

# Appendix A

## **Results of Field Investigation**

Explanation Sheets (2 pages)

Engineering logs (9 pages)

Test Pit Photographs (5 pages)



## Rock Description Explanation Sheet (1 of 2)

The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726-1993.

**DEFINITIONS:** Rock substance, defect and mass are defined as follows:

**Rock Substance** In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.

**Defect** Discontinuity or break in the continuity of a substance or substances.

**Mass** Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

### SUBSTANCE DESCRIPTIVE TERMS:

**ROCK NAME** Simple rock names are used rather than precise geological classification.

**PARTICLE SIZE** Grain size terms for sandstone are:  
 Coarse grained Mainly 0.6mm to 2mm  
 Medium grained Mainly 0.2mm to 0.6mm  
 Fine grained Mainly 0.06mm (just visible) to 0.2mm

**FABRIC** Terms for layering of penetrative fabric (eg. bedding, cleavage etc. ) are:

Massive No layering or penetrative fabric.

Indistinct Layering or fabric just visible. Little effect on properties.

Distinct Layering or fabric is easily visible. Rock breaks more easily parallel to layering of fabric.

### CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition
<b>Residual Soil</b>	<b>RS</b>	Soil derived from the weathering of 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.
<b>Extremely Weathered Material</b>	<b>XW</b>	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded in water. Original rock fabric still visible.
<b>Highly Weathered Rock</b>	<b>HW</b>	Rock strength is changed by weathering. The whole of the rock substance is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Some minerals are decomposed to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of minerals in pores.
<b>Moderately Weathered Rock</b>	<b>MW</b>	The whole of the rock substance is discoloured, usually by iron staining or bleaching, to the extent that the colour of the fresh rock is no longer recognisable.
<b>Slightly Weathered Rock</b>	<b>SW</b>	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance (usually by limonite) has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
<b>Fresh Rock</b>	<b>FR</b>	Rock substance unaffected by weathering.

#### Notes on Weathering:

- AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a distinction. DW may be used with the definition given in AS1726.
- Where physical and chemical changes were caused by hot gasses and liquids associated with igneous rocks, the term "altered" may be substituted for "weathering" to give the abbreviations XA, HA, MA, SA and DA.

### ROCK SUBSTANCE STRENGTH TERMS

Term	Abbreviation	Point Load Index, I <sub>s(50)</sub> (MPa)	Field Guide
<b>Very Low</b>	<b>VL</b>	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; pieces up to 30mm thick can be broken by finger pressure.
<b>Low</b>	<b>L</b>	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a pick point; has a dull sound under hammer. Pieces of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
<b>Medium</b>	<b>M</b>	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
<b>High</b>	<b>H</b>	1 to 3	A piece of core 150mm long by 50mm can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
<b>Very High</b>	<b>VH</b>	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.
<b>Extremely High</b>	<b>EH</b>	More than 10	Specimen requires many blows with geological pick to break; rock rings under hammer.

#### Notes on Rock Substance Strength:

- In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.
- The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms.
- The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fall across the planar anisotropy) is typically 10 to 25 times the point load index I<sub>s(50)</sub>. The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

## Rock Description Explanation Sheet (2 of 2)

COMMON DEFECTS IN ROCK MASSES		Diagram	Map Symbol	Graphic Log (Note 1)	DEFECT SHAPE TERMS	
Term	Definition				Planar	TERMS
<b>Parting</b>	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (eg bedding) or a planar anisotropy in the rock substance (eg, cleavage). May be open or closed.				<b>Planar</b>	The defect does not vary in orientation
<b>Joint</b>	A surface or crack across which the rock has little or no tensile strength, but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.				<b>Curved</b>	The defect has a gradual change in orientation
<b>Sheared Zone (Note 3)</b>	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.				<b>Undulating</b>	The defect has a wavy surface
<b>Sheared Surface (Note 3)</b>	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.				<b>Stepped</b>	The defect has one or more well defined steps
<b>Crushed Seam (Note 3)</b>	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.				<b>Irregular</b>	The defect has many sharp changes of orientation
<b>Infilled Seam</b>	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1mm thick may be described as veneer or coating on joint surface.				<b>Note:</b>	The assessment of defect shape is partly influenced by the scale of the observation.
<b>Extremely Weathered Seam</b>	Seam of soil substance, often with gradational boundaries. Formad by weathering of the rock substance in place.				<b>ROUGHNESS TERMS</b>	
					<b>Slickensided</b>	Grooved or striated surface, usually polished
					<b>Polished</b>	Shiny smooth surface
					<b>Smooth</b>	Smooth to touch. Few or no surface irregularities
					<b>Rough</b>	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
					<b>Very Rough</b>	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.
					<b>COATING TERMS</b>	
					<b>Clean</b>	No visible coating
					<b>Stained</b>	No visible coating but surfaces are discoloured
					<b>Veneer</b>	A visible coating of soil or mineral, too thin to measure; may be patchy
					<b>Coating</b>	A visible coating up to 1mm thick. Thicker soil material is usually described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein.
					<b>BLOCK SHAPE TERMS</b>	
					<b>Blocky</b>	Approximately equidimensional
					<b>Tabular</b>	Thickness much less than length or width
					<b>Columnar</b>	Height much greater than cross section

