REPORT OF BOREHOLE: HCAH01

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 657894 m E 7580242 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: Golder
LOCATION:	Harrybrandt Creek	INCLINATION: -90°	LOGGED: ACF DATE: 12/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 1.10 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M	12/07/09	0.0	0.10	DS 0.00-0.10m			SP	SAND Fine to medium, pale grey and pale brown, trace fine gravel	D	VL	0 5 10 15 20 25
				0.20					. becoming moist	M		
				0.30	DS 0.20-0.30m			GP	. fine to coarse, some fine angular gravel			
				0.40					Sandy GRAVEL Fine, angular, pale grey and pale brown, fine to coarse sand			
			0.5	0.60	DS 0.40-0.50m			SM	. becoming wet	W	L	
	M-H				DS 0.70-0.80m				Silty SAND Fine to medium, grey, trace fine gravel			
			1.0	1.10					END OF BOREHOLE @ 1.10 m Auger hole discontinued due to caving. Sidewalls caving below 0.3m. Backfilled on completion.			
			1.5									
			2.0									
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

REPORT OF BOREHOLE: HCAH02

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 656171 m E 7580224 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: Golder
LOCATION:	Harrybrandt Creek	INCLINATION: -90°	LOGGED: ACF DATE: 12/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 1.80 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M	12/07/09	0.0	0.10	DS 0.00-0.10m			SP	SAND Fine to medium, pale grey and pale brown, trace fine angular gravel	D		0 5 10 15 20 25
					DS 0.20-0.30m				. becoming moist	M		
				0.40					. becoming wet		VL	
	M-H		0.5		DS 0.80-0.90m					W	L-MD	
			1.0									
			1.5	1.80					END OF BOREHOLE @ 1.80 m Auger hole discontinued due to caving. Sidewalls caving below 0.4m. Backfilled on completion.			
			2.0									
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

REPORT OF BOREHOLE: HCAH03

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 655150 m E 7580035 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: Golder
LOCATION:	Harrybrandt Creek	INCLINATION: -90°	LOGGED: ACF DATE: 12/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 1.10 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M M-H	12/07/09	0.0 0.5 1.0	0.20 1.10	DS 0.00-0.10m DS 0.40-0.50m			SP	SAND Fine to coarse, pale grey and pale brown, trace fine to medium gravel . trace fine to coarse angular gravel, becoming wet	M W	VL	0 5 10 15 20 25
			1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0						END OF BOREHOLE @ 1.10 m Auger hole discontinued due to caving. Sidewalls caving below 0.2m. Backfilled on completion.			

REPORT OF BOREHOLE: HCAH04

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 650278 m E 7580052 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: Golder
LOCATION:	Harrybrandt Creek	INCLINATION: -90°	LOGGED: ACF DATE: 12/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 0.90 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M	12/07/09 ▽	0.0		DS 0.00-0.10m			SP	SAND Fine to coarse, pale grey and pale brown, trace fine angular gravel	M		0 5 10 15 20 25
				0.20								
			0.5		DS 0.30-0.40m				. trace fine to medium angular gravel, becoming wet	W	VL	
				0.90					END OF BOREHOLE @ 0.90 m Auger hole discontinued due to caving. Sidewalls caving below 0.2m. Backfilled on completion.			
			1.0									
			1.5									
			2.0									
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF BOREHOLE: HCAH05

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 652192 m E 7580729 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: Golder
LOCATION:	Harrybrandt Creek	INCLINATION: -90°	LOGGED: ACF DATE: 12/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 2.50 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M		0.0		DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown	D	VL	0 5 10 15 20 25
			0.5									
				0.90					. becoming moist			
			1.0	1.10	DS 1.10-1.20m				. pale brown and brown, some fine angular gravel			
	H		1.5	1.40					SANDY GRAVEL (80%) and COBBLES (20%) Sandy GRAVEL: fine, brown, angular, fine to coarse sand COBBLES: up to 0.07m	M	MD	
		12/07/09	2.0									
				2.30	DS 2.30-2.40m				. becoming wet	W		
			2.5	2.50					END OF BOREHOLE @ 2.50 m Auger hole discontinued due to caving. Sidewalls caving below 2.2m. Backfilled on completion.			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

