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**Queensland  
Government**

Department of  
Main Roads

# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND  
SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH13

SHEET 1 of 7

REFERENCE No H9562

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION

LOCATION PIER 6 - NORTHERN FACE OF THE PILE CAP COORDINATES 10332.7 E; 167726.7 N

PROJECT No FG5388 SURFACE R.L. -9.55 DATE STARTED 17/3/05 DATUM SETP

JOB No \_\_\_\_\_ DATUM AHD DATE COMPLETED 18/3/05 DRILLER CAIRNS DRILLING

DEPTH (m)	R.L. (m)	CASING WASH BORING CORE DRILLING	ROD (%)	CORE REC %	SAMPLE	MATERIAL DESCRIPTION	LITHOLOGY	USC	WEATHERING	INTACT STRENGTH					DEFECT SPACING (mm)			GRAPHIC LOG	ADDITIONAL DATA AND TEST RESULTS	SAMPLES TESTS		
										GH	VT	IM	HL	VE	20	60	200				500	2000
0	-9.55					<b>ESTUARINE SILTY CLAY</b> Dark grey moist firm to stiff.  High plasticity.																
1							OH															
2	-11.05					<b>ESTUARINE SILTY SAND</b> Dark grey moist to mainly wet loose.  Fine grained sand with some shell fragments.														8,5,4 N=9	SPT	
3	-11.65					<b>LOW GRADE COAL</b> <b>BLACK MAINLY DULL TO VITREOUS</b> <b>FINE GRAINED THINLY LAMINATED</b> <b>FRAGILE CARBONACEOUS</b> <b>SEDIMENTARY ROCK</b>  HW: Black moist hard gravelly silt gradually grading into very low to low strength coal.  Frequent completely weathered minor siltstone interbeds/seams exhibiting engineering properties of high plastic clay.														11,16,15 N=31	SPT	
4							HW															
5	-14.55																				22,10/10,HB N>50	SPT

REMARKS This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles have been measured with respect to a horizontal plane.

LOGGED BY  
**A. DISSANAYAKE (DISS)**



**Queensland  
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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND  
SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No     BH13    

SHEET     2     of     7    

REFERENCE No     H9562    

PROJECT     GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION    

LOCATION     PIER 6 - NORTHERN FACE OF THE PILE CAP     COORDINATES     10332.7 E; 16726.7 N    

PROJECT No     FG5388     SURFACE R.L.     -9.55     DATE STARTED     17/3/05     DATUM     SETP    

JOB No                      DATUM     AHD     DATE COMPLETED     18/3/05     DRILLER     CAIRNS DRILLING    

DEPTH (m)	R.L. (m)	CASING WASH BORING CORE DRILLING	ROD ( ) %	CORE REC %	SAMPLE	MATERIAL DESCRIPTION	LITHOLOGY	USC WEATHERING	INTACT STRENGTH					DEFECT SPACING (mm)				GRAPHIC LOG	ADDITIONAL DATA AND TEST RESULTS	SAMPLES TESTS		
									ET	VH	VJ	N	J	L	EL	20	60				200	600
5	-14.55					LOW GRADE COAL HW: (As above)	HW															
6	-15.65		(20)			MW: Black mainly dull to vitreous, mainly low to medium strength. Frequent siltstone interbeds up to 160mm.  Defects : - Frequent lamination/bedding partings <20° (3-4/m) - Weathered and fractured seams (<250mm) - Occasional joints @ 35° and 70° (1/3m)	MW													30/85, -- N>50	SPT	
7																						
8			100 (63)																			
9																						
10	-19.55		100 (55)																			

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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND  
SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No **BH13**

SHEET **3** of **7**

REFERENCE No **H9562**

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION

LOCATION PIER 6 - NORTHERN FACE OF THE PILE CAP COORDINATES 10332.7 E; 167726.7 N

PROJECT No FG5388 SURFACE R.L. -9.55 DATE STARTED 17/3/05 DATUM SETP

JOB No \_\_\_\_\_ DATUM AHD DATE COMPLETED 18/3/05 DRILLER CAIRNS DRILLING

DEPTH (m)	R.L. (m)	CASING WAS BORING CORE DRILLING	RQD (%) CORE REC %	SAMPLE	MATERIAL DESCRIPTION	LITHOLOGY	USC	WEATHERING	INTACT STRENGTH	DEFECT SPACING (mm)	GRAPHIC LOG	ADDITIONAL DATA AND TEST RESULTS	SAMPLES TESTS
10	-19.55				<b>LOW GRADE COAL</b> MW : (As above).							Is(50)=0.16 MPa Is(50)=0.32 MPa High strength siltstone	x o
11	-20.37				<b>SILTSTONE FINE GRAINED THINLY LAMINATED SEDIMENTARY ROCK</b> SW : Pale grey to grey fine grained thinly laminated mainly low to medium strength.  Defects : Generally rare. Occasional drilling induced lamination partings @ 30° (1-3/m).							UCS=6.6MPa WD=2336N/m <sup>2</sup> Is(50)=0.08 MPa Is(50)=0.08 MPa Is(50)=0.27 MPa Is(50)=0.03 MPa	x o x o
12	-21.10				<b>INTERBEDDED LOW GRADE COAL SILTSTONE AND SANDSTONE. LOW GRADE COAL DOMINANT</b> SW : Pale grey to black fine grained laminated/interbedded mainly medium to high strength. Defects : - Lamination/bedding partings <10° (4/m) - Weathered seams <50mm - Joints @ 50° to 80° (2-3/m)  Becoming predominantly sandstone between 12.5m and 13.6; some altered and weathered zones along bedding/lamination partings.							Clay seam HW siltstone interbed  Is(50)=0.27 MPa	o
13			94 (42)									Predominantly sandstone  Is(50)=0.40 MPa	x
14												Is(50)=0.47 MPa Is(50)=0.21 MPa	x o
15	-24.55											Broken zone LL=30.8%; PI=9.5% Clay seam Coreloss	

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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH13  
SHEET 4 of 7  
REFERENCE No H9562

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION  
LOCATION PIER 6 - NORTHERN FACE OF THE PILE CAP COORDINATES 10332.7 E; 167726.7 N  
PROJECT No FG5388 SURFACE R.L. -9.55 DATE STARTED 17/3/05 DATUM SETP  
JOB No \_\_\_\_\_ DATUM AHD DATE COMPLETED 18/3/05 DRILLER CAIRNS DRILLING

