jurassic	Cockleshell Gully Formation (Eneabba Member)	Siltstone, sandstone shale

REMARKS: A log of the ditch cuttings is given in Appendix 1
A sidewall-core log is given in Appendix 2

GEOPHYSICAL DATA

LOGGING UNIT: HL4A-G01 No2 (Temperature Log-G01N01)
HL4B-SIE

LOGGING OPERATOR: J Collier

LOGS RUN:

Log Type	Depth (m bns)	Date
HL4A		
Gamma Ray	0 - 590.6	6. 4.1984
Neutron-Neutron	1.4 - 592	6. 4.1984
Self Potential	55 - 594.1	6. 4.1984
Short Normal		
Resistivity (16")	55 - 594.1	6. 4.1984
Long Normal		
Resistivity (64")	55 - 594.1	6. 4.1984
Caliper	0 - 592.3	6. 4.1984
Temperature	0 - 573.3	8. 4.1986
HL4B		
Gamma Ray	0 - 50	17.12.1984
Short Normal		
Resistivity (16")	0 - 50	17.12.1984
Long Normal		
Resistivity (64")	0 - 50	17.12.1984

- REMARKS: (1) Log zeros were taken at the drilling pad surface.
- (2) Apparent resistivities obtained from G01 logs must be multiplied by a factor of 1.25 to give true formation resistivities.
- (3) The temperature log was run approximately 2 years after completion of the bore to allow time for the natural geothermal gradient to be re-established.

PALAEONTOLOGICAL DATA

PALAEONTOLOGICAL REPORT: Palynology of Harvey Line 4. Pal. Rept.
18/1983 by J Backhouse (appendix 3)

SUMMARY OF RESULTS:

None of the sidewall cores were processed for reasons of obvious oxidation or unsuitable lithology.

HYDROLOGICAL DATA

SUMMARY:

Bore/Interval	HL4A1	HL4A2	H14B	HL4W1	HL4W2 ^c
Interval (m bns)	273-282	459-465	38-48	18-24	14-50
Formation	Cockleshell Gully Formation		Leederville Formation	Superficial formations and Leederville Formation	
Airlift rate ^a (m ³ /d)	350	<1 ^d	<1 ^d	<1 ^d	<1 ^d
Water Level (m btc)	16.620	11.290 X	7.470 ✓	8.1 ^e	8.1 ^e
Water Level (m AHD)	16.844	21.752	26.001	24.9	24.9
Date (W.L.)	5.8.1986	5.8.1986	5.8.1986	2.12.1982	2.12.1982
Salinity ^b (TDS mg/L)	4790	2750 ^d	1690 ^f	479 ^d	-
Conductivity ^b (mS/m@25°C)	859	506 ^d	318 ^f	78 ^d	-
Formation					
Resistivity (ohm-m)	6.9	26.3 ^g	26.3 ^g	-	-
Formation Factor	5.9	-	-	-	-

REMARKS:

- (a) Approximate final airlift rate.
- (b) Values obtained from chemical analyses (Chemistry Centre of WA) of samples taken at the end of airlifting (Appendix 4).
- (c) Sample from this bore not submitted for analysis.
- (d) Insufficient supply to fully develop the interval. Water sample probably is representative of formation water.
- (e) Approximate static water level measured at completion.
- (f) Sample taken using bailer.
- (g) Formation resistivity could not be accurately determined and hence a formation factor was not calculated.

m btc = metres below top of casing.

G.S.W.A.

Bore Hole No... HL 4.....

Locality... WASEP.....

Elevation.....m. above A.H.D.