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GAP gINT FN. F01b RL2

REPORT OF BOREHOLE: IRTP01

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 617322 m E 7561199 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: T&M
LOCATION:	Isaac River	INCLINATION: -90°	LOGGED: ACF DATE: 9/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 0.80 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	L		0.0		DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine angular gravel	D	VL	0 5 10 15 20 25
				0.30								
	M	9/07/09	0.5	0.40	DS 0.40-0.80m			GP	Sandy GRAVEL Fine angular gravel, pale grey and pale brown, fine to coarse sand . becoming wet	M W		
				0.80					END OF BOREHOLE @ 0.80 m Auger hole discontinued due to water caving. Sidewalls caving below 0.6m. Backfilled on completion.			10/10mm, HB
			1.0									
			1.5									
			2.0									
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01b
RL2

REPORT OF TEST PIT: IRTP02

Golder Associates

CLIENT:	SunWater	COORDS: 617058 m E 7561064 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 1.10 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 9/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L	9/07/09	0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine angular gravel	D		0 5 10 15 20 25
				0.40					. becoming moist	M		
	M		0.5		DS 0.60-0.70m				. trace fine to coarse angular gravel, rounded cobbles to 0.12m (~5%)	W	VL	
			1.0	1.10					TEST PIT DISCONTINUED @ 1.10 m Test pit discontinued due to caving. Sidewalls caving below 0.5m. Backfilled on completion.			
			1.5									
			2.0									
			2.5									
			3.0									10/10mm, HB
			3.5									
			4.0									
			4.5									
			5.0									

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP02

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 617058 m E 7561064 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 1.10 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 1.10m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP03

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 617127 m E 7561090 m N 55 MGA94	MACHINE: Backhoe
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	CONTRACTOR: T&M
LOCATION:	Isaac River	PIT DEPTH: 0.90 m	LOGGED: ACF DATE: 9/7/09
JOB NO:	077632049	BUCKET TYPE: 0.9 m	CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Fine to medium, pale grey and pale brown	D		0 5 10 15 20 25
	M	9/07/09 ▽	0.5	0.40	DS 0.60-0.70m			GP	. becoming moist Sandy GRAVEL Fine angular gravel, pale brown and pale grey, fine to coarse sand, rounded cobbles to 0.11m (~5%)	M W	VL	
			1.0	0.90					TEST PIT DISCONTINUED @ 0.90 m Test pit discontinued due to caving. Sidewalls caving below 0.5m. Backfilled on completion.			10/10mm, HB
			1.5									
			2.0									
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP03

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 617124 m E 7561090 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 0.90 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 0.90m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP04

CLIENT:	SunWater	COORDS: 616615 m E 7561280 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 1.90 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 9/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale brown and pale grey, some fine to medium angular gravel	D		0 5 10 15 20 25
			0.5						. becoming moist	M		
	M	9/07/09		0.80					. becoming wet	W	VL	
			1.0		DS 1.20-1.30m							
			1.5	1.70	DS 1.70-1.80m				. becoming grey			
				1.90					TEST PIT DISCONTINUED @ 1.90 m Test pit discontinued due to caving. Sidewalls caving below 1.4m. Backfilled on completion.			
			2.0									
			2.5									
			3.0									
			3.5									10/15mm
			4.0									
			4.5									
			5.0									

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP04

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 616615 m E 7561280 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 1.90 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 1.90m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP05

CLIENT:	SunWater	COORDS: 615955 m E 7562250 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 2.10 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 9/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L / M	9/07/09	0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, some fine to medium angular gravel	D		
									. becoming moist	M		
			0.5	0.70					. becoming wet	W	VL	
			1.0		DS 1.20-1.30m							
			1.5	1.70	DS 1.70-1.80m			CH	Sandy Silty CLAY Green grey, fine to medium sand	M	VSt	
			2.0	2.10					TEST PIT DISCONTINUED @ 2.10 m Test pit discontinued due to caving. Sidewalls caving below 0.7m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP05

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 615955 m E 7562250 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 2.10m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP06