DEPTH (m)	R.L. (m)	CASING WASH BORING CORE DRILLING	ROD (%)	CORE REC %	SAMPLE	MATERIAL DESCRIPTION	LITHOLOGY	USC WEATHERING	INTACT STRENGTH	DEFECT SPACING (mm)	GRAPHIC LOG	ADDITIONAL DATA AND TEST RESULTS		SAMPLES TESTS
												UCS	Is(50)	
15	-24.55					<b>INTERBEDDED LOW GRADE COAL SILTSTONE AND SANDSTONE. LOW GRADE COAL DOMINANT</b> SW : (As above) <b>MUDSTONE</b> SW : Pale grey to black grey fine grained thinly laminated low to mainly medim strength.  Defects : Generally rare. - Occasional drilling induced lamination partings @ 5° (1/m). - Occasional weathered and clay seams <30mm.	SW					Coreloss		
	-24.60		86 (95)									UCS=10.8MPa WD=2291/m <sup>2</sup>	Is(50)=0.20 MPa Is(50)=0.38 MPa Is(50)=0.29 MPa Is(50)=0.35 MPa	x o x o
	-25.30					<b>SANDSTONE</b> Pale grey to dark grey fine grained mainly massive to slightly laminated, mainly medium to high strength with occasional very high strength bands.  Defects : Generally rare. - Occasional lamination partings <20°(3/2m).	SW					UCS=21.6MPa WD=2462N/m <sup>2</sup>	Is(50)=0.41 MPa Is(50)=0.76 MPa Is(50)=0.46 MPa Is(50)=0.89 MPa	x o x o
						Defects are generally drilling induced planar, smooth with no alteration or infillings.	SW					UCS=24.74MPa WD=2501N/m <sup>2</sup>	Is(50)=1.49 MPa Is(50)=1.64 MPa	x o
						<b>INTERBEDDED SILTSTONE AND MUDSTONE</b> SW : Grey to black grey, fine grained thinly laminated, mainly medium to high strength.  More interbedded sandstone below 18.75m  Defects : Generally rare. -Occasional drilling induced lamination partings @ 30° (1/2m) - Occasional joints @ 85° (3/m).	SW					UCS=22MPa MC=2.75% WD=2500N/m <sup>2</sup>	Is(50)=0.56 MPa Is(50)=0.65 MPa	x o
						Defects are generally planar, rough and closed with no ironstaining or alteration.	SW					UCS=16.4MPa WD=2475N/m <sup>2</sup>	Is(50)=0.41 MPa Is(50)=0.63 MPa	x o
						<b>SANDSTONE</b> (See next page)	SW						Is(50)=0.66 MPa Is(50)=1.38 MPa	x o
20	-29.55													

BOREHOLE WITH LITHOLOGY MEERA PIER 6 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09\_04.GDT 31/8/05

REMARKS This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles have been measured with respect to a horizontal plane.

LOGGED BY  
A. DISSANAYAKE (DISS)



# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH13  
SHEET 5 of 7  
REFERENCE No H9562

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION  
LOCATION PIER 6 - NORTHERN FACE OF THE PILE CAP COORDINATES 10332.7 E; 167726.7 N  
PROJECT No FG5388 SURFACE R.L. -9.55 DATE STARTED 17/3/05 DATUM SETP  
JOB No \_\_\_\_\_ DATUM AHD DATE COMPLETED 18/3/05 DRILLER CAIRNS DRILLING

DEPTH (m)	R.L. (m)	CASING WASH BORING CORE DRILLING	ROD (%)	CORE REC %	SAMPLE	MATERIAL DESCRIPTION	LITHOLOGY	UCS WEATHERING	INTACT STRENGTH	DEFECT SPACING (mm)	GRAPHIC LOG	ADDITIONAL DATA AND TEST RESULTS	SAMPLES TESTS	
														SW
20	-29.55					<b>SANDSTONE</b> SW : Pale grey to dark grey fine grained mainly massive to slightly laminated mainly very high strength. Some mudstone interbeds up to 100mm. Defects : Generally rare. - Occasional lamination partings <30° (1-2/m).	SW					UCS=130.2MPa WD=2951N/m <sup>2</sup>	Is(50)=6.31 MPa Is(50)=5.57 MPa	x o
	-29.99					<b>INTERBEDDED MUDSTONE AND SANDSTONE. SANDSTONE DOMINANT</b> SW : Grey to black, fine grained interbedded /interlaminated mainly medium to high strength. Defects : Generally rare. - Broken zone <40mm.	SW						Is(50)=1.79 MPa	o
21	-30.81		100 (93)			<b>SANDSTONE</b> SW : Pale grey to white fine grained slightly massive to laminated medium to mainly high strength. Defects : Generally rare.	SW					UCS=31.0MPa WD=2433/m <sup>2</sup>	Is(50)=1.27 MPa Is(50)=1.27 MPa	o x
	-31.79					<b>SANDSTONE</b> SW : Pale grey to white fine grained slightly massive to laminated medium to mainly high strength. Defects : Generally rare.	SW					UCS=31.0MPa WD=2461N/m <sup>2</sup>	Is(50)=1.27 MPa Is(50)=2.43 MPa	x o
22	-31.79					<b>MUDSTONE</b> SW : Dark grey to black, fine grained thinly laminated mainly medium to high strength. Defects : Generally rare. -Occasional drilling induced lamination partings @ 20° (3/m).	SW					UCS=31.0MPa WD=2461N/m <sup>2</sup>	Is(50)=0.63 MPa Is(50)=1.23 MPa	x o
	-33.20					<b>MUDSTONE</b> SW : Dark grey to black, fine grained thinly laminated mainly medium to high strength. Defects : Generally rare. -Occasional drilling induced lamination partings @ 20° (3/m).	SW					UCS=31.0MPa WD=2461N/m <sup>2</sup>	Is(50)=0.54 MPa Is(50)=0.74 MPa	x o
23	-33.20					<b>MUDSTONE</b> SW : Dark grey to black, fine grained thinly laminated mainly medium to high strength. Defects : Generally rare. -Occasional drilling induced lamination partings @ 20° (3/m).	SW					UCS=46.85MPa WD=2435N/m <sup>2</sup>	Is(50)=1.24 MPa Is(50)=0.38 MPa	o x
	-33.80					<b>MUDSTONE</b> SW : Dark grey to black, fine grained thinly laminated mainly medium to high strength. Defects : Generally rare. -Occasional drilling induced lamination partings @ 20° (3/m).	SW					UCS=46.85MPa WD=2435N/m <sup>2</sup>	Is(50)=0.55 MPa Is(50)=1.46 MPa	x o
24	-33.80		100 (70)			<b>INTERBEDDED MUDSTONE AND SANDSTONE. SANDSTONE DOMINANT</b> MW - SW : Pale grey to grey, low to medium strength, altered and erodable throughout. Defects: Lamination partings <35° (1-2/m)	MW-SW					UCS=71.7MPa WD=2497N/m <sup>2</sup> LL=41%; PI=17%	Is(50)=1.11 MPa Is(50)=2.75 MPa Is(50)=1.44 MPa Is(50)=2.50 MPa	x o o x
	-33.80					<b>INTERBEDDED MUDSTONE AND SANDSTONE. SANDSTONE DOMINANT</b> MW - SW : Pale grey to grey, low to medium strength, altered and erodable throughout. Defects: Lamination partings <35° (1-2/m)	MW-SW					LL=38.4%; PI=15.6%; LS=12.4%		
	-34.55					<b>SANDSTONE</b> SW : Pale grey to dark grey, fine grained, interbedded/interlaminated, mainly medium to high strength. Defects : - Lamination partings <30° (3/m) - Broken zones <600mm - Occasional joints @ 60° (**/m) Significant alteration and weathering along some joint planes especially below 26m.	SW					UCS=11.2MPa; WD=2567N/m <sup>2</sup>		

