14 Attachment 3D – Catchment Areas

PRE DEVELOPMENT CATCHMENT AREAS

								PERVIOUS INPUT PARAMTERS						
RECEIVING NODE	**CATCHMENT ID**	**AREA (HA)**	**IMPERVIOUS AREA (HA)**	**%**	**PERVIOUS AREA**	**%**	**EMC CATEGORY**	**SOIL TYPE**	**SSC**	**FC**	**INF A**	**INF B**	**DDR (%)**	**DBR (%)**
J-LAKE	JLAKE CS	0.2	0.00	0	0.20	100	Forest	SAND/SANDY CLAY	161.8	82	288	1.5	70	40
	JLAKE S/SC	0.27	0.09	33	0.18	67	Agricultural	SAND/SANDY CLAY	161.8	82	288	1.5	70	40
	JLAKE FOREST	3.66	0.00	0	3.66	100	Agricultural	CLAYEY SAND	107	75	250	1.3	60	45
	JLAKE CS/SC	5.38	0.32	6	5.06	94	Agricultural	CLAYEY SAND/SANDY CLAY	128	86.4	208	2.32	39	33
		9.5												
MYALL CREEK	MYALL FOREST	2.32	0.00	0	2.32	100	Forest	LOAMY SAND	139	69	360	0.5	100	50
	MYALL LS/S	7.47	0.00	0	7.47	100	Agricultural	LOAMY SAND/SAND	168	73	360	0.5	100	50
	MYALL LS	13.37	0.00	0	13.37	100	Agricultural	LOAMY SAND	139	69	360	0.5	100	50
	UPSLOPE MYALL	8.887	0.89	10	8.00	90	Forest	SANDY CLAY LOAM	108	73	250	1.3	60	45
	ADDITIONAL MYALL LS/S	7.47	0.00	0	7.47	100	Agricultural	LOAMY SAND/SAND	168	73	360	0.5	100	50
		39.5												
WETLAND 1	WETLAND 1 FOREST LS/S	2.3	0.00	0	2.30	100	Forest	LOAMY SAND/SAND	168	73	360	0.5	100	50
	WETLAND 1 FOREST CS	1.04	0.00	0	1.04	100	Forest	CLAYEY SAND	107	75	250	1.3	60	45
	WETALND 1 CS	2.03	0.00	0	2.03	100	Agricultural	CLAYEY SAND	107	75	250	1.3	60	45
	UPSLOPE WETLAND 1	4.8	0.48	10	4.32	90	Forest	SANDY CLAY LOAM	108	73	250	1.3	60	45
	WETLAND 1 BUFFER	0.4	0.00	0	0.40	100	Forest	CLAYEY SAND	107	75	250	1.3	60	45
	ADDITIONAL WETLAND 1 BUFFER	7.73	0.00	0	7.73	100	Forest	CLAYEY SAND	107	75	250	1.3	60	45
	ADDITIONAL WETLAND 1 LS/S	0.69	0.00	0	0.69	100	Agricultural	LOAMY SAND/SAND	168	73	360	0.5	100	50
	ADITIONAL WETLAND 1 CS	0.15	0.00	0	0.15	100	Agricultural	CLAYEY SAND	107	75	250	1.3	60	45
		19.1												
WETLAND 2	UPSLOPE WETLAND 2 AGRICULTURALa	27.38	0.82	3	26.56	97	Agricultural	SANDY CLAY LOAM	108	73	250	1.3	60	45
	UPSLOPE WETLAND 2 FOREST	74.44	7.44	10	67.00	90	Forest	SANDY CLAY LOAM	108	73	250	1.3	60	45
	WETLAND 2 SC/C	6.22	0.00	0	6.22	100	Agricultural	SANDY CLAY/CLAY	107.7	75.8	148.5	3.7	14.5	14.5
	WETLAND 2 SC	27.03	0.00	0	27.03	100	Agricultural	SANDY CLAY	142	94	180	3	25	25
	WETLAND 2 S/SC	1.02	0.00	0	1.02	100	Agricultural	SAND/SANDY CLAY	161.8	82	288	1.5	70	40
	WETLAND 2 CS/SC	11.58	0.00	0	11.58	100	Agricultural	CLAYEY SAND/SANDY CLAY	128	86.4	208	2.32	39	33
	WETLAND 2 CS	15.96	0.00	0	15.96	100	Agricultural	CLAYEY SAND	107	75	250	1.3	60	45
	WETLAND 2 LS	7.09	0.00	0	7.09	100	Agricultural	LOAMY SAND	139	69	360	0.5	100	50
	WETLAND 2 BUFFER	4.12	0.00	0	4.12	100	Forest	CLAYEY SAND	107	75	250	1.3	60	45
		174.8												
WETLAND 3	WETLAND 3 FOREST 1	0.8	0.00	0	0.80	100	Forest	SANDY CLAY/CLAY	107.7	75.8	148.5	3.7	14.5	14.5
	WETLAND 3 FOREST 2	0.77	0.00	0	0.77	100	Forest	SANDY CLAY	142	94	180	3	25	25
	WETLAND 3 FOREST 3	0.96	0.00	0	0.96	100	Forest	SAND/SANDY CLAY	161.8	82	288	1.5	70	40
	WETLAND 3 SC/C	1.07	0.00	0	1.07	100	Agricultural	SANDY CLAY/CLAY	107.7	75.8	148.5	3.7	14.5	14.5
	WETLAND 3 SC	0.28	0.00	0	0.28	100	Agricultural	SANDY CLAY	142	94	180	3	25	25
	WETLAND 3 S/SC	1.88	0.00	0	1.88	100	Agricultural	SAND/SANDY CLAY	161.8	82	288	1.5	70	40
	WETLAND 3 CS/SC	1.03	0.00	0	1.03	100	Agricultural	CLAYEY SAND/SANDY CLAY	128	86.4	208	2.32	39	33
	WETLAND 3 CS	15.15	0.00	0	15.15	100	Agricultural	CLAYEY SAND	107	75	250	1.3	60	45
	WETLAND 3 LS	1.65	0.00	0	1.65	100	Agricultural	LOAMY SAND	139	69	360	0.5	100	50
	WETLAND 3 BUFFER	10.01	0.00	0	10.01	100	Forest	CLAYEY SAND	107	75	250	1.3	60	45
	UPSLOPE WETLAND 3 FOREST	11.84	1.18	10	10.66	90	Forest	SANDY CLAY LOAM	108	73	250	1.3	60	45
		45.4												
	TOTAL CATCHMENT AREA	**288.4**	**ha**											

POST DEVELOPMENT CATCHMENT AREAS

NB ALL POST DEVELOPMENT CATCHMENTS ARE 100MM LOAMY SAND/400MM SAND SOIL TYPE
ALL OTHER CATCHMENTS ARE BASED ON PRE DEVELOPMENT SOIL TYPES

														PERVIOUS INPUT PARAMTERS -ONLY APPLIES TO PRE=POST NODES AND UPSLOPE NODES						
RECEIVING NODE	**CATCHMENT**	**Total Area**	**Biofilter Area**	**1/2 DD Area.**	**Road Area**	**Driveway Area**	**Footpath Area**	**Lot Area**	**ROOF Area**	**Residential Node**	**% Impervious (Res)**	**%Pervious (Res)**	**NODE**	**SOIL TYPE**	**SSC**	**FC**	**INF A**	**INF B**	**DDR (%)**	**DBR (%)**
JLAKE	JLAKE FLOODWAY	1.833									0%	100%	URBAN	LOAMY SAND/SAND	168	73	360	0.5	100	50
	10a	3.14	0.07	0.12	0.87	0.13	0.18	1.51	0.61	1.67	19%	81%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	10b	3.89	0.00	0.00	0.00	0.04	0.00	3.90	3.51	3.89	90%	10%		LOAMY SAND/SAND	168	73	360	0.5	100	50
		8.87																		
Wetland 3	5	2.78	0.07	0.12	0.45	0.15	0.09	1.73	0.69	1.64	14%	86%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	6	4.39	0.05	0.09	0.66	0.24	0.11	2.26	0.90	2.84	12%	88%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	7	6.48	0.10	0.18	0.86	0.35	0.14	4.52	1.81	3.82	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	9a	4.60	0.12	0.18	1.08	0.20	0.27	2.46	0.98	2.58	18%	82%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	9b	2.30	0.00	0.00	0.00	0.01	0.00	2.24	2.02	2.30	90%	10%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	1	3.79									0%	100%	AGRICULTURE	CLAYEY SAND	107	75	250	1.3	60	45
	WETLAND 3 REVEGETATION	9.36									0%	100%	FOREST	CLAYEY SAND	107	75	250	1.3	60	45
	WETLAND 3 BUFFER	10.20									0%	100%	FOREST	CLAYEY SAND	107	75	250	1.3	60	45
	WETLAND 3 FLOODWAYS	6.70									4%	96%	URBAN							
	Total	**50.60**																		
WETLAND 2	2	4.38	0.09	0.17	0.79	0.20	0.17	2.38	0.95	2.63	14%	86%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	3	4.69	0.07	0.14	0.87	0.25	0.13	2.31	0.92	2.90	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	4	4.69	0.08	0.15	0.76	0.25	0.13	3.03	1.21	2.72	14%	86%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	11	2.55												LOAMY SAND/SAND	168	73	360	0.5	100	50
	12	5.86	0.07	0.15	0.93	0.30	0.19	3.67	1.47	3.46	14%	86%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	13	5.88	0.13	0.24	1.11	0.24	0.28	2.83	1.13	3.64	14%	86%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	14	4.07	0.07	0.13	0.57	0.23	0.07	2.87	1.15	2.36	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	15	3.84	0.06	0.11	0.58	0.23	0.08	2.69	1.08	2.19	14%	86%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	16	4.80	0.07	0.13	0.62	0.22	0.13	2.63	1.05	3.13	11%	89%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	17	3.64	0.07	0.13	0.52	0.17	0.12	2.49	1.00	2.13	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	UPSLOPE WEST	14.26									3%	97%	FOREST	SANDY CLAY LOAM	108	73	250	1.3	60	45
	UPSLOPE WETLAND 2 AG	15.57									6%	94%	AGRICULTURE	SANDY CLAY LOAM	108	73	250	1.3	60	45
	UPSLOPE WETLAND 2 FOREST	85.36									10%	90%	FOREST	SANDY CLAY LOAM	108	73	250	1.3	60	45
	WETLAND 2 REVEGETATION	9.18									0	100%	FOREST	LOAMY SAND/SAND	168	73	360	0.5	100	50
	WETLAND 2 BUFFER	4.12									0	100%	FOREST	CLAYEY SAND	107	75	250	1.3	60	45
	Total	**172.9**																		
WETLAND 1	WETLAND 1 REVEGETATION	9.92									0	100%	FOREST	LOAMY SAND/SAND	168	73	360	0.5	100	50
	ADDITIONAL WETLAND 1 BUFFER	6.52									0	100%	FOREST	CLAYEY SAND	107	75	250	1.3	60	45
	Total	**16.4**																		
MYALL CREEK	20	1.96	0.06	0.11	0.41	0.09	0.06	1.13	0.45	1.10	14%	86%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	21	2.00	0.08	0.13	0.42	0.09	0.06	1.11	0.45	1.13	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	22	4.11	0.05	0.10	0.48	0.24	0.07	3.08	1.23	2.39	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	23	1.88	0.05	0.09	0.31	0.10	0.05	1.21	0.48	1.08	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	24	1.71	0.04	0.08	0.30	0.09	0.04	1.10	0.44	0.97	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	25	2.21	0.07	0.12	0.46	0.10	0.06	1.28	0.51	1.24	13%	87%		LOAMY SAND/SAND	168	73	360	0.5	100	50
	MYALL UPSLOPE	13.38									10%	90%	FOREST	SANDY CLAY LOAM	108	73	250	1.3	60	45
	PARKLAND RESERVE	8.34												LOAMY SAND/SAND	168	73	360	0.5	100	50
	MYALL REVEGETATION	3.01									0%	100%	FOREST	LOAMY SAND/SAND	168	73	360	0.5	100	50
	MYALL FLOODWAY	0.99									0%	100%	URBAN	LOAMY SAND/SAND	168	73	360	0.5	100	50
	Total	**39.6**																		
	Total Catchment Area	**288.4**	**ha**																	

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue		AV			

* Denote the original signature and date when revision was issued.

