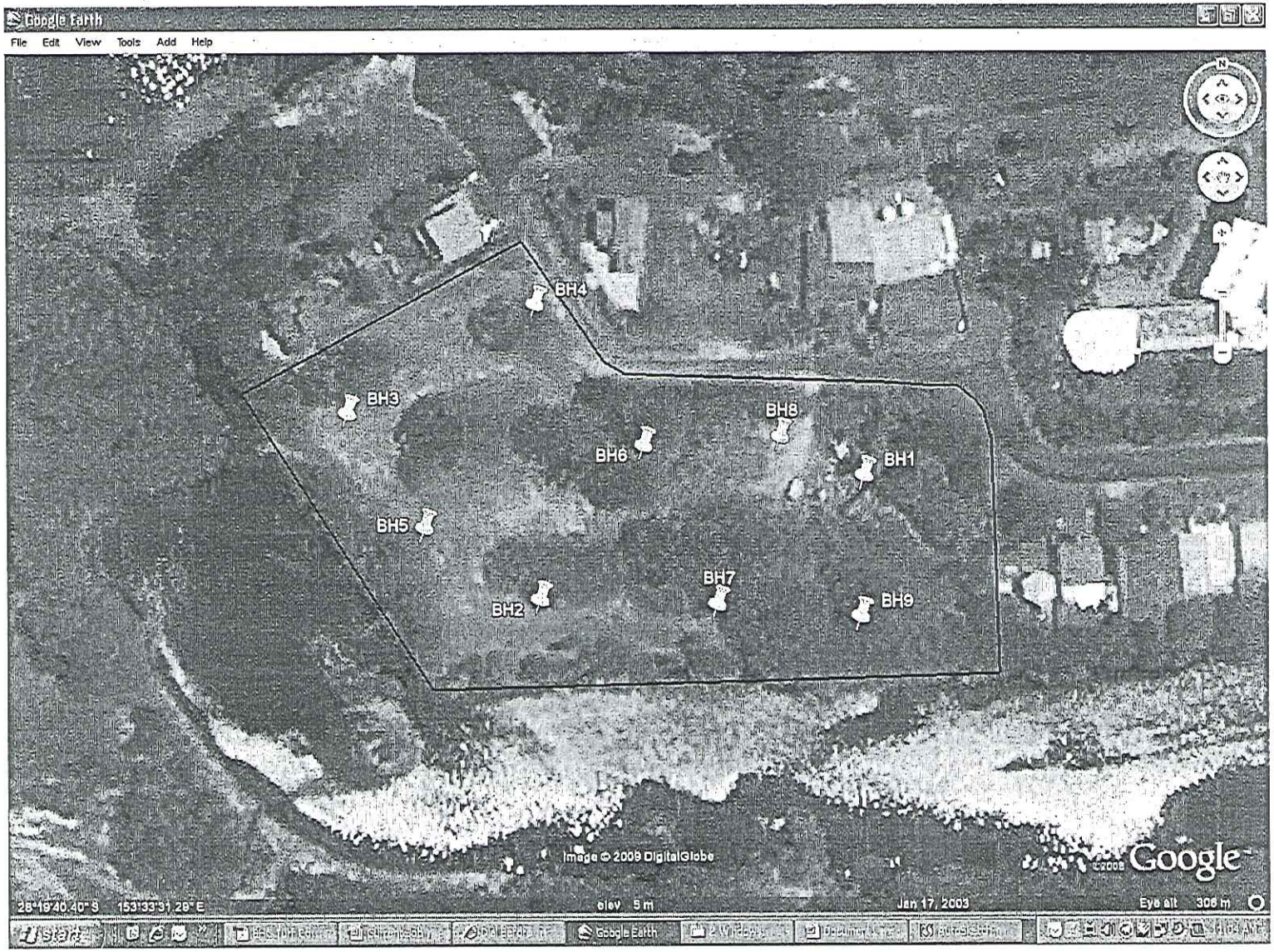
APPENDIX A

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: KENMAR FARMS PTY LTD	PROJECT: LOT 4 WILLOW AVENUE BOGANGAR	NORTH JOB No: BT 19135-1 SITE PLAN

