Network Geotechnics Pty Ltd

ACN 089 211 565
6/6 Marcus Close
TUHIGBERAH NSW 2328
02 4351 6200
02 4351 6300

BOREHOLE LOG

Job No:	GW03/91
Hole No:	BH6
Sheet:	PAGE 1 / 1
Started:	02/03/06
Finished:	02/03/06
Logged:	TS
Checked:	GP
RL Surface:	-
Datum:	-

Client: DAVID LANE & ASSOCIATES

Project: PELICAN BEACH RESORT

Location: 740 PACIFIC HWY, SAPHIRE BAY, COFFS HARBOUR
GPS (-)

Equipment Type: SKID STEER DRILL RIG

Borehole Diameter: -mm (I.D.)100mm (O.D.) Inclination: deg Bearing:

method	water	samples, tests etc	UCS (blows per 150 mm)	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments notes, structure, and additional observations
ADT	Nuisance Encountered		7 9 12 15+	1.0			TARMAC ARGILLITE extremely to distinctly weathered, pale yellow-brown, estimated very low rock strength.	-	-	WEARING COURSE ROCK
			15+	2.0						
			15+	3.0						
			15+	4.0						
				5.0						
				6.0			BH Terminated at 6 m			
				7.0						

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Appendix 3

Sample Inventory

Sample Inventory – Soils.

Sample ID	Date	BTEX	C_6-C_9	C_{10}-C_{36}	PAH	BaP	PCB	OCP	OPP	As	Be	B	Cd	Co	Cr	Cu	Pb	Mn	Hg	Ni	Zn
BH1-0.1	2.03.06				✓	✓	✓	✓	✓	✓			✓		✓	✓	✓		✓	✓	✓
BH1-0.5	2.03.06				✓	✓				✓			✓		✓	✓	✓		✓	✓	✓
BH2-0.3	2.03.06	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓		✓	✓	✓
BH2-0.3A	2.03.06	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓		✓	✓	✓
BH2-1.0	2.03.06				✓	✓				✓			✓		✓	✓	✓		✓	✓	✓
BH3-0.3	2.03.06	✓	✓	✓	✓	✓				✓			✓		✓	✓	✓		✓	✓	✓
BH3-1.0	2.03.06				✓	✓	✓	✓	✓	✓			✓		✓	✓	✓		✓	✓	✓
BH4-0.5	2.03.06	✓	✓	✓	✓	✓				✓			✓		✓	✓	✓		✓	✓	✓
HS-1	2.03.06				✓	✓	✓	✓	✓	✓			✓		✓	✓	✓		✓	✓	✓
BH3-W	2.03.06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Network Geotechnics Pty Ltd

Central Coast Office
6/6 Morton Close, Tuggerah NSW 2259
Telephone (02) 4351 6200 Facsimile (02) 4351 6300
Email gosnetgeo@bigpond.com

G26029/1-A GP:TC
16th March 2006

Attentus Projects and Properties Pty Ltd
c/- David Lane & Associates
3 Isabella Street
CAMPERDOWN NSW 2050

Attention: Bill Jenner

Dear Sir

Re: Pelican Beach Resort, 740 Pacific Highway, Sapphire Bay: Geotechnical Assessment.

1.0 INTRODUCTION

As requested, we have carried out geotechnical studies at the above site in order to provide advice and recommendations on excavation support requirements, footing options, retaining wall parameters and related construction advice for possible site redevelopment. Our Interim Report was issued as a facsimile transmission on 9/3/06. A plan of the site is shown on the attached Drawing No G26029/1-1.

The resort is located at Sapphire Beach about 7 to 8km north of Coffs Harbour. The site is held under two property titles and has a frontage of about 65m to the eastern side of the Pacific Highway. The rear eastern boundary is about 265m long and adjoins Sapphire Beach.

Existing resort structures mostly occupy the southern half of the site and include two Y-shaped low rise buildings with adjoining landscaped garden beds, tennis courts, pool and carparking. The northern portion of the site is mostly vacant.

2.0 FIELDWORK

Fieldwork was carried out on 2nd March, 2006 and included four boreholes (BH1 to BH4) machine augered by a skid steer drill rig to depths ranging from 5.2m to 6.25m. Dynamic cone penetrometer (DCP) soundings were advanced to depths ranging from 4.65m to 6.3m within/adjacent to the boreholes to aid assessment of insitu density/consistency. BH2 and BH3 were completed as temporary open standpipe piezometers to aid assessment of the depth to standing groundwater.