TATTERSALL LANDER PTY LTD
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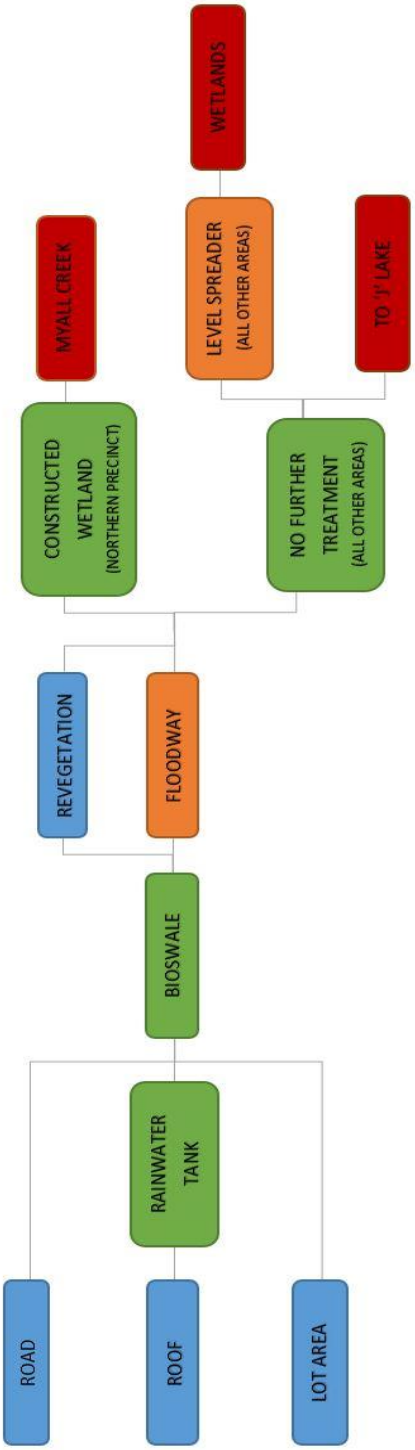
OVERALL CATCHMENT PLAN

RIVERSIDE ESTATE
TEA GARDENS

COUNCIL: GLC	REFERENCE: ####
PARISH:	SHEET SIZE: A1
SCALE: 1:4000 on A1	SHEET No.: 1
DATE : Plotted 14:03 17/05/16	
CLIENT: CRIGHTON PROPERTIES	JOB No.: 210549
COMPUTER FILE : S:\projects\Riverside\dwg\MUSIC Catchment Plan.dwg	

Xref: Riverside [Riverside.dwg] Xref: Myall Quays Bdys [Myall Quays Bdys.dwg] Xref: Shearwater Bdys [Shearwater Bdys.dwg]

15 Attachment 3E – Conceptual Layout: Proposed Water Quality Treatment Train

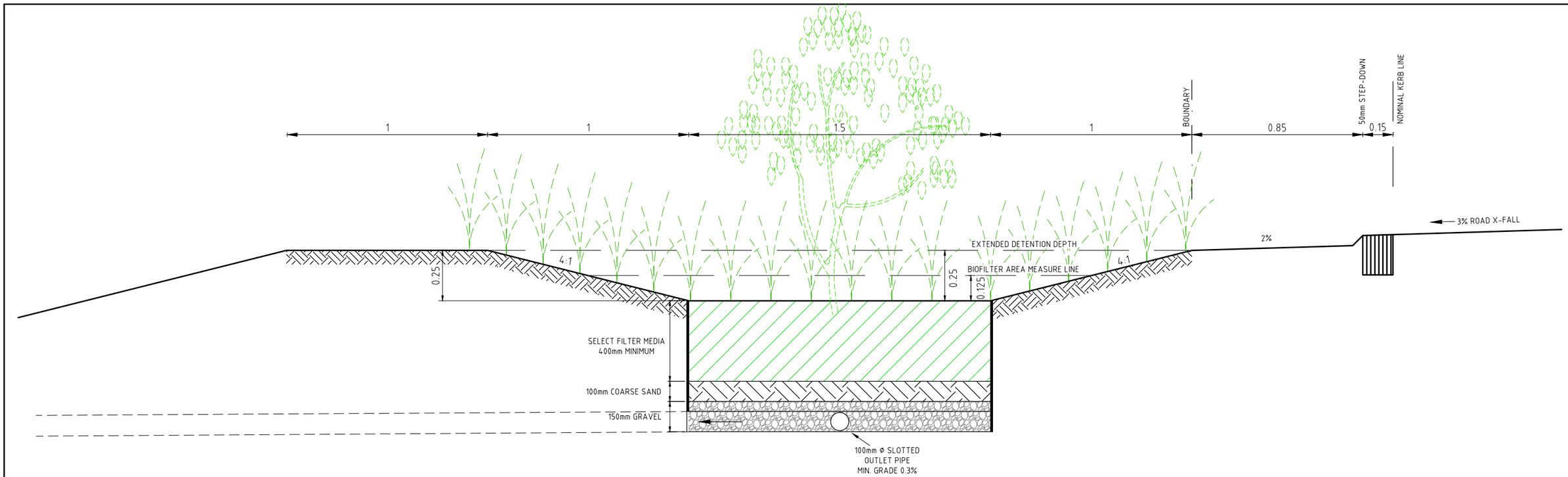


Key:

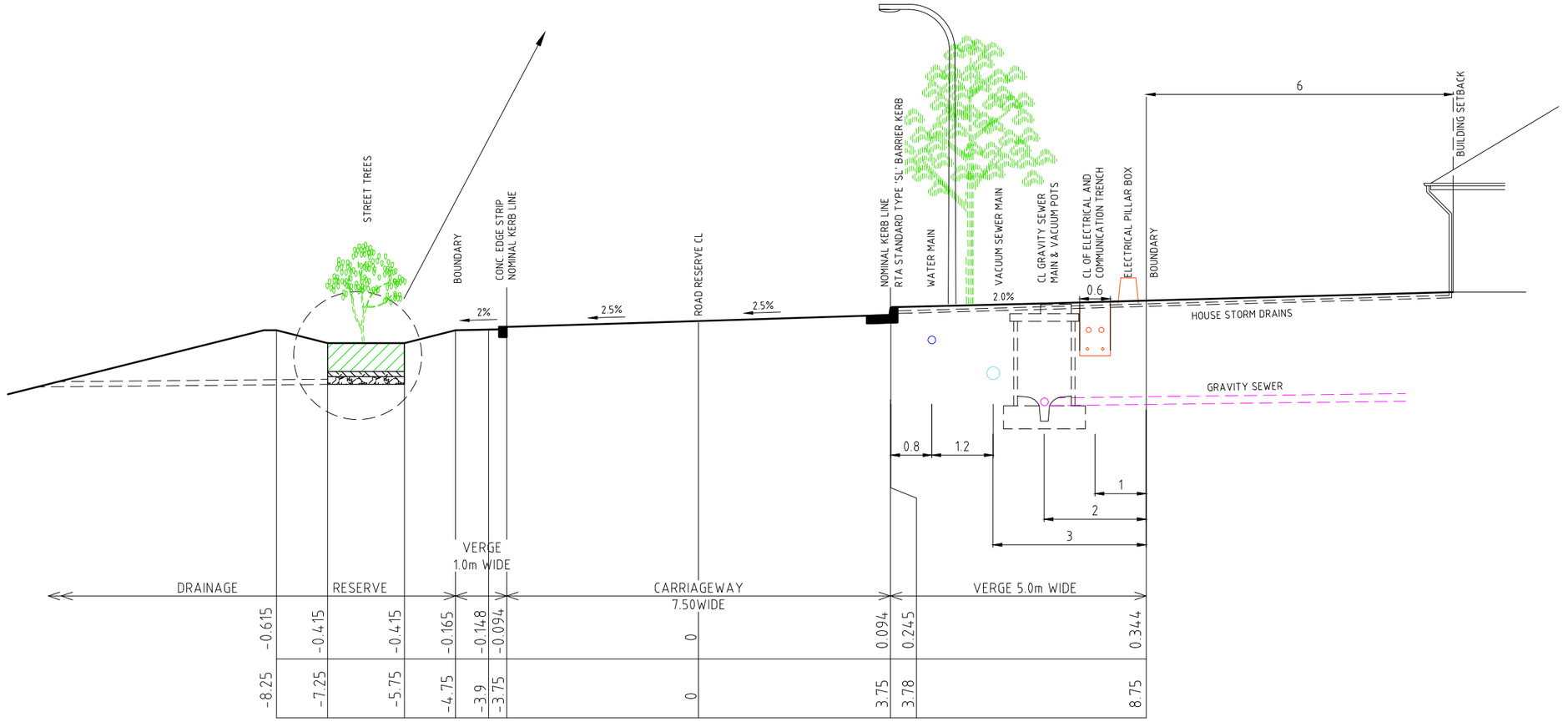
- Source Node
- Treatment Node
- Disposal System
- Outlet

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	DG	**Conceptual Model – Proposed Treatment Train**	**Attachment E**
Approved:	DM		
Date:	09/09/2015		
Scale:	NA		Job No: P1504136

16 Attachment 3F - Proposed Bioswale Design



TYPICAL 1.0m WIDE VERGE PROFILE WITH
BIO-FILTER IN ADJACENT RESERVE



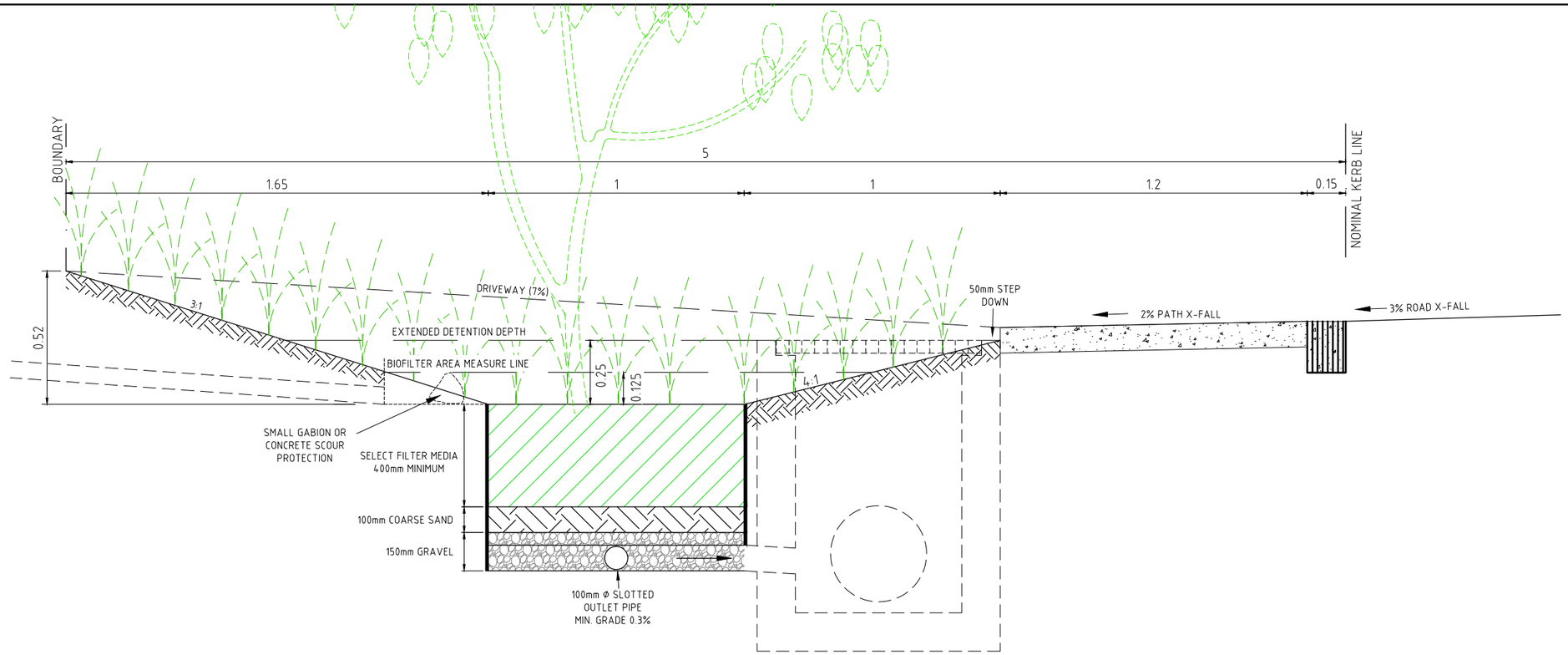
T.S. 2 TYPICAL SECTION
RING ROAD 12.5m WIDE
SCALE 1:50