REMARKS This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles have been measured with respect to a horizontal plane.

LOGGED BY  
**A. DISSANAYAKE (DISS)**



# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No   BH13    
SHEET   6   of   7    
REFERENCE No   H9562  

PROJECT   GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION    
LOCATION   PIER 6 - NORTHERN FACE OF THE PILE CAP   COORDINATES   10332.7 E; 167726.7 N    
PROJECT No   FG5388   SURFACE R.L.   -9.55   DATE STARTED   17/3/05   DATUM   SETP    
JOB No            DATUM   AHD   DATE COMPLETED   18/3/05   DRILLER   CAIRNS DRILLING  

DEPTH (m)	R.L. (m)	CASING WASH BORING CORE DRILLING	ROD ( ) %	CORE REC %	SAMPLE	MATERIAL DESCRIPTION	LITHOLOGY	USC WEATHERING	INTACT STRENGTH					DEFECT SPACING (mm)	GRAPHIC LOG	ADDITIONAL DATA AND TEST RESULTS	SAMPLES TESTS
									EH	VH	N	J	LE				
25	-34.55					SW : (As above) Significant alteration and weathering along some joint planes especially below 26m. Defects are generally planar, smooth and closed with no alteration or infillings.									Weathered broken and altered zone		
				100 (83)			SW								Broken zone.		
	-36.45					<b>SANDSTONE</b> SW : Pale grey to white, slightly massive to mainly laminated, high to mainly very high strength. Defects : - Lamination partings <30° (3/0.5m) - Joints <30° (2/0.5m)	SW									Is(50)=0.54 MPa Is(50)=1.72 MPa	x o
	-37.00					<b>INTERBEDDED MUDSTONE AND SANDSTONE. MUDSTONE DOMINANT</b> MW-SW : Grey to black, fine grained, interbedded /interlaminated, mainly high to very high strength. Defects : - Lamination partings <35° (5/2m) - Joints @ 70° (3/m)	SW									Is(50)=0.41 MPa Is(50)=1.04 MPa	x o
				100 (77)			MW								Broken zone.		
	-39.11					<b>MUDSTONE</b> SW : (As below).	SW									Is(50)=3.26 MPa Is(50)=3.56 MPa	x o
							SW									Is(50)=0.33 MPa Is(50)=2.07 MPa Is(50)=0.51 MPa Is(50)=1.55 MPa Is(50)=0.34 MPa Is(50)=1.32 MPa	x o x o x o
																UCS=14.50MPa; WD=2454N/m²	
																Is(50)=0.40 MPa Is(50)=1.17 MPa	x o
																Is(50)=1.15 MPa	o
																Is(50)=0.23 MPa Is(50)=1.02 MPa	x o
																Is(50)=0.27 MPa Is(50)=1.77 MPa	x o
30	-39.55						SW										

BOREHOLE WITH LITHOLOGY MEERA PIER 6 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 08\_04.GDT 31/8/05

REMARKS   This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles have been measured with respect to a horizontal plane.  

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**A. DISSANAYAKE (DISS)**





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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND  
SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No   BH13    
SHEET   7   of   7    
REFERENCE No   H9562  

PROJECT   GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION    
LOCATION   PIER 6 - NORTHERN FACE OF THE PILE CAP   COORDINATES   10332.7 E; 167726.7 N    
PROJECT No   FG5388   SURFACE R.L.   -9.55   DATE STARTED   17/3/05   DATUM   SETP    
JOB No \_\_\_\_\_ DATUM   AHD   DATE COMPLETED   18/3/05   DRILLER   CAIRNS DRILLING  

DEPTH (m)	RL (m)	CASING WASH BORING CORE DRILLING	ROD (%) CORE REC %	SAMPLE	MATERIAL DESCRIPTION	LITHOLOGY	USC	WEATHERING	INTACT STRENGTH					DEFECT SPACING (mm)	GRAPHIC LOG	ADDITIONAL DATA AND TEST RESULTS	SAMPLES TESTS	
									EH	VM	LM	VL	EL					20
30	-39.55				<b>MUDSTONE</b> SW : Dark grey to black, fine grained thinly laminated mainly medium to high strength.  Minor sandstone interbeds throughout.  Defects : Generally rare. - Occasional drilling induced lamination partings @ 20° (1-3/m) - Joints @ 75° (3/m) - Broken and fractured zones up to 400mm.  Defects are generally planar, smooth and closed with no discolouration or alteration.													
31															UCS=33.1MPa; WD=2529N/m <sup>2</sup>		is(50)=0.62 MPa is(50)=3.06 MPa	x o
32			100 (99)														is(50)=0.59 MPa is(50)=2.31 MPa	x o
33																	is(50)=0.53 MPa is(50)=2.51 MPa	x o
34																	is(50)=0.72 MPa is(50)=1.83 MPa	x o
																	is(50)=1.20 MPa	o
																	Fractured zone.	
																	is(50)=1.37 MPa is(50)=1.00 MPa	o x
																	Sandstone interbed is(50)=0.65 MPa is(50)=1.32 MPa	x o
																	Drillcore remained in the borehole.	
35	-44.45				Borehole terminated at 34.8m													

REMARKS   This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles have been measured with respect to a horizontal plane.  

