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REPORT OF BOREHOLE: CRR 211

SHEET: 1 OF 5

CLIENT: Aecom Australia Pty Ltd
 PROJECT: Cross River Rail
 LOCATION: Fairfield Rd / Brougham St
 JOB NO: 107632034

COORDS: 502416.04 m E 6957252.87 m N MGA94 56
 SURFACE RL: 3.14 m DATUM: AHD
 INCLINATION: -90°
 HOLE DEPTH: 40.00 m

DRILL RIG: FD500
 CONTRACTOR: Foundril Pty Ltd
 LOGGED: CA DATE: 26/8/10
 CHECKED: NK DATE: 18/10/10

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 CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT			0	3.14			CL-CI	CLAY low medium plasticity, dark grey to black, with some fine gravel		F	
			0.40	2.74			CI	Gravelly CLAY medium plasticity, orange brown, fine to medium, angular gravel, with some broken glass		S	
			1		SPT 1.00-1.45 m 3, 1, 2 N=3						
			1.50	1.64			CH-OH	CLAY high plasticity, dark grey, roots and decomposing odour			
			2								
			3		SPT 2.50-2.95 m 0, 1 N=1						
			4		U50 4.00-4.45 m PP = 20 kPa					M	
			5								
			6		U50 5.50-5.95 m PP = 20 kPa					VS-S	
			7		SPT 7.00-7.45 m 0, 1 N=1						
		8									
		9		U50 8.50-8.95 m PP = 40 kPa							
		9.00	-5.86			CH	Sandy Gravelly CLAY high plasticity, dark grey, fine to medium, subangular gravel		M-W		
		10									

GAP 8.03 LIB: GLE Log GAP NON-CORED FULL PAGE 107632034_ACO.GPJ <<DrawingFile>> 29/11/2010 13:39 8.2.007

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. F01a
RL3



REPORT OF BOREHOLE: CRR 211

SHEET: 2 OF 5

CLIENT: Aecom Australia Pty Ltd
 PROJECT: Cross River Rail
 LOCATION: Fairfield Rd / Brougham St
 JOB NO: 107632034

COORDS: 502416.04 m E 6957252.87 m N MGA94 56
 SURFACE RL: 3.14 m DATUM: AHD
 INCLINATION: -90°
 HOLE DEPTH: 40.00 m

DRILL RIG: FD500
 CONTRACTOR: Foundril Pty Ltd
 LOGGED: CA DATE: 26/8/10
 CHECKED: NK DATE: 18/10/10

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 CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
RT			10		SPT 10.00-10.45 m 0, 1 N=1		CH	Sandy Gravelly CLAY high plasticity, dark grey, fine to medium, subangular gravel	M-W	Vs - s		
			11.75 -8.61		SPT 11.50-11.95 m 6, 5, 6 N=11		CI	MIXTURE of residual SOIL and ROCK. SOIL is: CI CLAY, medium plasticity, grey with yellow brown and red patches. ROCK is extremely weathered to gravel sized fragments.	M	St - VSt		
			13					For Continuation Refer to Sheet 3				
			14									
			15									
			16									
			17									
			18									
			19									
			20									

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GAP gINT FN. F01a
RL3

GAP 8.03 LIB: GLE Log GAP NON-CORED FULL PAGE 107632034_ACO.GPJ <<DrawingFile>> 29/11/2010 13:39 8.2.007



REPORT OF BOREHOLE: CRR 211

SHEET: 3 OF 5

CLIENT: Aecom Australia Pty Ltd
 PROJECT: Cross River Rail
 LOCATION: Fairfield Rd / Brougham St
 JOB NO: 107632034

COORDS: 502416.04 m E 6957252.87 m N MGA94 56
 SURFACE RL: 3.14 m DATUM: AHD
 INCLINATION: -90°
 HOLE DEPTH: 40.00 m

DRILL RIG: FD500
 CONTRACTOR: Foundril Pty Ltd
 LOGGED: CA DATE: 26/8/10
 CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description				Defect Information				
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)	
								EL 0.03 VL 0.03 J 0.1 M 0.3 H 1 VH 3 EH 10					
				10									
				11									
				12									
				13	13.00		Continuation of Sheet 2						
				13	13.20		SANDSTONE fine to coarse grained, grey, with brown staining				13.00-13.27: J, 90°, Un, Sm-Ro, Vr, clay, orange brown, core crushed around vertical joint		
			100	35	-10.06		CONGLOMERATE fine to coarse grained, polyimictic, grey matrix with quartz and lithic clasts				13.50: J, 10°, Un, Ro, Ct, crushed rock fragments		
				14							13.76-13.82: CS, 60 mm, clayey sandy gravel, fine grained, subrounded 13.82-14.24: J, 90°, Un, Ro, Cn		
				15							14.32-14.42: CZ, 100 mm, clayey gravel, medium grained, subrounded 14.42-14.54: J, 90°, Un, Ro, Cn 14.54-14.56: CS, 20 mm, clayey sandy gravel, fine grained		
			100	70							15.41: J, 35°, Un, Ro, Cn-Ct, 10 mm, 50% clean; 50% clay infilled, brown 15.72: J, 15°, Un, Ro, Cn		
				16							16.11-16.13: CS, 20 mm, clayey gravel, fine grained 16.22: J, 0°, Un, Ro, Cn		
				17							16.61-17.25: J, 90°, Un, Ro, Vr, clay, pale grey, some vertical drilling breaks		
				18	17.36		CORE LOSS				17.62-17.82: J, 90°, Un, Ro, Cn 17.68-17.70: CS, 20 mm, clayey sandy gravel, fine grained		
			75	55	-14.22		CONGLOMERATE fine to coarse grained, polyimictic, grey matrix with quartz and lithic clasts				18.20: J, 45°, Un, Ro, Ct, 10 mm, sandy gravelly clay, pale grey		
				19	17.62		CORE LOSS				18.85-18.97: CS, 120 mm, clayey sandy gravel, fine grained 19.00-19.10: FZ, 100 mm, highly fractured core, fragments crushed to medium gravel size 19.35-20.00: FZ, 650 mm, highly fractured core, fragments crushed to fine to medium gravel size with clayey seams and numerous Pl, Sm, Cn bedding partings at 30 deg		
			40	0	-14.48		CONGLOMERATE fine to coarse grained, polyimictic, grey matrix with quartz and lithic clasts						
				20	18.48		CORE LOSS						
			45	0	-18.67		CONGLOMERATE fine to coarse grained, polyimictic, grey matrix with quartz and lithic clasts						
				20	18.67		MUDSTONE fine grained, subhorizontally bedded, brown to dark grey, and interbedded SANDSTONE, medium, grey						
			30	0	-15.53								
				20	19.10								
			75	0	-15.96								