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
B	Additional Details Added	AV	AV			
A	Original Issue	VL	DWK			

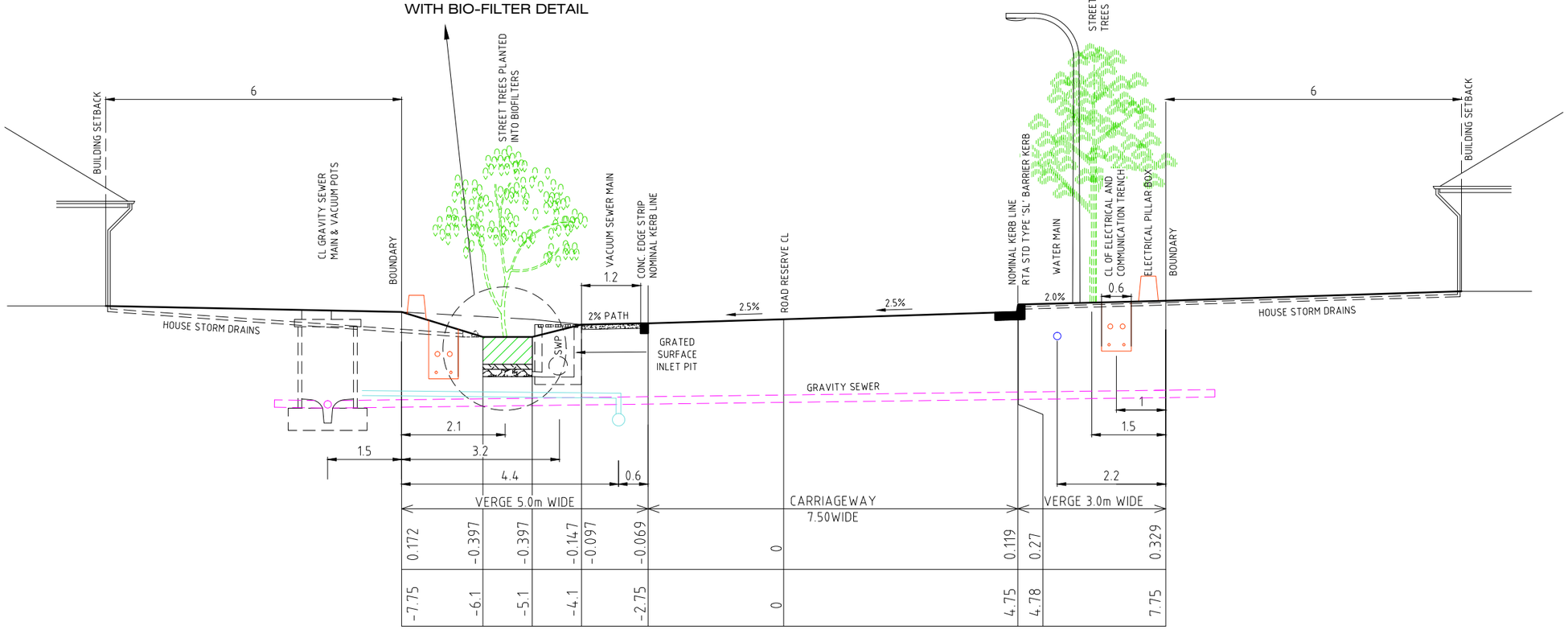
* Denote the original signature and date when revision was issued.

TATTERSALL LANDER Pty Ltd
DEVELOPMENT CONSULTANTS

SCALE :
SHEET No. :####
JOB No. : ####
FILE : ####
DATE : Plotted 14:39 04/08/15
SHEET SIZE A1
COMPUTER FILE : S:\projects\Riverside\dwg\Street Typical Service Allocations.dwg



TYPICAL 5.0m WIDE VERGE PROFILE
WITH BIO-FILTER DETAIL



T.S. 1 TYPICAL SECTION
ROAD 15.5m WIDE
SCALE 1:50

REV	DETAILS OF AMENDMENT	DESIGNED	DRAWN	CHECKED	APPROVED	DATE
A	Original Issue	AV	AV			
*	Denote the original signature and date when revision was issued.					

TATTERSALL LANDER Pty Ltd
DEVELOPMENT CONSULTANTS

SCALE :	SHEET No. :5	FILE : 21200151	SHEET SIZE A1
	JOB No. : 201479	DATE : Plotted 14:42 04/08/15	

COMPUTER FILE : S:\projects\Riverside\dwg\Street Typical Service Allocations.dwg

17 Attachment 3G – Pre and Post Development Recharge Rates; MUSIC Modelling

INFILTRATION RATES EXISTING - WATER BALANCE BY CATCHMENT AREA

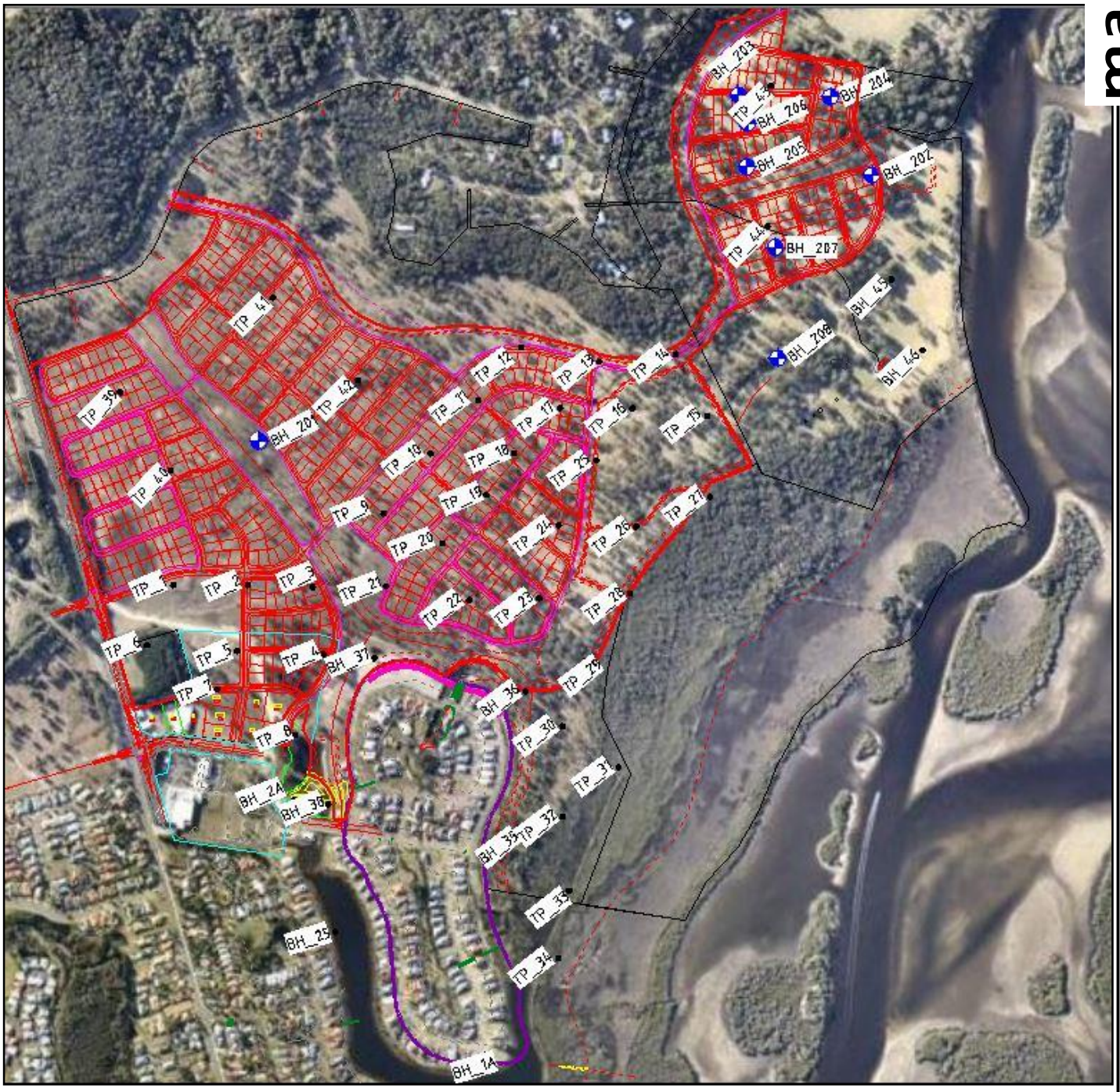
			ML/yr				
RECEIVING NODE	**CATCHMENT ID**	**TOTAL AREA (HA)**	**RAINFALL**	**ET**	**GW INFILTRATION**	**RUNOFF/FLOW OUT**	**RECHARGE RATE (mm/yr)**
J-LAKE	JLAKE FOREST	0.20	2.70	1.70	0.90	0.10	450.00
	JLAKE S/SC	6.97	95.80	57.60	30.90	7.30	443.33
	JLAKE CS	3.66	50.30	32.60	11.00	6.70	300.55
	JLAKE CS/SC	0.27	3.70	1.80	0.50	1.40	185.19
MYALL CREEK	MYALL FOREST	2.32	31.90	19.40	11.70	0.80	504.31
	MYALL LS/S	3.83	52.60	31.50	20.70	0.40	540.47
	MYALL LS	9.73	133.70	81.20	49.10	3.40	504.62
	UPSLOPE MYALL	9.14	121.90	71.70	25.60	24.60	280.09
	ADDITIONAL MYALL LS/S	7.47	102.60	61.30	40.40	0.80	540.83
WETLAND 1	WETLAND 1 FOREST LS/S	2.30	31.60	18.90	12.40	0.30	539.13
	WETLAND 1 FOREST CS	1.04	14.30	9.30	3.10	1.90	298.08
	WETLAND 1 LS/S	7.28	100.00	59.80	39.40	0.80	541.21
	WETLAND 1 CS	2.03	27.90	18.10	6.10	3.70	300.49
	UPSLOPE WETLAND 1	4.80	66.00	38.80	13.80	13.30	287.50
	WETLAND 1 BUFFER	0.40	5.50	3.60	1.20	0.70	300.00
	ADDITIONAL WETLAND 1 BUFFER	7.73	106.20	68.90	23.20	14.10	300.13
	ADDITIONAL WETLAND 1 LS/S	0.69	9.50	5.70	3.70	0.10	536.23
	ADDITIONAL WETLAND 1 CS	0.15	27.90	18.10	6.10	3.70	4066.67
WETLAND 2	UPSLOPE WETLAND 2 AGRICULTURAL	27.38	213.90	130.70	46.80	36.40	170.93
	UPSLOPE WETLAND 2 FOREST	86.28	1185.50	697.40	248.50	239.60	288.02
	WETLAND 2 SC/C	6.22	85.50	55.70	3.50	23.60	56.27
	WETLAND 2 SC	27.03	371.40	250.80	55.00	65.50	203.48
	WETLAND 2 S/SC	1.02	14.00	8.90	4.80	0.30	470.59
	WETLAND 2 CS/SC	11.58	159.10	105.80	35.20	18.10	303.97
	WETLAND 2 CS	15.96	219.30	142.30	47.90	29.10	300.13
	WETLAND 2 LS	7.09	97.40	59.10	35.80	2.50	504.94
	WETLAND 2 BUFFER	4.12	56.60	36.70	12.40	7.50	300.97
WETLAND 3	WETLAND 3 FOREST 1	0.80	11.00	7.20	0.50	3.40	62.50
	WETLAND 3 FOREST 2	0.77	10.60	7.10	1.60	34.00	207.79
	WETLAND 3 FOREST 3	0.96	13.20	8.40	4.50	0.30	468.75
	WETLAND 3 SC/C	1.07	14.70	9.60	0.60	5.10	56.07
	WETLAND 3 SC	0.28	3.80	2.60	0.60	0.70	214.29
	WETLAND 3 S/SC	1.88	25.80	16.40	8.90	0.60	473.40
	WETLAND 3 CS/SC	1.03	14.20	9.40	3.10	1.60	300.97
	WETLAND 3 CS	15.15	208.20	135.10	45.40	27.70	299.67
	WETLAND 3 LS	1.65	22.70	13.80	8.30	0.60	503.03
	WETLAND 3 BUFFER	10.01	137.50	89.20	30.00	18.30	299.70

