BORDER-TECH

GEOTECHNICAL ENGINEERING SERVICES

PREPARED FOR
MR LANCE HANSEN
C/- TWEED COAST HOMES PTY LTD

PRELIMINARY
ACID SULFATE SOIL ASSESSMENT

LOTS 1-3 in DP29748 and Lot 4 in DP31209
CYPRESS CRESCENT, CABARITA BEACH, NSW

Ref: BT 19320-A

BORDER-TECH
SUITE 10, 8 CORPORATE HOUSE
CORPORATION CIRCUIT
TWEED HEADS SOUTH NSW 2486
Ph: (07) 5524 6199 Fax: (07) 5524 6533
Email: info@bordertech.com.au
www.bordertech.com

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Border-Tech was commissioned by Mr Lance Hansen to undertake a Preliminary Acid Sulfate Soil (ASS) Assessment at Lots 1-3 in DP29748 and Lot 4 in DP31209 located on the corner of Tweed Coast Road and Cypress Crescent, Cabarita Beach, NSW. It is understood that this report will be submitted as part of a Part 3A Major Project Development Application, to the NSW Department of Planning.

1.1 Scope of Work

Written authorisation to proceed with the following works was provided by Mr Lance Hansen, on behalf of Tweed Coast Homes Pty Ltd on 6 August 2009.

- Excavation of two (2) boreholes to 4.5m below existing surface level
- Screening and laboratory testing of samples
- Compilation of a Preliminary Acid Sulfate Soils Assessment

The investigation was conducted in accordance with the New South Wales Acid Sulfate Soils Advisory Committee (ASSMAC) Guidelines 1998. Laboratory analysis was undertaken in accordance with the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et. al. 2004).

1.1.1 Objectives

The assessment aimed to satisfy the following objectives:

- To determine the presence of acid sulfate soil materials within the site
- To estimate the net acid generating potential of the soil material and
- To provide recommendations where necessary

2.0 PROJECT DISCUSSION

Border-Tech has received a consultant brief and preliminary conceptual drawings by Pat Twohill Designs Pty Ltd (dated 21/4/09) indicating the type of development proposed for the site. From this information it is understood that the project involves the creation of a three (3) storey development with single storey basement, containing both residential and tourist accommodation.

The complex which is to be accessed via Cypress Crescent, includes lap pool, landscaped gardens and a 49 space basement carpark. Basement excavations are to extend to approximately 3.5m AHD in order to facilitate a basement floor level of 3.95m AHD. This will require an approximate cut depth of between 2.5 and 4.5m.

3.0 SITE DESCRIPTION

The subject site is located on the corner of Tweed Coast Road and Cypress Crescent, Cabarita Beach, NSW, described as Lots 1-3 in DP29748 and Lot 4 in DP31209. A vacant easement borders the site to the north with the Cabarita Beach foreshore approximately 200m to the east. Covering an area of 2822 m^2 the site is currently occupied by a caravan park comprising of approximately 20 permanent sites.

The site is sloping with a fall of approximately 2.0 from the western boundary to the eastern boundary. Elevations range from roughly 6m to 8m AHD.

At the time of the site investigation the caravan park was still occupied.

Figure 1 – Approximate Location of Subject Site

3.1 Geology and Subsurface Conditions

The Geological Survey of Queensland and NSW, Moreton Geology Map, 1:500,000 series, shows the site to be located on a Holocene beach ridge system. Soils in this area will likely consist of quartz and heavy mineral sands deposited as wind borne sediments.

Based on the borehole drilling, the soils onsite consist of a layer of fine-medium dark grey silty sand, overlying fine-medium yellow-pale grey sand to the termination depth of 4.5m. Borehole logs from the ASS and Geotechnical Investigations are attached as Appendix 2.

3.2 Groundwater

Groundwater was encountered at approximately 4.5m below existing surface level at the time of the investigation. The water table may fluctuate with seasonal variations and during periods of high rainfall.