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GAP gINT FN. F02b
RL3

GAP 8_03 LIB: GLE Log GAP CORED BOREHOLE 107632034_ACO.GPJ <<DrawingFile>> 29/11/2010 13:57 8.2.007



REPORT OF BOREHOLE: CRR 211

SHEET: 4 OF 5

CLIENT: Aecom Australia Pty Ltd

COORDS: 502416.04 m E 6957252.87 m N MGA94 56

DRILL RIG: FD500

PROJECT: Cross River Rail

SURFACE RL: 3.14 m DATUM: AHD

CONTRACTOR: Foundril Pty Ltd

LOCATION: Fairfield Rd / Brougham St

INCLINATION: -90°

LOGGED: CA

DATE: 26/8/10

JOB NO: 107632034

SOLE DEPTH: 40.00 m

CHECKED: NK

DATE: 18/10/10

Drilling					Field Material Description			Defect Information					
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)	
								EL VI J M H VH EH					
		75	0	20			MUDSTONE fine grained, subhorizontally bedded, brown to dark grey; and interbedded SANDSTONE, medium, grey				20.23-20.68: FZ, 630 mm, core too fractured for detailed defect logging, core is clayey and with crushed rock fragments 20.23-20.86: FZ, 630 mm, core too fractured for detailed defect logging, core is clayey and with crushed rock fragments 20.80-20.93: FZ, 130 mm, highly fractured core, crushed to medium gravel size 20.98: J, 70°, Pl, Sm, Cn 21.03: B, 10°, Pl, Sm, Cn 21.07-21.10: CS, 30 mm, clayey gravel, fine grained, angular 21.14: J, 70°, Pl, Sm, Cn 21.22: B, 15°, Pl, Sm, Vr, clay, dark grey 21.41: B, 15°, Pl, Sm, Ct, clay, dark grey 21.48-21.62: CZ, 140 mm, gravel with some clay, fine to medium grained, angular 21.77: B, 10°, Pl, Sm, Ct, clay, dark grey 21.81: J, 70°, Pl, Sm, Cn 21.94-22.00: FZ, 60 mm, highly fractured core, medium gravel size 22.00: J, 30°, Pl, Sm, Ct, gravelly clay, dark grey 22.12: J, 30°, Pl, Sm, Ct, gravelly clay, dark grey 22.12-23.12: J, 30°, Pl, Sm, Ct, gravelly clay, dark grey 22.20: B, Pl, Sm, Cn 22.39: J, 40°, Un, Sm, Ct, clay, dark grey 22.46: B, 5°, Pl, Sm, Vr, CH clay, dark grey 22.53: B, 0°, Pl, Sm, Vr, clay, dark grey 22.57: B, 0°, Pl, Sm, Vr, CH clay, dark grey 22.62-22.64: CS, 20 mm, clayey gravel, fine grained, angular 22.76: J, 50°, Un, Ro, infilled with crushed rock fragments 23.07: J, 70°, Un, Ro, infilled with crushed rock fragments 23.14: B, 10°, Pl, Sm, Vr, clay, dark grey 23.17: J, 80°, Un, Ro, Cn 23.20: B, 10°, Pl, Sm, Vr, clay, dark grey 23.23: B, 10°, Pl, Sm, Vr, clay, dark grey 23.35-23.56: CZ, 210 mm, clayey core with gravel sized rock fragments 23.60-24.25: FZ, 650 mm, core highly fractured around vertical joint with closely spaced bedding partings at 10 deg, crushed to fine gravel and clayey in places 24.34: B, 0°, Pl, Sm, Vr, clay, dark grey 24.45: B, 0°, Un, Sl, Cn 24.52: B, 10°, Pl, Sm, Cn 24.60-28.60: B, 15°, Pl, Sm, Cn 24.61-28.61: B, 15°, Pl, Sm, Cn 24.63-24.74: CZ, 110 mm, mixture of clay and fine to medium gravel 24.63-28.74: CZ, 110 mm, mixture of clay and fine to medium gravel 24.74-24.90: FZ, 160 mm, bedding partings <10mm spacing at 5 deg cut by approximately perpendicular joints 24.74-28.90: FZ, 160 mm, bedding partings <10mm spacing at 5 deg cut by approximately perpendicular joints 24.82: J, 60°, Pl, Sm, Ct, 10 mm, clay, crushed around joint 24.95: B, 0°, Pl, Sm, Ct, 10 mm, clay with some fine gravel 25.05-25.07: CS, 20 mm, clayey rock fragments, fine gravel size, angular 25.18-25.21: CS, 30 mm, clayey rock fragments, fine gravel size, angular 25.24-25.25: CS, 10 mm, clayey rock fragments, fine gravel size, angular 25.34-25.38: CS, 40 mm, clayey rock fragments, fine gravel size, angular 25.41-25.42: CS, 10 mm, clayey rock fragments, fine gravel size, angular 25.67-33.67: B, 5°, Pl, Sm, Vr, clay, dark grey 25.85: B, 0°, Pl, Sm, Vr, clay, grey 25.93: J, 55°, Un, Sm, Vr, clay, grey 26.08: J, 45°, Un-St, Sm, Vr, clay, dark grey 26.10: B, 0°, Pl, Sm, Vr, clay with fine angular gravel, grey 26.14: J, 45°, Un-St, Sm, Vr, clay, dark grey 26.17: B, 0°, Un, Sm, Cn 26.26: B, 15°, Pl-St, Sm, Vr, clay, brown 26.33-26.38: CS, 50 mm, clayey rock fragments, fine gravel size, angular 26.45-26.47: CS, 20 mm, clayey rock fragments, fine gravel size, angular 26.50-26.62: CZ, 120 mm, mixture of coal and mudstone fragments, fine to medium gravel sized, angular 26.87-27.10: CS, 230 mm, carbonaceous rock fragments, fine to medium gravel size, angular 27.13: B, 10°, Pl, Sm, Ct, clay, brown 27.18: B, 10°, Pl, Sm, Ct, clay, brown 27.28: B, 0°, Pl, Sm, Cn		
		80	0	21									
		100	45	22									
		95	20	23									
		100	0	24									
		100	20	25	25.00 -21.86		pale brown bands						
		100	25	26									
		95	45	27									
				28									
				29									
				30									