The borehole locations were nominated and selected by the client and Environmental Consultant. The fieldwork was carried out by one of our Geologists who carried out insitu testing and prepared field logs of the boreholes.

Borehole logs are attached and approximate borehole locations are shown on the attached Drawing.

3.0 SITE CONDITIONS

3.1 Surface

The site is situated within regionally undulating terrain. The upper, western portion of the site adjoins the Pacific Highway and the lower, eastern portion of the site adjoins Sapphire Beach. There is estimated to be about 20m to 25m fall from west to east across the site which extends some 250m to 270m.

The western half of the site appears to contain extensive gardens and trees. The eastern portion of the site appears to contain extensive lawns.

3.2 Subsurface

A geological map of the area (Dorrigo – Coffs Harbour 1:250000 series) indicates the site to be underlain by Quaternary Beach and Dune Sand (Qs) and then Greywacke, Slate and Siliceous Argillite of the Carboniferous Coramba Beds (P-Cc).

The subsurface profile encountered at **BH1 and BH4 within the upper, western portion of the site** may be summarised as follows:

Layer	Description	Depth to Base of Layer (m) BH1	BH4
PAVEMENT:	Asphalt (wearing course)	-	0.02
TOPSOIL FILL:	Sandy Silty CLAY	0.1	-
RESIDUAL:	Silty CLAY, medium plasticity, orange-yellow, M≥Wp, stiff	0.8	-
ROCK:	ARGILLITE, extremely to distinctly weathered, pale yellow-brown and orange-grey, dry, estimated very low rock strength	6.0+	6.0+

The subsurface profile encountered **at BH2 and BH3 within the lower, eastern portion of the site** may be summarised as follows:

Layer	Description	Depth to Base of Layer (m) BH2	BH3
PAVEMENT:	Asphalt overlying Clayey Gravelly SAND (basecourse)	-	0.2
FILL:	Sandy CLAY and Sandy GRAVEL	-	1.1

AEOLIAN:	SAND, medium to coarse grained, pale brown and yellow brown, dry/moist becoming wet with depth, dense/medium dense becoming loose/medium dense below about 2m depth		
		3.3	5.0
RESIDUAL:	Gravelly SAND/Sandy GRAVEL, medium to coarse sand, pale yellow-brown, fine to medium gravel, moist-wet, dense: refusal on rock (probable Argillite)		
		5.2	6.25

Groundwater was encountered at depths of 3.0m in BH2 and 4.2m in BH3 at the time of investigation. Groundwater was not encountered within BH1 and BH4 during drilling. However, groundwater levels and seepages may vary with time, rainfall, temperature and other factors.

4.0 DISCUSSION & RECOMMENDATIONS

The investigation has indicated that the western and eastern portions of the site are underlain by distinctly different geologies. Subsurface conditions within the upper western portion generally comprise up to 0.8m depth of stiff residual Silty CLAY, underlain by extremely weathered Argillite rock to the 6m depth limit of investigation. Subsurface conditions within the lower eastern portion generally comprise up to 1.1m depth of Sandy CLAY and Sandy GRAVEL fill, underlain by loose to medium dense aeolian SAND to depths ranging from 3.3m to 5.0m, overlying dense residual Gravelly SAND/Sandy GRAVEL to depths of 5.2m to 6.25m, overlying probable Argillite rock. Groundwater was encountered within the eastern portion of the site at depths of 3.0m and 4.2m below existing surface levels at BH2 and BH3, respectively.

In view of the above, it is anticipated that foundations for possible future development may span Clay and GRAVEL fill, aeolian SAND, residual Silty CLAY and extremely weathered ARGILLITE. It is expected that bulk excavations within these materials may be carried out with conventional earthmoving equipment.

In the absence of site fill records to the contrary, the fill encountered only at BH3 is assessed unlikely to meet engineered fill requirements of AS2870-1996 "Residential Slabs and Footings" or AS3798-1996 "Guidelines on Earthworks for Commercial and Residential Development".

Footing and structural details will need to address the issue of potential differential settlements for buildings which straddle the residual and aeolian geologies. Conventional strip, pad and pier footings may be used within the west portion of the site where relatively shallow, stiff residual Silty CLAY overlying extremely weathered ARGILLITE is expected. Footings may be proportioned for a maximum allowable bearing pressure of up to 100kPa in stiff residual Silty CLAY and up to 300kPa in extremely weathered ARGILLITE. A higher capacity in ARGILLITE (of say 500kPa) may be adopted based on further investigation or inspection during earthworks. Piered footings will be required within the east portion of the site where loose/medium dense aeolian SANDS are expected to depths of about 3m to 6m. It is considered likely that substantial building loads

would need to be founded in dense residual Gravelly SAND or ARGILLITE below this material.