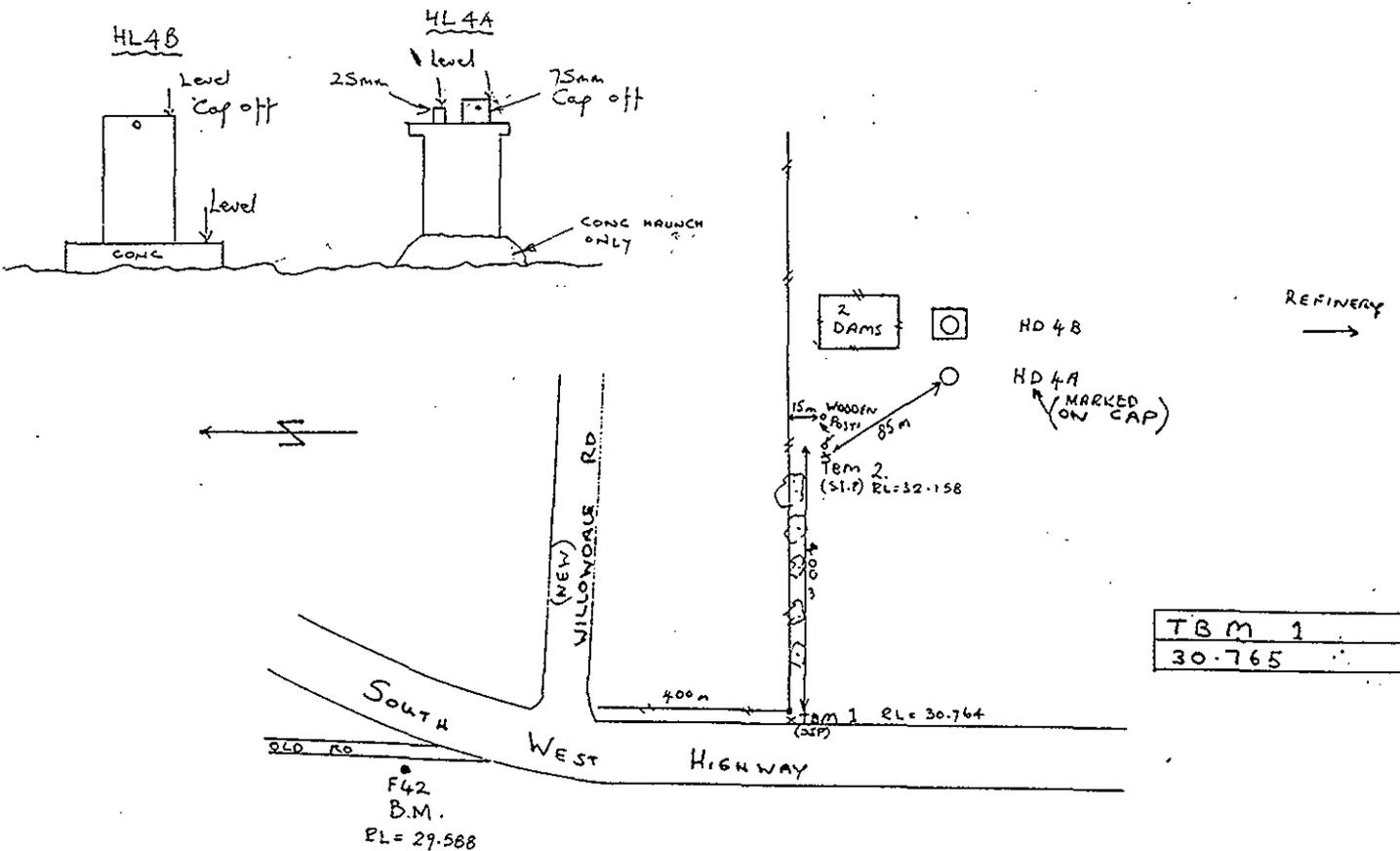
C E FARRELL

Surveyor... S. HARPER... Field Book... 18..... Date... 17-7-85...

Index Plan..... Calculation Folder.....

SITE SKETCH

BORE	Top	CONC BASE	T. B. M. 2
HL 4A:75mm	33.672	-	32.158
HL 4A:25mm	33.464	-	
HL 4B:110mm	33.471	-	
HL 4B	-	33.042	



TBM 1
30.765

Checked.....

Date.....