3.3 Acid Sulfate Risk

The Cudgen ASS Risk Map produced by the Department of Land and Water Conservation (DLWC) classifies the site as 'disturbed terrain' which includes filled areas as well as

former mines and dredged sites (DLWC 1997). The area has a known history of sand mining.

4.0 SAMPLING AND ANALYSIS

Site evaluation and sampling was undertaken on 31 August 2009 in order to assess the presence of actual and potential acid sulfate soils within the site. This involved sampling at two (2) locations across the site in conjunction with the geotechnical investigation consisting of three (3) boreholes. Borehole locations are displayed on the attached site map (*see Appendix 1*). Acid sulfate sampling extended to a depth of 4.5m below existing surface or approximately 2.0m AHD in boreholes BH1 and BH3 using a Gold Coast Hydraulic truck mounted drilling rig incorporating spiral flight auguring and undisturbed SPT sample recovery techniques.

Samples were recovered at 0.5m depth intervals and sealed in air tight zip-lock bags. All samples were stored on site below 4°C to prevent oxidation. A total of 18 samples were recovered for field pH and peroxide pH testing, with 9 of these samples selected for laboratory analysis by the Chromium Reducible Sulfur Suite (S_{CR} method 22B).

Screening tests (Field pH and pH oxidation) were conducted by qualified Border-Tech personnel, with laboratory analysis of soil samples by the Chromium Reducible Sulfur Suite (S_{CR}) conducted by Mazlab Pty Ltd at Tweed Heads South, NSW.

5.0 RESULTS AND DISCUSSION

5.1 Screening Tests

Two measurements of pH are made as part of the screening process, both of which are carried out on a soil:water paste. The first of which (pH_F) is used to indicate the current pH of the soil. The second test (pH_{FOX}) uses an oxidising agent in the form of 30% hydrogen peroxide to identify oxidisable sulfur in the soil and measure the potential effect of these compounds on soil pH if oxidised. The reaction rate is noted and logged on a scale from nil to very high.

A soil with an initial pH (pH_F) of less than 4 is considered likely to be an actual acid sulfate soil (AASS), while a soil exhibiting a pH after oxidation (pH_{FOX}) of less than 3 is considered to be a potential acid sulfate soil (PASS) (Dear et al. 2002). Table 1 shows a summary of the screening test results with laboratory certificates attached as Appendix 3.

Table 1: Screening Test Results

Test	Range	Ass Range
pH_F	5.9 – 6.4	<4.0 (AASS)
pH_{FOX}	5.0 – 5.2	<3.0 (PASS)
Reaction to H_2O_2	Nil	Mod – Very high

Screening test results were outside the indicative range for both AASS and PASS. No reactivity to peroxide was recorded in any of the samples suggesting that ASS are not present at the subject site. However as screening tests are indicative only, quantitative laboratory testing was required to confirm this.

5.2 Laboratory Testing

A total of 9 samples were selected for laboratory analysis by the Chromium Reducible Sulfur Suite (S_{CR} Method 22B). Selection for laboratory analysis was based on the most positive screening test results, whilst maintaining a representative spread of samples through the soil profile.

Table 2 displays a summary of the Chromium Reducible Sulfur test results and the acid base account (ABA). The ABA assesses the risk of acid production by using the following formula:

$$Net\ Acidity = S_{CR} + TAA + S_{NAS} - ANC$$

Where:

- S_{CR} = Potential Sulfidic Acidity (Mol H^+/t)
- TAA = Actual Acidity (Mol H^+/t)
- S_{NAS} = Retained Acidity (Mol H^+/t)
- ANC = Measured Acid Neutralising Capacity / Fineness Factor (Mol H^+/t)