Infiltration = 180 mm/hr for sandy loams and sands

INFILTRATION RATES PROPOSED - WATER BALANCE BY CATCHMENT AREA

		ML/yr					
RECEIVING NODE	**CATCHMENT ID**	**RAINFALL/INFLOW**	**ET**	**GW INFILTRATION**	**RUNOFF/FLOW OUT**	**AREA (HA)**	**RECHARGE RATE (mm/yr)**
JLAKE	**JLAKE FLOODWAY**	25.19	15.05	9.92	0.22	1.83	541.19
	10 Residential	22.92	11.45	7.31	4.16		
	10 Bioswale	72.94	0.87	17.62	54.45		
	10 commercial	53.50	7.06	2.11	44.33		
	10				0.00	7.03	384.64
Wetland 3	5 Residential	22.55	11.73	7.55	3.27		
	5 Bioswale	23.39	0.83	2.97	19.59		
	5					2.78	378.42
	6 Residential	38.95	20.86	13.50	4.59		
	6 Bioswale	34.90	0.59	6.67	27.64		
	6					4.39	459.45
	7 residential	52.45	27.82	17.96	6.67		
	7 Bioswale	54.15	1.20	9.53	43.42		
	7					6.48	424.23
	9 residential	35.49	17.91	11.46	6.12		
	9 commercial	31.55	4.16	1.24	26.15		
	9 Bioswale	68.49	1.45	11.39	55.65		
	9					6.95	346.62
	1	52.12	31.15	20.52	0.45	3.79	541.42
	WETLAND 3 REVEGETATION	128.62	83.46	28.07	17.09	9.36	299.89
	WETLAND 3 BUFFER	140.08	90.90	30.58	18.60	10.20	299.80
	WETLAND 3 FLOODWAYS	92.04	55.02	36.24	0.78	6.70	540.90
WETLAND 2	2 Residential	36.18	18.07	11.54	6.57		
	2 Bioswale	37.67	0.13	4.99	32.55		
	2					4.38	377.40
	3 Residential	39.83	21.13	13.64	5.06		
	3 Bioswale	38.64	0.36	8.64	29.64		
	3					4.69	475.05
	4 Residential	37.35	19.62	12.64	5.09		
	4 Bioswale	39.67	0.40	9.03	30.24		
	4					4.69	462.05
	12 Residential	47.60	25.00	16.12	6.48		
	12 Bioswale	49.29	0.36	12.21	36.72		
	12					5.86	483.45
	13 Residential	49.99	26.00	16.73	7.26		
	13 Bioswale	49.29	0.65	10.05	38.59		
	13					5.88	455.44
	14 Residential	32.44	17.38	11.24	3.82		
	14 Bioswale	33.97	0.36	7.34	26.27		
	14					4.07	456.51
	15 Residential	30.10	15.81	10.19	4.10		
	15 Bioswale	32.43	0.29	0.26	31.88		
	15					3.84	272.14
	16 Residential	43.05	23.28	15.08	4.69		
	16 Bioswale	38.19	0.36	7.66	30.17		
	16					4.80	473.75
	17 Residential	29.21	15.49	10.01	3.71		
	17 Bioswale	30.92	0.36	6.45	24.11		
	17					3.64	452.20
	UPSLOPE WEST	195.92	122.92	44.27	28.73	14.26	310.45
	UPSLOPE WETLAND 2 AG	213.90	130.70	46.80	36.40	15.57	300.58
	UPSLOPE WETLAND 2 FOREST	1172.00	723.00	259.00	190.00	85.36	303.42
	WETLAND 2 REVEGETATION	126.00	75.41	49.67	0.92	9.18	541.07
	WETLAND 2 BUFFER	56.57	36.71	12.35	7.51	4.12	299.76
WETLAND 1	**WETLAND 1 REVEGETATION**	136.33	81.49	53.67	1.17	9.92	541.03
	ADDITIONAL WETLAND 1 BUFFER	89.63	58.16	19.56	11.91	6.52	300.00
MYALL CREEK	20 Residential	15.05	7.90	5.09	2.06		
	20 Bioswale	16.20	0.75	1.77	13.68		
	20					1.96	350.00
	21 Residential	15.58	8.26	5.34	1.98		
	21 Bioswale	16.38	0.94	1.35	14.09		
	21					2.00	334.50
	22 Residential	32.89	17.45	11.27	4.17		
	22 Bioswale	32.38	0.67	6.28	25.43		
	22					4.11	427.01
	23 Residential	14.89	7.90	5.10	1.89		
	23 Bioswale	15.04	0.61	1.78	12.65		
	23					1.88	365.96
	24 Residential	13.31	7.06	4.56	1.69		
	24 Bioswale	13.87	0.54	1.72	11.61		
	24					1.71	367.25
	25 Residential	16.97	9.00	5.81	2.16		
	25 Bioswale	18.29	0.87	1.47	15.95		
	25					2.21	329.41
	MYALL UPSLOPE	183.87	116.47	41.98	25.42	13.38	313.75
	PARKLAND RESERVE	114.56	68.48	45.11	0.97	8.34	541.02
	MYALL REVEGETATION	25.97	15.52	10.22	0.00	1.89	540.74
	MYALL FLOODWAY	13.53	8.09	5.33	0.10	0.99	541.12

18 Attachment 3H – Site Testing Plan



Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	DG	**Site Testing Plan**	**Attachment H**
Approved:	GT		
Date:	21.09.2015		
Scale:	NA		Job No: P1404136

19 Attachment 3I – Borelogs

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP 1**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.586

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5	0.5			**TOPSOIL:** SAND, fine to medium grained, dark brown with approximately 30% low plasticity fines, with 300mm of rootlets.	M			TOPSOIL
				D	2.0			CI	**Sandy CLAY:** medium plasticity, dark brown-orange, sand fine to medium grained.				
						1.0		SP	**SAND:** fine to medium grained, pale grey-white.		VD		
				D	1.5								
						1.5			Becoming pale grey-brown.	W			
				D	1.0								
			04-04-07 8:54am		0.5	2.0			Test pit TP 1 terminated at 1.9m				
						2.5							

Sketch

method

N	natural exposure
X	existing excavation
BH	backhoe bucket
B	bulldozer blade
R	ripper
E	excavator

support

S shoring N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water

water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
V	vane shear (kPa)
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

TESTPIT 20248AA LOGS.GPJ COFFEY.GDT 23.10.07

Form GEO 5.2 Issue 3 Rev.2

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP 2**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.433

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N	▼ 04-04-07 9:13am	D	2.0	0.5			**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark brown with approximately 30% of low plasticity fines, with approximately 300mm of rootlets.	M			TOPSOIL
				D	1.5	1.0		CI	**Sandy CLAY:** medium plasticity, dark brown-orange, with some sand lenses.	M/W	St	× × ×	
				D	1.0	1.5		SP	**SAND:** fine to medium grained, brown-dark grey.	W			Rapid inflow of groundwater and pit collapsing below 1.7m depth.
				D	0.5	2.0			Test pit TP 2 terminated at 1.9m				
					0.0	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

TESTPIT 20248AA LOGS.GPJ COFFEY.GDT 23.10.07

Form GEO 5.2 Issue 3 Rev.2

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP 3**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.571

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5	0.5			**TOPSOIL:** Silty Clayey SAND, fine to coarse grained, pale brown-brown, low plasticity fines with some rootlets to 300mm.	M			TOPSOIL
				D	2.0			SC	**Clayey SAND:** fine to medium grained, orange-brown / pale brown, low plasticity fines.		VD		
						1.0		SP	**SAND:** fine to coarse grained to fine to medium grained, pale grey-white.	M/W			
				D	1.5				Becoming pale brown-white.				
			04-04 07		1.0	1.5			Becoming white.				Rapid inflow of groundwater and pit collapsing below 1.7m depth.
					0.5	2.0			Test pit TP 3 terminated at 1.8m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

TESTPIT 20248AA LOGS.GPJ COFFEY.GDT 23.10.07

Form GEO 6.2 Issue 3 Rev.2

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Engineering Log - Excavation

Excavation No. **TP 4**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.260

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			2.0	0.0			**TOPSOIL:** Silty CLAY, medium plasticity, dark grey-black, small percentage of sand <10% with some rootlets.	M			TOPSOIL
				D		0.5		CH	**CLAY:** medium to high plasticity, dark grey.	M>Wp	St	×	
				D	1.5	1.0						×	
			▼ 05-04-07 12:12pm		1.0	1.5						×	
					0.5	2.0						×	Rapid inflow of groundwater at 2.0m depth.
				D				SP	**SAND:** fine to coarse grained, pale grey.	W			
					0.0	2.5			Test pit TP 4 terminated at 2.1m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP 5**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.765

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N	04-04-07 8:35am	D	2.5	0.5			**TOPSOIL:** SAND, fine to medium grained, dark brown, with low plasticity fines, approximately 30% fines with some rootlets to approximately 150mm.	M			TOPSOIL
				D	2.0	1.0		CI	**Sandy CLAY:** medium plasticity, orange-brown, sand fine to medium grained.		VSt		
				D	1.5	1.5		SP	**SAND:** fine to medium grained, pale grey-white. Becoming pale grey-brown.		VD		
				D	1.0					W			Rapid groundwater inflow below 1.7m depth.
					0.5	2.0			Test pit TP 5 terminated at 1.9m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP 6**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.846

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			2.5	0.5			**TOPSOIL:** Silty SAND, fine to medium grained, dark grey mottled white, with some rootlets and roots to 150mm.	D			TOPSOIL
				D	2.0	1.0		SM	**Silty SAND:** fine to medium grianed, brown / red cemented sand nodules.	M	VD		INDURATED SAND?
				D	1.5	1.5		SP	**SAND:** fine to medium grained, pale brown-white with some cemented sand nodules.				
			▼ 05-04-07 12:33pm		1.0	2.0			Becoming pale grey-white.	W			Water visible. Pit collapsing due to groundwater.
									Lenses of cemented sand nodules dark brown-red present.				
					0.5	2.5			Test pit TP 6 terminated at 2.1m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. TP 7

Sheet 1 of 1

Project No: GEOTSGTE20248AA

Client: TATTERSALL SURVEYORS PTY LTD

Date started: 13.4.2007

Principal:

Date completed: 13.4.2007

Project: RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS

Logged by: JJT

Test pit location: REFER TO FIGURE 1

Checked by:

equipment type and model:

Pit Orientation:

Easting: m

R.L. Surface: 2.388

excavation dimensions: m long m wide

Northing: m

datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
HA		N			2.0	0.5		CH	**Sandy CLAY:** high plasticity, dark brown, sand fine to medium grained.	M			
			▼	D									
					1.5			SC	**Clayey SAND:** fine to medium grained, grey.		VD		
				D		1.0				W			
									Hole terminated at 1.0m, hole collapsing because of groundwater. Test pit TP 7 terminated at 1m				
					1.0	1.5							
					0.5	2.0							
					0.0	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP 8**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **13.4.2007**

Principal:

Date completed: **13.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **JJT**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: | Pit Orientation: | Easting: m | R.L. Surface: 3.184

excavation dimensions: m long m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
HA		N	Not Measured	D	3.0	0.5		SP	Clayey SAND: fine to medium grained, black.	M	D		
					2.5	1.0			Hole terminated at 0.6m, sand too dry to retrieve. Test pit TP 8 terminated at 0.6m				
					2.0	1.5							
					1.5	2.0							
					1.0	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP 9**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.735