HARVEY LINE BORE HL4A

SLUDGE SAMPLE LOG

Depth (m bns)	Description
0-15	CLAY; variegated, light grey, orange-brown, purple-red, silty, sandy to very sandy, lateritised, few fragments of weathered granite and subangular quartz up to 7mm. Sand is fine to medium, subangular to subrounded, mainly quartz.
15-21	CLAY; similar to 0-12m intervals but very sandy, abundant fragments of weathered granite and subangular quartz up to 1cm. Sand is fine to very coarse, subangular to subrounded, mainly quartz.
21-24	CLAY; variegated, dark green, grey-green, purple-red, orange-brown, predominantly olive-green, silty, sandy, micaceous, fragments of weathered granitic material and quartz, subangular to angular, up to 5mm. Sand is fine to medium, subangular to angular.
24-27	GRAVEL; purple-red, dark green, orange brown, grey variegated, sandy clayey. Largely composed of fragments of weathered granitic material and quartz which are angular to subangular, up to 2 cm. Sand is fine to very coarse, subangular to angular. Sample poorly sorted.
27-45	SILT; purple-red, variegated, light grey-green and orange brown, clayey, sandy, micaceous. Sand ranges in grade from fine sand to 1cm pebbles, angular to subangular, quartz, weathered feldspar and weathered granitic material. Intervals 27-30m and 33-36m are very sandy.
45-48	CLAY; purplish-red, variegated, silty, sandy, micaceous. Sand ranges in grade from fine sand to 5mm pebbles, angular to subangular.
48-51	CLAY; dark green-grey, variegated, silty, sandy.
51-54	SILT; purplish red, variegated, light grey-green and orange-brown, slightly clayey, sandy. Sand ranges in grade from fine sand to 5mm pebbles, mainly quartz, weathered granitic rock fragments, weathered feldspar, subangular to angular.

54-57 SAND; grey-brown, silty, slightly clayey, ranges in grade from fine sand to 5mm pebbles, subangular to angular, poorly sorted, mainly quartz, minor weathered feldspar and granitic rock. Quartz often green stained.

57-60 CLAY; grey-brown, mottled purplish-red and orange-brown, silty, sandy, trace of mica. Sand is fine to very coarse, angular to subangular, mainly quartz.

60-78 SAND; similar to 54-57m interval.

78-93 CLAY; grey-brown, mottled purplish-red and dark grey-green, silty, slightly sandy to sandy, trace of mica. Sand is fine to very coarse, angular to subangular, mainly quartz, often green stained.

93-99 CLAY; similar to 78-93m interval, but very sandy.

99-102 CLAY, red-brown, mottled dark grey-green, slightly silty and sandy.

102-600(TD) SANDSTONE, SILTSTONE (AND SHALE); Sandstone is generally light grey, light grey-green, sometimes multicoloured, very fine to very coarse grained, often very fine to fine grained, poorly to moderately sorted, mainly quartz, sometimes micaceous (finer grained sandstones), slightly silty weakly cemented.
Siltstone is grey, yellow-brown, light green, purple, slightly sandy to sandy, slightly clayey, micaceous, moderately to well cemented.
Shale is variegated (colours similar to siltstone), slightly sandy, micaceous, moderately cemented, much less abundant than siltstone. Sequence sometimes includes fragments of weathered granite and large quartz up to 40mm. Sequence very hard from 550-600m. Percentage of sandstone approximately equivalent to siltstone and shale.
276-307m Sandstone predominates.