Table 2: Acid Base Accounting

Sample	pH KCL	S_{CR} (S%)	S_{CR} (Mol H^+/t)	TAA (Mol H^+/t)	S_{NAS} (Mol H^+/t)	ANC (Mol H^+/t)	Net Acidity (Mol H^+/t)
BH01 0.00 – 0.50	4.8	<0.01	<2	10	-	-	10
BH01 1.00 – 1.50	5.3	<0.01	<2	2	-	-	2
BH01 2.00 – 2.50	5.4	<0.01	<2	5	-	-	5
BH01 3.00 – 3.50	5.8	<0.01	<2	2	-	-	2
BH01 4.00 – 4.50	6.1	<0.01	<2	3	-	-	3
BH03 0.50 – 1.00	5.8	<0.01	<2	2	-	-	2
BH03 1.50 – 2.00	5.6	<0.01	<2	5	-	-	5
BH03 2.50 – 3.00	5.6	<0.01	<2	5	-	-	5
BH03 3.50 – 4.00	6.2	<0.01	<2	2	-	-	2

Note: BH03 is recorded as BH02 on the Mazlab Pty Ltd laboratory Certificate.

5.3 Results Summary and Discussion

Test results indicate the following:

- The soil onsite has a relatively neutral initial pH in the range of 5.9 – 6.4
- None of the samples showed any reactivity to peroxide
- None of the samples submitted for Chromium analysis breached the Oxidisable Sulfur Action Criteria of 0.03%S or had any detectable sulfate
- None of the samples breached the Net Acidity Action Criteria of 18 moles H+/tonne for sandy material

The soils onsite have been shown to exhibit a relatively neutral initial pH with no reactivity to peroxide or possess any detectable oxidisable sulfate, and therefore cannot be considered as ASS. These soils are characteristic of coastal aeolian dune systems which typically do not contain ASS material. Disturbance of the soil onsite for basement excavations is not likely to result in significant levels of mobilised acidity and no further action is proposed.

6.0 CONCLUSION

The results of the investigation suggest that acid sulfate soils are not present at the subject site to a depth of 4.5m below existing surface level. The dark grey - yellow sands found across the site exhibited a relatively neutral pH, and showed little potential to oxidise and produce additional acidity. Disturbance of this material is not going to lead to sulfate oxidation or significant levels of mobilised acidity, and therefore no further action is proposed.

Recommendations set-out in this report are based on the information supplied at the time of assessment. Should any details change, further testing and/or assessment may be required.

Should you require any further information or clarification please do not hesitate to contact the undersigned at this office.