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 616312 m E 7561781 m N 55 MGA94	MACHINE: Backhoe
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	CONTRACTOR: T&M
LOCATION:	Isaac River	PIT DEPTH: 1.50 m	LOGGED: ACF DATE: 9/7/09
JOB NO:	077632049	BUCKET TYPE: 0.9 m	CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, some fine angular gravel . becoming moist	D		
	M	9/07/09	0.5							M	VL	
			1.0	1.10					. becoming wet	W		
					DS 1.30-1.40m							
			1.5	1.50					TEST PIT DISCONTINUED @ 1.50 m Test pit discontinued due to caving. Sidewalls caving below 0.9m. Backfilled on completion.			
			2.0									
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

DCP TEST (AS1289.6.3.2) Blows per 100 mm: 0 5 10 15 20 25

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP06

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 616312 m E 7561781 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 1.50 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 1.50m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP07

CLIENT:	SunWater	COORDS: 614003 m E 7564533 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 1.90 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 9/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale brown and pale grey	D		0 5 10 15 20 25
			0.5						. becoming moist, some fine angular gravel	M		
	M	9/07/09	1.0		DS 0.80-0.90m						VL	
				1.20					. becoming wet	W		
			1.5	1.90								
			2.0						TEST PIT DISCONTINUED @ 1.90 m Test pit discontinued due to caving. Sidewalls caving below 1.1m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP07

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 614003 m E 7564533 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 1.90 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 1.90m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP08

Golder Associates

CLIENT:	SunWater	COORDS: 613614 m E 7564497 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 2.10 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 9/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine angular gravel . becoming moist	D		
	M	9/07/09	0.5							M	VL	
			1.0	1.30				SP	Gravelly SAND (90%) and COBBLES (10%) Gravelly SAND: medium to coarse, pale grey and pale brown, fine to medium gravel COBBLES: rounded and subangular to 0.11m	W		
			1.5		DS 1.50-1.60m							
			2.0	2.10					TEST PIT DISCONTINUED @ 2.10 m Test pit discontinued due to caving. Sidewalls caving below 1.2m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

DCP TEST (AS1289.6.3.2) Blows per 100 mm: 0 5 10 15 20 25

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP08

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 613614 m E 7564497 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 2.10m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP09

CLIENT:	SunWater	COORDS: 613256 m E 7564704 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 2.10 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 9/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L	9/07/09	0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine angular gravel	D		0 5 10 15 20 25
									becoming moist	M		
			0.5	0.60					becoming wet, some fine to medium angular gravel			
	M		1.0		DS 1.30-1.40m					W	VL	
			1.5									
			2.0	2.10								13/HB
									TEST PIT DISCONTINUED @ 2.10 m Test pit discontinued due to caving. Sidewalls caving below 0.5m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

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GAP gINT FN. F01f RL2

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP09

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 613256 m E 7564704 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 2.10m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 9/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP10

CLIENT:	SunWater	COORDS: 613363 m E 7565080 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 2.10 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 10/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description						
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm	
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine angular gravel . becoming moist	D			
			0.5							M			
	M	10/07/09		0.90				SP	Gravelly SAND (95%) and COBBLES (5%) Gravelly SAND: medium to coarse, pale grey and pale brown, fine gravel COBBLES: rounded and subangular		VL		
			1.0										
			1.5							W			
			2.0	2.10	DS 1.90-2.00m				TEST PIT DISCONTINUED @ 2.10 m Test pit discontinued due to caving. Sidewalls caving below 0.8m. Backfilled on completion.				
			2.5									15/50mm	
			3.0										
			3.5										
			4.0										
			4.5										
			5.0										

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GAP gINT FN. F01f
RL2

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP10

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 613363 m E 7565080 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 2.10m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 10/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP11

CLIENT:	SunWater	COORDS: 613554 m E 7565425 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 2.00 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 10/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L / M	10/07/09	0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine to medium angular gravel . becoming moist, cobbles to 0.11m (~5%)	D / M		
			0.5	0.80					. becoming wet	W	VL	
			1.0		DS 1.20-1.30m							
			1.5	1.60				SC	Clayey SAND Medium to coarse, green grey and brown, high plasticity clay, some cobbles to 0.09m	M	VD	
			2.0	2.00	DS 1.80-1.90m				TEST PIT DISCONTINUED @ 2.00 m Test pit discontinued due to caving. Sidewalls caving below 0.7m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