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GAP gINT FN. F02b
RL3

GAP 8_03 LIB: GLE Log GAP CORED BOREHOLE 107632034_ACO.GPJ <<DrawingFile>> 29/11/2010 13:57 8.2.007



REPORT OF BOREHOLE: CRR 211

SHEET: 5 OF 5

CLIENT: Aecom Australia Pty Ltd
 PROJECT: Cross River Rail
 LOCATION: Fairfield Rd / Brougham St
 JOB NO: 107632034

COORDS: 502416.04 m E 6957252.87 m N MGA94 56
 SURFACE RL: 3.14 m DATUM: AHD
 INCLINATION: -90°
 HOLE DEPTH: 40.00 m

DRILL RIG: FD500
 CONTRACTOR: Foundril Pty Ltd
 LOGGED: CA DATE: 26/8/10
 CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description			Defect Information				
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations	FRACTURE FREQUENCY (Defects per unit metre length)	
								EL 0.03 VL 0.01 J 0.1 M 0.3 H 1 VH 0 EH			5 10 15 20 25 30 35 40	
		95	45	30			MUDSTONE fine grained, subhorizontally bedded, brown to dark grey; and interbedded SANDSTONE, medium, grey			27.32-27.33: CS, 10 mm, carbonaceous rock fragments, fine gravel size 27.40-27.78: FZ, 380 mm, core too fractured for detailed defect logging, closely spaced subhorizontal fractures, core is crushed and clayey in places 27.90-28.45: FZ, 550 mm, core highly fractured around vertical joint with closely spaced bedding partings at 20 deg, crushed rock fragments up to 50mm 28.68-28.76: CS, 80 mm, crushed rock fragments up to 50mm 28.86-29.00: CS, 140 mm, sandy rock fragments, fine to coarse gravel size, subangular 29.06: B, 15°, Pl, Sm, Ct, 5 mm, clay, dark grey 29.19-29.46: J, 90°, Un, Ro, Ct, 8 mm, infilled with pale brown silty clay and rock fragments 29.46-29.52: CS, CL silty clay, pale brown, with some rock fragments 29.70: J, 10°, Pl, Sm, Vr, clay, dark brown 29.70-29.81: CS, 110 mm, core remaining intact, fragments up to 60mm easily dislodged from clayey matrix 29.96: J, 20°, Un, Sm, Ct, clay, brown 30.03: B, 5°, Pl, Sm, Cn 30.56: HB, 40°, Pl, Sm, Cn 30.64: HB, 40°, Pl, Sm, Ct 30.90-31.00: DB, 90°, healed joint broken by drilling, 31.20: B, 0°, Pl, Sm, Vr, clay, dark grey 31.28: HB, 30°, Pl, Sm, Cn 32.15: HB		
		100	100	31								
		100	100	32	32.00 -28.86		CONGLOMERATE, polymictic, grey matrix with quartz and lithic clasts; and interbedded SANDSTONE, medium, grey			33.45: V, 15°, 20 mm, carbonaceous rock, also conglomerate/sandstone contact 33.69: DB 33.76: DB 33.87: V, 15°, 3 mm, coal, also sandstone/conglomerate contact 34.23: DB 34.44-34.49: CS, 50 mm, fine gravel in a clay matrix 34.72: DB		
		100	100	33								
		100	100	34						36.14: J, 5°, Un, Sm, Vr, coal 36.32: DB		
		100	100	35						36.60: J, 10°, Pl, Sm, Ct, CH clay, dark grey		
		100	100	36								
		100	100	37								
		100	100	38								
		100	100	39								
		100	100	40	40.00		END OF BOREHOLE @ 40.00 m GROUNDWATER ENCOUNTERED @ m DEPTH 1.70m					

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GAP gINT FN. F02b
RL3

GAP 8.03 LIB: GLE Log GAP CORED BOREHOLE 107632034_ACO.GPJ <<DrawingFile>> 29/11/2010 13:57 8.2.007



REPORT OF CORE PHOTOGRAPHS: CRR 211

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Fairfield Rd/Brougham St
JOB NO: 107632034

COORDS: 0502416 m E 6957252 m N
SURFACE RL: 3.14 DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 40.5 m

DEPTH RANGE: 13.0-31.0 m
DRILL RIG: FD500
DRILLER: Foundril Pty Ltd
LOGGED: CA DATE: 26/08/10
CHECKED: NK DATE: 4/10/10





REPORT OF CORE PHOTOGRAPHS: CRR 211

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Fairfield Rd/Brougham St
JOB NO: 107632034

COORDS: 0502416 m E 6957252 m N
SURFACE RL: 3.14 DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 40.5 m