LOGGED BY  
**A. DISSANAYAKE (DISS)**



Project: **Gateway Upgrade Project - Gateway Bridge**

Borehole No: **BH 13**

Start Depth: 6.10m

Finish Depth: 34.80m

Project No: FG 5388

H No: 9562



Project: **Gateway Upgrade Project - Gateway Bridge**

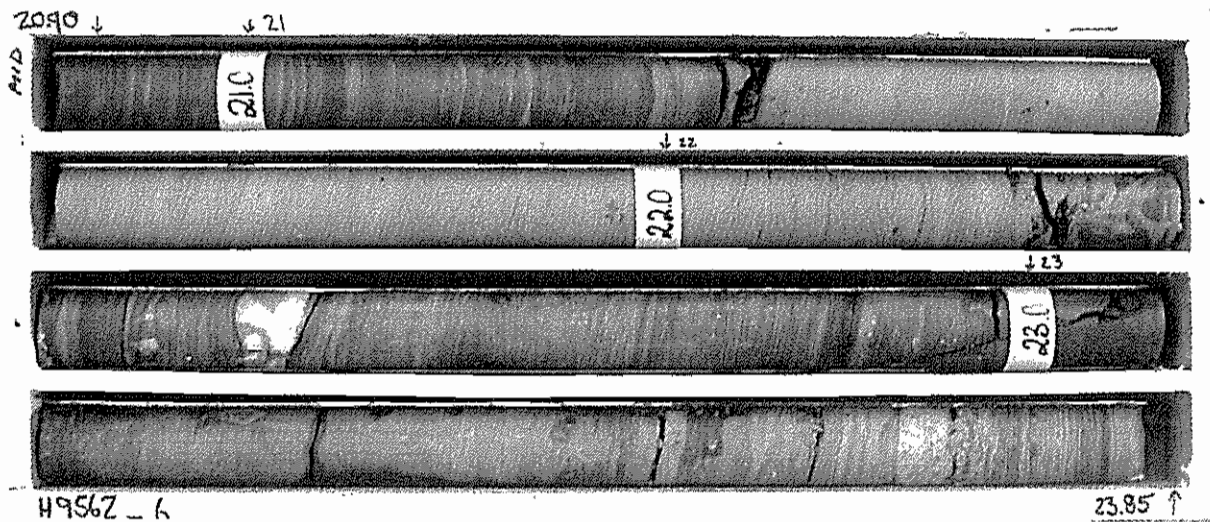
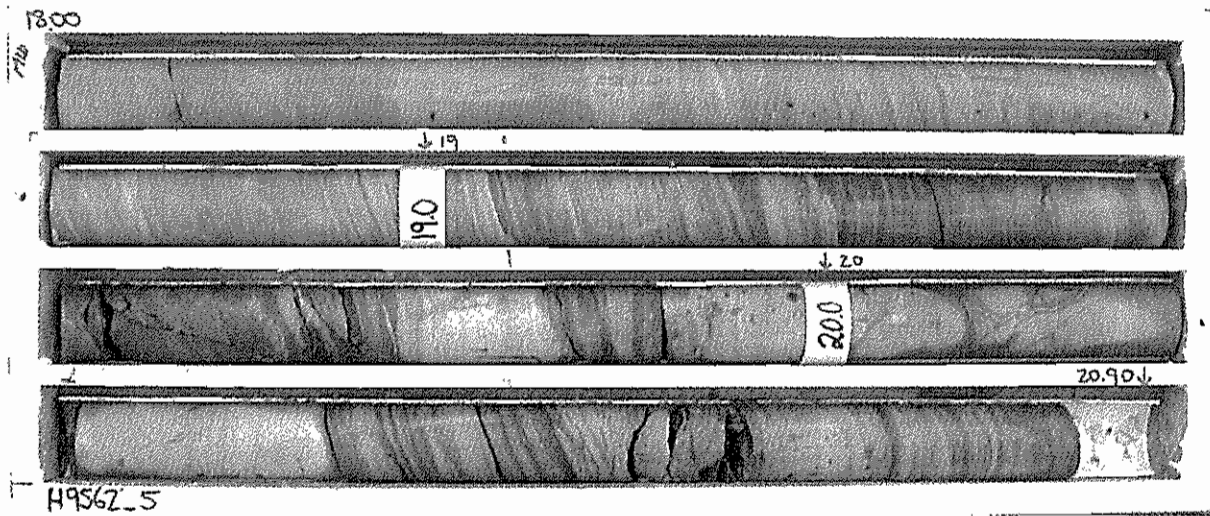
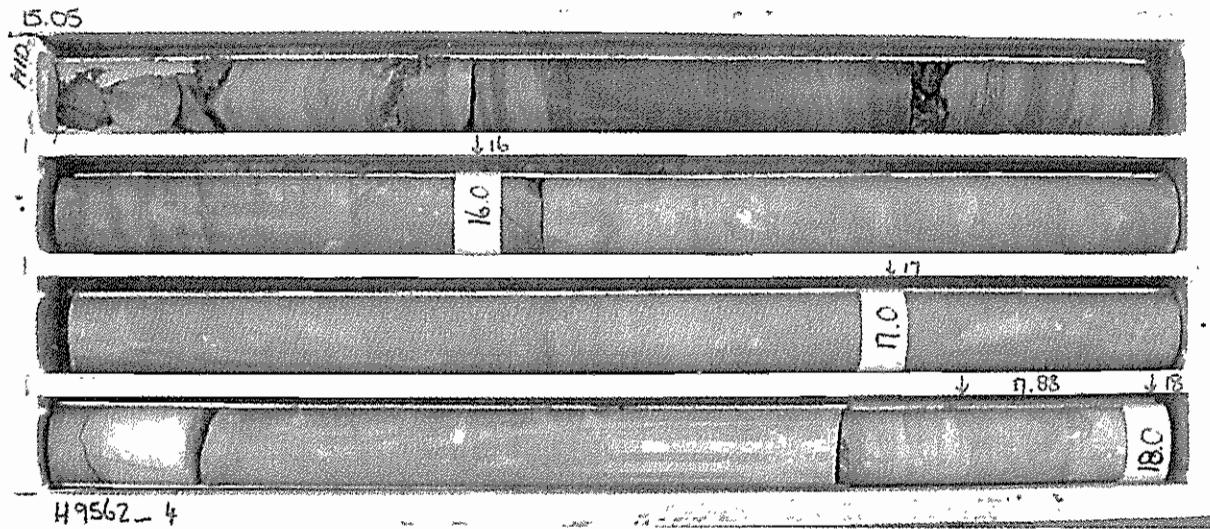
Borehole No: **BH 13**