DCP TEST (AS1289.6.3.2) Blows per 100 mm: 0 5 10 15 20 25

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP11

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 613554 m E 7565425 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 2.00 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 2.00m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 10/07/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP12

Golder Associates

CLIENT:	SunWater	COORDS: 613609 m E 7565826 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 2.10 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 10/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown . becoming moist	D		
			0.5	0.60				SP	SAND (95%) and COBBLES (5%) SAND: medium to coarse, pale grey and pale brown, some fine angular gravel COBBLES: rounded and subangular to 0.07m	M		
	M	10/07/09			DS 0.70-0.80m							
			0.90						. becoming wet	W	VL	
			1.0									
			1.5									
			2.0	2.10					TEST PIT DISCONTINUED @ 2.10 m Test pit discontinued due to caving. Sidewalls caving below 0.8m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

DCP TEST (AS1289.6.3.2) Blows per 100 mm: 0 5 10 15 20 25

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GAP gINT FN. F01f
RL2

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP12

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 613609 m E 7566119 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 2.10m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 10/7/09
CHECKED: AB DATE: 8/10/09

REPORT OF TEST PIT: IRTP13

CLIENT:	SunWater	COORDS: 613536 m E 7566119 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	MACHINE: Backhoe
LOCATION:	Isaac River	PIT DEPTH: 2.10 m	CONTRACTOR: T&M
JOB NO:	077632049	BUCKET TYPE: 0.9 m	LOGGED: ACF DATE: 10/7/09
			CHECKED: AB DATE: 8/10/09

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
BH	L		0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine gravel . becoming moist	D		0 5 10 15 20 25
			0.5							M		
				0.90				SP	SAND (95%) and COBBLES (5%) SAND: medium to coarse, pale grey and pale brown, trace fine angular gravel COBBLES: rounded and subangular to 0.09m . becoming wet		VL	
	M	10/07/09	1.0	1.10								
					DS 1.30-1.40m					W		
			1.5									
			2.0	2.10					TEST PIT DISCONTINUED @ 2.10 m Test pit discontinued due to caving. Sidewalls caving below 1.0m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

Golder Associates

REPORT OF PHOTOGRAPHS: IRTP13

CLIENT: SunWater
PROJECT: Connors River Dam Pipeline
LOCATION: Isaac River
JOB NO: 077632049

COORDS: 613538 m E 7566119 m N MGA94
SURFACE RL: m DATUM: AHD
PIT DEPTH: 2.10 m
BUCKET TYPE: 0.9 m

DEPTH RANGE: 0.00 – 2.10m
MACHINE: Backhoe
CONTRACTOR: T&M
LOGGED: ACF DATE: 10/7/09
CHECKED: AB DATE: 8/10/09

REPORT OF BOREHOLE: NCAH01

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 634601 m E 7596062 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: Golder
LOCATION:	North Creek	INCLINATION: -90°	LOGGED: ACF DATE: 13/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 1.60 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M	13/07/09	0.0	0.20	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey, trace fine gravel	D	VL	0 5 10 15 20 25
				0.50					. becoming moist	M		
			0.5		DS 0.50-0.60m				. some fine to coarse angular gravel, pale brown			
				0.70	DS 0.80-0.90m				. becoming pale brown, trace silt			
			1.0	1.10					. becoming fine to medium brown	W		
	M-H				DS 1.20-1.30m							
			1.5	1.60					END OF BOREHOLE @ 1.60 m Auger hole discontinued due to caving in. Sidewalls caving below 0.7m. Backfilled on completion.			
			2.0									HB, best of 2 attempts
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

