

APPENDIX D

ACID SULFATE SOIL INVESTIGATIONS

**BORDERTECH
NOVEMBER 2003**

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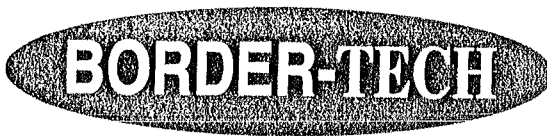
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GEOTECHNICAL ENGINEERING SERVICES

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SOIL TESTING LABORATORIES • COMPACTION CONTROL • FOUNDATION DRILLING & ENGINEERING DESIGN

DB:db:BT 12582

28 November 2003

Codlea Pty Ltd

c/- Martin Findlater & Associates Pty Ltd

PO Box 216

Murwillumbah NSW 2484

Attention: Martin Findlater

Dear Sir

Re: Bayside Brunswick Estate – ASS and Water Quality Testing

As requested we have undertaken the acid sulfate soils and water quality sampling and testing at the above location. All fieldwork was undertaken on 17 November 2003.

Acid Sulfate Soils Sampling

Samples were recovered directly from spiral flight augers at 0.5m depth increments to a total depth of 2.0m below the existing surface level. The 23 borehole locations are displayed in Appendix 1.

The Soil profile within each borehole was logged according to AS 1726-1993 'Geotechnical Site Investigations'. Soil profiles at each sampling location are presented in the form of Borelogs and are attached as Appendix 2.

All samples were sealed in plastic bags with excess air evacuated and stored on site below 4°C to prevent oxidation. A total of 92 samples were recovered for field pH and hydrogen peroxide oxidation testing. All samples were registered prior to testing at our Beenleigh laboratory. A total of 10 samples were selected for laboratory analysis by the POCAS method, and delivered to Mazlab.

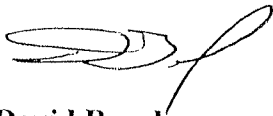
Certificates of test results for all acid sulfate soils screening and POCAS tests are attached as Appendix 3.

Surface Water Sampling

Surface water samples were recovered at five of the requested eight locations. The eastern swale drain was dry at the time of sampling, therefore no samples were obtained in this area. All samples were preserved on-site below 4°C to prevent degradation. Samples were delivered to the Tweed Laboratory Centre and analysed for pH, EC, total nitrogen and total phosphorous. Laboratory results are presented in Appendix 3.

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

Yours faithfully
For and on behalf of
BORDER - TECH



David Bayel
Environmental Scientist

Appendix 1 – Borehole Locations

Client

Codlea Pty Ltd
c/- Martin Findlater & Associates Pty Ltd

Project

Proposed Subdivision at
Bayside Brunswick Estate
Brunswick Heads

Job Number : BT 12582
Figure Number : 1 of 2



FIGURE 1. ACID SULFATE SOILS BOREHOLE LOCATIONS

Plan supplied by - Martin Findlater & Associates Pty Ltd

Scale n/a

Do Not Scale - Printed Dimensions Only

Appendix 2 – Borelogs

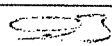
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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 3	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200			HOLE DIAMETER: 100mm			
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
ALLUVIUM			0.2		Silty SAND: Fine grained sand, Dry to moist, Grey (SM)	
			1.1		SAND: Fine grained sand, Moist to very moist, Pale grey/brown (SP)	
			2.0		Silty SAND: Fine grained sand, Very moist to wet, Grey /brown (SM)	
					BH 3 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By 		Date 26/11/03

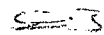
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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 5	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200					HOLE DIAMETER: 100mm	
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.6		Silty SAND: Fine grained sand, Some organic material (Decomposed vegetable matter), Moist, Dark grey (SM)	
ALLUVIUM			1.0		SAND: Fine grained sand, Trace of silt, Moist, Grey /brown (SP)	
			1.6		Silty SAND: Fine grained sand, Very moist, Grey (SM)	
			2.0		Silty SAND: Fine grained sand, Wet, Grey/brown (SM)	
					BH 5 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By 		Date 26/11/03

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CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 8	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200					HOLE DIAMETER: 100mm	
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.4		Silty SAND: Fine grained sand, Moist, Grey (SM)	
ALLUVIUM			1.6		SAND: Fine grained sand, Very moist, Pale brown (SP)	
			2.0		Silty SAND: Fine grained sand, Wet, Dark grey/brown (SM)	
					BH 8 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By		Date 26/11/03

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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 9	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200					HOLE DIAMETER: 100mm	
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		Silty SAND: Fine grained sand, Moist, Dark grey (SM)	
ALLUVIUM			1.2		SAND: Fine grained sand, Moist, Pale brown (SP)	
			1.6		Silty SAND: Fine grained sand, Very moist, Grey (SM)	
			2.0		Silty SAND: Fine grained sand, Very moist to wet, Grey/brown (SM)	
					BH 9 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By: 		Date 26/1/03