**Notes on Defects:**

1. Usually borehole logs show the true dip of defects and face sketches and sections the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones, sheared surfaces and crushed seams are faults in geological terms.

# Soil Description Explanation Sheet (1 of 2)

## DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

## CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on Sheet 2.

## PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 $\mu$ m to 2.36 mm
	medium	200 $\mu$ m to 600 $\mu$ m
	fine	75 $\mu$ m to 200 $\mu$ m

## MOISTURE CONDITION

**Dry** Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.

**Moist** Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.

**Wet** As for moist but with free water forming on hands when handled.

## CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH $S_u$ (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 - 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 - 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 - 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 - 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	-	Crumbles or powders when scraped by thumbnail.

## DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	Greater than 85

## MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: <5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%

## SOIL STRUCTURE

ZONING	CEMENTING
Layers Continuous across exposure or sample.	Weakly cemented Easily broken up by hand in air or water.
Lenses Discontinuous layers of lenticular shape.	Moderately cemented Effort is required to break up the soil by hand in air or water.
Pockets Irregular inclusions of different material.	

## GEOLOGICAL ORIGIN

### WEATHERED IN PLACE SOILS

Extremely weathered material Structure and fabric of parent rock visible.

Residual soil Structure and fabric of parent rock not visible.

### TRANSPORTED SOILS

Aeolian soil Deposited by wind.

Alluvial soil Deposited by streams and rivers.

Colluvial soil Deposited on slopes (transported downslope by gravity).

Fill Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.

Lacustrine soil Deposited by lakes.

Marine soil Deposited in ocean basins, bays, beaches and estuaries.



# Soil Description Explanation Sheet (2 of 2)

## SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)				USC	PRIMARY NAME	
COARSE GRAINED SOILS More than 50% of materials less than 63 mm is larger than 0.075 mm	GRAVELS More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	GRAVEL	
		GRAVELS WITH FINES (Appreciable amount of fines)	Predominantly one size or a range of sizes with more intermediate sizes missing.	GP	GRAVEL	
		CLEAN SANDS (Little or no fines)	Non-plastic fines (for identification procedures see ML below)	GM	SILTY GRAVEL	
			Plastic fines (for identification procedures see CL below)	GC	CLAYEY GRAVEL	
	SANDS More than half of coarse fraction is smaller than 2.36 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes	SW	SAND	
		SANDS WITH FINES (Appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	SAND	
		IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.	DRY STRENGTH	DILATANCY	TOUGHNESS	
			None to Low	Quick to slow	None	ML
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm (A 0.075 mm particle is about the smallest particle visible to the naked eye)	SILTS & CLAYS Liquid limit less than 50	Medium to High	None	Medium	CL	CLAY
		Low to medium	Slow to very slow	Low	OL	ORGANIC SILT
		Low to medium	Slow to very slow	Low to medium	MH	SILT
	SILTS & CLAYS Liquid limit greater than 50	High	None	High	CH	CLAY
		Medium to High	None	Low to medium	OH	ORGANIC CLAY
		HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture.	Pt	PEAT	

• Low plasticity – Liquid Limit  $w_L$  less than 35%. • Medium plasticity –  $w_L$  between 35% and 50%. • High plasticity –  $w_L$  greater than 50%.

### COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM	TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.		SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2 m in length.		TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.		TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.		INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	



## Engineering Log - Excavation

Client: **Crookwell Developments Pty Ltd**

Date started: **31.3.2010**

Principal: **Union Fenosa Wind Australia**

Date completed: **31.3.2010**

Project: **Crookwell 3 Wind Farm**

Logged by: **DBA**

Test pit location: **WTG A4**

Checked by: **NSP**

equipment type and model: CAT 432 D Backhoe	Pit Orientation: E-W	Easting: 742142 m	R.L. Surface: 923
excavation dimensions: 3m long 0.5m wide		Northing: 6174888 m	datum: AHD

excavation information				material substance									
method	penetration 1 2 3	support	water	notes samples, tests, etc	depth metres	graphic log	classification symbol	material  soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa 100 200 300 400	structure and additional observations	
U		N					ML	TOPSOIL: CLAYEY SILT: low plasticity, brown	D	St		TOPSOIL	
					922.5 0.5		CH	SILTY CLAY: high plasticity, orange brown, with grey mottling, with fine to coarse basalt gravels and cobbles		H		*TERTIARY AGE VOLCANICS	
					922.0 1.0						600		
					921.5 1.5		CL	SILTY CLAY: medium to low plasticity, brown-yellow with black-red (iron staining) with fine to coarse basalt gravels, some basalt cobbles (extremely weathered Basalt)				600	
					921.0 2.0								
					920.5 2.5								
					920.0 3.0								
								Test pit CTP A4 terminated at 3m					
					919.5 3.5								
					919.0 4.0								

Sketch

Form GEO 5.2 Issue 3 Rev.2 TEST PIT GEOTABTF07881AC.GPJ COFFEY.GDT 3.5.10

<b>method</b> N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	<b>support</b> S shoring N nil  <b>penetration</b> 1 2 3 4 no resistance ranging to refusal  <b>water</b> ▽ water level on date shown ► water inflow ◄ water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet W <sub>p</sub> plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Excavation No. **CTP A6**  
 Sheet 1 of 1  
 Project No: **GEOTABTF07881AC**  
 Date started: **31.3.2010**  
 Date completed: **31.3.2010**  
 Logged by: **DBA**  
 Checked by: **TJP**

## Engineering Log - Excavation

Client: **Crookwell Developments Pty Ltd**  
 Principal: **Union Fenosa Wind Australia**  
 Project: **Crookwell 3 Wind Farm**  
 Test pit location: **WTG A6**

equipment type and model: CAT 432 D Backhoe Pit Orientation: E-W Easting: 741185 m R.L. Surface: 895  
 excavation dimensions: 3.5m long 0.5m wide Northing: 6174648 m datum: AHD

excavation information				material substance								
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations
1	2	3						soil type: plasticity or particle characteristics, colour, secondary and minor components.	M D	St	100 200 300 400	
					894.5		ML	<b>TOPSOIL: CLAYEY SILT:</b> low plasticity, brown, with some gravels and cobbles (Basalt)	M	St		TOPSOIL
					894.0		CH	<b>SILTY CLAY:</b> high plasticity, orange, with calcaerous pockets (10%)	M	St/VSt	X	TERTIARY AGE VOLCANICS
				None Observed	893.5						X	
					893.0		SM	<b>SILTY SAND:</b> fine grained, cemented to very low strength rock, red, yellow, very low specific gravity (possibly highly weathered sandstone)		VD	X	ORDOVICIAN AGE SEDIMENTARY DEPOSITS
					892.5			Test pit CTP A6 terminated at 2.6m				
					892.0							
					891.5							
					891.0							

Sketch

<b>method</b> N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	<b>support</b> S shoring N nil  <b>penetration</b> 1 2 3 4 no resistance ranging to refusal  <b>water</b> water level on date shown water inflow water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet W <sub>p</sub> plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Form GEO 5.2 Issue 3 Rev.2 TEST PIT GEOTABTF07881AC.GPJ COFFEY.GDT 3.5.10






Excavation No. **CTP A11**  
 Sheet 1 of 1  
 Project No: **GEOTABTF07881AC**  
 Date started: **31.3.2010**  
 Date completed: **31.3.2010**  
 Logged by: **DBA**  
 Checked by: **TSP**