Form A10 Issue 7

APPENDIX B

BOREHOLE PROFILE

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

BOREHOLE PROFILE

CLIENT:	KENMAR FARMS PTY LTD	BOREHOLE No:	BH 1 Page 1
PROJECT:	LOT 4 WILLOW AVENUE BOGANGAR	JOB No:	BT 19135-1
EQUIPMENT TYPE:	GCH 200	HOLE DIAMETER: 110mm	APPROXIMATE SL (m): -

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
TOPSOIL			0.2		(SP) SAND: Fine to medium sand, Moist, Dark grey/brown	LOOSE	
FILL			0.6		(SM) Silty SAND: Fine to medium sand, Moist, Brown	LOOSE	
			1.3		(SM) Silty SAND: Fine to medium sand, Moist, Grey/brown	MEDIUM DENSE	
	SPT 4,5,7 N = 12		1.5 1.9		(SP) SAND: Fine to medium sand, Moist, Grey	MEDIUM DENSE	
		▼	2.3		(SP) SAND: Fine to medium sand, Trace of SILT, Moist, Pale grey/brown	MEDIUM DENSE	
ALLUVIUM			3.0		(SP) SAND: Fine to medium sand, Wet, Pale grey (white)	LOOSE	
	SPT 2,3,4 N = 7		3.3		(SP) SAND: Fine to medium sand, With CLAY, Trace of SILT, Wet, Grey	LOOSE	
			3.8		(SM) Silty SAND: Fine to medium sand, Trace of CLAY, Wet, Grey/brown	LOOSE	
	SPT 5,3,4 N = 7		4.5 5.2				
			6.0		(SP) SAND: Fine to medium sand, Trace of SILT, Wet, Brown with bands of dark grey	LOOSE	
	SPT 3,3,5 N = 8		7.1				
			7.35		(SP) SAND: *Continued on Page 2*		

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	BOREHOLE No: BH 1 Page 2
PROJECT: LOT 4 WILLOW AVENUE BOGANGAR	JOB No: BT 19135-1
EQUIPMENT TYPE: GCH 200 HOLE DIAMETER: 110mm	APPROXIMATE SL (m): -

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
ALLUVIUM			7.5		(SP) SAND: Fine to medium sand, Wet, Dark grey and grey/brown	MEDIUM DENSE	
	SPT 6,5,8 N = 13						
			8.8				
			9.0		(SP) SAND: Fine to medium sand, Wet, Pale brown with bands of dark grey/brown	MEDIUM DENSE	
	SPT 14,15,12 N = 27						
			10.5				
	SPT 11,15,16 N = 31						
			11.0		(SP) SAND: Fine to medium sand, Wet, Brown	DENSE	
			12.0				
	SPT 11,15,20 N = 35						
			12.5				

BH 1 TERMINATED AT 12.5m
LIMIT OF INVESTIGATION

NOTES: Standard Penetration Test (SPT) to AS 1289 6.3.1 – 2004.

Augered to 3.0m, Mud drilled to 12.0m.

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BOREHOLE PROFILE

CLIENT:	KENMAR FARMS PTY LTD	BOREHOLE No:	BH 2 Page 1
PROJECT:	LOT 4 WILLOW AVENUE BOGANGAR	JOB No:	BT 19135-1
EQUIPMENT TYPE:	GCH 200	HOLE DIAMETER: 110mm	APPROXIMATE SL (m): -

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
FILL					(SM) Silty SAND: Fine to medium sand, Moist, Grey/brown	LOOSE	
			0.6				
			1.0		(SP) SAND: Fine to medium sand, Trace of SILT, Moist, Pale grey/brown	LOOSE	
	SPT 2,2,4 N = 6						
			2.0				
	SPT 5,5,6 N = 11		2.3				
					(SP) SAND: Fine to medium sand, Moist becoming wet, Dark grey/brown	MEDIUM DENSE	
			2.85				
ALLUVIUM			3.0		(SP) SAND: Fine to medium sand, Trace of SILT, Wet, Grey	MEDIUM DENSE	
	SPT 6,8,9 N = 17						
		▼	4.0				
			4.3				
ALLUVIUM			4.5		(SP) SAND: Fine to medium sand, Trace of SILT, Wet, Dark brown	MEDIUM DENSE	
	SPT 5,6,5 N = 11						
			5.8				
			6.0		(SP) SAND: Fine to medium sand, Wet, Brown	MEDIUM DENSE	
	SPT 8,11,12 N = 23		6.2				
					(SP) SAND: Fine to medium sand, Wet, Grey/brown	MEDIUM DENSE	
			7.35		*Continued on Page 2*		