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5	0.5			TOPSOIL: Silty Clayey SAND, fine to medium grained, dark grey, low plasticity fines, with some rootlets and thick roots to 100mm.	M			TOPSOIL
				D									
					2.0			SC	Clayey SAND: fine to medium grained, dark brown-black, low plasticity fines with some black cemented sand nodules up to approximately 0.13m diameter.		D/VD		
				D		1.0							
			04-04-07 10:41am		1.5			SP	SAND: medium to coarse grained, pale grey-white.				
					1.0	1.5			Becoming pale grey-brown.	W			Groundwater inflow below 1.8m depth.
				D		2.0							
					0.5				Test pit TP 9 terminated at 2m				
						2.5							

Sketch

method
N natural exposure
X existing excavation
BH backhoe bucket
B bulldozer blade
R ripper
E excavator

support
S shoring N nil

penetration
1 2 3 4 no resistance ranging to refusal

water
water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
V vane shear (kPa)
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP10**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.585

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N	None Observed		2.5	0.5			TOPSOIL: Clayey SAND, fine to medium grained, brown, low plasticity fines, with some rootlets and roots (10-30mm thick) to approximately 450mm.	M			TOPSOIL
				D	2.0			SC	Clayey SAND: fine to medium grained, pale brown, with some cemented sand nodules, low plasticity fines.		MD		
						1.0		SP	SAND: fine to medium grained, pale grey-white.		D		
				D	1.5						VD		
					1.0	1.5							
				D					One big, 0.7mm dia., cemented sand nodule.	W			No obvious groundwater level or inflow but pit collapsing.
					0.5	2.0			Test pit TP10 terminated at 1.9m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP11**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.732

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			2.5	0.5			**TOPSOIL:** Silty SAND, fine to medium grained, grey-brown, low plasticity fines? with some rootlets.	M			TOPSOIL
								SC	**Clayey SAND:** fine to medium grained, pale grey-brown, low plasticity fines.		VD		
				D	2.0	1.0		SC	**Clayey SAND:** fine to medium grained, orange-brown, dark brown-black, low plasticity fines, with cemented sand nodules up to approximately 0.13mm dia.				
				D	1.5	1.5		SP	**SAND:** fine to coarse grained, pale grey-brown. Colour change.	W			
			04-04-07 11:15am	D	1.0	2.0			Test pit TP11 terminated at 1.9m				
					0.5	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP12**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 3.126

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			3.0				**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey, low plasticity fines, with some rootlets to approximately 350mm.	M			TOPSOIL
						0.5		SC	**Clayey SAND / Sandy CLAY:** fine to medium grained, dark grey-brown, medium plasticity fines.		St	x x	
				D	2.5			CL	**Sandy CLAY:** low to medium plasticity, orange-brown, sand fine to medium grained.				
						1.0		SP	**SAND:** fine to coarse grained, pale grey-white.		VD		
				D	2.0								
						1.5			Becoming pale grey-brown.				
				D	1.5								
			04-04-07 11:30am		1.0				Test pit TP12 terminated at 2m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP13**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.825

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5	0.5			**TOPSOIL:** Silty SAND, fine to medium grained, dark grey-black with some rootlets and roots (10-30mm thick).	D/M			TOPSOIL
				D	2.0	1.0		SM	**Silty SAND:** dark brown-dark red, fine to medium grained, with cemented sand nodules to 0.16mm dia.	M	VD		Bucket scraping on hard layer.
			04-04-07 11:51am	D	1.5	1.5			Becoming brown-pale brown cemented nodules of sand still present.				
				D	1.0	2.0			Becoming dark brown-brown weakly cemented nodules present.	W			
					0.5	2.5			Test pit TP13 terminated at 2m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP14**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.760

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			2.5	0.5			**TOPSOIL:** Silty CLAY, medium plasticity fines, brown with some rootlets approximately 400mm.				TOPSOIL
				D	2.0	1.0		CH	**CLAY:** high plasticity, brown-dark brown.		VSt	×	
				D	1.5	1.5			Becoming dark grey-black with some mottled orange.			×	
				D	1.0	2.0			Test pit TP14 terminated at 1.8m			×	
					0.5	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP15**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.355

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.0	0.5			TOPSOIL: Silty (Clayey) SAND, fine to medium grained, dark grey-black, with some roots 10mm and rootlets to approximately 400mm.	M			TOPSOIL
				D				SP	SAND: fine to coarse grained, pale grey-brown, small percent of fines <20%.	M/W	D/VD		
					1.5	1.0			Becoming pale grey mottled black and white.				
				D									
					1.0	1.5							Pit collapsing no groundwater observed.
				D									
					0.5	2.0			Pit collapsing. Test pit TP15 terminated at 1.7m				
					0.0	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP16**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.683

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5				**TOPSOIL:** Silty SAND, fine to medium grained, dark grey-black mottled white, with some rootlets.	D			TOPSOIL
						0.5		SP	**SAND:** fine to medium grained, pale grey-brown.	M	D		
				D	2.0								
						1.0					VD		
				D	1.5					M/W			
			04-04-07 12:54pm			1.5							
				D	1.0			SP	**SAND:** fine to medium grained, dark grey-black, cemented sand nodules, coffee rock.	W			INDURATED SAND
						2.0			Pit collapsing. Test pit TP16 terminated at 1.8m				
					0.5								
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP17**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.635

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5 / 0.5			**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey-black mottled white, low plasticity fines, with some rootlets.	D			TOPSOIL
				D	2.0 / 1.0		SC	**Silty Clayey SAND:** fine to medium grained, dark brown / red, low to medium plasticity fines, with cemented nodules of SAND.	M	VD		
							SC	**Clayey SAND:** fine to medium grained, brown-pale brown, low plasticity fines, with weakly cemented nodules of sand.				
				D	1.5 / 1.0		SP	**SAND:** fine to coarse grained, pale grey-pale brown.				
			05-04-07 10:53am					Becoming grey-brown.	W			Rapid inflow of groundwater below 1.7m depth.
				D	2.0 / 0.5			Pit collapsing. Test pit TP17 terminated at 2m				
					2.5							

Sketch

method
N natural exposure
X existing excavation
BH backhoe bucket
B bulldozer blade
R ripper
E excavator

support
S shoring N nil

penetration
1 2 3 4 no resistance ranging to refusal

water
water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
V vane shear (kPa)
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

Excavation No. **TP18**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.302

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			2.0	0.5			**TOPSOIL:** Sandy CLAY, low to medium plasticity, dark brown-black, sand fine to medium grained, with some rootlets to 100mm.	M			TOPSOIL
				D				CI	**CLAY:** medium plasticity, dark grey mottled orange, with minor sand component approximately 10%.		VSt		
					1.5	1.0		SC	**Clayey SAND:** fine to medium grained, grey, low plasticity fines.		D		
				D				SP	**SAND:** fine to coarse grained, pale grey-white. Becoming grey / brown.		VD		
			05-04-07 10:35am		1.0	1.5							
				D	0.5				Sand becoming indurated and dark brown / red.	W			
					0.0	2.0			Pit collapsing due to inflow of groundwater, collapsing from sides. Test pit TP18 terminated at 1.9m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP19**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.261

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			2.0	0.0			**TOPSOIL:** Clayey SAND, fine to medium grained, dark brown-black, low plasticity fines with some rootlets.	D			TOPSOIL
				D		0.5		CH	**Sandy CLAY:** medium to high plasticity, dark brown-black, sand fine to coarse grained.				
					1.5	1.0							
				D					Becoming dark grey-grey.				
			04-04-07 2:31pm		1.0			SP	**SAND:** fine to coarse grained, pale grey-white.	W	VD		
				D	0.5	1.5			Becoming pale brown / grey.				
									Pit collapsing due to groundwater. Test pit TP19 terminated at 1.8m				
					0.0	2.0							
						2.5							

Sketch

method
N natural exposure
X existing excavation
BH backhoe bucket
B bulldozer blade
R ripper
E excavator

support
S shoring N nil

penetration
1 2 3 4 no resistance ranging to refusal

water
water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
V vane shear (kPa)
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

TESTPIT 20248AA LOGS.GPJ COFFEY.GDT 23.10.07

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Engineering Log - Excavation

Excavation No. **TP20**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.255

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.0 / 0.5			**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey-black mottled white, with some rootlets.	D			TOPSOIL
							CL	**Sandy CLAY:** low plasticity, dark brown-red, sand fine to medium grained, trace of rootlets and cemented sand nodules.	M			
				D	1.5 / 1.0		CL	**Sandy CLAY:** low to medium plasticity, pale grey-pale brown mottled orange, sand fine to medium grained.	M/W			
			04-04-07 2:15pm	D	1.0 / 1.5			Becoming pale brown / grey.				
				D	0.5 / 2.0			Pit collapsing due to groundwater. Test pit TP20 terminated at 1.7m				
					0.0 / 2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP21**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.675

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5				**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey, low plasticity fines with some rootlets and some thick roots to 300mm.	M			TOPSOIL
						0.5		SC	**Clayey SAND:** fine to medium grained, orange-pale brown, low plasticity fines with some cemented red sand nodules.		VD		
				D									
					2.0			SP	**SAND:** fine to medium grained, pale grey-white.				
						1.0							
				D	1.5								
						1.5			Becoming pale brown-pale grey.				
			04-04-07		1.0					W			Rapid groundwater inflow below 1.7m depth.
						2.0							
				D	0.5				Test pit TP21 terminated at 2m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP22**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.332

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.0	0.5			**TOPSOIL:** Sandy CLAY, low to medium plasticity, dark brown-black, sand fine to medium grained, with some rootlets.	D			TOPSOIL
				D				CI	**CLAY:** medium plasticity, dark brown-black, with some sand component approximately 30%.	M			
					1.5	1.0		SM	**Silty SAND:** fine to medium grained, brown-pale brown, with some cemented sand nodules.		D		
				D							VD		
					1.0	1.5		SP	**SAND:** fine to medium grained, pale grey-white. Becoming pale grey / brown.	M/W			
				D	0.5								
			04-04-07 2:50pm			2.0			Pit collapsing due to groundwtaer inflow. Test pit TP22 terminated at 1.9m				
					0.0	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP23**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.090

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N	None Observed		2.0				**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey-black, low plasticity fines, with some rootlets to 300mm.	D			TOPSOIL
						0.5		SC	**Clayey SAND:** fine to medium grained, dark grey-black, low to medium plasticity fines.				
					1.5			CL	**Sandy CLAY:** low to medium plasticity, pale brown / orange, sand fine to medium grained.	M			
				D				SC	**Clayey SAND:** fine to medium grained, pale grey / pale brown, low plasticity fines.		VD		
								SP	**SAND:** fine to coarse grained, pale grey-white.				
						1.0							
				D	1.0								
						1.5							
					0.5				Becoming grey / brown.	W			No visible water, but pit collapsing below 1.7m depth.
				D		2.0							
					0.0				Test pit TP23 terminated at 2m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP24**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.177

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			2.0	0.0			**TOPSOIL:** Sandy CLAY, low to medium plasticity, sand fine to medium grained, with some rootlets to 100mm.	M		x x x	TOPSOIL
				D		0.5		CL	**Sandy CLAY:** low to medium plasticity, orange, sand fine to coarse grained.				
					1.5			SP	**SAND:** fine to medium grained, pale grey-white mottled orange.		D		
				D		1.0					VD		
			05-04-07 11:44am		1.0	1.5							
				D	0.5	2.0			Lenses of colour change to pale grey / brown, with some clay lenses.	W			
					0.0	2.5			Pit collapsing from groundwater table. Test pit TP24 terminated at 2m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP25**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.611

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information						material substance							
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5 / 0.5			**TOPSOIL:** Silty SAND, fine to medium grained, dark grey mottled white with some rootlets and roots (10mm) to 150mm.	D			TOPSOIL
				D	2.0 / 1.0			**Silty SAND:** fine to medium grained, dark grey-black, cemented nodules of SAND.	M	D / VD		INDURATED SAND
			05-04-07 11:08am	D	1.5 / 1.5			100mm band of pale grey-pale brown and then becoming grey-brown weakly cemented sand nodules.	W			
			▼	D	1.0 / 2.0			Becoming dark brown / red weakly sand nodules.				Rapid inflow of groundwater below 1.9m depth.
					0.5 / 2.5			Test pit TP25 terminated at 2m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP26**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 1.709