DEPTH RANGE: 31.0-40.5 m
DRILL RIG: FD500
DRILLER: Foundril Pty Ltd
LOGGED: CA DATE: 26/08/10
CHECKED: NK DATE: 4/10/10





REPORT OF STANDPIPE INSTALLATION: CRR 211

SHEET: 1 OF 1

CLIENT: Aecom Australia Pty Ltd

COORDS: 502416.04 m E 6957252.87 m N MGA94 56

DRILL RIG: FD500

PROJECT: Cross River Rail

SURFACE RL: 3.14 m DATUM: AHD

CONTRACTOR: Foundril Pty Ltd

LOCATION: Fairfield Rd / Brougham St

INCLINATION: -90°

LOGGED: CA

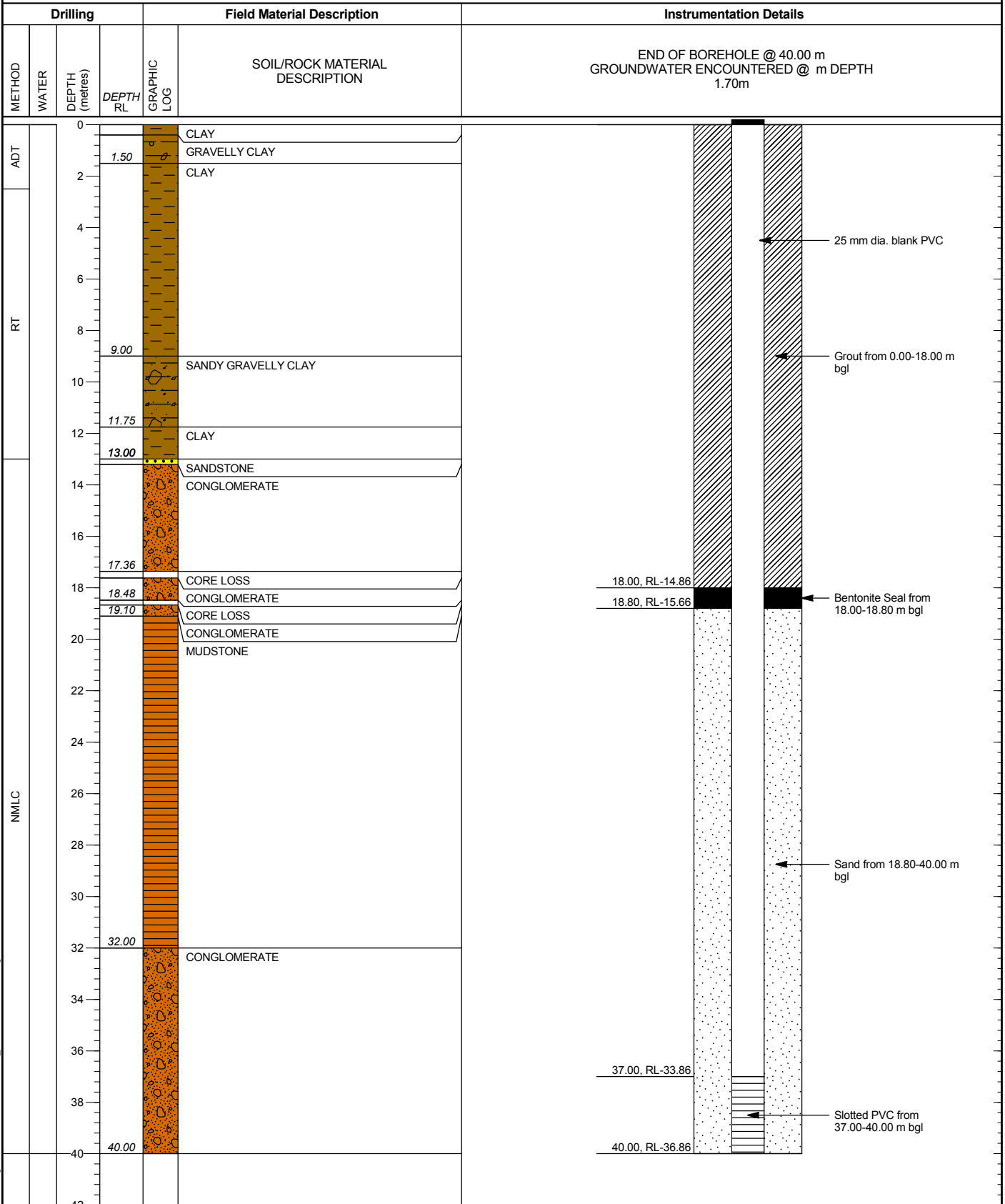
DATE: 26/8/10

JOB NO: 107632034

HOLE DEPTH: 40.00 m

CHECKED: NK

DATE: 18/10/10



This report of standpipe installation 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. F17
RL1

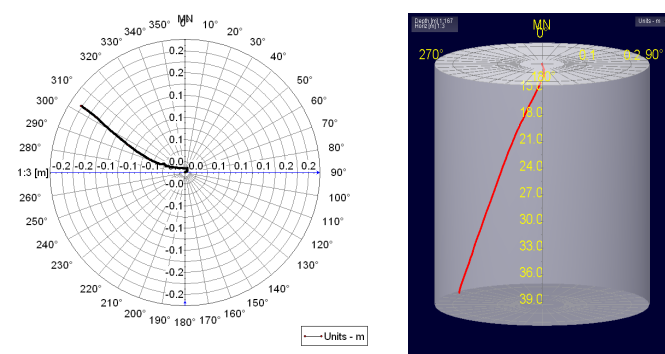
GAP 8.03 LIB: GLE Log GAP WELL 3 107632034_ACO.GPJ <-DrawingFile>> 29/11/2010 15:36 8.2.007



GEOPHYSICAL RECORD OF BOREHOLE: CRR 211

PROJECT **Cross River Rail** PROJECT # **107632034**
 CLIENT **Department of Transport and Main Roads** DATE **12/10/2010**