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	BOREHOLE No: BH 2 Page 2
PROJECT: LOT 4 WILLOW AVENUE BOGANGAR	JOB No: BT 19135-1

EQUIPMENT TYPE: GCH 200 HOLE DIAMETER: 110mm APPROXIMATE SL (m): -

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
ALLUVIUM			7.5		(SP) SAND: Fine to medium sand, Wet, Grey/brown	MEDIUM DENSE	
	SPT 9,12,14 N = 26		7.7		(SP) SAND: Fine to medium sand, Wet, Pale brown and pale grey	MEDIUM DENSE	
			8.1		(SP) SAND: Fine to medium sand, Wet, Brown	MEDIUM DENSE	
			8.8				
			9.0		(SP) SAND: Fine to medium sand, Wet, Grey/brown	MEDIUM DENSE	
	SPT 9,14,15 N = 29		9.1		(SP) SAND: Fine to medium sand, Wet, Grey	MEDIUM DENSE TO DENSE	
			10.5				
	SPT 10,11,15 N = 26						
			12.0				
	SPT 8,12,11 N = 23		12.45				

BH 2 TERMINATED AT 12.45m
LIMIT OF INVESTIGATION

NOTES: Standard Penetration Test (SPT) to AS 1289 6.3.1 – 2004.

Augered to 3.0m, Mud drilled to 12.0m.

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	BOREHOLE No: BH 3 Page 1
PROJECT: LOT 4 WILLOW AVENUE BOGANGAR	JOB No: BT 19135-1
EQUIPMENT TYPE: GCH 200 HOLE DIAMETER: 110mm APPROXIMATE SL (m): -	

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
FILL			0.2		(SM) Silty SAND: Fine to medium sand, Moist, Dark grey/brown	LOOSE	
			0.7		(SM) Silty SAND: Fine to medium sand, Moist, Pale brown/grey	LOOSE	
			1.0		(SP) SAND: Fine to medium sand, Trace of SILT, Moist, Dark brown with pale brown bands	MEDIUM DENSE	
			1.2		(SP) SAND: Fine to medium sand, Moist, Grey /brown	MEDIUM DENSE	
ALLUVIUM			1.5		(SP) SAND: Fine to medium sand, Wet, Grey	MEDIUM DENSE	
	SPT 6,5,6 N = 11						
		▼	2.6				
			3.0				
	SPT 2,4,7 N = 11		3.2				
ALLUVIUM					(SM) Silty SAND: Fine to medium sand, Trace of organic material, Wet, Pale grey	MEDIUM DENSE	
			4.0				
					(SP) SAND: Fine to medium sand, Trace of SILT, Wet, Brown with bands of grey/brown	LOOSE TO MEDIUM DENSE	
	SPT 1,2,4 N = 6		4.5				
			5.7				
			6.0		(SP) SAND: Fine to medium sand, Wet, Dark brown with bands of brown	DENSE	
	SPT 10,15,17 N = 32						
			7.35		*Continued on Page 2*		

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BOREHOLE PROFILE

CLIENT:	KENMAR FARMS PTY LTD	BOREHOLE No:	BH 3 Page 2
PROJECT:	LOT 4 WILLOW AVENUE BOGANGAR	JOB No:	BT 19135-1

EQUIPMENT TYPE: GCH 200 HOLE DIAMETER: 110mm APPROXIMATE SL (m): -

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
ALLUVIUM			7.5		(SP) SAND: Fine to medium sand, Wet, Dark brown with bands of brown	VERY DENSE	
	SPT 24/150mm N >50		8.0				
					(SP) SAND: Fine to medium sand, Wet, Dark brown	DENSE	
			9.0				
	SPT 14,14,18 N = 32		9.45				

BH 3 TERMINATED AT 9.45m
LIMIT OF INVESTIGATION

NOTES: Standard Penetration Test (SPT) to AS 1289 6.3.1 – 2004.