Start Depth: 6.10m

Finish Depth: 34.80m

Project No: FG 5388

H No: 9562



Project: **Gateway Upgrade Project - Gateway Bridge**

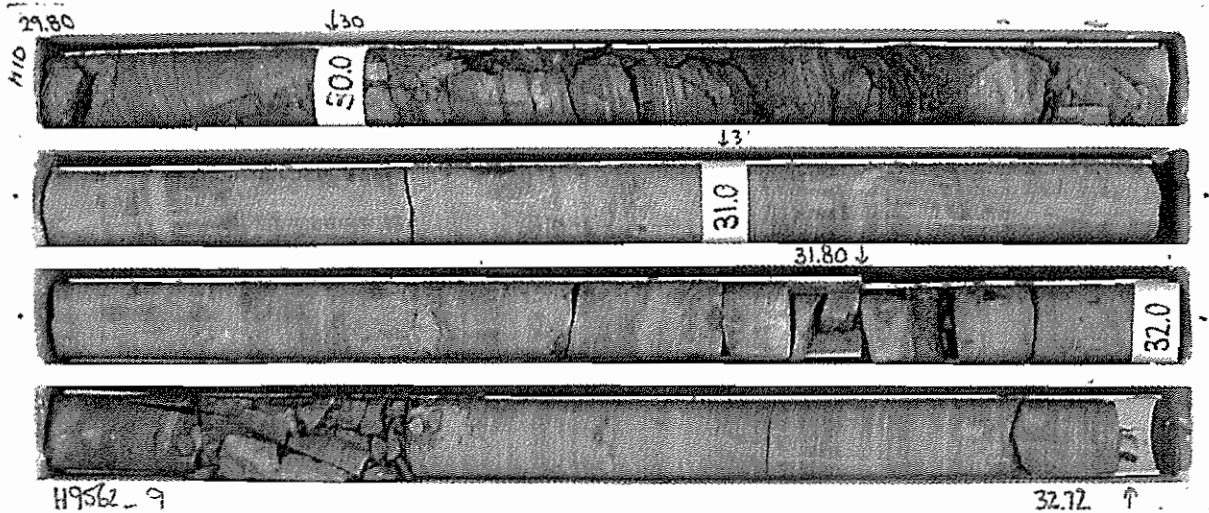
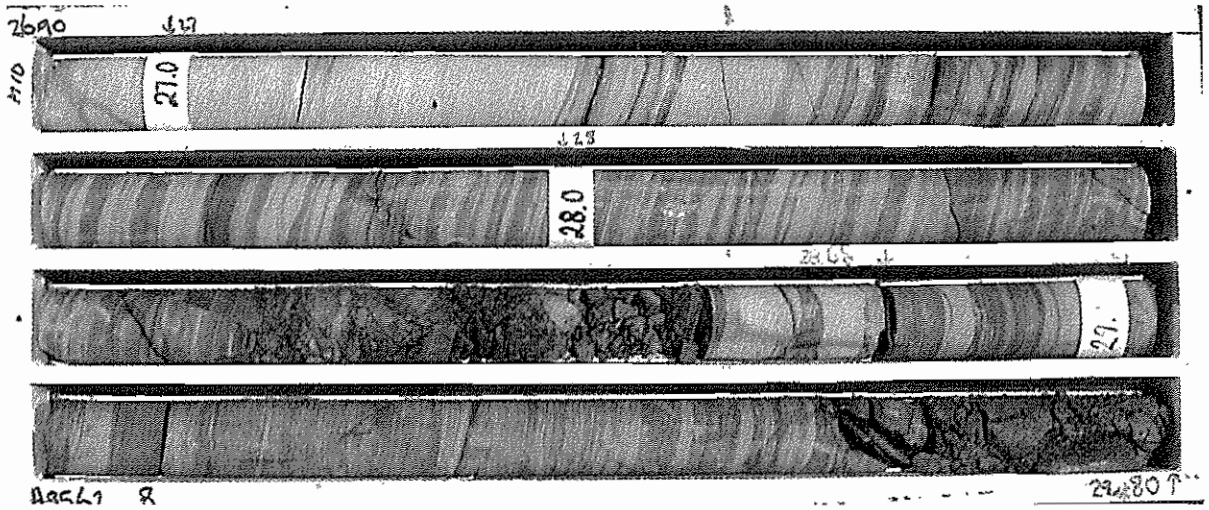
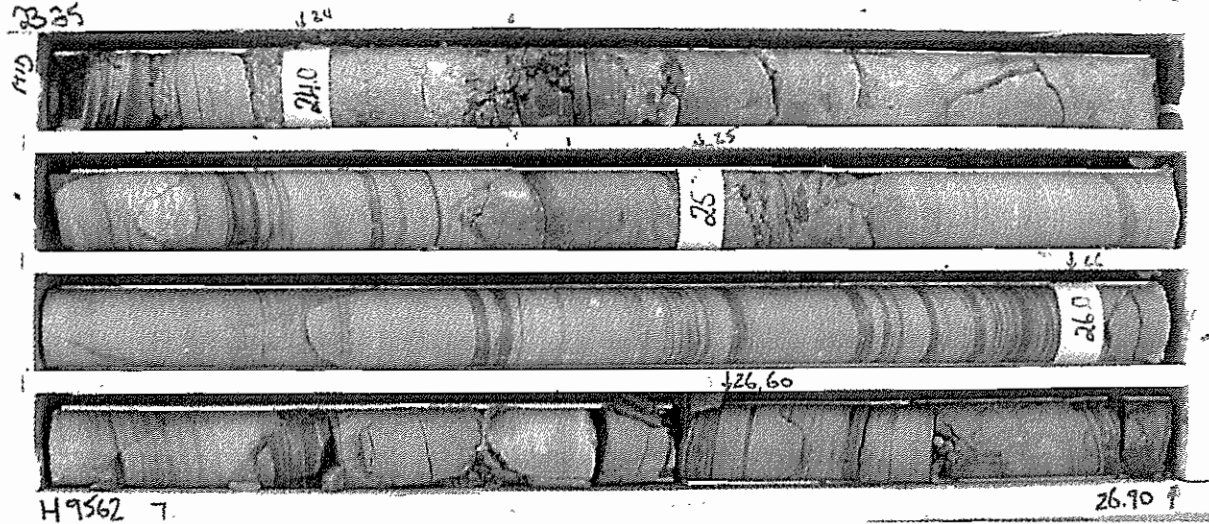
Borehole No: **BH 13**