DEVIATION DATA



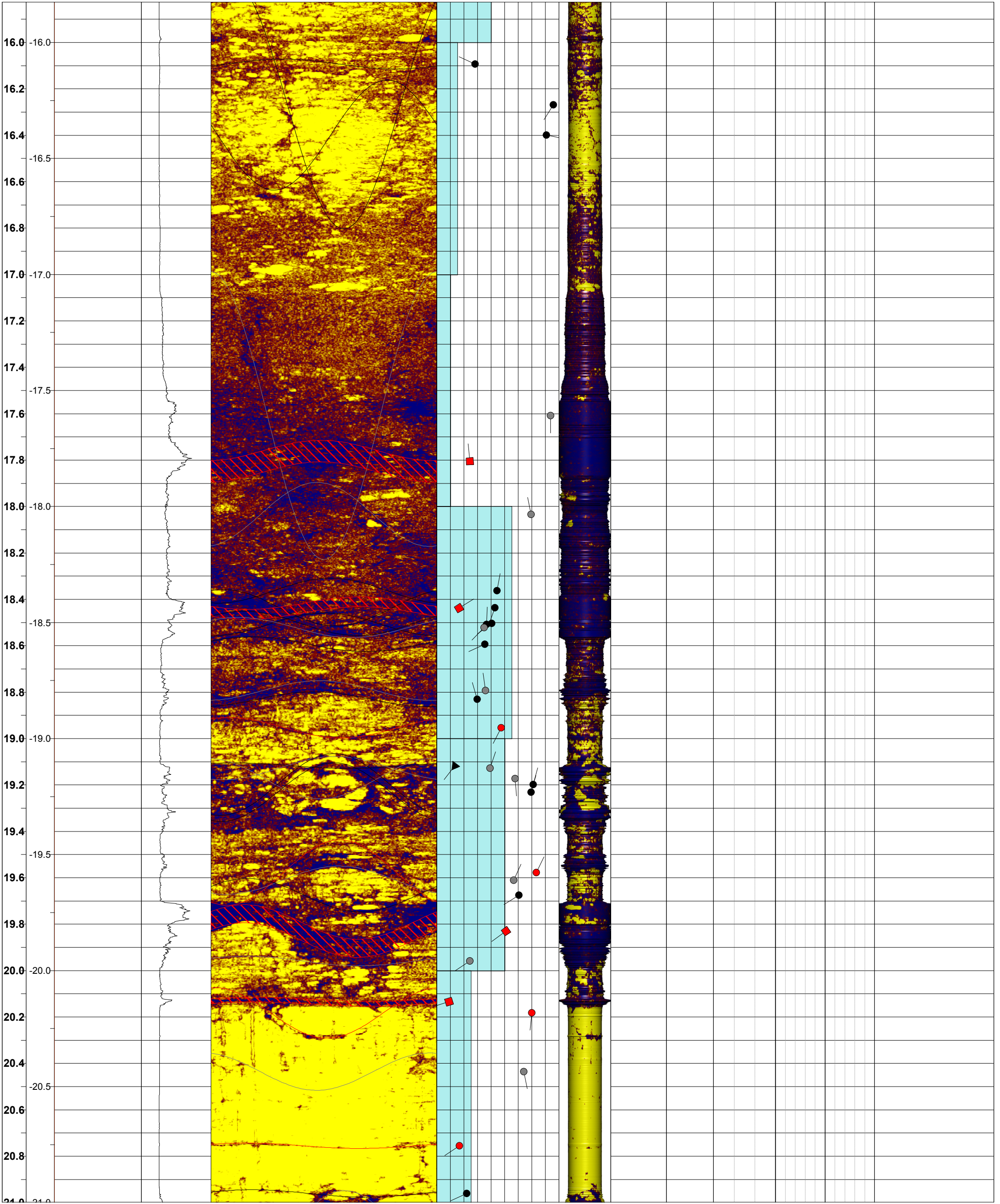
LOCATION- **Fairfield Rd** LOGGED BY- **CA**
 EASTING- **502410.00 m E** LOGGED DATE- **26/8/10**
 NORTHING- **6957251.00 m N** LOGGING DATUM-
 ELEVATION- LOGGED DEPTH- **39.22 m**
 DRILLED DEPTH- **40.00 m** DIAMETER- DRAWN BY- **RCD**
 PLUNGE- **-90°** AZIMUTH- **000** REVIEWED BY- **TR**
 CASING- DEPTH- FILE NAME- **CRR211-U.HED.WCL**