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			1.5	0.0			**TOPSOIL:** Silty Sandy CLAY, medium plasticity, dark grey-black, sand fine to medium grained, with some rootlets to 100mm.	M			TOPSOIL
				D	1.0	0.5		SP	**SAND:** fine to coarse grained, pale grey-white.		D		
				D	0.5	1.0			Becoming pale brown / grey.				
				D	0.0	1.5			Pit collapsing due to groundwater. Test pit TP26 terminated at 1.5m				
					-0.5	2.0							
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP27**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 1.536

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / 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
BH		N			1.0 / 0.5			**TOPSOIL:** Silty (Clayey) SAND, fine to medium grained, dark grey-black, with some rootlets to 200mm.	D			TOPSOIL
				D			SM	**Silty SAND:** fine to medium grained, dark brown, with some cemented sand nodules.	M	VD		
			04-04-07 3:46pm		0.5 / 1.0		SP	**SAND:** fine to coarse grained, brown / grey, with small percent of fines approximately 20-30% possibly clay lenses or nodules.				
				D								
					0.0 / 1.5			Becoming pale grey-white.	M/W			
				D				Becoming pale grey / brown.				
					-0.5 / 2.0			Pit collapsing due to groundwater inflow. Test pit TP27 terminated at 1.8m				
					2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP28**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **4.4.2007**

Principal:

Date completed: **4.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.012

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			1.5 / 0.5			TOPSOIL: Silty SAND, fine to medium grained, dark grey-black, with some rootlets.	D			TOPSOIL
				D			SM	**Silty SAND:** fine to medium grained, dark brown-black / red, cemented sand nodules.	M	D		
				D	1.0 / 1.0							
			04-04-07 3:31pm				SP	**SAND:** fine to coarse grained, pale brown / grey.	W			
				D	0.5 / 1.5			Becoming brown / grey mottled orange.				
					0.0 / 2.0			Test pit TP28 terminated at 1.8m				
					2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP29**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.170

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.0			TOPSOIL: Silty SAND, fine to medium grained, dark brown-black, with some rootlets.	D			TOPSOIL
				D	0.5 / 1.5			Silty SAND: fine to medium grianed, pale grey / pale brown.		D		
							SC	Clayey SAND: fine to medium grained, pale brown, low plasticity fines.	M			
				D	1.0							
							SP	SAND: fine to medium grained, pale grey-white.	W			
				D	1.5 / 0.5							
			05-04-07 3:12pm		0.0			Pit collapsing. Test pit TP29 terminated at 1.7m				
					2.0 / 2.5							

Sketch

method
N natural exposure
X existing excavation
BH backhoe bucket
B bulldozer blade
R ripper
E excavator

support
S shoring N nil

penetration
1 2 3 4 no resistance ranging to refusal

water
water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
V vane shear (kPa)
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index

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

TESTPIT 20248AA LOGS.GPJ COFFEY.GDT 23.10.07

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Engineering Log - Excavation

Excavation No. **TP30**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 1.159

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N	05-04-07 ▼		1.0	0.5			TOPSOIL: Silty Clayey SAND, fine to medium grained, dark grey-black mottled white, low plasticity fines, some rootlets 300mm and roots to 300mm.	D			TOPSOIL
				D	0.5			SP	SAND: fine to coarse grained, pale grey-white.	W	MD		Some inflow of groundwater to pit at 0.3m, 8:05am, pit slowly collapsing from sides, organic odour.
											D		
				D		1.0			Becoming pale brown-grey.				
					0.0								
				D		1.5			Becoming dark brown-red, with some cemented sand nodules.				
					-0.5								
									Pit collapsing. Test pit TP30 terminated at 1.7m				
					-1.0	2.0							
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP31**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 0.732

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			0.5	0.5		SC	**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey-black mottled white, low to medium plasticity fines, with layer of mulch and rootlets to 100mm.	D / M	MD		TOPSOIL (swampy area) organic odour.
				D					**Clayey SAND:** fine to medium grained, pale grey / pale brown, low plasticity fines.		D		
					0.0				Becoming grey / brown.	W			Very slow inflow of groundwater.
			05-04-07 8:29am	D		1.0							
					-0.5			SP	**SAND:** fine to medium grained, dark brown-red, indurated cemented sand nodules.				Rapid inflow of groundwater.
				D	-1.0	1.5			**Silty Gravelly SAND:** fine to coarse grained, dark grey-black, gravel fine to medium grained, rounded-subrounded.				
									Pit collapsing due to inflow of groundwater. Test pit TP31 terminated at 1.8m				
					-1.5	2.0							
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP32**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 0.994

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N							TOPSOIL: Silty Clayey SAND, fine to medium grained, dark grey-black mottled white, low plasticity fines, with some rootlets and roots (10mm).	D			TOPSOIL (swampy area)
					0.5	0.5		SC	**Clayey SAND:** fine to coarse grained, pale grey-pale brown, low plasticity fines maybe low percentage of fines approximately 30-40%.	M	D		Some inflow of water.
			05-04-07 8:47am ▼	D									
					0.0	1.0			Becoming grey-brown, some presence of cemented sand nodules.	W			Moderate inflow of groundwater 8:47am.
				D									
					-0.5	1.5							
				D					Becoming grey mottled brown / orange and presence of subrounded to rounded gravel (fine to medium grained) less than 10mm size.				
					-1.0	2.0			Pit continually collapsed due to water table. Test pit TP32 terminated at 1.7m				
					-1.5	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

Excavation No. **TP33**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 0.923

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N							**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey-black mottled white, low plasticity fines, with some rootlets to 250mm.	D/M			TOPSOIL (swampy area)
					0.5	0.5		SC	**Clayey SAND:** fine to coarse grained, pale grey-pale brown.	M	D		
			05-04-07 8:56am	D									
					0.0	1.0			Becoming grey / brown.	W			Very slow inflow of groundwater 8:56am, organic odour.
				D									
					-0.5	1.5							
				D	-1.0	2.0		SP	**SAND:** fine to medium grained, dark brown-black, some cemented nodules of sand.				
									Pit collapsing due to water table. Test pit TP33 terminated at 2m				
					-1.5	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP34**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.4.2007**

Principal:

Date completed: **5.4.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **CW**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 0.893

excavation dimensions: 1.5m long 0.4m wide | Northing: m | datum: AHD

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			0.5 / 0.5			**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey-black mottled white, low to medium plasticity fines.	M			TOPSOIL
							SC	**Clayey SAND:** fine to coarse grained, pale grey-white, low plasticity fines. Becoming pale grey-pale brown.		D		
			05-04-07 9:13am ▼	D	0.0 / 1.0		SP	**SAND:** with some clayey lenses, fine to medium grained, low plasticity fines.	M/W			Very slow inflow of water, 9:13am.
				D	-0.5 / 1.5		SC	**Clayey SAND:** fine to coarse grained, grey / brown, low to medium plasticity fines. Pit slowly collapsing due to water table.	W	MD L MD		
					-1.0 / 2.0		SM	**Silty SAND:** fine to medium grained, dark brown / red.				
					-1.5 / 2.5			Pit collapsing due to groundwater. Test pit TP34 terminated at 2m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Borehole

Borehole No.	BH35
Sheet	1 of 1
Project No:	GEOTSGTE20248AA
Client:	TATTERSALL SURVEYORS PTY LTD
Date started:	11.4.2007
Principal:	
Date completed:	11.4.2007
Project:	RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS
Logged by:	JJT
Borehole Location:	REFER TO FIGURE 1
Checked by:	

drill model and mounting: MD20 | Easting: | slope: -90° | R.L. Surface: 1.006

hole diameter: 100 mm | Northing | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
HF		C	▼	SPT 2,2,3 N*=5	0	1		SP	**SAND:** fine to medium grained, grey.	M	MD		
										W			
					-1	2					D		
				SPT 2,3,11 N*=14	-2	3							
				SPT 6,4,12 N*=16	-3	4							
									Borehole BH35 terminated at 4m				
					-4	5							
					-5	6							
					-6	7							
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

▼ 10/1/98 water level on date shown
► water inflow
◄ water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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 - Borehole

Borehole No. **BH36**
Sheet 1 of 1
Project No: **GEOTSGTE20248AA**

Client: *TATTERSALL SURVEYORS PTY LTD*
Date started: *11.4.2007*
Principal:
Date completed: *11.4.2007*
Project: *RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS*
Logged by: *JJT*
Borehole Location: *REFER TO FIGURE 1*
Checked by:

drill model and mounting: MD20 | Easting: | slope: -90° | R.L. Surface: 2.361
hole diameter: 100 mm | Northing | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
HF		C	▼		2			SC	**Clayey SAND:** fine to medium grained, black, clay low plasticity.	M			
				SPT 4,4,5 N*=9		1		SP	**SAND:** fine grained, white.	W	D		
					1			SP	**SAND:** fine to medium grained, black (coffee rock).				
						2		SP	**SAND:** fine grained, white. Becoming grey.				
				SPT 2,9,11 N*=20	0								
						3					VD		
				SPT 6,13,24 N*=37	-1								
						4		SP	**SAND:** fine to medium grained, black (coffee rock). Becoming softer.				
					-2								
				SPT 6,9,23 N*=32	-3	5							
						6							
					-4								
				SPT 8,16,14 N*=30		7							
					-5				Borehole BH36 terminated at 7m				
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix e.g.	ADT

support
M mud N nil
C casing

penetration
1 2 3 4 — no resistance ranging to refusal

water
▼ 10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description
based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Borehole

Borehole No. **BH37**
Sheet 1 of 1
Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**
Date started: **11.4.2007**
Principal:
Date completed: **11.4.2007**
Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**
Logged by: **JJT**
Borehole Location: **REFER TO FIGURE 1**
Checked by:

drill model and mounting: MD20 | Easting: | slope: -90° | R.L. Surface: Not Measured
hole diameter: 100 mm | Northing | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
HF		C						SC	**Clayey SAND:** fine to medium grained, black, clay low plasticity.	M			
								SP	**SAND:** fine to medium grained, white.		D		
			▼	SPT 4,6,10 N*=16		1				W			
									Becoming dark brown, with some organic material.				
				SPT 1,7,8 N*=15		2							
						3							
				SPT 6,18,R N*=R		4		SP	**SAND:** fine to medium grained, black (coffee rock).		VD		INDURATED SAND
						5			Becoming brown.				
				SPT 5,7,R N*=R		6							
				SPT 6,7,R N*=R		7							
									Borehole BH37 terminated at 7m				
						8							

BOREHOLE 20248AA LOGS.GPJ COFFEY.GDT 23.10.07

method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V bit
T TC bit
*bit shown by suffix
e.g. ADT

support
M mud N nil
C casing

penetration
1 2 3 4 no resistance ranging to refusal

water
▼ 10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index

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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coffey geotechnics

Engineering Log - Borehole

Borehole No.	BH38
Sheet	1 of 1
Project No:	GEOTSGTE20248AA
Client:	TATTERSALL SURVEYORS PTY LTD
Date started:	11.4.2007
Principal:	
Date completed:	11.4.2007
Project:	RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS
Logged by:	JJT
Borehole Location:	REFER TO FIGURE 1
Checked by:	

drill model and mounting:	MD20	Easting:	slope: -90°	R.L. Surface:	2.303
hole diameter:	100 mm	Northing	bearing:	datum:	AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa (100 200 300 400)	structure and additional observations
HF		C							TOPSOIL: Clayey SAND, fine grained, dark grey, clay low plasticity.	M			TOPSOIL
					2			CL	**Sandy CLAY:** medium to high plasticity, grey, sand fine grained.	>Wp			
				SPT 2,2,3 N*=5		1							
			▼		1			CL	**Sandy CLAY:** low to medium plasticity, dark brown, sand fine grained.				
						2				W			
				SPT 4,5,5 N*=10	0			SW	**SAND:** fine to medium grained, grey.		D		
						3							
					-1				Becoming black.				
				SPT 12,18,23 N*=41		4							
					-2								
						5							
				SPT 4,8,11 N*=19	-3								
						6					MD		
					-4								
				SPT 4,8,8 N*=16		7							
					-5				Borehole BH38 terminated at 7m				
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