Augered to 3.0m, Mud drilled to 12.0m.

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	**BOREHOLE No:** BH 4
PROJECT: LOT 4 WILLOWVALE AVENUE BOGANGAR	**JOB No:** BT 19135-1
EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 110mm **APPROXIMATE SL (m):** -	

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
TOPSOIL / FILL					**(SM) Silty SAND:** Fine sand, Moist, Dark grey	**MEDIUM DENSE To DENSE**	1 1 3 3 4 4 4
			0.7				
ALLUVIUM					**(SP) SAND:** Fine sand, Moist becoming wet, Pale grey	**DENSE**	4 5 5 5 5 5 6 6 6 6 6 6 6 6 3 4 5 5 6 6 6 7 7
		▼	2.0				
			3.0				

BH 4 TERMINATED AT 3.0m
LIMIT OF INVESTIGATION

NOTES: Dynamic Cone Penetrometer (DCP) to AS 1289 6.3.2 – 1997.

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	BOREHOLE No: BH 5
PROJECT: LOT 4 WILLOWVALE AVENUE BOGANGAR	JOB No: BT 19135-1
EQUIPMENT TYPE: MAIDTECH 500 HOLE DIAMETER: 110mm APPROXIMATE SL (m): -	

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
FILL					(SM) Silty SAND: Fine sand, Moist, Dark grey	MEDIUM DENSE	1 2 3 2 3 3 2 3 2 2 3 4 4 5 7 4 3 2 3 3
ALLUVIUM		▼	2.0 2.7 3.0		(SP) SAND: Fine sand, Moist becoming wet, Pale grey	DENSE	3 4 5 5 5 6 6 7 7

BH 5 TERMINATED AT 3.0m
LIMIT OF INVESTIGATION

NOTES: Dynamic Cone Penetrometer (DCP) to AS 1289 6.3.2 – 1997.

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	BOREHOLE No: BH 6
PROJECT: LOT 4 WILLOWVALE AVENUE BOGANGAR	JOB No: BT 19135-1
EQUIPMENT TYPE: MAIDTECH 500 HOLE DIAMETER: 110mm APPROXIMATE SL (m): -	

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
FILL					(SM) Silty SAND: Fine sand, Moist, Dark grey	MEDIUM DENSE To DENSE	1 2 3 4 3 5 4 3 4 4 3
ALLUVIUM		▼	1.1		(SP) SAND: Fine sand, Moist becoming wet, Pale grey	DENSE	4 5 5 5 5 5 6 6 6 5 4 3 3 4 5 5 5 6
			2.2				
			3.0				

BH 6 TERMINATED AT 3.0m
LIMIT OF INVESTIGATION

NOTES: Dynamic Cone Penetrometer (DCP) to AS 1289 6.3.2 – 1997.

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	BOREHOLE No: BH 7
PROJECT: LOT 4 WILLOWVALE AVENUE BOGANGAR	JOB No: BT 19135-1
EQUIPMENT TYPE: MAIDTECH 500 HOLE DIAMETER: 110mm APPROXIMATE SL (m): -	

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
FILL					(SM) Silty SAND: Fine sand, Moist, Dark grey	MEDIUM DENSE	1 2 3 2 2 3 4 3 5 3 4
FILL			1.8		(SP) SAND: Fine sand, With bands of Silty Sand, Moist, Brown	MEDIUM DENSE	3 4 4 3 4 3 2 3 2 4 3 3 2 3 2 3 2 4
			3.0				

BH 7 TERMINATED AT 3.0m
LIMIT OF INVESTIGATION

NOTES: Dynamic Cone Penetrometer (DCP) to AS 1289 6.3.2 – 1997.

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	**BOREHOLE No:** BH 8
PROJECT: LOT 4 WILLOWVALE AVENUE BOGANGAR	**JOB No:** BT 19135-1

EQUIPMENT TYPE: MAIDTECH 500 **HOLE DIAMETER:** 110mm **APPROXIMATE SL (m):** -

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
FILL					(SM) Silty **SAND:** Fine sand, Moist, Dark grey	**MEDIUM DENSE To DENSE**	1 2 3 4 3 3 3 4 5 5 3 4 5 6 4 5
			1.6				
ALLUVIUM					(SP) **SAND:** Fine sand, Moist becoming wet, Pale grey	**DENSE**	5 6 6 6 5 4 3 5 5 6 6 7 7
		▼	2.3				
			3.0				

BH 8 TERMINATED AT 3.0m
LIMIT OF INVESTIGATION

NOTES: Dynamic Cone Penetrometer (DCP) to AS 1289 6.3.2 – 1997.