Start Depth: 6.10m

Finish Depth: 34.80m

Project No: FG 5388

H No: 9562



Project: **Gateway Upgrade Project - Gateway Bridge**

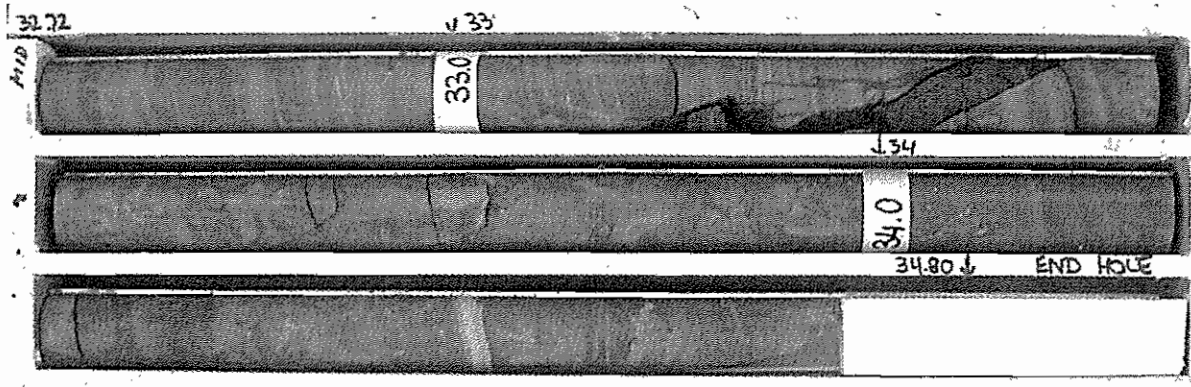
Borehole No: **BH 13**

Start Depth: 6.10m

Finish Depth: 34.80m

Project No: FG 5388

H No: 9562







**DEFECT DESCRIPTIONS  
OF ENGINEERING BORELOGS**

(CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH  
ISRM SUGGESTED METHODS (1981))

BOREHOLE NO : BH13

SHEET : 1 of 6

REFERENCE NO : H9562

PROJECT : GATEWAY UPGRADE PROJECT – GATEWAY BRIDGE DUPLICATION FOUNDATION  
INVESTIGATION

LOCATION : PIER 6 – NORTHERN FACE OF THE PILE CAP

PROJECT NO : FG5388 SURFACE R.L : -9.55 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD DATE DRILLED : 17 - 18/3/05

DEPTH	DEFECT TYPE	DIP	PLANARITY	ROUGHNESS	APERTURE	WALL ALTERATION	OTHER
6.1-6.34	WS	10°	-	-	-	W	Parallel to BP
6.41	J	35°	St	R	C	Cn	-
6.45-6.46	WS	-	Ir	R	O	W	Parallel to LP
6.54-6.65	WS	-	-	-	O	W	-
6.75	10°<	LP	Cu / Un	S	O	Cn	Parallel to LP
6.91	<5°	LP	P	S	O	Cn	-
7.08-7.15	BZ	-	-	-	O	Cn	-
7.24	WS	10°	Pl	R	O	W	Parallel to LP
7.30-7.34	WS	-	Ir	R	O	W	-
7.45	LP	10°	P	S	C	Cn	-
7.81-7.70	BZ	-	-	-	O	Cn	-
7.80	LP	-	Un / P	S	C	Cn	-
7.87	LP	15°	P	R	O	Cn	-
7.97	LP	15°	Ir / P	S	O	Cn	-
8.15-8.20	WS	-	-	-	O	W	Parallel to LP
8.24	LP	20°	P	R	C	Cn	-
8.49-8.45	WS	<10°	-	-	O	W	Parallel to LP
8.51-8.52	WS	-	-	-	O	W	Parallel to LP
8.73	LP	<5°	P	S	C	Cn	-
8.79	LP	<5°	P	S	C	Cn	-
8.95	LP	35°	P	S	C	Cn	-
9.03	LP	<10°	P	S	C	Cn	-
9.23	Fr	10°	Ir	R	C	Cn	-

**Abbreviations**

ROUGHNESS		WALL ALTERATIONS		TYPE		OTHER	
R	Rough	FeSt	Iron Stained	J	Joint	P	Partly
Sm	Smooth	W	Weathered	B	Bedding	CL	Carbonaceous lamination
SL	Slickensided	SM	Secondary Mineralisation	BP	Bedding Parting	Co	Coal seam
				FP	Foliation Parting	In	Incipient
				LP	Lamination Parting	SI	Sand Infill
PLANARITY		APERTURE		SZ	Sheared Zone	H	Horizontal
Pl	Planar	C	Closed	CZ	Crushed Zone	V	Vertical
St	Stepped	O	Open	WS	Weathered Seam	CI	Clay Infill
Un	Undulating	F	Filled	BZ	Broken Zone	Cn	Clean
Cu	Curved	T	Tight	HFZ	Highly Fractured Zone	CS	Clay Seam
Ir	Irregular			Fr	Fracture	DI	Drilling Induced

NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.



**DEFECT DESCRIPTIONS  
OF ENGINEERING BORELOGS**

(CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH  
ISRM SUGGESTED METHODS (1981))

BOREHOLE NO	: BH13
SHEET	: 2 of 6
REFERENCE NO	: H9562

PROJECT : GATEWAY UPGRADE PROJECT – GATEWAY BRIDGE DUPLICATION FOUNDATION  
INVESTIGATION

LOCATION : PIER 6 – NORTHERN FACE OF THE PILE CAP

PROJECT NO : FG5388 SURFACE R.L : -9.55 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD DATE DRILLED : 17 - 18/3/05