REPORT OF BOREHOLE: NCAH02

CLIENT:	SunWater	COORDS: 635388 m E 7569062 m N 55 MGA94	SHEET: 1 OF 1
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILL RIG: HAND
LOCATION:	North Creek	INCLINATION: -90°	DRILLER: Golder
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 1.40 m	LOGGED: ACF DATE: 13/7/09
			CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M	13/07/09	0.0	0.10	DS 0.00-0.10m			SP	SAND Medium to coarse, pale grey and pale brown, trace fine angular gravel	D		0 5 10 15 20 25
			0.5	0.60	DS 0.60-0.70m				. becoming moist	M	VL	
				0.80					. becoming wet, fine to medium angular gravel	W		
			1.0		DS 0.90-1.00m PP = 130kPa			MH	Clayey SILT High plasticity, brown	M	VSt	
				1.40								
	H		1.5						END OF BOREHOLE @ 1.40 m Auger hole discontinued due to caving in. Sidewalls caving below 0.6m. Backfilled on completion.			
			2.0									
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

REPORT OF BOREHOLE: NCAH03

SHEET: 1 OF 1

CLIENT:	SunWater	COORDS: 635146 m E 7571051 m N 55 MGA94	DRILL RIG: HAND
PROJECT:	Connors River Dam and Pipelines	SURFACE RL: m DATUM: AHD	DRILLER: Golder
LOCATION:	North Creek	INCLINATION: -90°	LOGGED: ACF DATE: 13/7/09
JOB NO:	077632049	HOLE DIA: 70 mm HOLE DEPTH: 2.10 m	CHECKED: AB DATE: 8/10/09

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	DCP TEST (AS1289.6.3.2) Blows per 100 mm
HAND	M	Groundwater not encountered	0.0		DS 0.00-0.10m			SP	SAND Medium to coarse, pale brown and brown, fine angular gravel	D	VL	
				0.30								
			0.5		DS 0.40-0.50m			SM	Silty SAND Fine to medium, brown, trace fine gravel			
				0.80								
					DS 0.80-0.90m			CH	Sandy CLAY High plasticity, grey and dark grey, fine to medium sand		St-VSt	
				1.00								
	H		1.0					SC	Clayey SAND Fine to coarse, brown, medium to high plasticity clay	M	MD-D	
			1.5		DS 1.60-1.70m							
				1.80								
					DS 1.80-1.90m			CH	Sandy CLAY High plasticity, brown and yellow brown, fine to coarse sand, trace fine gravel		VSt	
			2.0	2.10					END OF BOREHOLE @ 2.10 m Auger hole discontinued due to high resistance below 1.8m. Backfilled on completion.			
			2.5									
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									

after 2 attempts

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT REPORTS


FILL


GRAVEL (GP or GW)


SAND (SP or SW)


SILT (ML or MH)


CLAY (CL, CI or CH)


ORGANIC SOILS (OL or OH or Pt)


COBBLES or BOULDERS

Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay.

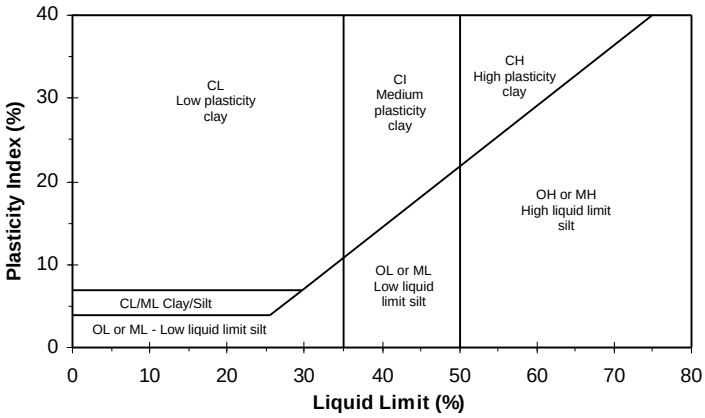
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the preferred method given in AS1726 – 1993, Appendix A. The material properties are assessed in the field by visual/tactile methods.

Particle Size

Major Division	Sub Division	Particle Size
BOULDERS		> 200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	20 to 63 mm
	Medium	6.0 to 20 mm
	Fine	2.0 to 6.0 mm
SAND	Coarse	0.6 to 2.0 mm
	Medium	0.2 to 0.6 mm
	Fine	0.075 to 0.2 mm
SILT		0.002 to 0.075 mm
CLAY		< 0.002 mm

Plasticity Properties



MOISTURE CONDITION

AS1726 - 1993

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays & Silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

CONSISTENCY AND DENSITY

AS1726 - 1993

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	Above 200 kPa

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

SPT correlations are not stated in AS1726 – 1993, and may be subject to corrections for overburden pressure and equipment type.