Logged By	DAW	Date	18/06/09	Checked By		Date	25/06/09

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BOREHOLE PROFILE

CLIENT: KENMAR FARMS PTY LTD	BOREHOLE No: BH 9
PROJECT: LOT 4 WILLOWVALE AVENUE BOGANGAR	JOB No: BT 19135-1
EQUIPMENT TYPE: MAIDTECH 500 HOLE DIAMETER: 110mm APPROXIMATE SL (m): -	

Geological Profile	Samples / Tests	WATER	Depth in m	Graphic Log	Soil or Rock Description – Field and /or Laboratory	Consistency / Rel. Density	DCP Blows / 100mm
FILL					(SM) Silty SAND: Fine sand, Trace of fine to coarse GRAVEL, Moist, Dark grey	LOOSE	1 1 1 1 1 1 1 3 2 2 1 1
			1.2		(SM) Silty SAND: Fine sand, Moist, Dark grey	LOOSE	1 1 3 2 1 2 4 2 2 2 3 2 1 2 2
			2.7		(SP) SAND: Fine sand, Bands of CLAY, Moist, Grey	MEDIUM DENSE	2 4 4
		▼	3.1				
ALLUVIUM					(SP) SAND: Fine sand, Wet, Pale grey	DENSE	
			4.5				

BH 9 TERMINATED AT 4.5m
LIMIT OF INVESTIGATION

Logged By	DAW	Date	18/06/09	Checked By		Date	25/06/09

APPENDIX C

NOTES ON UNDERSTANDING YOUR GEOTECHNICAL REPORT

SCOPE These standard notes may be of assistance when understanding terms and recommendations given in this report. These notes are for general conditions and not all terms given may be of concern to the report attached. The descriptive terms adopted by Border-Tech are given below and are largely consistent with Australian Standards AS1726-1993 'Geotechnical Site Investigations'.

CLIENT can be described and is limited to the financer of this geotechnical investigation.

LEGALITY and privacy of this document is based on communication between Border-Tech and the client. Unless indicated otherwise the report was prepared specifically for the client involved and for the purposes indicated by the client. Use by any other party for any purpose, or by the client for a different purpose, will result in recommendations becoming invalid and Border-Tech will hold no responsibility for problems which may arise.

GEOTECHNICAL REPORTS are predominantly derived using professional estimates determined from the results of fieldwork, in-situ and laboratory testing and experience from previous investigations in the area, from which geotechnical engineers then formulate an opinion about overall subsurface conditions. The client must be made aware that the investigations are undertaken to ensure minimal site impact using test-pits or small diameter boreholes and soil conditions on-site may vary from those encountered during the investigation.

CLIENTS RESPONSIBILITY to notify this office should there be adjustments in proposed structure/location or inconsistencies with material descriptions given in this report and those encountered on site. Border-Tech is able to provide a range of services from on-site inspections to full project supervision to confirm recommendations given in the report.

CSIRO Publication BTF 18 'Foundation Maintenance and Footing Performance: A Homeowner's Guide' explains how to adequately maintain drainage during and post construction which lies as the responsibility of the client. Suitable drainage ensures recommendations given in this report remain valid.

INVESTIGATION METHODS adopted by Border-Tech are designed to incorporate individual project-specific factors to obtain information on the physical properties of soil and rock around a site to design earthworks and foundations for proposed structures. The following methods of investigation currently adopted by this company are summarised below:-

HAND AUGER – investigations enable field work to be undertaken where access is limited. The materials must have sufficient cohesion to stand unsupported in an unlined borehole and there must be no large cobbles boulders or other obstructions which would prevent rotation of the auger.

TEST-PITS – investigations are carried out with an excavator or backhoe, allowing a visual inspection of sub-surface material in-situ and from samples removed. The limit of investigation is restricted by the reach of the excavator or backhoe.