Bored piers are not recommended within the eastern portion of the site due to the presence of groundwater within the aeolian SAND. Driven treated hardwood piles or proprietary screw piles may be considered. Screw piles would be appropriate near existing structures as their installation should not initiate settlement or vibration related damage, as may conventional driven piling options. Footing systems should be designed by a Structural Engineer. Footings should be inspected and approved by a Structural or Geotechnical Engineer prior to placement of concrete.

Being in close proximity to the coastline, Council may require assessment of potential erosion hazards by a Coastal Engineering Consultant. Measures to mitigate erosion hazard can include minimum buffer distances and/or structures considered at risk being plied/pierod to stable strata beneath the depth of possible storm scour.

The site has considerable fall from west to east, particularly within the central portion of the site. Benched development may create the need for extensive cut and fill embankments requiring retaining wall support or batter profiling and protection measures. Unsupported cut and fill should be limited to a height of 1m, battered no steeper than 2H:1V in CLAY or 4H:1V in SAND and vegetated or otherwise protected against erosion. Unsupported temporary batters during construction should not be steeper than 1H:1V in CLAY and 3H:1V in SAND. Contiguous bored piers or other support systems may be required where such batters are not possible due to space restrictions near existing structures or boundaries. These may be designed based on the parameters given below for permanent retaining walls. Cut and fill exceeding 1m height should be supported by engineered retaining walls constructed with provision for subsoil drainage and designed for surcharge loads from sloping ground and/or adjacent structures.

Retaining walls may be designed using the following parameters:

Soil Layer	Unit Weight (Kn/m^3)	Coefficient of active earth pressure (Ka)	Coefficient of passive earth pressure (Kp)
Aeolian: SAND	1.9	0.25	4
Residual: Silty CLAY	1.7	0.4	2.5

Collected surface and runoff water should be discharged in a controlled manner away from structures. Sewerage should be connected to Council's reticulated system.

The above recommendations are generalised and have been based on a limited subsurface investigation without knowledge of possible future site development. We anticipate that further investigation/inspection may be required depending on the nature of future development. In view of the above, we recommend that design plans for any future development be reviewed in conjunction with this report by a Geotechnical Consultant.

This report should be read in conjunction with the attached General Notes. Please contact the undersigned if you require further assistance.

For and on behalf of
Network Geotechnics Pty Ltd

Gary Peake *BE (Civil), GCE*
Senior Geotechnical Engineer

Reviewed by

R J King *BE (Civil)*
Principal Geotechnical Engineer

Encl: Borehole Logs (BH1 to BH4)
Terms & Symbols Sheet
General Notes
Drawing No G26029/1-1 Site Plan

G26029/1-A

Network Geotechnics Pty Ltd

ACN 005 211 561
6/6 Mirror Close
TUGGERAH NSW 2259
02 4351 6200
02 4351 6300

BOREHOLE LOG

Job No:	G/050291
Hole No:	BH8
Sheet:	PAGE 1 / 1
Started:	02/03/06
Finished:	02/03/06
Logged:	TB
Checked:	DP
RL Surface:	-
Datum:	-

Client: DAVID LANE & ASSOCIATES

Project: PELICAN BEACH RESORT

Location: 740 PACIFIC HWY, SAPHIRE BAY, COFFS HARBOUR
GPS (-)