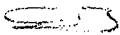
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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 10	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200			HOLE DIAMETER: 100mm			
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		Silty SAND: Fine grained sand, Moist, Dark grey (SM)	
ALLUVIUM			0.7		SAND: Fine grained sand, Moist, Pale brown (SP)	
			2.0		Silty SAND: Fine grained sand, Very moist to wet, Grey/brown (SM)	
					BH 10 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By 		Date 26/11/03

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BOREHOLE PROFILE

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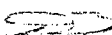
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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 12	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200			HOLE DIAMETER: 100mm			
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		Silty SAND: Fine grained sand, Some organics material (Decomposed vegetable matter), Moist, Dark grey (SM)	
AEOLIAN			2.0		SAND: Fine grained sand, Dry to moist, Pale grey (SP)	
					BH 12 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By 		Date 26/11/03

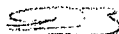
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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 13	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200			HOLE DIAMETER: 100mm			
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		Silty SAND: Fine grained sand, Some organics material (Decomposed vegetable matter), Moist, Dark grey (SM)	
ALLUVIUM			0.6		SAND: Fine grained sand, Moist to very moist, Pale brown (SP)	
					SAND: Fine grained sand, Very moist to wet, Dark grey/brown (SP)	
			2.0		BH 13 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW Date 17/11/03 Checked By  Date 26/11/03						

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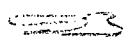
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BOREHOLE PROFILE

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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 16	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200			HOLE DIAMETER: 100mm			
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.6		Silty SAND: Fine grained sand, Dry to moist, Grey (SM)	
AEOLIAN			2.0		SAND: Fine grained sand, Dry to moist to wet, Pale brown (SP)	
					BH 16 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Drawn By DAW		Date 17/11/03		Checked By 		Date 26/11/03

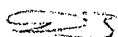
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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 17	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200			HOLE DIAMETER: 100mm			
Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		Silty SAND: Fine grained sand, Moist, Grey (SM)	
ALLUVIUM			1.3		SAND: Fine grained sand, Dry to moist to wet, Pale brown (SP)	
			2.0		Silty SAND: Fine grained sand, Moist to wet, Grey/brown (SM)	
					BH 17 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By 		Date 26/11/03

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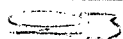
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CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD					BOREHOLE No: BH 19	
PROJECT: BAYSIDE BRUNSWICK ESTATE					JOB No: BT 12582	
EQUIPMENT TYPE: JACRO 200					HOLE DIAMETER: 100mm	
Geological Profile	Samples	W A T E R	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.6		Silty SAND: Fine grained sand, Some organics material (Decomposed vegetable matter), Moist, Dark grey (SM)	
AEOLIAN			2.0		SAND: Fine grained sand, Dry to moist, Pale grey (SP)	
					BH 19 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By		Date 26/11/03

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BOREHOLE PROFILE

CLIENT: CODLEA PTY LTD c/- MARTIN FINDLATER & ASSOCIATES PTY LTD				BOREHOLE No: BH 20		
PROJECT: BAYSIDE BRUNSWICK ESTATE				JOB No: BT 12582		
EQUIPMENT TYPE: JACRO 200			HOLE DIAMETER: 100mm			
Geological Profile	Samples	WATER	Depth in m	Graphic Log	Soil or Rock Type, Structure	Consistency/ Rel. Density
TOPSOIL			0.2		Silty SAND: Fine grained sand, Some organics material (Decomposed vegetable matter), Moist, Dark grey (SM)	
AEOLIAN			2.0		SAND: Fine grained sand, Dry to moist, Pale grey (SP)	
					BH 20 TERMINATED AT 2.0m LIMIT OF INVESTIGATION	
Logged By DAW		Date 17/11/03		Checked By  Date 26/11/03		

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Geotechnical Engineering Services