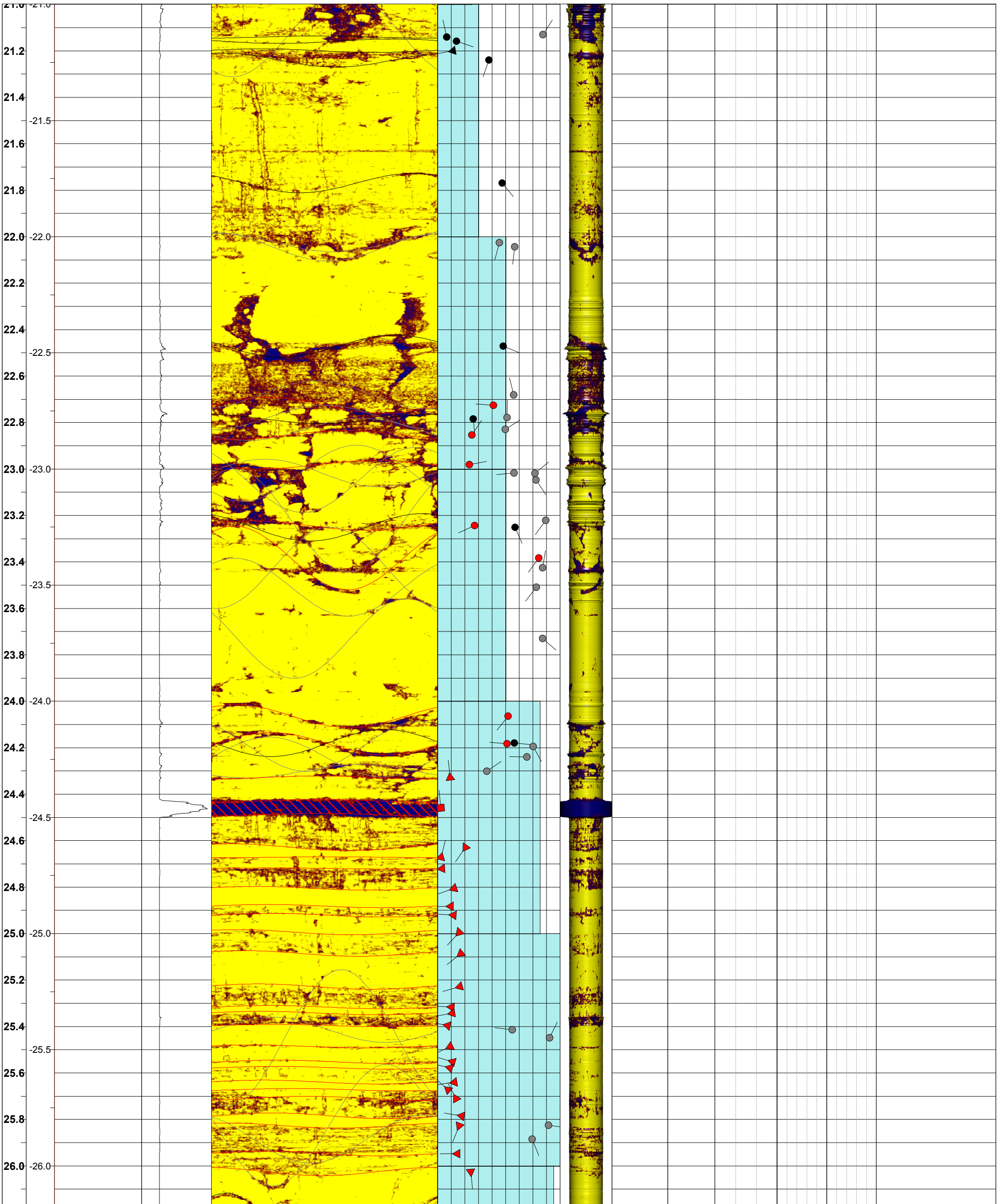
Lithology

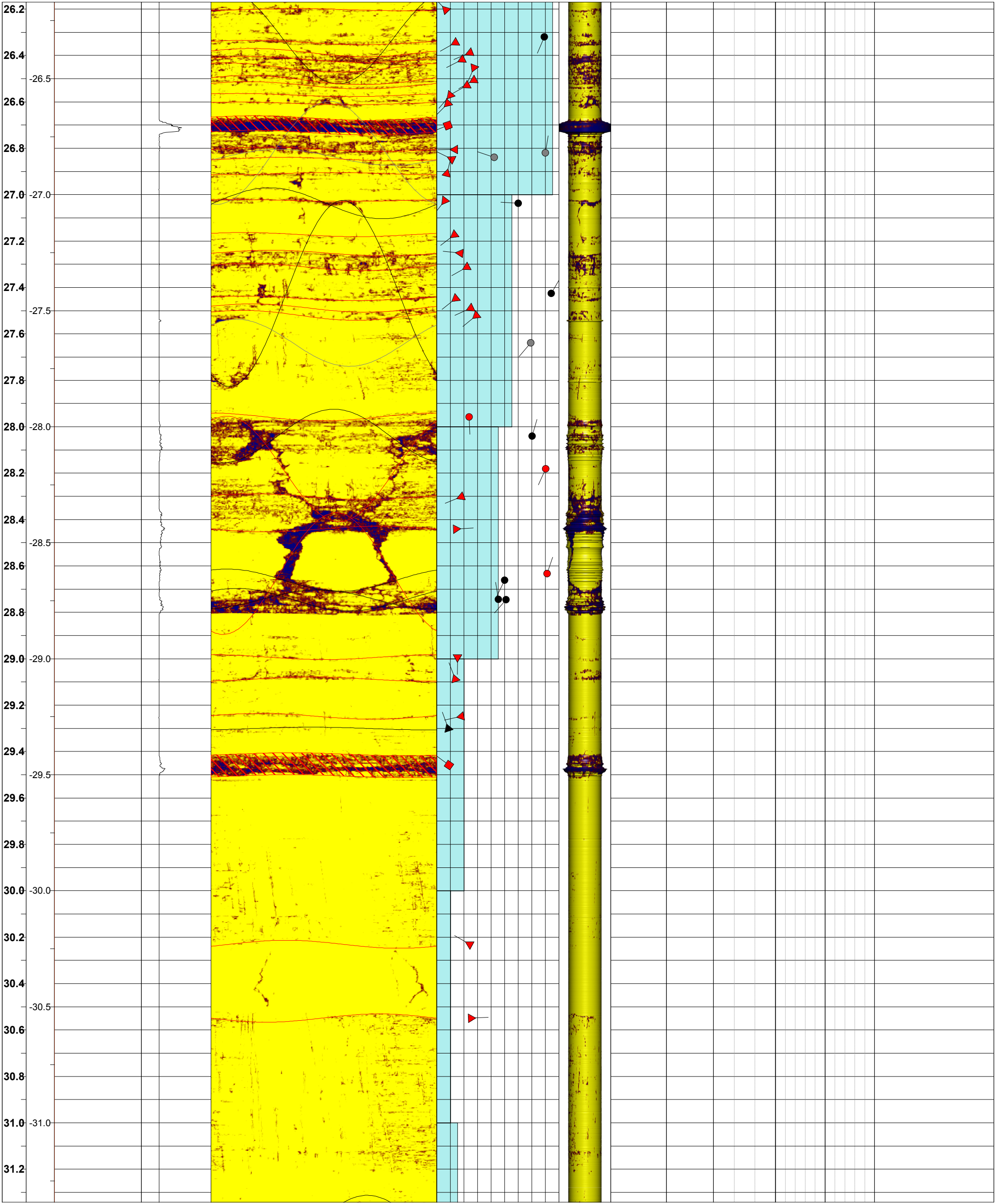
Interpreted Structures

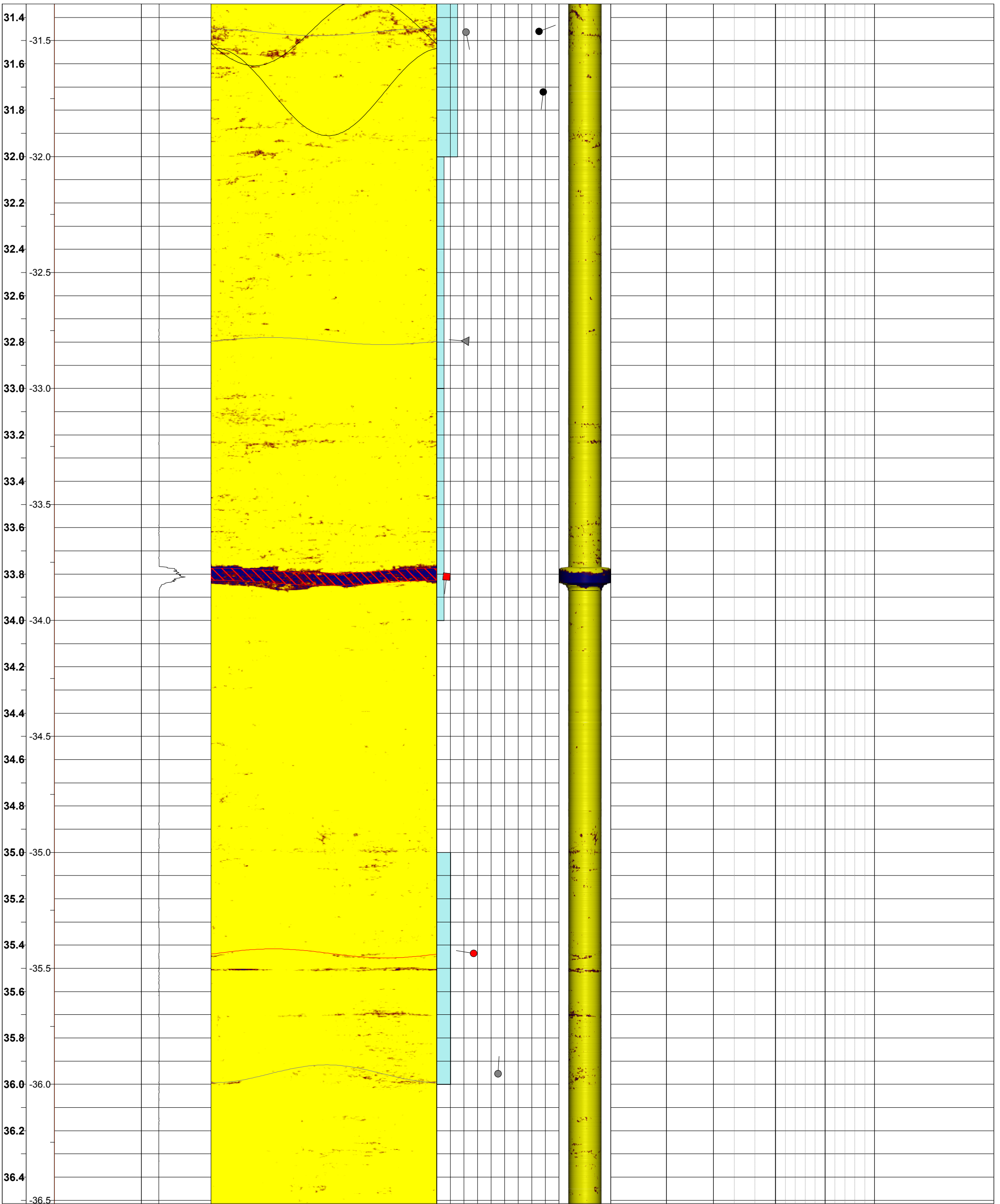
- Joint - Medium Confidence
- ◆ Crushed Seam - High Confidence
- Joint - High Confidence
- ▼ Bedding - Medium Confidence
- ▼ Bedding - High Confidence
- ▼ Bedding - Low Confidence
- Joint - Low Confidence

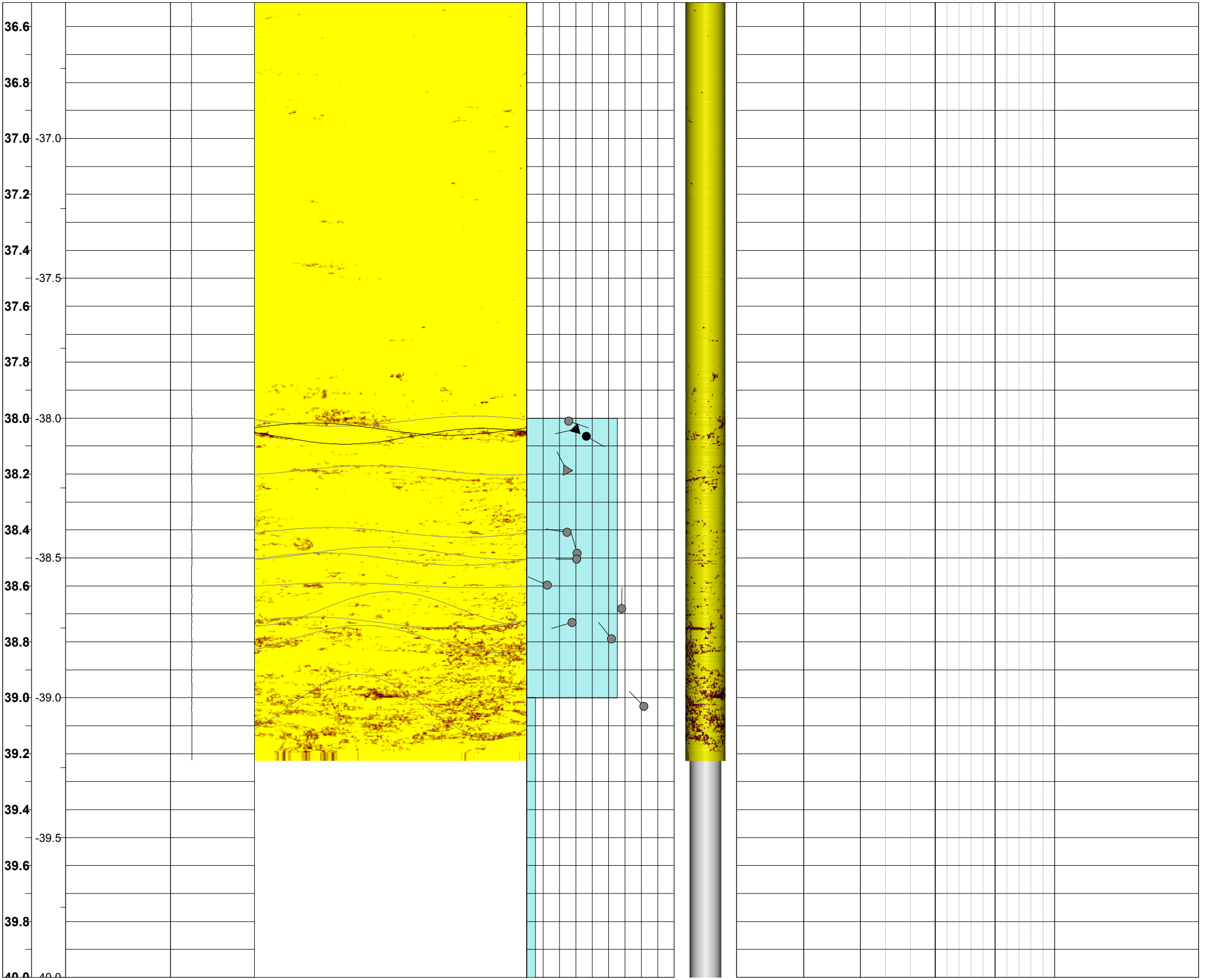
Depth 1:15	RL	TELEVIEWER DATA					CORE DATA					
		NATURAL GAMMA 0 cps 300	ATV - Caliper 0 mm 300	Amplitude 0° 90° 180° 270° 0°	ATV FF 0 counts/m 18	3D log 219°	Core Photo	Lithology	Logged FF 0 30	RQD 0 100	TCR 0 100	Defect Description
		Interpreted Structures					Structure Orientations					
		0° 90° 180° 270° 0°					0 90					
(Refer to detailed core log, provided separately)												
12.4	-12.5											
12.6												
12.8												
13.0	-13.0											
13.2												
13.4												
13.6	-13.5											
13.8												
14.0	-14.0											
14.2												
14.4												
14.6	-14.5											
14.8												
15.0	-15.0											
15.2												
15.4												
15.6	-15.5											
15.8												