DEPTH	DEFECT TYPE	DIP	PLANARITY	ROUGHNESS	APERTURE	WALL ALTERATION	OTHER
9.31	LP	10°	P	S	C	Cn	-
9.41	BP	<15°	P	-	T	Cn	Co
9.57-9.59	WS	-	-	-	O	W	-
9.63-9.72	WS / BZ	-	-	-	O	W	-
9.72 – 9.91							Core loss
9.91-10.22				BZ			
10.10	J	70°	P	-	C	Cn	-
10.27	WS	<10°	-	R	O	Cn	Parallel to LP
10.36	LP	<10°	P	S	C	Cn	-
10.41-10.44	BZ	-	-	-	O	Cn	Parallel to LP
10.50-10.56	WS/BZ	-	-	-	O	W	Parallel to LP
10.61	LP	<10°	P	R	C	Cn	-
10.67-10.73	BZ	-	-	-	O	Cn	-
10.76-10.79	BZ / WS	-	-	-	O	Cn	Parallel to LP
10.91	BP / LP	<20°	Un	S	C	Cn	Co
11.05	LP	25°	P	-	T	Cn	-
11.20	LP	25°	P	-	T	Cn	-
11.35	LP	25°	P	-	T	Cn	-
11.55-11.58	LP	10°	P	-	-	Cn	CS
11.60	LP	<10°	P	R	C	Cn	-
11.90	BP	<10°	P	-	T	Cn	Co
12.05	BP	<10°	P	-	T	Cn	Co
12.10	LP	<10°	P	S	C	Cn	-

**Abbreviations**

ROUGHNESS		WALL ALTERATIONS		TYPE		OTHER	
R	Rough	FeSt	Iron Stained	J	Joint	P	Partly
Sm	Smooth	W	Weathered	B	Bedding	CL	Carbonaceous lamination
SL	Slickensided	SM	Secondary Mineralisation	BP	Bedding Parting	Co	Coal seam
				FP	Foliation Parting	In	Incipient
				LP	Lamination Parting	SI	Sand Infill
				SZ	Sheared Zone	H	Horizontal
				CZ	Crushed Zone	V	Vertical
				WS	Weathered Seam	CI	Clay Infill
				BZ	Broken Zone	Cn	Clean
				HFZ	Highly Fractured Zone	CS	Clay Seam
				Fr	Fracture	DI	Drilling Induced

NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.



## DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH  
ISRM SUGGESTED METHODS (1981)]

BOREHOLE NO : BH13

SHEET : 3 of 6

REFERENCE NO : H9562

PROJECT : GATEWAY UPGRADE PROJECT – GATEWAY BRIDGE DUPLICATION FOUNDATION  
INVESTIGATION

LOCATION : PIER 6 – NORTHERN FACE OF THE PILE CAP

PROJECT NO : FG5388 SURFACE R.L : -9.55 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD DATE DRILLED : 17 - 18/3/05

DEPTH	DEFECT TYPE	DIP	PLANARITY	ROUGHNESS	APERTURE	WALL ALTERATION	OTHER
12.22	J	30°	P	-	T	Cn	-
12.25	J	50°	P	R	C	Cn	-
12.27	LP	15°	P	S	C	Cn	-
12.30	J	50°	P	R	C	Cn	-
12.32	LP	<10°	P	-	C	Cn	-
12.42	LP	<5°	P	-	C	Cn	-
12.46	LP	<5°	St	-	C	Cn	-
12.50-13.10	Fr	-	Cu	R	O	Cn	-
13.30-13.38	BZ	-	-	R	O	Cn	Parallel to vertical Fr
13.38-13.43	WS	-	-	-	-	W	Parallel to LP & CI
13.5	J	75°	St	R	O	Cn	-
13.47	LP	15°	P	R	C	Cn	-
13.61	LP	<5°	P	S	C	Cn	-
13.68	LP	<5°	P	S	C	Cn	-
13.71	LP	<5°	P	S	C	Cn	-
13.79	WS	<5°	-	R	O	W	Parallel to LP
13.90-13.92	WS	-	-	R	O	W	Parallel to LP
13.98-14.03	WS	1	-	-	O	W	Parallel to LP
14.10-14.14	WS	-	-	-	O	W	Parallel to LP
14.25	J	85°	P	R	C	Cn	-
14.67-14.74	BZ	-	-	-	O	-	CI

### Abbreviations

ROUGHNESS		WALL ALTERATIONS		TYPE		OTHER	
R	Rough	FeSt	Iron Stained	J	Joint	P	Partly
Sm	Smooth	W	Weathered	B	Bedding	CL	Carbonaceous lamination
SL	Slickensided	SM	Secondary Mineralisation	BP	Bedding Parting	Co	Coal seam
				FP	Foliation Parting	In	Incipient
				LP	Lamination Parting	SI	Sand Infill
PLANARITY		APERTURE					
Pl	Planar	C	Closed	SZ	Sheared Zone	H	Horizontal
St	Stepped	O	Open	CZ	Crushed Zone	V	Vertical
Un	Undulating	F	Filled	WS	Weathered Seam	CI	Clay Infill
Cu	Curved	T	Tight	BZ	Broken Zone	Cn	Clean
Ir	Irregular			HFZ	Highly Fractured Zone	CS	Clay Seam
				Fr	Fracture	DI	Drilling Induced

NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.





## DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH  
ISRM SUGGESTED METHODS (1981)]

BOREHOLE NO : BH13

SHEET : 4 of 6

REFERENCE NO : H9562

PROJECT : GATEWAY UPGRADE PROJECT – GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION

LOCATION : PIER 6 – NORTHERN FACE OF THE PILE CAP

PROJECT NO : FG5388 SURFACE R.L. : -9.55 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD DATE DRILLED : 17 - 18/3/05

DEPTH	DEFECT TYPE	DIP	PLANARITY	ROUGHNESS	APERTURE	WALL ALTERATION	OTHER
15.15-15.17	WS	-	-	-	-	W	High plastic CS
15.27-15.31	WS	-	-	-	-	W	High plastic CS
15.35	LP	<5°	P	S	C	Cn	-
15.62-15.65	WS	-	-	-	O	W	Gravel up to 10mm
16.04	LP	-	P	S	C	Cn	DI
16.04	J	50°	P	S	C	Cn	-
17.30	LP	20°	P	R	C	Cn	DI
17.71	LP	20°	P	S	C	Cn	DI
19.33	LP	23°	P	R	C	Cn	DI
19.51	LP	35°	Un	S	C	Cn	DI
19.51-19.70	Fr	30°	Ir	R	C	Cn	Parallel to LP
19.60	J	85°	P	S	C	Cn	-
19.81	LP	30°	P	R	C	Cn	-
19.89	LP	10°	P	S	C	Cn	-
19.95	J	85°	P	R	T	Cn	?
19.95	J	40°	P	R	C	Cn	-
20.35	LP	30°	P	R	C	Cn	DI
20.40	LP	30°	P	S	C	Cn	DI
20.55-20.62	BZ	-	R	-	O	Cn	Co
21.30-21.34	BZ	-	-	-	O	Cn	Co
22.24	LP	30°	Fr	L	O	Cn	Co