12 GREENWAY DRIVE, SOUTH TWEED HEADS

1/35 OLD PACIFIC HIGHWAY, YATALA

ACID SULFATE SOILS SCREENING TEST RESULTS

pH_F pH_{FOX}

CLIENT: CODLEA PTY LTD C/- MARTIN FINDLATER &
ASSOCIATES PTY LTD

JOB No: 12582

PROJECT: BAYSIDE BRUNSWICK ESTATE

Sample #	Location & Depth	Soil Classification	Date Sampled	Reaction to HCl	Reaction to H ₂ O ₂	pH_F 1:05 suspension in 1MNaCl	pH_{FOX} 1:05 suspension in 1MNaCl
49131	BH1 0.5	Silty SAND(SM)Pale brown with grey	17/11/03	Nil	Nil	3.7	3.6
49132	BH1 1.0	SAND(SP)Pale grey/brown	17/11/03	Nil	Nil	3.9	3.6
49133	BH1 1.5	Silty SAND(SM)Dark grey/brown mottle	17/11/03	Nil	Nil	3	2.5
49134	BH1 2.0	Silty SAND(SM)Dark grey/brown mottle	17/11/03	Nil	Nil	3.1	2.6
49135	BH2 0.5	Silty SAND(SM) Pale grey	17/11/03	Nil	Nil	3.7	3.6
49136	BH2 1.0	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.5	3.3
49137	BH2 1.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.2	3.1
49138	BH2 2.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.6	3.5
49139	BH3 0.5	Silty SAND(SM) Pale grey	17/11/03	Nil	Nil	3.8	3.5
49140	BH3 1.0	SAND(SP) Pale brown	17/11/03	Slight	Nil	3.8	3.4
49141	BH3 1.5	Silty SAND(SM) Grey/brown	17/11/03	Slight	Nil	3.3	2.8
49142	BH3 2.0	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3.5	3.2
49143	BH4 0.5	Silty SAND(SM) Pale grey	17/11/03	Nil	Nil	3.6	3.4
49144	BH4 1.0	SAND(SP) Pale brown	17/11/03	Slight	Nil	3.3	2.9
49145	BH4 1.5	Silty SAND(SM)Dark grey/brown mottle	17/11/03	Nil	Nil	3.6	2.9
49146	BH4 2.0	Silty SAND(SM) Brown	17/11/03	Nil	Nil	3	3.2
49147	BH5 0.5	Silty SAND(SM)Pale brown/grey mottle	17/11/03	Nil	Nil	3.8	2.7
49148	BH5 1.0	SAND(SP) Grey with brown mottle	17/11/03	Nil	Nil	3.4	3.4
49149	BH5 1.5	Silty SAND(SM) Grey	17/11/03	Nil	Nil	3.4	3.1
49150	BH5 2.0	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3.7	3
49151	BH6 0.5	Silty SAND(SM)Pale brown/grey mottle	17/11/03	Nil	Nil	3.6	3.3
49152	BH6 1.0	Silty SAND(SM) Dark grey/brown	17/11/03	Nil	Nil	3.8	3.3
49153	BH6 1.5	Silty SAND(SM) Dark grey/brown	17/11/03	Nil	Nil	3.8	3.5
49154	BH6 2.0	Silty SAND(SM) Dark grey/brown	17/11/03	Nil	Nil	3.5	3.3
49155	BH7 0.5	Silty SAND(SM) Dark grey/black	17/11/03	Nil	Nil	3.1	2.7
49156	BH7 1.0	Silty SAND(SM) Dark grey	17/11/03	Nil	Nil	3.7	3.3
49157	BH7 1.5	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	4	3.6
49158	BH7 2.0	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3.7	3.2
49159	BH8 0.5	Silty SAND(SM) Grey	17/11/03	Nil	Nil	3.4	3.3
49160	BH8 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.5	3.5
49161	BH8 1.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.9	3.7
49162	BH8 2.0	Silty SAND(SM)Dark grey/brown	17/11/03	Nil	Nil	3.8	3
49163	BH9 0.5	Silty SAND(SM) Pale brown	17/11/03	Nil	Nil	3.8	3.7
49164	BH9 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	4.1	3.9
49165	BH9 1.5	Silty SAND(SM) Grey	17/11/03	Nil	Nil	3.7	3.4
49166	BH9 2.0	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3.1	2.8
49167	BH10 0.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.5	3.2
49168	BH10 1.0	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3.2	3
49169	BH10 1.5	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3.3	3
49170	BH10 2.0	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3	2.7

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Geotechnical Engineering Services