CONTINUOUS SPIRAL FLIGHT AUGERING TECHNIQUES – investigations are advanced by pushing a 100mm diameter spiral into the sub-surface and withdrawing it at regular intervals to allow sampling or testing as it emerges.

WASH BORING – investigations are advanced by removing the loosened soil from the borehole by a stream of water or drilling mud issuing from the lower end of the wash pipe which is worked up and down or rotated by hand in the borehole. The water or mud carries the soil up the borehole where it overflows at ground level where the soil in suspension is allowed to settle in a pond or tank and the fluid is re-circulated or discharged to waste as required.

NON-CORE ROTARY DRILLING – investigations are advanced using a rotary bit with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from feel and rate of penetration.

ROTARY MUD DRILLING – is carried out as above using mud as support and circulating fluid for the borehole drilling. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling.

CONTINUOUS CORE DRILLING – investigations are carried out in rock material, specimens of rock in the form of cylindrical cores are recovered from the drill holes by the means of core barrel. The core barrel is provided at its lower end with a detachable core bit which carries industrial diamond chips in a matrix of metal. Rotation of the barrel by means of the drill rods causes the core bit to cut an annulus in the rock, the cuttings being washed to the surface by a stream of pumped down the hollow drill rods.

TESTING METHODS adopted by Border-Tech to determine soil properties include but not limited to the following:-

U50 – Undisturbed samples are obtained by inserting a 50mm diameter thin-walled steel tube into the material and withdrawing with a sample of the soil in a moderately undisturbed condition.

PP – Pocket Penetrometer tests are commonly used on thin walled tube samples of cohesive soils to evaluate consistency and approximate unconfined compressive strength of saturated cohesive soils. They may also be used for the same purpose in freshly excavated trenches.

VS – Vane Shear test are commonly used in-situ or on thin walled tube samples of cohesive soils by introducing the vane into the material where the measurement of the undrained shear strength is required. Then the vane is rotated and the torsional force required to cause shearing is calculated.

DCP – Dynamic Cone Penetrometer tests are commonly used in-situ to measure the strength attributes of penetrability and compaction of sub-surface materials.

SPT – Standard Penetration Tests are commonly uses to determine the density of granular deposits but are occasionally used in cohesive material as a means of determining strength and also of obtaining a relatively undisturbed sample. Samples and results are obtained by driving a 50mm diameter split tube through blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. Blow counts are recorded for 150mm intervals with the sum of the number of blows required for the second and third 150mm of penetration is termed the "standard penetration resistance" or the "N-value".

GEOLOGICAL ORIGINS of sub-surface material plays a considerable role in the development of engineering parameters and have been summarised as follows:-

FILL – materials are man made deposits, which may be significantly more variable between test locations than naturally occurring soils.

RESIDUAL – soils are present in a region as a result of weathering over the geological time scale.

COLLUVIAL – soils have been deposited recently, on the geological time scale, as soils being transported slowly down slope due to gravitational creep.

ALLUVIAL – soils have been deposited recently, on the geological time scale, as water borne materials.

AEOLIAN – soils have been deposited recently, on the geological time scale, as wind borne materials.

SOIL DESCRIPTION is based on an assessment of disturbed samples, as recovered from boreholes and excavations, and from undisturbed materials. Soil descriptions adopted by Border-Tech are largely consistent with AS 1726-1993 '*Geotechnical Site Investigation*'. Soil types are described according to the predominating particle size, qualified by the grading of other particles present on the following bases detailed in Table 1.

COHESIVE SOILS ability to hold moisture known as its liquid limit is the state of a soil when it goes from a solid state to a liquid state described in Table 2

TABLE 1

Soil Classification	Particle Size
Clay	< 0.002 mm
Silt	0.002 – 0.06 mm
Sand	0.06 – 2.00 mm
Gravel	2.00 – 60.0 mm

TABLE 2

Descriptive Type	Range of Liquid Limit %
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50

Furthermore to soil description cohesive soils are described on there strength (assessed in conjunction with penetration tests) and liquid limit. Non-cohesive soil strengths are described by there density index. With descriptions for cohesive and non-cohesive soils summarised in Table 3.