A C Deeney

Hydrogeologist

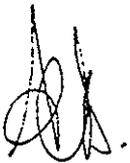
6 April 1984

HARVEY LINE - BORE HL4A+46
SIDEWALL CORE LOG

DEPTH (mbns)	RECOVERY (mm)	DESCRIPTION
11	35	SILT; light grey-green, sandy, slightly clayey sand is very fine to medium grained, subangular, mainly quartz. Trace of dark fines.
19	30	SAND; light grey-green, silty, very fine to coarse, subrounded, poorly sorted, mainly quartz, trace of dark fines.
35	35	GRANITE; slightly weathered granite in contact with dark green-brown sandy clay.
48	35	SILTSTONE; brown variegated yellow, green and purple micaceous, very sandy, poorly cemented. Sand very fine to very coarse, subangular, mainly quartz.
56	35	GRANITE; highly weathered, composed mainly of quartz and kaolinite.
58	41	SILTSTONE; yellow-brown, mottled light green, micaceous, slightly sandy, slightly clayey, poorly cemented.
65	43	SILTSTONE; light grey, slightly sandy, slightly clayey, micaceous, moderately cemented.
81	43	SANDSTONE; light grey-green, slightly silty, fine to very fine, subrounded, well sorted, micaceous, poorly cemented.
112	18	GRANITE; highly weathered, mainly quartz and kaolinite.
173.5	41	SILTSTONE; purple-grey, mottled yellow, micaceous slightly sandy, moderately cemented.
233	40	SILTSTONE; light grey, mottled yellow, micaceous, sandy, slightly clayey, moderately cemented.

285	40	SANDSTONE; light grey, slightly silty, fine to coarse moderately sorted, subangular, mainly quartz, poorly cemented.
292	35	SANDSTONE; light grey, slightly silty, very fine to coarse, moderately sorted, subangular, mainly quartz, poorly cemented.
324.5	40	SILTSTONE; dark grey, micaceous, slightly sandy, moderately to well cemented.
347	43	SANDSTONE; variegated, brown, white, grey, green and purple, silty, fine to very coarse, subangular to angular, poorly sorted, mainly quartz. Occasional large (20mm) fragments of quartz, moderately cemented.
410	40	SILTSTONE; variegated, grey, yellow-brown, purple, slightly sandy, slightly clayey, micaceous, moderately to well cemented.
460	41	SILTSTONE; variegated, purple, yellow, brown, dark green, slightly sandy. Occasional fragments of 8mm quartz, moderately to well cemented.
509	35	SILTSTONE; variegated, purple, yellow and grey, micaceous, moderately to well cemented.
547	40	SILTSTONE; variegated, grey, yellow and purple, micaceous, slightly sandy, moderately to well cemented.
563	40	SILTSTONE; variegated, purple, green and grey, micaceous sandy, moderately to well cemented.
568	40	SILTSTONE; variegated, grey, yellow and purple, micaceous sandy, moderately to well cemented.

571	40	SILTSTONE; variegated, purple, yellow green, grey, sandy, micaceous, moderately to well cemented.
583.5	35	SANDSTONE; variegated, grey, purple, brown, light green, silty, very fine to very coarse, predominantly very fine to fine, poorly sorted, subangular, mainly quartz, minor weathered feldspar, micaceous, moderately cemented.
584	38	SILTSTONE; variegated, purple, light green and yellow-brown, sandy, micaceous, moderately to well cemented.
585	40	SILTSTONE; variegated, grey, green, purple, yellow, sandy, slightly clayey, micaceous, moderately to well cemented.
586.5	37	SILTSTONE; variegated, purple, green, yellow, sandy, micaceous, moderately to well cemented.



GSWA File No.10/85
Harvey Line 4

Palaeontology Report 18/1985

PALYNOLOGY OF HARVEY LINE 4

by

J. Backhouse

NOTE

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Western Australia

Geological Survey

Perth, 1985

PALYNOLOGY OF HARVEY LINE 4

MATERIAL: Twenty six sidewall cores between 11 m and
86.5 m.

LOCATION: Australian metric grid 3977, 63592.

REQUESTED BY: A. Deeney on requisition No. 34285.

REPORT: After an examination of all the sidewall core
samples submitted from this borehole it was decided that
none of them were suitable for palynological processing.

All the samples showed clear signs of oxidation such
as brown, purple or yellow colouring. Even the highest
sample (11 m) was a slightly yellow pale grey clay. It
was therefore reluctantly concluded that all organic
matter would have been removed by the oxidation, and that
processing would be merely a waste of technician's time
and of chemicals.