▼ 10/1/98 water level on date shown
► water inflow
◄ water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP39**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: *TATTERSALL SURVEYORS PTY LTD*

Date started: **1.6.2007**

Principal:

Date completed: **1.6.2007**

Project: *RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS*

Logged by: **RJP**

Test pit location: *REFER TO FIGURE 1*

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.77

excavation dimensions: 2m long 0.45m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N							**TOPSOIL:** Sandy Silty CLAY, medium plasticity, dark grey, sand fine to medium grained.	M			TOPSOIL Root affected.
					2.5	0.5		CH	**CLAY:** high plasticity, grey-brown and orange mottled, some sand.	>Wp	St		
				D								x	
					2.0	1.0		CH	**CLAY:** high plasticity, grey-grey-brown, some orange mottled with a trace of sand fine to medium grained.			x	
				D									
					1.5	1.5		SP	**SAND:** fine to medium grained, white / light grey-brown.	W			Pit collapsing below 1.4m, organic odour.
				D									
					1.0	2.0			Moderate groundwater inflow below 1.4m. Test pit TP39 terminated at 1.7m				
					0.5	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

TESTPIT 20248AA LOGS.GPJ COFFEY.GDT 23.10.07

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Engineering Log - Excavation

Excavation No. **TP40**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **1.6.2007**

Principal:

Date completed: **1.6.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **RJP**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.59

excavation dimensions: 2m long 0.45m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			2.5	0.5			**TOPSOIL:** Silty Sandy CLAY, medium plasticity, dark grey, sand fine to medium grained.	>Wp			TOPSOIL Root affected.
				D	2.0			CI	**Sandy CLAY:** medium plasticity, grey-brown and orange mottled, sand fine to medium grained.		St	X	
						1.0			Becoming grey-brown and sand content increasing to Sandy CLAY / Clayey SAND.				
				D	1.5			SP	**SAND:** fine to medium grained, grey-brown with some clay.	W		X	
			▶	D	1.0	1.5		SP	**SAND:** fine to medium grained, light grey-brown.				Rapid groundwater inflow below 1.4m. Organic odour.
					0.5	2.0			Pit collapsing below 1.1m. Test pit TP40 terminated at 1.7m				
						2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP41**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **1.6.2007**

Principal:

Date completed: **1.6.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **RJP**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 3.63

excavation dimensions: 2m long 0.45m wide | Northing: m | datum: AHD

excavation information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N			3.5 / 0.0			**TOPSOIL:** Sandy CLAY, medium plasticity, grey-brown, sand fine to medium grained.	M			TOPSOIL Root affected.
				D	3.0 / 0.5		CI	**Sandy CLAY:** medium plasticity, light grey-brown and orange mottled, sand fine to medium grained.	>Wp	St	X	
								Becoming light grey-light grey-brown and orange mottled.			X	
				D	2.5 / 1.0			Sand content increasing light grey-brown and orange mottled.				
				D	2.0 / 1.5		SP	**SAND:** fine to medium grained, light grey-brown some orange mottled, cemented.	M			
			▶	D	1.5 / 2.0		SP	**SAND:** fine to medium grained, white-light grey-brown.	W			Slow groundwater inflow below 2.2m. Organic odour.
					2.5			Test pit TP41 terminated at 2.5m				

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP42**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **1.6.2007**

Principal:

Date completed: **1.6.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **RJP**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 2.82

excavation dimensions: 2m long 0.45m wide | Northing: m | datum: AHD

excavation information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
BH		N							**TOPSOIL:** Silty Sandy CLAY, low to medium plasticity, sand fine to medium grained, dark grey-brown.	M			TOPSOIL Root affected.
					2.5	0.5		CI	**Sandy CLAY:** medium plasticity, grey-brown and orange mottled, sand fine to medium grained.	>Wp	St	x	
				D									
					2.0	1.0		CI	**Sandy CLAY:** medium plasticity, grey-grey-brown some orange mottled, sand fine to medium grained, sand content increasing.			x	
			►	D				SP	**SAND:** fine to medium grained, white.	W			Very slow water inflow below 1.1m.
					1.5	1.5			Becoming grey-grey-brown, with a trace to some clay.				
				D									
					1.0	2.0			Test pit TP42 terminated at 1.7m				
					0.5	2.5							

Sketch

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method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration
1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description
based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP43**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **1.6.2007**

Principal:

Date completed: **1.6.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **RJP**

Test pit location: **REFER TO FIGURE 1**

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 4.75

excavation dimensions: 2m long 0.45m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
BH		N			4.5	0.5		SP	**SAND:** fine to medium grained, grey-brown.	M			AEOLIAN Root affected to 0.15m.
				D					Becoming light grey-brown.				
					4.0	1.0		SP	**SAND:** fine to medium grained, grey-brown and orange mottled, trace to some clay.				
				D									
					3.5	1.5		SP	**SAND:** fine to medium grained, light grey-brown, some weakly cemented nodules, grey-brown.				
			►	D	3.0					W			Very slow water inflow below 1.7m.
						2.0			Test pit TP43 terminated at 1.85m				
					2.5	2.5							

Sketch

method
N natural exposure
X existing excavation
BH backhoe bucket
B bulldozer blade
R ripper
E excavator

support
S shoring N nil

penetration
1 2 3 4 no resistance ranging to refusal

water
water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
V vane shear (kPa)
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Excavation

Excavation No. **TP44**

Sheet 1 of 1

Project No: **GEOTSGTE20248AA**

Client: ***TATTERSALL SURVEYORS PTY LTD***

Date started: ***1.6.2007***

Principal:

Date completed: ***1.6.2007***

Project: ***RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS***

Logged by: ***RJP***

Test pit location: ***REFER TO FIGURE 1***

Checked by:

equipment type and model: 4WD Backhoe | Pit Orientation: | Easting: m | R.L. Surface: 4.46

excavation dimensions: 2m long 0.45m wide | Northing: m | datum: AHD

excavation information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa (100 200 300 400)	structure and additional observations
BH		N	None Observed	D	4.0	0.5		SP	**SAND:** fine to medium grained, dark grey-brown.	M			AEOLIAN Root affected to 0.3m.
									Becoming light grey-brown.				
				D	3.5	1.0		SP	**SAND:** fine to medium grained, dark brown, some silt / Silty SAND.				INDURATED SAND
				D	3.0	1.5			Becoming cleaner and less cemented, brown.				
				D									
					2.5	2.0			Test pit TP44 terminated at 1.8m				
					2.0	2.5							

Sketch

method
- N natural exposure
- X existing excavation
- BH backhoe bucket
- B bulldozer blade
- R ripper
- E excavator

support
- S shoring
- N nil

penetration 1 2 3 4 — no resistance ranging to refusal

water
- water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{50} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- V vane shear (kPa)
- Bs bulk sample
- E environmental sample
- R refusal

classification symbols and soil description based on unified classification system

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- W_L liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Borehole

Borehole No.	BH45
Sheet	1 of 2
Project No:	GEOTSGTE20248AA
Client:	TATTERSALL SURVEYORS PTY LTD
Date started:	5.6.2007
Principal:	
Date completed:	5.6.2007
Project:	RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS
Logged by:	RJP
Borehole Location:	REFER TO FIGURE 1
Checked by:	

drill model and mounting: | Easting: | slope: -90° | R.L. Surface: 3.20

hole diameter: mm | Northing | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	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
HF		C			3			SP	**SAND:** fine to medium grained, grey-brown.	M	D		AEOLIAN SAND
						1							
				SPT 2,5,7 N*=12	2				Becoming light grey-brown.				
					1	2							
			▼	SPT 5,6,8 N*=14						W			
					0	3			Becoming dark grey-brown.				
						4							
				SPT 3,15,21 N*=36	-1			SP	**SAND:** fine to coarse grained, dark brown, trace of gravel fine grained and silt.		VD		
					-2	5							
				SPT 9,21,20 N*=41					With a trace fine grained gravel.				20 blows for 100mm penetration.
					-3	6							
				SPT 8,18,21 N*=39	-4	7			Becoming fine to medium grained, light brown and brown.				21 blows for 100mm penetration.
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

▼ 10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Borehole

Borehole No. **BH45**

Sheet 2 of 2

Project No: **GEOTSGTE20248AA**

Client: **TATTERSALL SURVEYORS PTY LTD**

Date started: **5.6.2007**

Principal:

Date completed: **5.6.2007**

Project: **RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**

Logged by: **RJP**

Borehole Location: **REFER TO FIGURE 1**

Checked by:

drill model and mounting: | Easting: | slope: -90° | R.L. Surface: 3.20

hole diameter: mm | Northing | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
HF		C			-5	9		SP	SAND: fine to coarse grained, dark brown, trace of gravel fine grained and silt. *(continued)*	W	D		
				SPT 5,13,17 N*=30									
					-6	10							
				SPT 1,6,15 N*=21	-7								
			▼ Collapsed back to 2.3m		-8	11			Borehole BH45 terminated at 10.45m				
					-9	12							
					-10	13							
					-11	14							
					-12	15							
						16							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix e.g.	ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

▼ 10/1/98 water level on date shown

► water inflow

◄ water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

coffey geotechnics

Engineering Log - Borehole

Borehole No.	**BH46**
Sheet	1 of 1
Project No:	**GEOTSGTE20248AA**
Client:	**TATTERSALL SURVEYORS PTY LTD**
Date started:	**6.6.2007**
Principal:	
Date completed:	**6.6.2007**
Project:	**RIVERSIDE ESTATE PROJECT APPLICATION, TEA GARDENS**
Logged by:	**RJP**
Borehole Location:	**REFER TO FIGURE 1**
Checked by:	

drill model and mounting: | Easting: | slope: -90° | R.L. Surface: 1.07

hole diameter: mm | Northing | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
HF		C							TOPSOIL: Sandy CLAY / Clayey SAND, low plasticity, dark grey, sand fine to medium grained, some silt.	M			TOPSOIL
			▼			1		SP	**SAND:** fine to medium grained, grey-brown.	W	MD		
				SPT 3,2,2 N*=4	0				Becoming light grey-brown.				
					-1	2							
				SPT 7,12,14 N*=26				SP	**SAND:** fine to medium grained, dark brown, trace silt.		VD		
					-2	3							
				SPT 5,16,23 N*=39	-3	4		SP	**SAND:** fine to medium grained, some clay, brown and dark brown, trace fine grained gravel.				
					-4	5							
				SPT 2,9,18 N*=27				SP	**SAND:** fine to medium grained, light brown.				
					-5	6							
				SPT 3,10,18 N*=28	-6	7			Becoming fine to coarse grained, trace fine grained gravel, light grey-brown.				
						8			Borehole BH46 terminated at 7.45m				

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	dialube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix e.g.	ADT

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

▼ 10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description
based on unified classification system

moisture

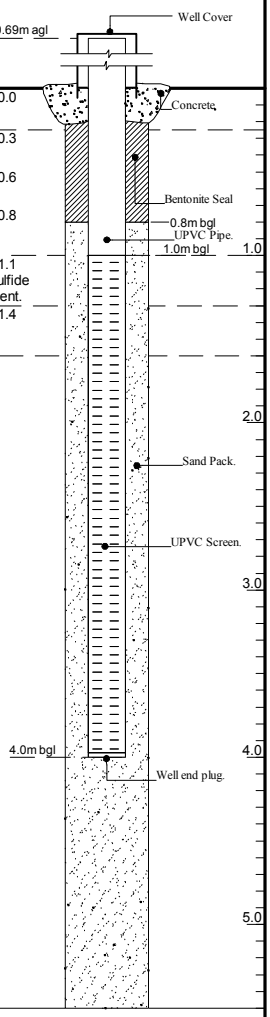
D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