Yours faithfully
For and on behalf of
BORDER - TECH

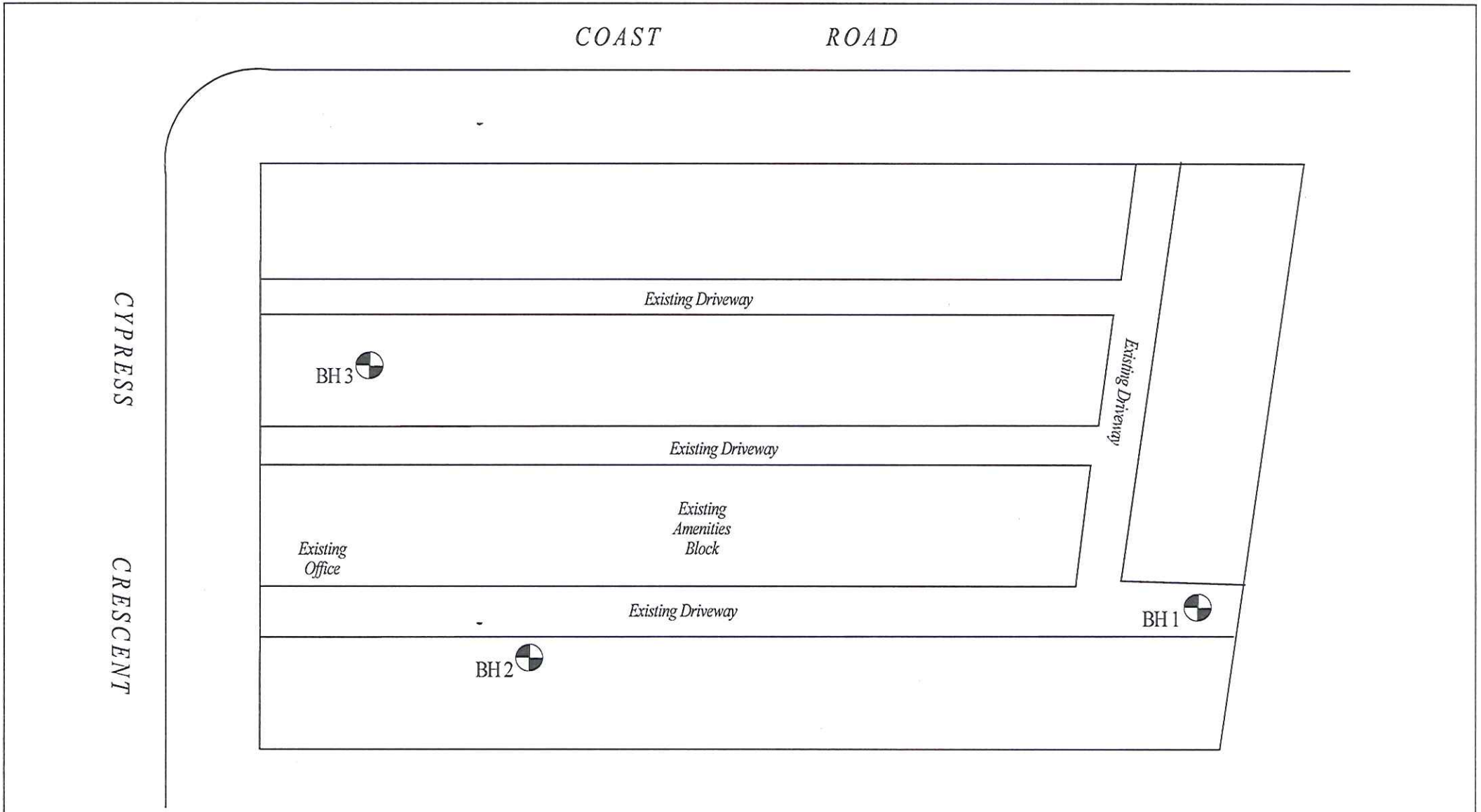
Nathan Piper *B.Sc (Env)*
Environmental Scientist

7.0 REFERENCES

Ahern, C.R., McElnea, A.E, and Sulivan, L.A. (2004). *Acid Sulfate Soils Laboratory Methods Guidelines*. Queensland Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia. ISBN 1 920920 66 8

Dear, S.E., Moore, N.G., Dobos, S.K., Watling, K.M, and Ahern, C.R. (2002). In *Queensland Acid Sulfate Soil Technical Manual*. Queensland Department of Natural Resources and Mines, Indooroopilly, Queensland, Australia.

APPENDIX 1 – SITE PLAN



Note: Drawing not to scale - Diagrammatic only - Measurements are approximate only

BORDER - TECH Unit 10 Corporate House, 8 Corporation Circuit Tweed Heads South NSW 2486	**CLIENT:** LANCE HANSEN c/- TWEED COAST HOMES PTY LTD	**PROJECT:** LOTS 1, 2, 3 & 4 Cnr COAST ROAD & CYPRESS CRESCENT CABARITA	NORTH	**JOB No:** BT 19320-1 **SITE PLAN**

Form A10 Issue 7

APPENDIX 2 - BORELOGS

BORDER – TECH

GEOTECHNICAL ENGINEERING SERVICES
Suite 10, No. 8 Corporation Cct, Tweed Heads South Ph (07) 5524 6199
1/35 Old Pacific Highway, Yatala Ph (07) 3804 6844

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT:	LANCE HANSEN c/- TWEED COAST HOMES PTY LTD	**BOREHOLE I.D. :**	BH 1
PROJECT:	LOTS 1, 2, 3 & 4 Cnr TWEED COAST RD & CYPRESS CRES CABARITA	**JOB NO. :**	BT 19320-A

EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 100mm **APPROXIMATE SL:** 6.5m AHD **PAGE:**1 of 2