12 GREENWAY DRIVE, SOUTH TWEED HEADS

1/35 OLD PACIFIC HIGHWAY, YATALA

ACID SULFATE SOILS SCREENING TEST RESULTS

pH_F pH_{FOX}

CLIENT: CODLEA PTY LTD C/ - MARTIN FINDLATER &
ASSOCIATES PTY LTD

JOB No: BT 12582

PROJECT: BAYSIDE BRUNSWICK ESTATE

Sample #	Location & Depth	Soil Classification	Date Sampled	Reaction to HCl	Reaction to H ₂ O ₂	pH_F 1:05 suspension in 1MNaCl	pH_{FOX} 1:05 suspension in 1MNaCl
49171	BH 11 0.5	SAND(SP) Pale grey	17/11/03	Nil	Nil	2.8	2.7
49172	BH 11 1.0	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.7	3.6
49173	BH 11 1.5	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.9	3.9
49174	BH 11 2.0	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.5	3.3
49175	BH 12 0.5	SAND(SP) Pale grey	17/11/03	Nil	Nil	4.2	3.8
49176	BH 12 1.0	SAND(SP) Pale grey	17/11/03	Nil	Nil	4	4.3
49177	BH 12 1.5	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.8	3.6
49178	BH 12 2.0	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.6	3.4
49179	BH 13 0.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	4	4
49180	BH 13 1.0	SAND(SP) Dark grey/brown	17/11/03	Nil	Nil	3.3	3.1
49181	BH 13 1.5	SAND(SP) Dark grey/brown	17/11/03	Nil	Nil	3.5	3.5
49182	BH 13 2.0	SAND(SP) Dark grey/brown	17/11/03	Nil	Nil	3.5	3.4
49183	BH 14 0.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.8	3.8
49184	BH 14 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.3	3
49185	BH 14 1.5	Silty SAND(SM)Dark grey/brown	17/11/03	Nil	Nil	3.2	2.8
49186	BH 14 2.0	Silty SAND(SM)Dark grey/brown	17/11/03	Nil	Nil	3.3	3.2
49187	BH 15 0.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.3	3.1
49188	BH 15 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.3	3
49189	BH 15 1.5	SAND(SP) Pale brown	17/11/03	Slight	Nil	3.4	3
49190	BH 15 2.0	Silty SAND(SM)Dark grey/brown	17/11/03	Moderate	Nil	3	3
49191	BH 16 0.5	Silty SAND(SM) Grey	17/11/03	Nil	Nil	3.9	3.8
49192	BH 16 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	4.2	4.1
49193	BH 16 1.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	4.2	4
49194	BH 16 2.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.8	3.8
49195	BH 17 0.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	4	3.9
49196	BH 17 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.4	3.2
49197	BH 17 1.5	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	2.8	2.5
49198	BH 17 2.0	Silty SAND(SM) Grey/brown	17/11/03	Nil	Nil	3.5	3.4
49199	BH 18 0.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.8	3.7
49200	BH 18 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3	2.7
49201	BH 18 1.5	Silty SAND(SM) Dark grey/brown	17/11/03	Nil	Nil	2.9	2.6
49202	BH 18 2.0	Silty SAND(SM) Dark grey/brown	17/11/03	Nil	Nil	2.8	2.6
49203	BH 19 0.5	Silty SAND(SM)Pale brown/grey mottle	17/11/03	Nil	Nil	3.6	3.5
49204	BH 19 1.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.7	3.5
49205	BH 19 1.5	SAND(SP) Pale brown	17/11/03	Nil	Nil	3.7	3.5
49206	BH 19 2.0	SAND(SP) Pale brown	17/11/03	Nil	Nil	2.8	2.7
49207	BH 20 0.5	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.5	3.5
49208	BH 20 1.0	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.7	3.6
49209	BH 20 1.5	SAND(SP) Pale grey	17/11/03	Nil	Nil	3.7	3.5
49210	BH 20 2.0	SAND(SP) Pale grey	17/11/03	Nil	Slight	3.5	3.5

Geotechnical Engineering Services

1/35 OLD PACIFIC HIGHWAY, YATALA

ACID SULFATE SOILS SCREENING TEST RESULTS

$\text{pH}_F \quad \text{pH}_{\text{FOX}}$

CLIENT: CODLEA PTY LTD C/- MARTIN FINDLATER &
ASSOCIATES PTY LTD

JOB No: BT 12582

PROJECT: BAYSIDE BRUNSWICK ESTATE

[illegible]

Certificate of Pocas Test Results

Issued: 28/11/03 2:12 PM

1 Anne Street
Chinderah
NSW 2487
Phone (02) 6674 3965
Fax (02) 6674 4469
Mobile 0427 149 374
email: mazlab@better.net.au

Ref. No.: BT0975 Project: BT12582, for Border-Tech

Ref. No.	I.D.	Date Sampled / Tested	Description	Reactions to Peroxide & Acid	Exclud. Gravel Shell	Density (t/m ³) M/C (%)	Limiting Rate (Kg/t) Using TPA	pH _{KCl} pH _{ox}	TAA TPA (mol H ⁺ /t)	SKCL SP (mol SO ₄ /t)	SPOS (%)
1	BH01 1.50 # 49133	17/11/2003 24/11/2003	SAND (SP), fine to medium grained, dark brown, trace of low pl. fines, wet.	Nil	-	1.6 e 23.7	0.0 0.0	3.6 7.0	12 0	0 0	0.00
2	BH05 1.50 # 49149	17/11/2003 24/11/2003	Silty SAND (SM), fine to medium grained, grey-brown mottled dark grey, low pl. fines, moist.	Nil	-	- 19.7	0.0 0.0	4.1 7.3	2 0	0 1	0.00
3	BH07 0.50 # 49155	17/11/2003 24/11/2003	Silty SAND (SM), fine to medium grained, dark grey-brown, low pl. fines, moist.	Slight	-	- 8.3	0.0 0.0	3.7 6.6	8 0	0 0	0.00
4	BH10 2.00 # 49170	17/11/2003 24/11/2003	Silty SAND (SM), fine to medium grained, dark grey-brown, low pl. fines, moist.	Slight	-	- 24.1	0.0 0.0	3.7 7.4	7 0	1 1	0.00
5	BH11 0.50 # 49171	17/11/2003 24/11/2003	SAND (SP), fine to medium grained, grey-brown, trace of low pl. fines, just moist.	Nil	-	- 1.8	0.0 0.0	3.4 4.5	8 16	1 1	0.00
6	BH14 1.50 # 49185	17/11/2003 24/11/2003	SAND (SP), fine to medium grained, dark grey-brown mottled light grey-brown, trace of low pl. fines, wet.	Nil	-	1.7 e 22.7	0.0 0.0	3.8 7.5	8 0	0 1	0.00
7	BH15 1.00 #49188	17/11/2003 24/11/2003	SAND (SP), fine to medium grained, grey-brown, trace of low pl. fines, moist.	Nil	-	- 20.4	0.0 0.0	4.1 7.4	1 0	1 1	0.00
8	BH18 2.00 # 49202	17/11/2003 24/11/2003	SAND (SP), fine to medium grained, dark brown-black, trace of low pl. fines, wet.	Slight	-	1.6 e 25.8	0.0 0.0	3.5 7.6	13 0	1 1	0.00
9	BH21 0.50 # 49211	17/11/2003 24/11/2003	SAND (SP), fine to medium grained, grey-brown, trace of low pl. fines, just moist.	Nil	-	- 1.5	0.0 0.0	3.4 8.3	7 0	0 0	0.00
10	BH22 1.00 # 49216	17/11/2003 24/11/2003	SAND (SP), fine to medium grained, grey-brown, trace of low pl. fines, moist.	Nil	-	- 9.2	0.0 0.0	3.7 7.2	6 0	0 0	0.00