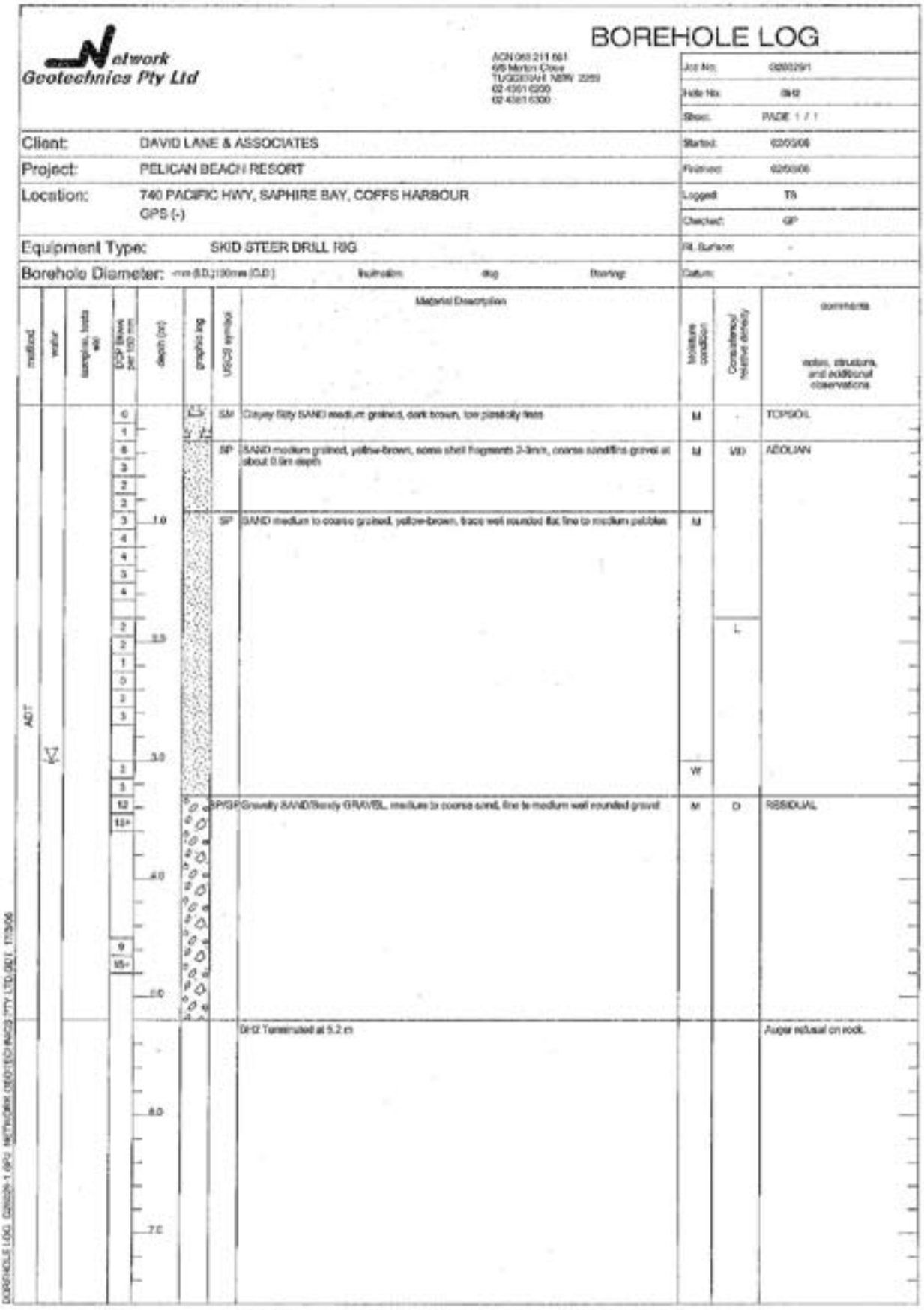
Equipment Type: SKID STEER DRILL RIG

Borehole Diameter: 4mm (I.D.) 109mm (O.D.) Inclination: deg Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments notes, structure, and additional observations
AS*	Some encountered		3 4 6 4 4 7 10+ 15+ 10+ 15+	1.0 2.0 3.0 4.0 5.0 6.0 7.0		CL CL	Sandy Silty CLAY low to medium plasticity, black-brown, fine to medium sand, trace tile fragments Silty CLAY medium plasticity, orange-yellow	>Wp ≈Wp	F St	TOPSOIL FILL RESIDUAL
							ARGILLITE extremely weathered, augers as Silty CLAY, low to medium plasticity, pale yellow-orange-grey, estimated very low rock strength	D	-	ROCK
							BH1 Terminated at 6 m			

BOREHOLE LOG G/050291-1 GPJ NETWORKS GEOTECHNICS PTY LTD.GDT 6/3/06

Refer To Explanation Sheets For Description Of Terms And Symbols Used.