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows / 100mm	Structure and additional observation
AD		0.0		(SM) Silty SAND: Fine sand, Moist, Black	L			FILL
		0.5		(SM) Silty SAND: Fine sand, Moist, Dark grey	L			
		1.0		(SP) SAND: Fine to coarse sand, Moist, Dark grey	L			
		1.5		(SP) SAND: Fine sand, Moist, Pale yellow with brown mottling	L-MD	ASS Every 0.5m		ALLUVIUM
		2.0						
		2.5						
		3.0						
		3.5						
		4.0						
	▼	4.5						
MS				*Limit of ASS sampling 4.5m*				
		5.0						
		5.5						

Continued on Page 2

BORDER – TECH

GEOTECHNICAL ENGINEERING SERVICES
Suite 10, No. 8 Corporation Cct, Tweed Heads South Ph (07) 5524 6199
1/35 Old Pacific Highway, Yatala Ph (07) 3804 6844

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT:	LANCE HANSEN c/- TWEED COAST HOMES PTY LTD	**BOREHOLE I.D. :** BH 1
PROJECT:	LOTS 1, 2, 3 & 4 Cnr TWEED COAST RD & CYPRESS CRES CABARITA	**JOB NO. :** BT 19320-A

EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 100mm **APPROXIMATE SL:** 6.5m AHD **PAGE:**1 of 2

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows / 100mm	Structure and additional observation
MS		6.0		(SP) SAND: Fine sand, Moist, Pale yellow with brown mottling	L-MD			ALLUVIUM
		7.0		(GP) Silty GRAVEL: Fine gravel, Moist, Dark brown /black	D			
		7.5		(SM) Silty SAND: Fine sand, Wet, Grey	VD			
		8.5		(SP) SAND: Fine sand, (Indurated), Moist, Dark brown/black	VD			
		9.0						

BH 1 TERMINATED AT 9.15m - LIMIT OF INVESTIGATION

METHOD	WEATHERING	Consistency / Density / Rock Strength		SAMPLES / TESTS
AD auger drilling	HW – Highly	VS - Very Soft	VL - Very Loose	U( ) - undisturbed (size in mm)
RR rock roller	DW – Distinctly	S - Soft	L - Loose	D - disturbed
MS mud support	MW – Moderately	F - Firm	MD - Medium Dense	BS - bulk sample
NMLC rock coring	SW – Slightly	St - Stiff	D - Dense	DCP - dynamic cone penetrometer
WB wash bore	F – Fresh	VSt - Very Stiff	VD - Very Dense	SPT - standard penetrometer test
		Hd - Hard	Fb - Friable	N - Number of blows for SPT / 300mm
WATER		EL - extremely low	VL - very low	VS - Vane Shear
▼ water level		Lw - low	M - medium	A - Acid Sulfate Sample
► water seepage		H - high	VH - very high	PP - Pocket Penetrometer (kPa)
»– partial loss				
–« complete loss				

Logged By: LD **Date:** 26/08/09 **Checked By:** **Date:** 30/9

BORDER – TECH

GEOTECHNICAL ENGINEERING SERVICES
Suite 10, No. 8 Corporation Cct, Tweed Heads South Ph (07) 5524 6199
1/35 Old Pacific Highway, Yatala Ph (07) 3804 6844

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT:	LANCE HANSEN c/- TWEED COAST HOMES PTY LTD	**BOREHOLE I.D. :** | BH 2
PROJECT:	LOTS 1, 2, 3 & 4 Cnr TWEED COAST RD & CYPRESS CRES CABARITA	**JOB NO. :** | BT 19320-A

EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 100mm **APPROXIMATE SL:** 6.0m AHD **PAGE:**1 of 2