TABLE 3

COHESIVE SOILS		NON-COHESIVE SOILS	
Term	**Undrained Shear Strength kPa**	**Term**	**Density Index %**
Very soft	≤ 12	Very Loose	≤15
Soft	> 12 ≤25	Loose	> 15 ≤35
Firm	> 25 ≤50	Medium Dense	> 35 ≤65
Stiff	> 50 ≤100	Dense	> 65 ≤85

Very Stiff	> 100 ≤200	Very Dense	> 85
Hard	> 200		

Description of terms used to describe material portion are summarised in Table 4.

TABLE 4

COARSE GRAINIED SOILS		FINE GRAINED SOILS	
% Fines	**Modifier**	**% Coarse**	**Modifier**
≤ 5	Omit or 'trace'	≤ 15	Omit or 'trace'
> 5 ≤12	Describe as 'with'	> 15 ≤30	Describe as 'with'
> 12	Prefix soil as 'silty/clayey'	> 30	Prefix soil as 'sandy/gravelly'

ROCK DESCRIPTIONS are determined from disturbed samples or specimens collected during field investigations. A rocks presence of defects and the effects of weathering are likely to have a great influence on engineering behaviour.

Rock Material Weathering Classification is summarised in Table 5.

TABLE 5

Term	Symbol	Definition
Residual Soils	-	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to decomposition of weathering products in pores
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh rock	FR	Rock shows no signs of decomposition or staining

Rock Material Strength Classification is summarised in Table 6.

TABLE 6

Term	Symbol	Point load index (MPa) I_s50	Field guide to strength
Extremely Low	EL	≤0.03	Easily remoulded by hand to a material with soil properties
Very Low	VL	>0.03 ≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 3cm thick can be broken by finger pressure
Low	L	>0.1 ≤0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling
Medium	M	>0.3 ≤1.0	Readiy scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty
High	H	>1.0 ≤3.0	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer
Very High	VH	>3.0 ≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer
Extremely High	EH	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer

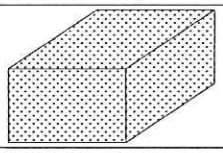
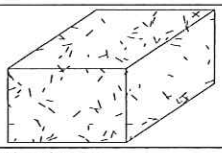
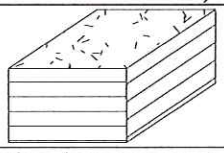
Rock Material Defect Shapes are summarised in Table 7.

TABLE 7

Term	Description
Planar	The defect does not vary in orientation.
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps.
Irregular	The defect has many sharp changes of orientation
Smooth	The defect has a flat even finish
Rough	The defect has a irregular disoriented finish

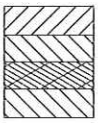
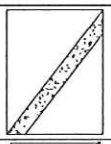
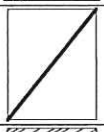
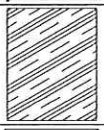
Rock Material Texture and Fabric are summarised in Table 8.

TABLE 8

Geological Description	Massive		Layered (Bedded foliate cleaved)
Diagram			
Fabric Type	Effectively homogenous and isotropic. Bulky or equi-dimensional grains uniformly distributed	Effectively homogeneous and isotropic. Elongated	Effective homogeneous with planar anisotropy. Elongated or tabular grains or pores in a layered arrangement

Rock Material Defect Type is summarised in Table 9

TABLE 9

Term	Definition	Diagram
Bedding	Signifying existence of beds or laminatae. Planes dividing sedimentary rocks of the same or different lithology. Structure occurring in granite and similar rocks evident in a tendency to split more or less horizontally to the land surface	
Cross Bedding	Also called cross-lamination or false bedding. The structure commonly present in granular sedimentary rocks, which consists of tabular, irregularly lenticular or wedge-shaped bodies lying essentially parallel to the general stratification and which them selves show pronounced lamination structure in which the laminae are steeply inclined to the general bedding.	
Crushed Seam	A fracture at a more or less acute angle to applied force generally with some pulverized material along its surface	
Joint	A fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.	
Parting	A small joint in rock or a layered rock where the tendency of crystals to separate along certain planes that are not true cleavage planes.	
Sheared Zone	A fracture that results from stresses which tend to shear one part of a specimen past the adjacent part