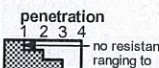



## Engineering Log - Excavation

Client: **Crookwell Developments Pty Ltd**  
 Principal: **Union Fenosa Wind Australia**  
 Project: **Crookwell 3 Wind Farm**  
 Test pit location: **WTG A11**

equipment type and model: CAT 432 D Backhoe Pit Orientation: E-W Easting: 742556 m R.L. Surface: 898  
 excavation dimensions: 3m long 0.5m wide Northing: 6174020 m datum: AHD

excavation information				material substance									
method	penetration	support	water	notes samples, tests, etc	depth RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations
1	2	3			RL	m			soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
W		N		None Observed				ML	<b>TOPSOIL: CLAYEY SILT:</b> low plasticity, brown red, with basalt gravels and cobbles	M	St		TOPSOIL
					897.5	0.5		CH	<b>SILTY CLAY:</b> high plasticity, brown-yellow, with basalt cobbles		VSt	X	TERTIARY AGE VOLCANICS
					897.0	1.0			<b>BASALT:</b> extremely to highly weathered, highly fractured, very low to medium strength	D			
					896.5	1.5			Refusal at 1.4m on high strength Basalt Test pit CTP A11 terminated at 1.4m				
					896.0	2.0							
					895.5	2.5							
					895.0	3.0							
					894.5	3.5							
					894.0	4.0							

Sketch

<b>method</b> N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	<b>support</b> S shoring N nil  <b>penetration</b>  1 2 3 4 no resistance ranging to refusal  <b>water</b>  water level on date shown  water inflow  water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet W <sub>p</sub> plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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## Engineering Log - Excavation

Client: **Crookwell Developments Pty Ltd**

Date started: **31.3.2010**

Principal: **Union Fenosa Wind Australia**

Date completed: **31.3.2010**

Project: **Crookwell 3 Wind Farm**

Logged by: **DBA**

Test pit location: **WTG A13**

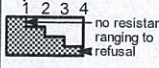



Checked by: **TWP**

equipment type and model: CAT 432 D Backhoe Pit Orientation: E-W Easting: 743466 m R.L. Surface: 868  
excavation dimensions: 3.5m long 0.5m wide Northing: 6173101 m datum: AHD

excavation information				material substance								
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material <small>soil type: plasticity or particle characteristics, colour, secondary and minor components.</small>	moisture condition	consistency/density index	pocket penetrometer	structure and additional observations
	1 2 3										100 200 300 400 kPa	
		N					ML	TOPSOIL: CLAYEY SILT: low plasticity, light grey	D	St		TOPSOIL
			None Observed		867.5		CL	SILTY CLAY: medium plasticity, orange with some organics		H/Fb	600	ORDOVICIAN AGE SEDIMENTARY DEPOSITS
					867.0		CL	SILTY CLAY: medium plasticity, white grey, extremely weathered siltstone, thinly bedded		H	600	
					866.5			SILTSTONE: moderately to slightly weathered, white grey, medium strength, thinly bedded (70°-80°) to the west				
					866.0			Test pit CTP A13 terminated at 1.8m				
					865.5							
					865.0							
					864.5							
					864.0							

Sketch

Form GEO 5.2 Issue 3 Rev.2 TEST PIT GEOTABTF07881AC.GPJ COFFEY.GDT 3.5.10

<b>method</b> N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	<b>support</b> S shoring N nil  <b>penetration</b> 1 2 3 4  no resistance ranging to refusal  <b>water</b>  water level on date shown  water inflow  water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet W <sub>p</sub> plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Excavation No. **CTP A15**

## Engineering Log - Excavation

Sheet 1 of 1

Project No: **GEOTABTF07881AC**

Client: **Crookwell Developments Pty Ltd**

Date started: **31.3.2010**

Principal: **Union Fenosa Wind Australia**

Date completed: **31.3.2010**




Project: **Crookwell 3 Wind Farm**

Logged by: **DBA**

Test pit location: **WTG A15**

Checked by: **TJS**

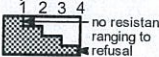



equipment type and model: CAT 432 D Backhoe Pit Orientation: E-W Easting: 744229 m R.L. Surface: 895  
 excavation dimensions: 3.5m long 0.5m wide Northing: 6173598 m datum: AHD

excavation information				material substance								
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer	structure and additional observations
	1 2 3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
E		N	None Observed		894.5 0.5		ML	<b>TOPSOIL: SANDY SILT:</b> low plasticity, brown, with fine to coarse sands and gravels and organics	M	St		TOPSOIL
					894.0 1.0		CL/SC	<b>SANDY CLAY/CLAYEY SAND:</b> medium plasticity, fine sand, yellow-orange, with some quartz gravels, angular	D	HVD	600	ORDOVICIAN AGE SEDIMENTARY DEPOSITS
					893.5 1.5			<b>SANDSTONE:</b> fine grained, high strength				
					893.0 2.0			Refusal at 1.5m on high strength Sandstone Test pit CTP A15 terminated at 1.5m				
					892.5 2.5							
					892.0 3.0							
					891.5 3.5							
					891.0 4.0							