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows / 100mm	Structure and additional observation
AD		0.0		(SM) Silty SAND: Fine sand, Moist, Black	L			FILL
				(SM) Silty SAND: Fine to medium sand, Moist, Dark grey	L			
		0.5		(SM) Silty SAND: Fine sand, With fine gravel, Moist, Yellow	L			
		1.0		(SP) SAND: Fine to medium sand, Moist, Pale grey /white	L			ALLUVIUM
		1.5						
		2.0		(SP) SAND: Fine to medium sand, Moist, Pale yellow	L			
		2.5						
		3.0		(SP) SAND: Fine to medium sand, Moist, Orange	L			
		3.5		(SM) Silty SAND: Fine to medium sand, Moist, Pale yellow with brown mottling				
	▼	4.0		(SP) SAND: Fine to medium sand, Moist, Pale yellow	D			
MS		4.5						
		5.0						
		5.5						

Continued on Page 2

BORDER – TECH

GEOTECHNICAL ENGINEERING SERVICES
Suite 10, No. 8 Corporation Cct, Tweed Heads South Ph (07) 5524 6199
1/35 Old Pacific Highway, Yatala Ph (07) 3804 6844

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT: LANCE HANSEN c/- TWEED COAST HOMES PTY LTD	**BOREHOLE I.D. :** BH 2
PROJECT: LOTS 1, 2, 3 & 4 Cnr TWEED COAST RD & CYPRESS CRES CABARITA	**JOB NO. :** BT 19320-A
EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 100mm **APPROXIMATE SL:** 6.0m AHD **PAGE:**2 of 2	

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows / 100mm	Structure and additional observation
MS		6.0		(SP) SAND: Fine to medium sand, Moist, Pale yellow	D			ALLUVIUM
		6.5						
		7.0		(SM) Silty SAND: Fine sand, Wet, Grey	VD			
		7.5						
		8.0						
		8.5						
		9.0		(SP) SAND: Fine sand, (Indurated), Moist, Dark brown/black	VD			

BH 2 TERMINATED AT 9.15m - LIMIT OF INVESTIGATION

METHOD
AD auger drilling
RR rock roller
MS mud support
NMLC rock coring
WB wash bore

WATER
▼ water level
▶ water seepage
»– partial loss
–« complete loss

WEATHERING
HW – Highly
DW – Distinctly
MW – Moderately
SW – Slightly
F – Fresh

Consistency / Density / Rock Strength
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
Hd - Hard
EL - extremely low
Lw - low
H - high
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense
Fb - Friable
VL - very low
M - medium
VH - very high

SAMPLES / TESTS
U( ) - undisturbed (size in mm)
D - disturbed
BS - bulk sample
DCP - dynamic cone penetrometer
SPT - standard penetrometer test
N - Number of blows for SPT / 300mm
VS - Vane Shear
A - Acid Sulfate Sample
PP - Pocket Penetrometer (kPa)

Logged By:	LD	**Date:**	31/08/09	**Checked By:**		**Date:** 30/9

BORDER – TECH

GEOTECHNICAL ENGINEERING SERVICES
Suite 10, No. 8 Corporation Cct, Tweed Heads South Ph (07) 5524 6199
1/35 Old Pacific Highway, Yatala Ph (07) 3804 6844

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT:	LANCE HANSEN c/- TWEED COAST HOMES PTY LTD	**BOREHOLE I.D. :**	BH 3
PROJECT:	LOTS 1, 2, 3 & 4 Cnr TWEED COAST RD & CYPRESS CRES CABARITA	**JOB NO. :**	BT 19320-A

EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 100mm **APPROXIMATE SL:** 6.5m AHD **PAGE:**1 of 2

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows / 100mm	Structure and additional observation
AD		0.0		(SM) Silty SAND: Fine sand, Moist, Black	L			FILL
				(SM) Silty SAND: Fine to medium sand, Moist, Dark grey	L			
		0.5		(SM) Silty SAND: Fine sand, Moist, Yellow/brown	L			
		1.0		(SP) SAND: Fine to medium sand, Moist, Pale grey /white	L			ALLUVIUM
		1.5						
		2.0		(SP) SAND: Fine to medium sand, Moist, Yellow /brown	L	ASS Every 0.5m		
		2.5		(SP) SAND: Fine to medium sand, Moist, Orange	L			
		3.0						
		3.5		(SP) SAND: Fine to medium sand, Moist, Pale yellow /brown	L			
		4.0						
		4.5		(SP) SAND: Fine to medium sand, Moist, Pale yellow	D			
MS	▼	5.0		*Limit of ASS sampling 4.5m*				
		5.5		*Continued on Page 2*				