Density value from moisture content, estimated saturation and assumed s.g. of 2.65
Density value from measured volume.
Density value from remoulded sample.

Test method follows procedures described in POCAS - Method 21, (Vers. 2.1, 6 Nov 97)
Peroxide Oxidation - Combined Acidity & Sulfate (POCAS) Method. [ASS Method 21]
Limiting rate is calculated using a supplied combined safety and neutralising factor of 155.0%
and combined action levels of 18molH⁺/t & 0.03% S. (safety factor not applied to negative TAA values)

POCAS Analysis Codes
pH_{KCl} 21A
pH_{ox} 21B
TAA 21F
TPA 21G
SKCL 21Ca
SP 21Da
SPOS 21Ea

TWEED LABORATORY CENTRE

A COMMERCIAL UNIT OF THE TWEED SHIRE COUNCIL ABN 90 178 732 496

46 Enterprise Avenue,
Tweed Heads South NSW 2486.
Phone (07) 5569 3100
Fax (07) 5524 2676



All correspondence:
Tweed Shire Council
PO Box 816
Murwillumbah NSW 2484

LABORATORY REPORT

Page 1 of 1

Client: Border-Tech
Address: PO Box 6340
TWEED HEADS SOUTH
NSW 2486

Attention: David Bayel
Fax No: 07 5524 6533

Sample No:	Sample Description: Bayside Estate, Brunswick Heads.
1	#49223.
2	#49224.
3	#49225.
4	#49226.
5	#49227.

Taken by: Client
Date Taken: 18/11/2003

Date Received: 18/11/2003

Test	Method No	Results				
		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
pH (pH units)	P1	5.0	4.9	5.0	5.3	5.3
Conductivity @ 25°C μScm^{-1}	P2	134	144	132	112	122
Nitrogen – oxidised mg/L	C4	<0.05	<0.05	<0.05	<0.05	<0.05
Total – N (by calc) mg/L	C7	1.87	2.03	1.48	4.91	1.24
TKN mg/L	C6	1.9	2.0	1.5	4.9	1.2
Total Phosphorus – P mg/L	C17	0.09	0.10	0.44	1.07	0.20

Results refer to samples as received at the Laboratory.
All pages of this Report have been checked and approved.

This Report replaces the Report issued on 28 November 2003.

Edward Dickson
(Acting Laboratory Supervisor)