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

AS*	Auger Screwing	RD	Rotary blade or drag bit	HQ	Diamond Core - 63 mm
AD*	Auger Drilling	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
*V	V-Bit	RAB	Rotary Air Blast	NQ	Diamond Core - 47 mm
*T	TC-Bit, e.g. ADT	RC	Reverse Circulation	BH	Tractor Mounted Backhoe
HA	Hand Auger	PT	Push Tube	EX	Tracked Hydraulic Excavator
ADH	Hollow Auger	CT	Cable Tool Rig	EE	Existing Excavation
DTC	Diatube Coring	JET	Jetting	HAND	Excavated by Hand Methods
WB	Washbore or Bailer	NDD	Non-destructive drilling		

PENETRATION/EXCAVATION RESISTANCE

L **Low resistance.** Rapid penetration possible with little effort from the equipment used.

M **Medium resistance.** Excavation/possible at an acceptable rate with moderate effort from the equipment used.

H **High resistance** to penetration/excavation. Further penetration is possible at a slow rate and requires significant effort from the equipment.

R **Refusal or Practical Refusal.** No further progress possible without the risk of damage or unacceptable wear to the digging implement or machine.

These assessments are subjective and are dependent on many factors including the equipment power, weight, condition of excavation or drilling tools, and the experience of the operator.

WATER

▽	Water level at date shown	◁	Partial water loss
▷	Water inflow	◀	Complete water loss

GROUNDWATER NOT OBSERVED	The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.
GROUNDWATER NOT ENCOUNTERED	The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-1993
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm seating
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed sample
BDS	Bulk disturbed sample
G	Gas Sample
W	Water Sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength (s_v = peak value, s_r = residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres
WPT	Water pressure tests

Ranking of Visually Observable Contamination and Odour (for specific soil contamination assessment projects)

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\textit{Length of core recovered}}{\textit{Length of core run}} \times 100$$

SCR = Solid Core Recovery (%)

$$= \frac{\sum \textit{Length of cylindrical core recovered}}{\textit{Length of core run}} \times 100$$

RQD = Rock Quality Designation (%)

$$= \frac{\sum \textit{Axial lengths of core} > 100\,mm}{\textit{Length of core run}} \times 100$$

TERMS FOR ROCK MATERIAL STRENGTH & WEATHERING AND ABBREVIATIONS FOR DEFECT DESCRIPTIONS

STRENGTH

Symbol	Term	Point Load Index, $Is_{(50)}$ (MPa)	Field Guide
EL	Extremely Low	< 0.03	Easily remoulded by hand to a material with soil properties.
VL	Very Low	0.03 to 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 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK STRENGTH TEST RESULTS

▼ Point Load Strength Index, $I_s(50)$, Axial test (MPa)

◀ Point Load Strength Index, $I_s(50)$, Diametral test (MPa)

Relationship between $I_s(50)$ and UCS (unconfined compressive strength) will vary with rock type and strength, and should be determined on a site-specific basis. UCS is typically 10 to 30 x $I_s(50)$, but can be as low as 5.

ROCK MATERIAL WEATHERING

Symbol		Term	Field Guide
RS		Residual Soil	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.
EW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	Distinctly Weathered	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 deposition of weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW		
SW		Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

ABBREVIATIONS FOR DEFECT TYPES AND DESCRIPTIONS

Defect Type

B	Bedding parting
X	Foliation
C	Contact
L	Cleavage
J	Joint
SS/SZ	Sheared seam/zone (Fault)
CS/CZ	Crushed seam/zone (Fault)
DS/DZ	Decomposed seam/zone
IS/IZ	Infilled seam/zone
S	Schistocity
V	Vein

Coating or Infilling

Cn	Clean
Sn	Stain
Vr	Veneer
Ct	Coating or Infill

Planarity

Pl	Planar
Un	Undulating
St	Stepped

Roughness

Sl	Slickensided
Sm	Smooth
Ro	Rough

Vertical Boreholes – The dip (inclination from horizontal) of the defect is given.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.