### Abbreviations

ROUGHNESS		WALL ALTERATIONS		TYPE		OTHER	
R	Rough	FeSt	Iron Stained	J	Joint	P	Partly
Sm	Smooth	W	Weathered	B	Bedding	CL	Carbonaceous lamination
SL	Slickensided	SM	Secondary Mineralisation	BP	Bedding Parting	Co	Coal seam
				FP	Foliation Parting	In	Incipient
				LP	Lamination Parting	SI	Sand Infill
Pl	Planar	C	Closed	SZ	Sheared Zone	H	Horizontal
St	Stepped	O	Open	CZ	Crushed Zone	V	Vertical
Un	Undulating	F	Filled	WS	Weathered Seam	CI	Clay Infill
Cu	Curved	T	Tight	BZ	Broken Zone	Cn	Clean
Ir	Irregular			HFZ	Highly Fractured Zone	CS	Clay Seam
				Fr	Fracture	DI	Drilling Induced

NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane



## DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH  
ISRM SUGGESTED METHODS (1981)]

BOREHOLE NO : BH13
SHEET : 5 of 6
REFERENCE NO : H9562

PROJECT : GATEWAY UPGRADE PROJECT – GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION

LOCATION : PIER 6 – NORTHERN FACE OF THE PILE CAP

PROJECT NO : FG5388 SURFACE R.L. : -9.55 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD DATE DRILLED : 17 - 18/3/05

DEPTH	DEFECT TYPE	DIP	PLANARITY	ROUGHNES S	APERTURE	WALL ALTERATION	OTHER
22.41	LP	10°	P	S	C	Cn	-
23.05	J	85°	P	R	C	Cn	DI
23.28	LP	10°	P	R	C	Cn	DI
23.51	LP	20°	P	R	C	Cn	DI
23.65-23.71							CS (high plastic)
24.12-24.15							CS (high plastic)
24.30	LP	35°	D	S	C	Cn	-
24.36	LP	35°	P	S	C	Cn	-
24.68	J	50°	Cu	R	C	Cn	DI
24.89	LP	30°	P	S	C	Cn	DI
25.0-25.12	BZ				C	Cn	Parallel to LP
25.50	J	60°	P	R	C	-	CI
25.97	Fr	Ir	-	R	C	Cn	-
26.25	J	60°	P	R	C	Cn	-
26.27	LP	20°	P	S	C	Cn	-
26.30-26.58	BZ	-	-	-	-	Cn	Parallel to LP
26.68	LP	30°	P	S	C	Cn	-
26.70	LP	30°	P	S	C	Cn	-
26.88	LP	30°	P	S	C	Cn	-
27.09	LP	-	-	-	-	Cn	DI
27.29	LP	30°	Ir	R	C	Cn	DI
27.36	J	30°	P	-	T	Cn	DI

### Abbreviations

ROUGHNESS		WALL ALTERATIONS		TYPE		OTHER	
R	Rough	FeSt	Iron Stained	J	Joint	P	Partly
Sm	Smooth	W	Weathered	B	Bedding	CL	Carbonaceous lamination
SL	Slickensided	SM	Secondary Mineralisation	BP	Bedding Parting	Co	Coal seam
				FP	Foliation Parting	In	Incipient
				LP	Lamination Parting	SI	Sand Infill
PLANARITY		APERTURE					
Pl	Planar	C	Closed	SZ	Sheared Zone	H	Horizontal
St	Stepped	O	Open	CZ	Crushed Zone	V	Vertical
Un	Undulating	F	Filled	WS	Weathered Seam	CI	Clay Infill
Cu	Curved	T	Tight	BZ	Broken Zone	Cn	Clean
Ir	Irregular			HFZ	Highly Fractured Zone	CS	Clay Seam
				Fr	Fracture	DI	Drilling Induced

NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.



## DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH  
ISRM SUGGESTED METHODS (1981)]

BOREHOLE NO :	13
SHEET :	6 of 6
REFERENCE NO :	H9562

PROJECT : GATEWAY UPGRADE PROJECT – GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION

LOCATION : PIER 6 – NORTHERN FACE OF THE PILE CAP

PROJECT NO : FG5388 SURFACE R.L : -9.55 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD DATE DRILLED : 17 - 18/3/05

DEPTH	DEFECT TYPE	DIP	PLANARITY	ROUGHNESS	APERTURE	WALL ALTERATION	OTHER
27.41	J	30°	P	-	T	Cn	DI
27.50	LP	30°	P	S	C	Cn	DI
27.88	J	45°	St	R	C	Cn	-
28.27	J	15°	Cu	R	C	Cn	DI
28.37	J	40°	Ir	R	C	Cn	-
28.39	J	70°	P	S	C	Cn	-
28.80	LP	35°	P	R	C	Cn	-
28.45-28.75	FZ / BZ	-	-	-	O	Cn	P SI
29.12	LP	20°	P	S	C	Cn	DI
29.36	LP	25°	P	S	C-T	-	DI
29.55-29.80	FZ	20°	-	-	O	Cn	Parallel to LP
29.94-30.40	FZ	-	-	-	O	Cn	Parallel to LP
30.81	LP	<10°	P	R	C	Cn	DI
31.61	LP	20°	P	S	C	Cn	DI
31.70	LP	20°	P	S	C	Cn	-
31.71-31.91	BZ	-	-	R	C	Cn	Parallel to LP
32.10-32.22	BZ	-	-	-	O	Cn	Parallel to LP
32.48	LP	10°	-	-	C	Cn	DI
32.65	LP	10°	-	-	C	Cn	DI
33.34-33.36	BZ	75°	P	R	O	Cn	Parallel to J
33.62	J	75°	P	S	C	Cn	-
33.72	J	70°	P	S	C	Cn	-
34.22	J	<10°	P	S	C	Cn	DI

### Abbreviations

ROUGHNESS		WALL ALTERATIONS		TYPE		OTHER	
R	Rough	FeSt	Iron Stained	J	Joint	P	Partly
Sm	Smooth	W	Weathered	B	Bedding	CL	Carbonaceous lamination
SL	Slickensided	SM	Secondary Mineralisation	BP	Bedding Parting	Co	Coal seam
				FP	Foliation Parting	In	Incipient
				LP	Lamination Parting	SI	Sand Infill
				SZ	Sheared Zone	H	Horizontal
				CZ	Crushed Zone	V	Vertical
				WS	Weathered Seam	CI	Clay Infill
				BZ	Broken Zone	Cn	Clean
				HFZ	Highly Fractured Zone	CS	Clay Seam
				Fr	Fracture	DI	Drilling Induced

NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.