BORDER – TECH

GEOTECHNICAL ENGINEERING SERVICES
Suite 10, No. 8 Corporation Cct, Tweed Heads South Ph (07) 5524 6199
1/35 Old Pacific Highway, Yatala Ph (07) 3804 6844

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT: LANCE HANSEN c/- TWEED COAST HOMES PTY LTD	**BOREHOLE I.D. :** BH 3
PROJECT: LOTS 1, 2, 3 & 4 Cnr TWEED COAST RD & CYPRESS CRES CABARITA	**JOB NO. :** BT 19320-A

EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 100mm **APPROXIMATE SL:** 6.5m AHD **PAGE:**2 of 2

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample/ Test	DCP Blows / 100mm	Structure and additional observation
MS		6.0		(SP) SAND: Fine to medium sand, Moist, Pale yellow	D			ALLUVIUM
		6.5						
		7.0		(SM) Silty SAND: Fine sand, Wet, Grey	VD			
		7.5						
		8.0						
		8.5						
		9.0		(SP) SAND: Fine sand, (Indurated), Moist, Dark brown/black	VD			

BH 3 TERMINATED AT 9.15m - LIMIT OF INVESTIGATION

METHOD
AD auger drilling
RR rock roller
MS mud support
NMLC rock coring
WB wash bore

WATER
▼ water level
▶ water seepage
»– partial loss
–« complete loss

WEATHERING
HW – Highly
DW – Distinctly
MW – Moderately
SW – Slightly
F – Fresh

Consistency / Density / Rock Strength

VS - Very Soft	VL - Very Loose
S - Soft	L - Loose
F - Firm	MD - Medium Dense
St - Stiff	D - Dense
VSt - Very Stiff	VD - Very Dense
Hd - Hard	Fb - Friable
EL - extremely low	VL - very low
Lw - low	M - medium
H - high	VH - very high

SAMPLES / TESTS
U( ) - undisturbed (size in mm)
D - disturbed
BS - bulk sample
DCP - dynamic cone penetrometer
SPT - standard penetrometer test
N - Number of blows for SPT / 300mm
VS - Vane Shear
A - Acid Sulfate Sample
PP - Pocket Penetrometer (kPa)

Logged By:	LD	**Date:**	31/08/09	**Checked By:**		**Date:**	30/9

APPENDIX 3 – LABORATORY CERTIFICATES

BORDER-TECH
GEOTECHNICAL ENGINEERING SERVICES
ABN 22 379 074 308

Head Office & Engineering
Suite 10 Corporate House
8 Corporation Circuit
PO Box 6340
Tweed Heads South NSW 2486

telephone: 07 55 246 199
facsimile: 07 55 246 533
info@bordertech.com.au
www.bordertech.com.au