Sketch

TEST PIT GEOTABTF07881AC.GPJ COFFEY.GDT 3.5.10

Form GEO 5.2 Issue 3 Rev.2

<b>method</b> N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	<b>support</b> S shoring N nil  <b>penetration</b> 1 2 3 4  no resistance ranging to refusal  <b>water</b>  water level on date shown  water inflow  water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet W <sub>p</sub> plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Excavation No. **CTP A20**

## Engineering Log - Excavation

Sheet 1 of 1  
Project No: **GEOTABTF07881AC**

Client: **Crookwell Developments Pty Ltd**

Date started: **31.3.2010**

Principal: **Union Fenosa Wind Australia**

Date completed: **31.3.2010**

Project: **Crookwell 3 Wind Farm**

Logged by: **DBA**

Test pit location: **WTG A20**

Checked by: **TJP**

equipment type and model: CAT 432 D Backhoe Pit Orientation: E-W Easting: 743051 m R.L. Surface: 880  
excavation dimensions: 4m long 0.5m wide Northing: 6172313 m datum: AHD

excavation information				material substance								
method	penetration 1 2 3	support	water	notes samples, tests, etc	depth metres	graphic log	classification symbol	material  soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
W		N			0.5		ML	TOPSOIL: SANDY SILT: low plasticity, fine sands, brown	D	St		TOPSOIL
			None Observed		0.5		CL	SANDY CLAY: low to medium plasticity, orange, fine to medium sands		H	600	ORDOVICIAN AGE SEDIMENTARY DEPOSITS
					1.0			SHALE: light grey, moderately to slightly weathered. medium strength rock, bedding very thin ~45° to the west				
					1.5							
					2.0			Test pit CTP A20 terminated at 1.7m				
					2.5							
					3.0							
					3.5							
					4.0							

Sketch

<b>method</b> N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	<b>support</b> S shoring N nil  <b>penetration</b> 1 2 3 4  no resistance ranging to refusal  <b>water</b>  water level on date shown  water inflow  water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet W <sub>p</sub> plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Excavation No. **LS1**  
 Sheet 1 of 1  
 Project No: **GEOTABTF07881AC**  
 Date started: **31.3.2010**  
 Date completed: **31.3.2010**  
 Logged by: **DBA**  
 Checked by: **TJP**

## Engineering Log - Excavation

Client: **Crookwell Developments Pty Ltd**  
 Principal: **Union Fenosa Wind Australia**  
 Project: **Crookwell 3 Wind Farm**  
 Test pit location: **Refer to site Plan**

equipment type and model: CAT 432 D Backhoe Pit Orientation: E-W Easting: 742068 m R.L. Surface: 910  
 excavation dimensions: 3m long 0.5m wide Northing: 6174724 m datum: AHD

excavation information				material substance								
method	penetration	support	water	notes samples, tests, etc	depth RL metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer	structure and additional observations
	1 2 3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
W		N					ML	TOPSOIL: CLAYEY SILT: low plasticity, brown/orange with basalt cobbles	D	St		TOPSOIL
			None Observed		909.5 0.5		CL GC	SILTY CLAY: medium plasticity, brown, with basalt cobbles GRAVEL: in clay matrix, fine to coarse gravels of sandstone, highly weathered, yellow grey		MD		COLLUVIUM
					909.0 1.0							
					908.5 1.5			becoming predominantly SANDSTONE cobbles				more difficult to excavate
					908.0 2.0			Test pit LS1 terminated at 1.7m				
					907.5 2.5							
					907.0 3.0							
					906.5 3.5							
					906.0 4.0							

Sketch

TEST PIT GEOTABTF07881AC.GPJ COFFEY.GDT 3.5.10

Form GEO 5.2 Issue 3 Rev.2

<b>method</b> N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	<b>support</b> S shoring N nil  <b>penetration</b> 1 2 3 4 no resistance ranging to refusal  <b>water</b> water level on date shown water inflow water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample V vane shear (kPa) Bs bulk sample E environmental sample R refusal	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet W <sub>p</sub> plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Test Pit A4





Test Pit A6





Test Pit A11





Test Pit A13





Test Pit A15





Test Pit A20





Test Pit LS1