J. Backhouse
(Palaeontologist)

3 January 1986

GE764SSB080

Government Chemical Laboratories
 125 Hay Street, Perth
 Western Australia 6000

Telephone: 325 5544

Director
 Geological Survey of W.A.
 Mineral House
 66 Adelaide Terrace
 Perth 6000

2 water sample(s), received 3 May 85 - Lab numbers 85X 801 to 802
 HARVEY LINE PROJECT

Lab number *HL4A1*
 85X 801
 G.S.W.A. No. 79767
 pH 7.7
 Colour (A.P.H.A. units) < 5
 Conductivity (mS/m at 25C) 859

		me/l	mg/l
Total dissolved solids (180C by calc)			4790
Total hardness (as CaCO3)			420
Total alkalinity (as CaCO3)			102
Calcium,	Ca	6.34	127
Magnesium,	Mg	2.06	25
Sodium,	Na	73.91	1700
Potassium,	K	0.20	8
Carbonate,	CO3	0.00	< 2
Bicarbonate,	HCO3	2.05	125
Chloride,	Cl	77.29	2740
Sulphate,	SO4	2.27	109
Nitrate,	NO3	0.00	< 1
Silica,	SiO2		14
Boron,	B		0.2
Fluoride,	F		1.3

HL4A2

Lab number 85X 802
S.W.A. No. 79768
pH 9.8
Colour (A.P.H.A. units) < 5
Conductivity (mS/m at 25C) 506

	me/l	mg/l
Total dissolved solids (180C by calc)		2750
Total hardness (as CaCO3)		16
Total alkalinity (as CaCO3)		186
Calcium, Ca	0.15	3
Magnesium, Mg	0.16	2
Sodium, Na	44.35	1020
Potassium, K	2.51	98
Carbonate, CO3	2.37	71
Bicarbonate, HCO3	1.34	82
Chloride, Cl	41.47	1470
Sulphate, SO4	0.81	39
Nitrate, NO3	0.00	< 1
Silica, SiO2		1
Boron, B		0.13
Fluoride, F		0.4

HL4A2
J. Platell
Chief
Water Science Laboratory
7 Jun 85

NOTE. Sample considered not to be representative of formation water.

Government Chemical Laboratories
125 Hay Street, Perth
Western Australia 6000

Telephone: 325 5544

Director
Geological Survey of W.A.
Mineral House
66 Adelaide Terrace
Perth 6000

1 water sample(s), received 13 Feb 86 - Lab numbers 86X 335 to 335
HARVEY DEEP

HL4B

Lab number	86X 335
G.S.W.A. No.	16774
pH	7.6
Colour (A.P.H.A. units)	10
Conductivity (mS/m at 25C)	318

	me/l	mg/l
Total dissolved solids (180C by calc)		1690
Total hardness (as CaCO ₃)		186
Total alkalinity (as CaCO ₃)		170
Calcium, Ca	1.75	35
Magnesium, Mg	1.97	24
Sodium, Na	24.57	565
Potassium, K	0.36	14
Carbonate, CO ₃	0.00	< 2
Bicarbonate, HCO ₃	3.39	207
Chloride, Cl	24.82	880
Sulphate, SO ₄	1.25	60
Nitrate, NO ₃	0.00	< 1
Silica, SiO ₂		8
Boron, B		0.36
Fluoride, F		0.4

KI brown for

P.N. Jack
Acting Chief
Water Science Laboratory
7 Mar 86

Lab No. 82W8407-14

HL4W1

Sample	77903	
Lab No.	8411	
pH	4.2	
Appearance	cloudy	
Colour (A.P.H.A. units)	6	
Odour	paraffinic	
Conductivity (mS/m at 25°C)	78	
	me/l	mg/l
Total dissolved solids (180°C by calc)		479
Total hardness (as CaCO ₃)		170
Total alkalinity (as CaCO ₃)		<2
Calcium, Ca	1.75	35
Magnesium, Mg	1.56	19
Sodium, Na	2.17	50
Potassium, K	0.08	3
Carbonate, CO ₃		<2
Bicarbonate, HCO ₃		<2
Chloride, Cl	1.66	59
Sulphate, SO ₄	6.38	306
Nitrate, NO ₃		<1
Silica, SiO ₂		7
Boron, B		0.21
Fluoride, F		<0.1

This analysis is out of balance due to the low pH. Aluminium was found to be present at 24 mg/l and this brings the ions into acceptable balance.