Network Geotechnics Pty Ltd

ACN 063 211 661
6/6 Morton Close
TUGGERAH NSW 2259
02 4351 0200
02 4351 0300

BOREHOLE LOG

Job No:	0200259/1
Hole No:	BH2
Sheet:	PAGE 1 / 1
Started:	02/03/06
Finished:	02/03/06
Logged:	TS
Checked:	GP
Rl. Surface:	-
Datum:	-

Client: DAVID LANE & ASSOCIATES

Project: PELICAN BEACH RESORT

Location: 740 PACIFIC HWY, SAPHIRE BAY, COFFS HARBOUR
GPS (-)

Equipment Type: SKID STEER DRILL RIG

Borehole Diameter: mm (S.D.) 100mm (O.D.) Inclination: deg Bearing:

method	water	samples, tests etc	DCP (Blows per 100 mm)	depth (m)	graphic log	USCS symbol	Material Description	moisture condition	Consistency/ relative density	comments notes, structure, and additional observations
AUT	▽		0 1 6 3 2 2			SM	Clayey Silty SAND medium grained, dark brown, low plasticity fines	M	-	TOPSOIL
			3 4 4 3 4	1.0		SP	SAND medium grained, yellow-brown, some shell fragments 2-3mm, coarse sand/fine gravel at about 0.9m depth	M	MD	AEOLIAN
			2 2 1 0 3 3	2.5		SP	SAND medium to coarse grained, yellow-brown, trace well rounded flat fine to medium pebbles	M	L	
			2	3.0				W		
			5 12 15+			GP/GP	Gravelly SAND/Sandy GRAVEL, medium to coarse sand, fine to medium well rounded gravel	W	D	RESIDUAL
			9 15+	4.0						
				5.0			BH2 Terminated at 5.2 m			Auger refusal on rock.
				6.0						
				7.0						

DDBOREHOLE LOG GINDEX 1.GPJ NETWORK GEOTECHNICS PTY LTD 8/01 11/3/06

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

BOREHOLE LOG

Network Geotechnics Pty Ltd

ACN 003 211 661
6/6 Morton Close
THORNTON NSW 2259
02 4351 5300
02 4351 6300

Job No:	G0802/01
Hole No:	BH3
Sheet:	PAGE 1 / 1
Started:	01/03/06
Finished:	01/03/06
Logged:	TS
Checked:	DP
RL Surface:	-
Datum:	-

Client: DAVID LANE & ASSOCIATES

Project: PELICAN BEACH RESORT

Location: 740 PACIFIC HWY, SAPPHIRE BAY, COFFS HARBOUR
GPS (-)