Project: Cypress Crescent, Bogangar, NSW
Job No: BT 19320-A

Date: 31/8/09

SCREENING TEST RESULTS

Sample No.	Bag No.	Soil Description	Reaction to H_2O_2	pH_F	pH_{FOX}
E19095	BH01 0 – 0.5	Silty SAND (SM): Dark grey	Nil	5.9	5.0
E19096	BH01 0.5 – 1.0	SAND (SP): Dark grey	Nil	6.3	5.2
E19097	BH01 1.0 – 1.5	SAND (SP): Dark grey	Nil	6.0	5.1
E19098	BH01 1.5 – 2.0	SAND (SP): Pale yellow with brown mottling	Nil	6.0	5.1
E19099	BH01 2.0 – 2.5	SAND (SP): Pale yellow with brown mottling	Nil	6.2	5.2
E19100	BH01 2.5 – 3.0	SAND (SP): Pale yellow with brown mottling	Nil	6.3	5.2
E19101	BH01 3.0 – 3.5	SAND (SP): Pale yellow with brown mottling	Nil	6.2	5.2
E19102	BH01 3.5 – 4.0	SAND (SP): Pale yellow with brown mottling	Nil	6.3	5.2
E19103	BH01 4.0 – 4.5	SAND (SP): Pale yellow with brown mottling	Nil	6.1	5.2
E19104	BH03 0 – 0.5	Silty SAND (SM): Dark grey	Nil	6.4	5.2
E19105	BH03 0.5 – 1.0	SAND (SP): Pale grey/white	Nil	6.2	5.2
E19106	BH03 1.0 – 1.5	SAND (SP): Pale grey/white	Nil	6.1	5.0
E19107	BH03 1.5 – 2.0	SAND (SP): Yellow/brown	Nil	6.2	5.1
E19108	BH03 2.0 – 2.5	SAND (SP): Yellow/brown	Nil	6.1	5.1
E19109	BH03 2.5 – 3.0	SAND (SP): Pale yellow/brown	Nil	6.1	5.1
E19110	BH03 3.0 – 3.5	SAND (SP): Pale yellow/brown	Nil	6.3	5.2
E19111	BH03 3.5 – 4.0	SAND (SP): Pale yellow/brown	Nil	6.2	5.2
E19112	BH03 4.0 – 4.5	SAND (SP): Pale yellow/brown	Nil	6.1	5.2

Screening Test Methods as per Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1. (Watling, K.M., Ahern, C.R, and Hey, K.M. 2004.)

MAZLAB Pty Ltd
Environmental Testing, Sampling and Drilling (Vibracore)
ABN 44 334 849 724 ACN 109 324 370

33B Machinery Dve PO Box 3218 Phone: 07 5523 9922
Tweed Heads South Tweed Heads South Fax: 07 5523 9822
NSW 2486 NSW 2486 Email: mazlab@bigpond.com

Client: Border Tech
Mazlab Job No: BTT 1935

Project: Cypress Cres, Bogangar (BT19320-A)
Date: 04/09/2009

Certificate of Test Results – Chromium Reducible Sulphur

Sample No.	Client I.D	Soil Description (truncated)	pH KCL	SCr mol H+/t %S	TAA mol H+/t %S	SNAS mol H+/t %S	ANC mol H+/t NAG Screaction limit	Net Acidity mol H+/t %S	Liming Rate (Kg/dry t)
23492	BH01 0.00-0.50m	Silty SAND(SM) grey-dark grey	4.8	<2 <0.01%	10 0.02%	- -	- -	10	Nil
23493	BH01 1.00-1.50m	SAND(SP) light orange-brown, traces of light grey	5.3	<2 <0.01%	2 <0.01%	- -	- -	2	Nil
23494	BH01 2.00-2.50m	SAND(SP) brown-orange brown	5.4	<2 <0.01%	5 0.01%	- -	- -	5	Nil
23495	BH01 3.00-3.50m	SAND(SP) light brown	5.8	<2 <0.01%	2 <0.01%	- -	- -	2	Nil
23496	BH01 4.00-4.50m	SAND(SP) light grey	6.1	<2 <0.01%	3 <0.01%	- -	- -	3	Nil
23497	BH02 0.50-1.00m	SAND(SP) light grey-brown	5.8	<2 <0.01%	2 <0.01%	- -	- -	2	Nil
23498	BH02 1.50-2.00m	SAND(SP) orange-brown, traces of light grey	5.6	<2 <0.01%	5 0.01%	- -	- -	5	Nil
23499	BH02 2.50-3.00m	SAND(SP) orange-brown, traces of light grey	5.6	<2 <0.01%	5 0.01%	- -	- -	5	Nil
23500	BH02 3.50-4.00m	SAND(SP) light grey-brown	6.2	<2 <0.01%	2 <0.01%	- -	- -	2	Nil

SENT DATE 4/9/09 BY

Checked By: Date:

Laboratory Test Methods follow procedures described in : QASSIT – Acid Sulphate Soils Laboratory Methods Guidelines – Version 2.1 June 2004

Form Number MAZREP08