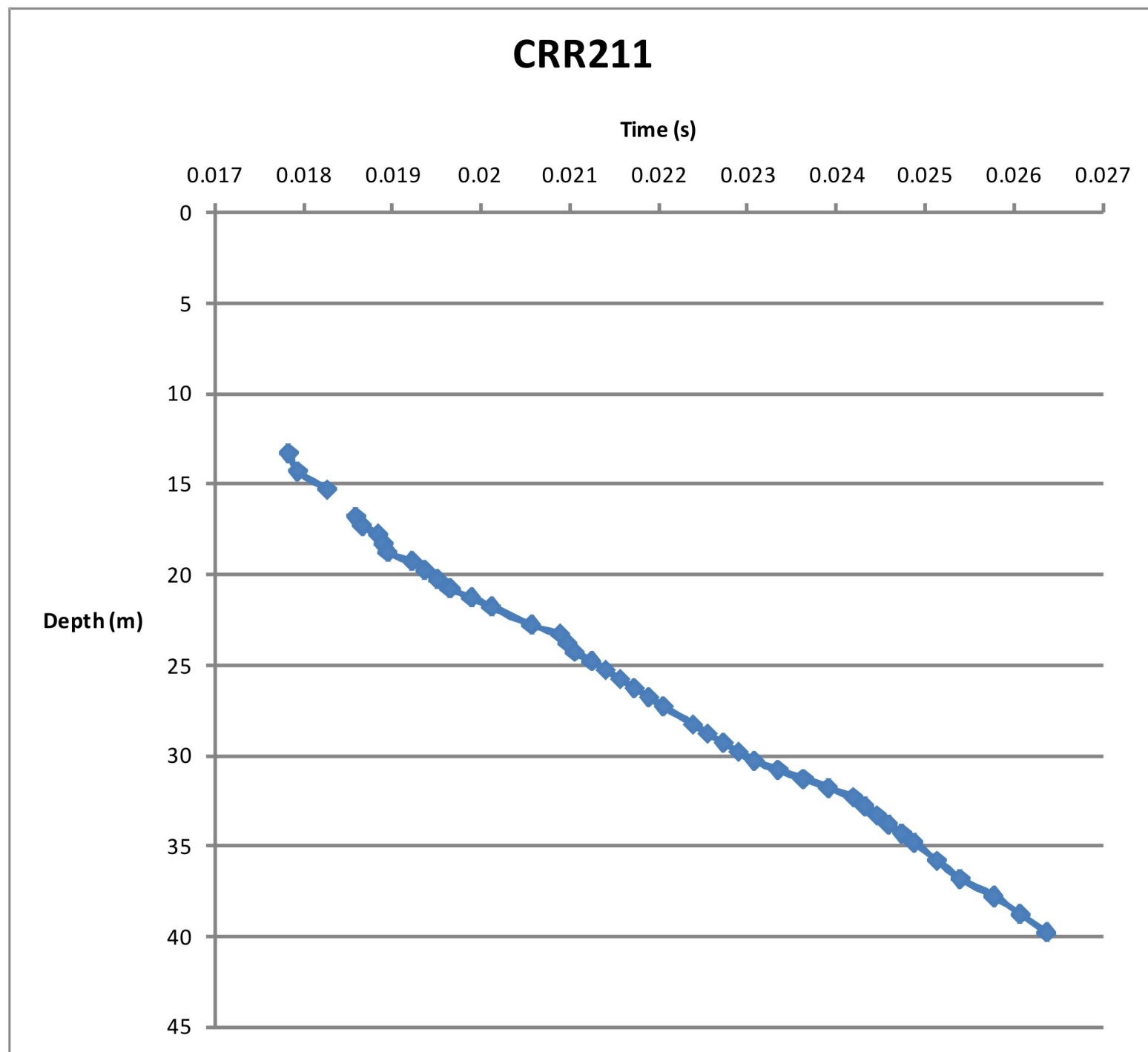








GA-BQ-291 RL1
 Issued 31/03/10



Geophone Depth (m)		Interval velocity (P wave m/s)
from	to	
13.3	14.3	9584
14.3	15.3	2994
15.3	16.3	*
16.3	16.8	*
16.8	17.3	6606
17.3	17.8	2764
17.8	18.3	9106
18.3	18.8	9757
18.8	19.3	1801
19.3	19.8	3540
19.8	20.3	3542
20.3	20.8	3544
20.8	21.3	2069
21.3	21.8	2228
21.8	22.8	2229
22.8	23.3	1528
23.3	23.8	6112
23.8	24.3	6115
24.3	24.8	2690
24.8	25.3	3111
25.3	25.8	3112
25.8	26.3	3110
26.3	26.8	3029
26.8	27.3	3029
27.3	28.3	3030
28.3	28.8	3036
28.8	29.3	2852
29.3	29.8	2852
29.8	30.3	2853
30.3	30.8	1875
30.8	31.3	1762
31.3	31.8	1762
31.8	32.3	1789
32.3	32.8	3777
32.8	33.3	3777
33.3	33.8	3777
33.8	34.3	3339
34.3	34.8	3780
34.8	35.8	3780
35.8	36.8	3863
36.8	37.8	2632
37.8	38.8	3398
38.8	39.8	3305

Note:

* - 1st arrival not clear due to noise

Calculations done without accounting for borehole deviation

	CLIENT Department of Transport and Main Roads		PROJECT Cross River Rail	
	DRAWN GDK	DATE OCT 4	TITLE CRR211 VSP	
	CHECKED TR	DATE		
	SCALE NTS	PROJECT No 000-107632034	FIGURE No	REV No A3