Date of Report: 01 December 2003

APPENDIX C

**BYRON SHIRE COUNCIL
WATER RETICULATION NETWORK ANALYSIS**

DRAFT

Trunk Mains

BRUNSWICK HEADS WATER SUPPLY

0.11 L/s NET WITH BAYSIDE

TOTAL DEMANDS

Node Demands 148.775 L/s
Hydrant Flows 0.000

RESERVOIRS

LABEL	LOCATION NODE	WATER LEVEL RL m	OUTFLOW RATE (TO SYSTEM)	INFLOW RATE (FROM SYSTEM)
	N1	43.90	148.775	

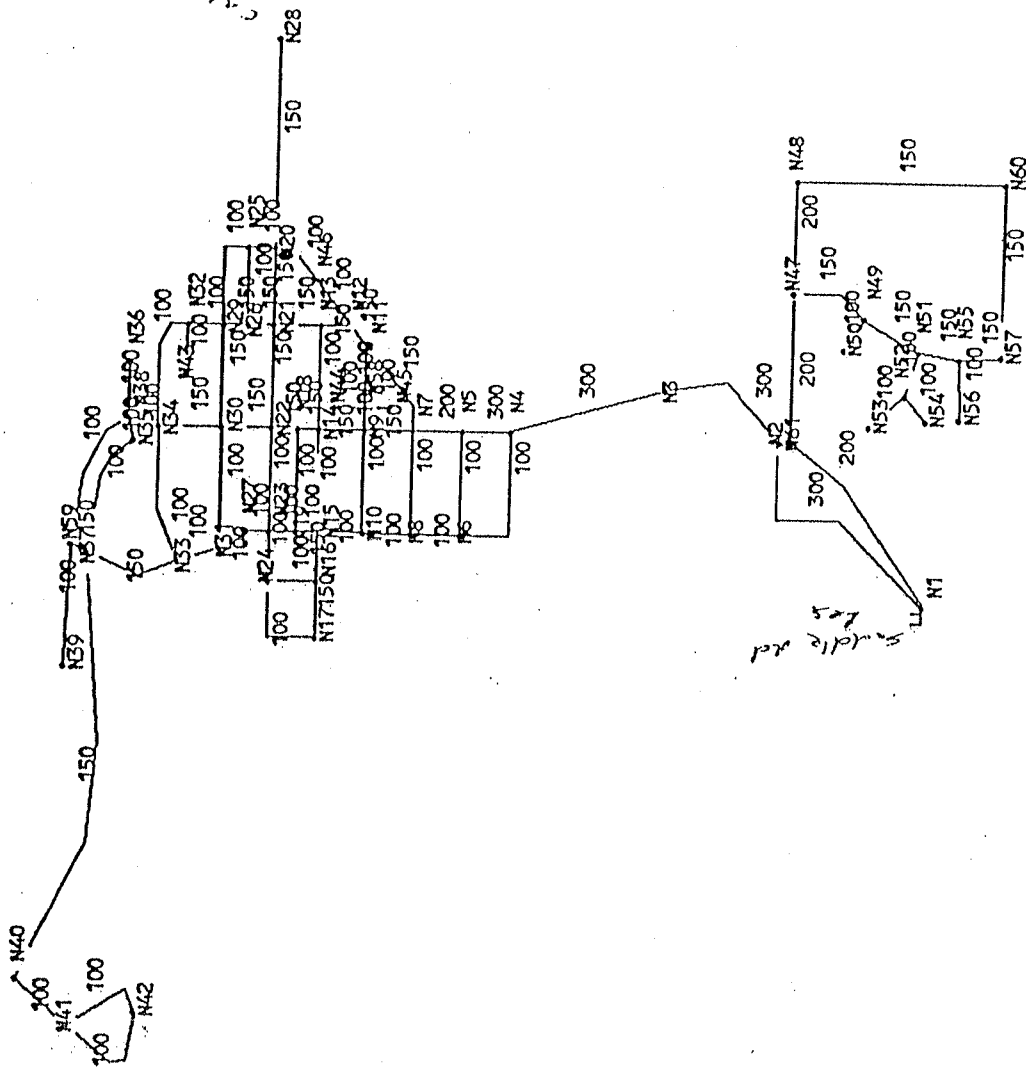
NODE HEADS

NODE LABEL	DISCHARGE L/s	HGL RL m	PRESSURE HEAD m	NODE LABEL	DISCHARGE L/s	HGL RL m	PRESSURE HEAD m
N1	0.000	43.90	0.1	N38	0.000	24.77	23.2
N10	2.530	29.74	25.9	N39	1.529	24.32	23.1
N11	3.410	29.13	24.8	N4	0.110	36.48	31.9
N12	0.330	28.19	24.1	N40	2.475	24.04	22.3
N13	3.036	27.34	23.8	N41	0.990	23.96	22.4
N14	0.638	27.63	22.6	N42	0.440	23.96	22.4
N15	2.420	27.14	22.3	N43	0.440	25.64	24.0
N16	0.550	27.02	23.5	N44	0.440	29.80	25.2
N17	0.000	27.00	24.8	N45	0.550	29.79	25.2
N18	0.660	27.04	22.0	N46	4.950	26.54	23.2
N19	1.870	26.85	22.8	N47	1.320	32.26	27.8
N2	0.220	40.51	36.1	N48	0.110	31.75	27.3
N20	0.957	25.90	22.9	N49	1.100	30.46	25.6
N21	4.323	26.22	22.7	N5	0.660	36.10	31.6
N22	0.242	26.41	21.9	N50	0.660	30.45	25.6
N23	1.540	26.44	22.9	N51	0.770	29.17	24.1
N24	2.860	26.68	23.8	N52	0.110	29.16	24.1
N25	4.125	25.86	23.0	N53	0.550	29.14	23.8
N26	1.133	26.00	23.0	N54	0.330	29.15	24.1
N27	0.330	25.99	22.6	N55	0.440	28.39	23.2
N28	11.000	24.84	21.8	N56	0.220	28.39	23.4
N29	3.960	25.87	23.3	N57	0.330	27.74	22.7
N3	5.599	38.30	33.0	N58	0.000	29.80	25.7
N30	1.056	25.84	22.3	N59	6.578	24.42	23.3
N31	2.717	25.48	22.4	N6	3.091	34.59	30.0
N32	0.990	25.64	23.7	N60	48.950	25.35	20.3
N33	0.440	24.83	22.7	N61	0.000	35.48	*****
N34	5.830	25.28	23.7	N7	0.517	33.40	28.6
N35	0.154	24.82	23.3	N8	2.640	32.64	28.3
N36	1.452	24.71	23.2	N9	0.660	29.88	25.7
N37	3.443	24.43	23.3				