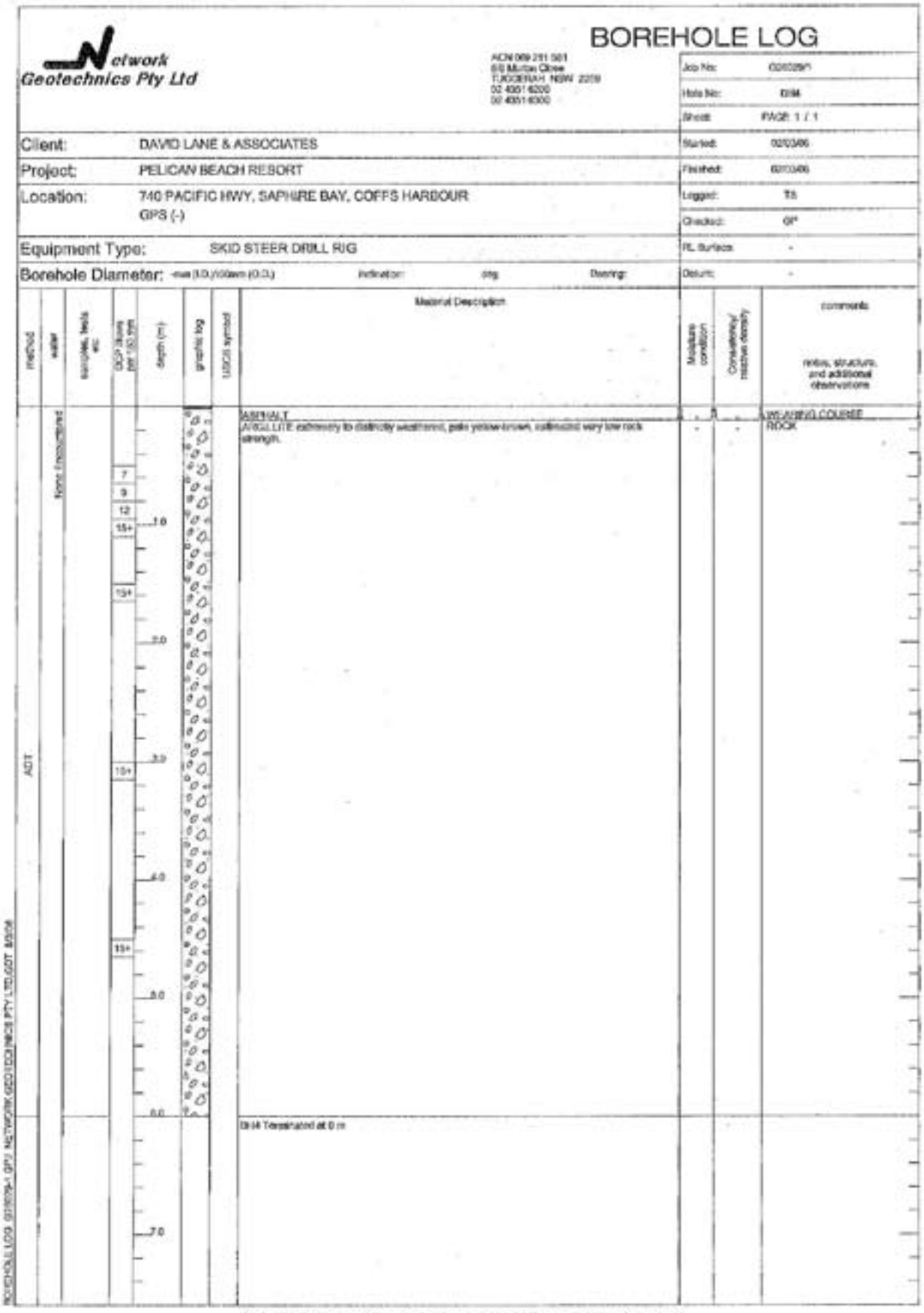
Equipment Type: SKID STEER DRILL RIG

Borehole Diameter: mm (0.0) to 0mm (0.0) Inclination: deg Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	moisture condition	Consistency/ relative density	comments: notes, structure, and additional observations
ADT	▽		9 10 10 10	1.0		SP	MEDIUM T (Gravelly Clayey SAND fine to medium grained, red-brown, low to medium plasticity fines, fine gravel	M M/D	- -	WEARING COURSE SUBSECOURSE
						CL	Sandy CLAY low to medium plasticity, red-brown/yellow-brown, fine to medium sand	>WP	-	FILL
			10 10 15			SP	Sandy GRAVEL (crushed shale), fine to medium grained, dark grey, medium sand	M	-	
			10 8 6			SP	SAND medium grained, pale brown becoming pale yellow-brown below 1.0m depth, trace coarse sand	M/D	D	AEOLIAN
			5 4 3	2.0		SP	SAND medium to coarse grained, pale yellow-brown, trace fine gravel	D/M	MD	
			8 3 3							
			3 12 15	3.0					D-MD	
			15+ 15 8							
			6	4.0						
			3 7 7							
			15+	5.0		SP/GP	Gravelly SAND/Sandy GRAVEL, medium to coarse sand, pale yellow-brown, fine to medium gravel	W	D	RESIDUAL
			4 15+	6.0						
							BH3 Terminated at 6.25 m			Auger refusal on rock
				7.0						

BOREHOLE LOG G0802/01 GEO NETWORK GEOTECHNICS PTY LTD 9/01 17/3/06

Refer To Explanation Sheets For Description Of Terms And Symbols Used.


Network Geotechnics Pty Ltd
ACN 089 251 561
6/8 Murdoo Close
TUGGERAH NSW 2259
02 4351 6200
02 4351 6300
BOREHOLE LOG
Job No:
Hole No:
Sheet: PAGE 1 / 1
Client: DAVID LANE & ASSOCIATES
Started:
Project: PELICAN BEACH RESORT
Finished:
Location: 740 PACIFIC HWY, SAPPHIRE BAY, COFFS HARBOUR
GPS (-)
Logged: TS
Checked: GP
Equipment Type: SKID STEER DRILL RIG
RL Surface: -
Borehole Diameter:
Inclination:
Bearing:
Datum: -
method
water
samples, tests etc
DCP blows per 150 mm
depth (m)
graphic log
USCS symbol
Material Description
Moisture condition
Consistency/ relative density
comments
notes, structure, and additional observations
ADT
ASPHALT
ARGILLITE extremely to distinctly weathered, pale yellow-brown, calcareous very low rock strength.
WEARING COURSE
ROCK
7
9
12
15+
1.0
15+
2.0
10+
3.0
15+
5.0
8.0
7.0
Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Network Geotechnics Pty Ltd