PIPES

U/S NODE	D/S NODE	FLOW L/s	VELOCITY m/s	PIPE LOSS m	PIPE LOSS m/1000	FITNG LOSS	PIPE COUNT	LENGTH m	DIA mm	ROUGHNESS mm	FITTING K
N1	N61	54.89	1.747	8.42	11.09	0.00	1	760.0	200.0	0.003	0.00
N48	N60	27.66	1.565	6.39	12.79	0.00	2	500.0	150.0	0.003	0.00
N57	N60	21.29	1.205	2.39	7.95	0.00	3	300.0	150.0	0.003	0.00
N58	N45	0.55	0.070	0.01	0.09	0.00	4	80.0	100.0	0.015	0.00
N58	N44	0.44	0.056	0.00	0.06	0.00	5	80.0	100.0	0.015	0.00
N9	N58	5.46	0.695	0.07	4.94	0.00	6	15.0	100.0	0.015	0.00
N3	N4	88.07	1.246	1.82	3.95	0.00	7	460.0	300.0	0.030	0.00
N2	N3	93.66	1.325	2.22	4.44	0.00	8	500.0	300.0	0.030	0.00
N55	N56	0.22	0.028	0.00	0.02	0.00	9	70.0	100.0	0.003	0.00
N55	N57	21.62	1.223	0.65	8.18	0.00	10	80.0	150.0	0.003	0.00
N51	N55	22.28	1.261	0.78	8.64	0.00	11	90.0	150.0	0.003	0.00
N52	N54	0.33	0.042	0.00	0.04	0.00	12	50.0	100.0	0.003	0.00
N52	N53	0.55	0.070	0.01	0.09	0.00	13	120.0	100.0	0.003	0.00
N49	N50	0.66	0.084	0.01	0.12	0.00	14	80.0	100.0	0.003	0.00
N51	N52	0.99	0.126	0.01	0.24	0.00	15	60.0	100.0	0.003	0.00
N49	N51	24.04	1.360	1.29	9.91	0.00	16	130.0	150.0	0.003	0.00
N47	N49	25.80	1.460	1.80	11.27	0.00	17	160.0	150.0	0.003	0.00
N47	N48	27.77	0.884	0.51	3.22	0.00	18	160.0	200.0	0.003	0.00
N61	N47	54.89	1.747	3.21	11.09	0.00	19	290.0	200.0	0.003	0.00
N1	N2	93.88	1.328	3.39	4.46	0.00	20	760.0	300.0	0.030	0.00
N20	N46	-4.83	-0.615	-0.63	-3.97	0.00	21	160.0	100.0	0.015	0.00
N32	N43	0.44	0.056	0.01	0.06	0.00	22	90.0	100.0	0.015	0.00
N42	N41	-0.22	-0.028	0.00	-0.02	0.00	23	185.0	100.0	0.015	0.00
N41	N42	0.22	0.028	0.00	0.02	0.00	24	185.0	100.0	0.015	0.00

N40	N41	1.43	0.182	0.08	0.45	0.00	25	175.0	100.0	0.015	0.00
N37	N40	3.90	0.221	0.39	0.38	0.00	26	1030.0	150.0	0.003	0.00
N38	N59	2.88	0.367	0.35	1.57	0.00	27	220.0	100.0	0.015	0.00
N38	N36	1.45	0.185	0.06	0.47	0.00	28	120.0	100.0	0.015	0.00
N35	N38	4.33	0.552	0.05	3.26	0.00	29	15.0	100.0	0.015	0.00
N35	N37	3.23	0.411	0.38	1.92	0.00	30	200.0	100.0	0.015	0.00
N33	N37	9.35	0.529	0.40	1.84	0.00	31	215.0	150.0	0.015	0.00
N34	N35	7.71	0.982	0.46	9.27	0.00	32	50.0	100.0	0.015	0.00
N33	N34	-3.08	-0.392	-0.45	-1.77	0.00	33	255.0	100.0	0.015	0.00
N31	N33	6.71	0.854	0.65	7.18	0.00	34	90.0	100.0	0.015	0.00
N32	N34	2.59	0.330	0.36	1.30	0.00	35	280.0	100.0	0.015	0.00
N30	N34	14.04	0.794	0.56	3.85	0.00	36	145.0	150.0	0.015	0.00
N29	N32	4.02	0.512	0.23	2.85	0.00	37	80.0	100.0	0.015	0.00
N27	N31	6.53	0.832	0.51	6.85	0.00	38	75.0	100.0	0.015	0.00
N30	N31	2.89	0.368	0.36	1.58	0.00	39	230.0	100.0	0.015	0.00
N30	N29	-2.19	-0.124	-0.03	-0.14	0.00	40	240.0	150.0	0.015	0.00
N22	N30	15.79	0.893	0.57	4.77	0.00	41	120.0	150.0	0.015	0.00
N29	N25	0.36	0.046	0.01	0.04	0.00	42	245.0	100.0	0.015	0.00
N26	N29	10.53	0.596	0.13	2.24	0.00	43	60.0	150.0	0.003	0.00
N20	N28	11.00	0.622	1.06	2.47	0.00	44	430.0	150.0	0.015	0.00
N23	N27	6.86	0.874	0.45	7.49	0.00	45	60.0	100.0	0.015	0.00
N21	N26	13.61	0.770	0.21	3.55	0.00	46	60.0	150.0	0.003	0.00
N25	N26	-1.94	-0.247	-0.14	-0.78	0.00	47	185.0	100.0	0.015	0.00
N20	N25	1.82	0.232	0.04	0.70	0.00	48	60.0	100.0	0.015	0.00
N17	N24	2.56	0.326	0.32	1.26	0.00	49	255.0	100.0	0.003	0.00
N23	N24	-3.43	-0.437	-0.24	-2.11	0.00	50	115.0	100.0	0.003	0.00
N16	N24	3.73	0.474	0.34	2.44	0.00	51	140.0	100.0	0.003	0.00
N19	N23	5.68	0.723	0.41	5.18	0.00	52	80.0	100.0	0.003	0.00
N22	N23	-0.71	-0.090	-0.03	-0.13	0.00	53	210.0	100.0	0.015	0.00
N21	N20	8.95	0.507	0.32	1.70	0.00	54	185.0	150.0	0.015	0.00
N22	N21	5.87	0.332	0.19	0.80	0.00	55	240.0	150.0	0.015	0.00
N13	N21	21.01	1.189	1.13	8.04	0.00	56	140.0	150.0	0.015	0.00
N18	N22	21.20	1.199	0.63	7.89	0.00	57	80.0	150.0	0.003	0.00
N4	N5	81.85	1.158	0.38	3.45	0.00	58	110.0	300.0	0.030	0.00
N5	N7	74.37	2.367	2.70	19.31	0.00	59	140.0	200.0	0.003	0.00
N7	N9	38.61	2.185	3.52	23.47	0.00	60	150.0	150.0	0.003	0.00
N9	N14	30.72	1.739	2.24	15.48	0.00	61	145.0	150.0	0.003	0.00
N5	N6	6.82	0.868	1.51	7.19	0.00	62	210.0	100.0	0.003	0.00
N4	N6	6.11	0.778	1.89	5.90	0.00	63	320.0	100.0	0.003	0.00
N7	N8	4.62	0.589	0.75	3.59	0.00	64	210.0	100.0	0.003	0.00
N6	N8	9.84	1.252	1.95	13.90	0.00	65	140.0	100.0	0.003	0.00
N8	N10	11.82	1.505	2.90	19.36	0.00	66	150.0	100.0	0.003	0.00
N9	N10	1.77	0.226	0.14	0.66	0.00	67	210.0	100.0	0.003	0.00
N14	N15	3.64	0.464	0.49	2.34	0.00	68	210.0	100.0	0.003	0.00
N10	N15	11.06	1.408	2.60	17.92	0.00	69	145.0	100.0	0.015	0.00
N15	N16	6.84	0.387	0.12	1.03	0.00	70	115.0	150.0	0.003	0.00
N16	N17	2.56	0.145	0.02	0.18	0.00	71	115.0	150.0	0.003	0.00
N14	N18	23.96	1.356	0.59	9.86	0.00	72	60.0	150.0	0.003	0.00
N18	N19	2.11	0.268	0.19	0.90	0.00	73	210.0	100.0	0.015	0.00
N15	N19	5.44	0.693	0.29	4.80	0.00	74	60.0	100.0	0.003	0.00
N14	N13	2.48	0.316	0.29	1.20	0.00	75	240.0	100.0	0.015	0.00
N7	N11	30.62	1.733	4.27	16.10	0.00	76	265.0	150.0	0.015	0.00
N58	N11	4.47	0.569	0.67	3.45	0.00	77	195.0	100.0	0.015	0.00
N11	N12	31.67	1.792	0.94	17.14	0.00	78	55.0	150.0	0.015	0.00
N12	N13	21.57	1.220	0.84	8.44	0.00	79	100.0	150.0	0.015	0.00
N59	N39	1.53	0.195	0.10	0.51	0.00	80	200.0	100.0	0.015	0.00
N37	N59	5.23	0.296	0.01	0.64	0.00	81	15.0	150.0	0.003	0.00
N12	N46	9.78	1.245	1.65	13.75	0.00	82	120.0	100.0	0.003	0.00



BRUNSWICK HEADS WATER RETICULATION BRUNS
0.15 L/s VET EXISTING SYSTEM
+ AUGMENTATIO