TERMS AND SYMBOLS

SOIL DESCRIPTIONS

Moisture Condition

D	Dry
M	Moist
W	Wet
Wp	Plastic Limit
Wl	Liquid Limit
MC	Moisture Content

Consistency		Cu (kPa)
VS	Very Soft	<25
S	Soft	25 – 50
F	Firm	50 – 100
St	Stiff	100 – 200
VSt	Very Stiff	200 – 400
H	Hard	>400
Fb	Friable	

Density Index		I_D (%)
VL	Very Loose	< 15
L	Loose	15 – 35
MD	Medium Dense	35 – 65
D	Dense	65 – 85
VD	Very Dense	> 85

ROCK DESCRIPTIONS

Weathering

Rs	Residual Soil
XW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
DW	Distinctly Weathered
SW	Slightly Weathered
FR	Fresh

(DW covers both HW & MW)

Strength		Is (50) MPa
EL	Extremely Low	< 0.03
VL	Very Low	0.03 – 0.1
L	Low	0.1 – 0.3
M	Medium	0.3 – 1
H	High	1 – 3
VH	Very High	3 – 10
EH	Extremely High	> 10

Structure	Spacing
Thinly Laminated	< 6mm
Laminated	6 – 20mm
Very thinly bedded	20 – 60mm
Thinly bedded	60 – 200mm
Medium bedded	0.2 – 0.6m
Thickly bedded	0.6 – 2.0m
Very thickly bedded	> 2.0m

NOTE: Soil And rock descriptions are based on AS 1726 - 1993

Natural Fractures

Type		Shape	
JT	Joint	pl	Planar
BP	Bedding plane	cu	Curved
SM	Seam	un	Undulose
FZ	Fractured zone	st	Stepped
SZ	Shear zone	ir	Irregular
VN	Vein		

Infill or Coating		Roughness	
Cn	Clean	pol	Polished
Cl	Clay	slk	Slickensided
Ca	Calcite	smo	Smooth
Fe	Iron oxide	rou	Rough
Mi	Micaceous	vro	Very rough
Qz	Quartz		

EXCAVATION/DRILLING METHOD AND CASING

BH	Backhoe/excavator bucket
NE	Natural exposure
HE	Hand excavation
AS	Auger Screwing *
AD	Auger Drilling *
R	Rolls/Tricone
W	Washbore

denotes bit shown by suffix

B	Blank Bit
V	"V" Shaped Bit
T	Tungsten Carbide Bit
NMLC	NMLC Core Drilling
NQ/HQ	Wireline Core Drilling
C	Casing
M	Mud

SAMPLES/TESTS

B	Bulk sample
D	Disturbed sample
U50	Thin-walled tube sample (50mm diameter)
PP	Pocket penetrometer (kPa)
N*	SPT (blows per 300mm) *denotes sample taken
Nc	SPT with solid cone
R	SPT refusal

VANE SHEAR TESTS

s_v	Vane shear strength Peak/residual (kPa) and Vane size (mm)

WATER MEASUREMENTS

▼	Water level
▲–	Water inflow
–▲	Water outflow

Network Geotechnics Pty Ltd

GENERAL NOTES

GENERAL

Geotechnical reports present the results of investigations carried out for a specific project and usually for a specific phase of the project (e.g. preliminary design). The report may not be relevant for other phases of the project (e.g. construction), or where project details change.

SOIL AND ROCK DESCRIPTIONS

Soil and rock descriptions are based on AS 1726 – 1993, using visual and tactile assessment except at discrete locations where field and / or laboratory tests have been carried out. Refer to the terms and symbols sheet for definitions.

GROUNDWATER

The water levels indicated on the logs are taken at the time of measurement and depending on material permeability may not reflect the actual groundwater level at those specific locations. Also, groundwater levels can vary with time due to seasonal or tidal fluctuations and construction activities.

INTERPRETATION OF RESULTS

The discussion and recommendations in the accompanying report are based on extrapolation / interpolation from data obtained at discrete locations. The actual interface between the materials may be far more gradual or abrupt than indicated. Also, actual conditions in areas not sampled may differ from those predicted.

CHANGE IN CONDITIONS

Subsurface conditions can change with time and can vary between test locations. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions.

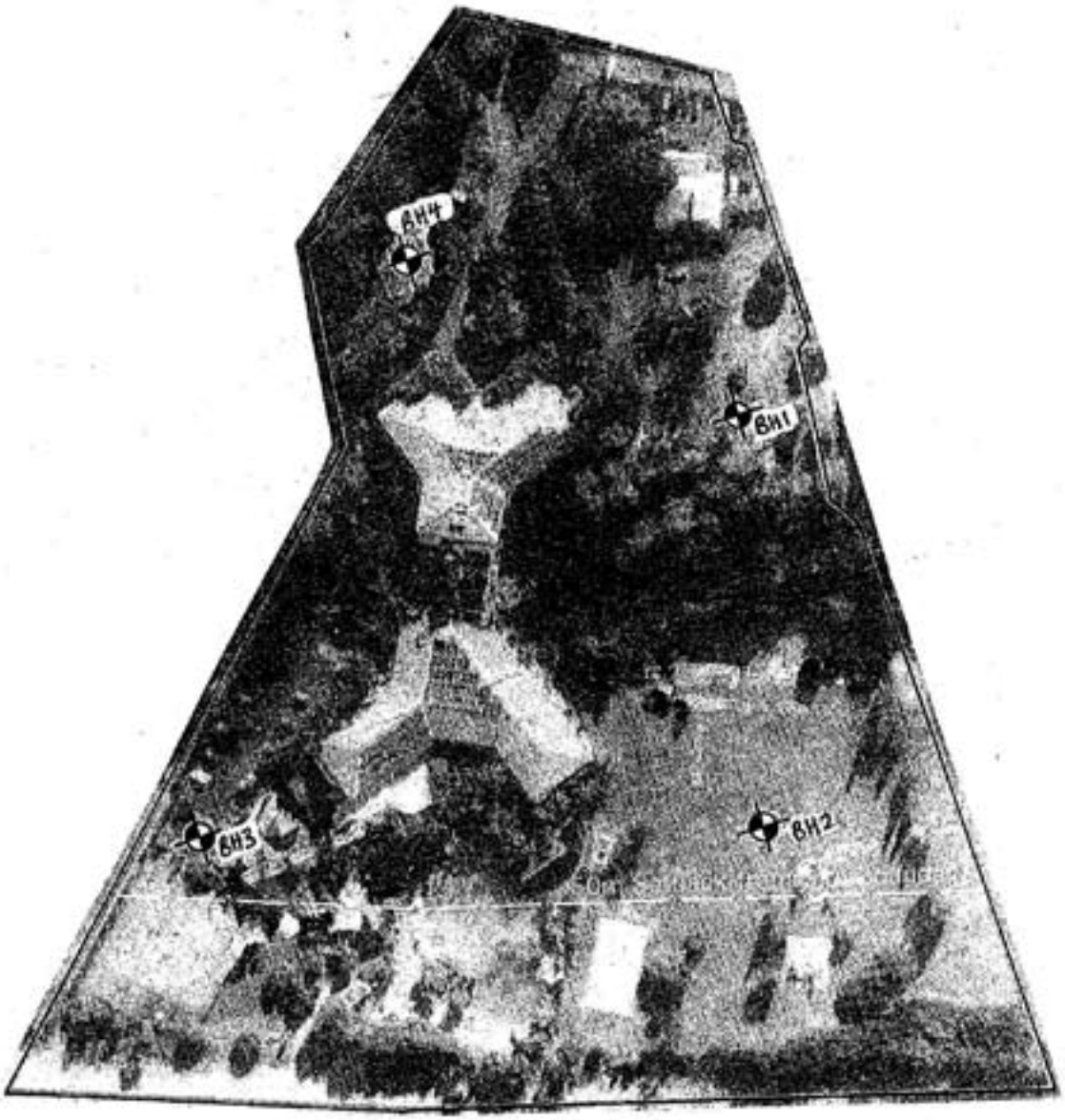
REPRODUCTION OF REPORTS

 Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimise the likelihood of misinterpretation from logs.

FURTHER ADVICE

Network Geotechnics would be pleased to further discuss how any of the above issues could affect your specific project. We would also be pleased to provide further advice or assistance including:

- assessment of suitability of designs and construction techniques;
- contract documentation and specification;
- construction control testing (earthworks, pavement materials, concrete);
- construction advice (foundation assessments, excavation support).



LEGEND

Approx location of boreholes

Network Geotechnics Pty Ltd
ACN 069 211 561

6/6 Horton Close TUGGERAH NSW 2259
Tel: (02) 4351 6200 Fax: (02) 4351 6300
Email: geonetgeo@bigpond.com

SCALE:
AS SHOWN

DRAWING NO:
G26029/1-1

DAVID LANE AND ASSOCIATES
PRELIMINARY GEOTECHNICAL ASSESSMENT

PELICAN BEACH RESORT
PACIFIC HIGHWAY, SAPHIRE BAY
COFFS HARBOUR

SITE PLAN