CLIENT	Crighton Properties Pty Ltd	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH201**
PROJECT	Hydrogeological Investigation	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	1 of 1
SITE	MRD, Tea Gardens, NSW	**GEOLOGY**	Marine Sands	**VEGETATION**	Sedges and Grasses	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 5.5m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA						MATERIAL DATA			SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	WATER WELL DETAILS
V	Nil	N	M	0.25			OL	ORGANIC SILT - Dark brown to black, with some organic matter present, and minor fine grained sand.	VS-S		D	0.0	2346/201/ 0.0
								SANDY CLAY - Medium plasticity, grey brown to grey, with some fine to medium grained sand and minor organic matter present (rootlets). Sand content decreasing with depth, becoming high plasticity >0.7m.	St		D	0.3	2346/201/ 0.3
V	Nil	N	M				CL		VSt		D	0.6	2346/201/ 0.6
				1.0					St		D	0.8	2346/201/ 0.8
V	Nil	N	M				SP	Sand content increasing >0.9m.			D	1.1	2346/201/ 1.1 Hydrogen sulfide odour present.
				1.3				SAND - Medium grained sand, brown to dark brown.					
V	Nil	N	D				CL	SANDY CLAY - Low to medium plasticity, brown to dark brown, with some medium grained sand.	F-St		D	1.4	2346/201/ 1.4
				1.6									
				2.0									
				3.0									
V	Nil	N	M				SC	ORGANIC CLAYEY SAND - Medium grained sand, black to dark grey, with some organic matter present, grading to organic sand >1.9m.					
				4.0									
				5.0									
				5.5									
								Borehole terminated at 5.5m in organic clayey sand.					
				6.0									
				7.0									
				8.0									
				9.0									



EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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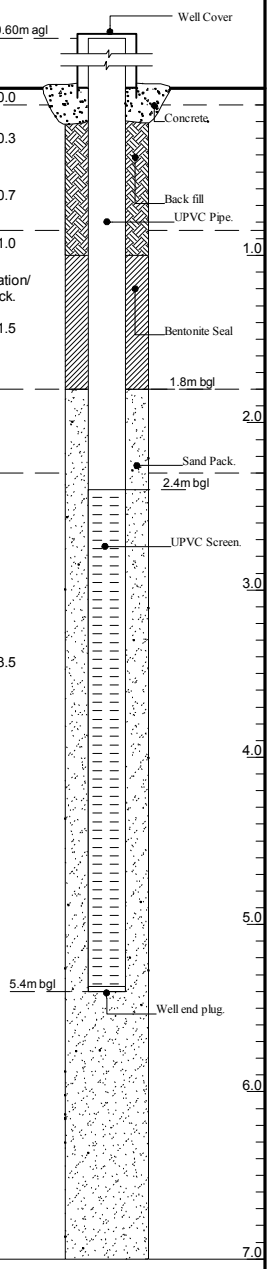
Engineering Log - Borehole

CLIENT	Crighton Properties Pty Ltd	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH202**
PROJECT	Hydrogeological Investigation	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	1 of 1
SITE	MRD, Tea Gardens, NSW	**GEOLOGY**	Marine Sands	**VEGETATION**	Grasses and Ferns	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 7.0m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA / MATERIAL DATA / SAMPLING & TESTING

METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA (Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.)	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	SAMPLING & TESTING
V	Nil	N	D	0.1			SP	LOAMY SAND - Medium grained, dark grey, with some organic matter present.			D	0.0	2346/202/ 0.0
V	Nil	N	D				SP	SAND - Medium grained, pale grey to grey, with some organic matter present.		L	D	0.3	2346/202/ 0.3
			M	0.85						MD-D	D	0.7	2346/202/ 0.7
V	Nil	N	M	1.0			SP	SAND - Medium grained, pale grey, poorly graded, very minor shell fragments present.			D	1.0	2346/202/ 1.0 Hard panatration/ coffee rock.
				1.8							D	1.5	2346/202/ 1.5
V	Nil	N	M	2.0			SP	SAND - Medium grained, dark brown to dark orange brown, cemented occasional roots and rootles present.					
				2.3									
		Y	W								D	3.5	2346/202/ 3.5
V	Nil	Y	W	5.0			SC	SAND - Medium grained, pale brown to grey brown, with some shell fragments present.					
				7.0				Borehole terminated at 7.0m in sand.					
				9.0									

WATER WELL DETAILS



EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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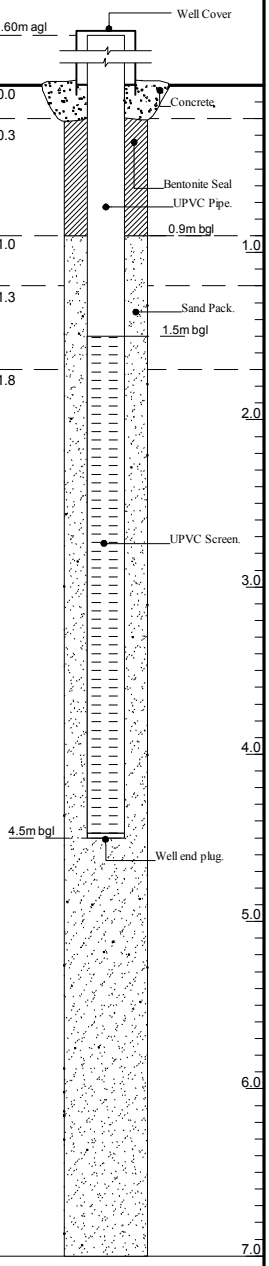
Engineering Log - Borehole

CLIENT	Crighton Properties Pty Ltd	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH203**
PROJECT	Hydrogeological Investigation	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	1 of 1
SITE	MRD, Tea Gardens, NSW	**GEOLOGY**	Marine Sands	**VEGETATION**	Grasses and Ferns	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 7.0m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA / MATERIAL DATA / SAMPLING & TESTING

METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA (Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.)	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	SAMPLING & TESTING
V	Nil	N	D	0.2			SP	LOAMY SAND - Medium brown to dark grey, organic matter and rootlets present, grasses at surface.		VL-L	D	0.0	2346/203/ 0.0
V	Nil	N	M	0.9			SC	CLAYEY SAND - Medium grained, dark brown, grading to low plasticity sandy clay >0.70m.		L-MD	D	0.3	2346/203/ 0.3
V	Nil	N	M	1.0			CL	SANDY CLAY - Low ot medium plasticity, grey brown to dark yellow brown, with some fine to medium grained sand present.			D	1.0	2346/203/ 1.0
V	Nil	Y	W	1.2			SP	SAND - Medium grained, dark grey, mottled orange brown and yellow brown, with some shell fragments and minor fines.			D	1.3	2346/203/ 1.3
		Y	W	1.7							D	1.8	2346/203/ 1.8
				2.0									
				2.25									
V	Nil	Y	W	3.0			SP	SAND - Medium grained, grey to dark grey, with some shell fragments present.					
				4.0									
				5.0									
				6.0									
				7.0									
				8.0				Borehole terminated at 7.0m in sand.					
				9.0									

WATER WELL DETAILS



EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Crighton Properties Pty Ltd**	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH204**
PROJECT	**Hydrogeological Investigation**	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	**1 of 1**
SITE	**MRD, Tea Gardens, NSW**	**GEOLOGY**	Marine Sands	**VEGETATION**	Grasses and Ferns	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 1.0m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
V	Nil	N	M	0.3			SP	ORGANIC LOAMY SAND - Medium grained, dark brown, black, with some organic matter and fines present.			D	0.1	2346/204/ 0.1
V	Nil	N	M	0.5			SP	LOAMY SAND - Medium grained, dark brown, with minor fines present.			D	0.4	2346/204/ 0.4
V	Nil	N Y	M W	0.65			SP	ORGANIC LOAMY SAND - Medium grained, dark brown to black, roots and rootles present.			D	0.6	2346/204/ 0.6
V	Nil	N	M	0.8 1.0			SC	CLAYEY SAND - Medium grained, pale brown, with minor shell fragments present.			D	0.9	2346/204/ 0.9
				1.5 2.0 2.25				Borehole terminated at 1.0m in clayey sand.					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Crighton Properties Pty Ltd	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH205**
PROJECT	Hydrogeological Investigation	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	1 of 1
SITE	MRD, Tea Gardens, NSW	**GEOLOGY**	Marine Sands	**VEGETATION**	Grasses and Ferns	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 1.0m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
V	Nil	N	M	0.2			SP	ORGANIC LOAMY SAND - Medium grained, dark grey, with some organic matter present.			D	0.0	2346/205/ 0.0
V	Nil	N	M	0.5			SP	SAND - Medium grained, pale grey.			D	0.3	2346/205/ 0.3 0.5
V	Nil	N Y	M W	0.7			SP	SAND - Medium grained, dark brown, grading to orange brown with depth, with some minor shell fragments and fines present.			D	0.7	2346/205/ 0.7
				1.0									1.0
								Borehole terminated at 1.0m in sand.					
				1.5									1.5
				2.0									2.0
				2.25									2.25

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Crighton Properties Pty Ltd**	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH206**
PROJECT	**Hydrogeological Investigation**	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	**1 of 1**
SITE	**MRD, Tea Gardens, NSW**	**GEOLOGY**	Marine Sands	**VEGETATION**	Grasses	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 1.0m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
V	Nil	N	M	0.25			SP	ORGANIC LOAMY SAND - Medium grained, dark brown, with some fines and organic present.			D	0.1	2346/206/ 0.1
V	Nil	N	M	0.5			SP	ORGANIC LOAMY SAND - Medium grained, dark brown to black, with some organics.			D	0.3	2346/206/ 0.3 0.5
V	Nil	N Y	M W	0.7 0.8			SP	SAND - Medium grained, dark grey, with minor organics.			D	0.7	2346/206/ 0.7
V	Nil	Y	W	1.0			SP	LOAMY SAND - Medium grained, black, parcially cemented.					Hard panatration/ coffee rock. 1.0
				1.5				Borehole terminated at 1.0m in sand.					1.5
				2.0									2.0
				2.25									2.25

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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Engineering Log - Borehole

CLIENT	**Crighton Properties Pty Ltd**	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH207**
PROJECT	**Hydrogeological Investigation**	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	**1** of **1**
SITE	**MRD, Tea Gardens, NSW**	**GEOLOGY**	Marine Sands	**VEGETATION**	Grasses	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 0.7m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS	
V	Nil	N	D	0.2			SP	ORGANIC LOAMY SAND - Medium grained, dark grey, with some organic matter present.			D	0.0	2346/207/ 0.0	0.0
V	Nil	N	D	0.5			SP	SAND - Medium grained, pale grey.			D	0.3	2346/207/ 0.3	0.5
		N	D	0.6										
		Y	W	0.7										
				1.0				Borehole terminated at 1.0m in sand.						1.0
				1.5										1.5
				2.0										2.0
				2.25										2.25

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

martens

MARTENS & ASSOCIATES PTY LTD
6/37 Leighton Place
Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

Engineering Log - Borehole

CLIENT	**Crighton Properties Pty Ltd**	**COMMENCED**	25.09.12	**COMPLETED**	25.09.12	**REF**	**BH208**
PROJECT	**Hydrogeological Investigation**	**LOGGED**	NF	**CHECKED**	GT/DM	**Sheet**	**1** of **1**
SITE	**MRD, Tea Gardens, NSW**	**GEOLOGY**	Marine Sands	**VEGETATION**	Grasses	**PROJECT NO.**	P0902346
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	-		
EXCAVATION DIMENSIONS	100mmØ X 1.0m depth	**NORTHING**	NA	**ASPECT**	-	**SLOPE**	<5%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
V	Nil	N	D	0.2			SP	ORGANIC LOAMY SAND - Medium grained, dark grey, with some organic matter present.			D	0.0	2346/208/ 0.0
V	Nil	N	M	0.5			SP	SAND - Medium grained, pale grey.			D	0.4	2346/208/ 0.4
		N	M	0.7									
		Y	W										
				1.0				Borehole terminated at 1.0m in sand.					
				1.5									
				2.0									
				2.25									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
PT Push tube
A Auger
TC Tungsten Carbide Bit
V V-Bit

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
E Environmental sample

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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Engineering Log - Borehole

20 Attachment 6A – Groundwater Assessment Figures

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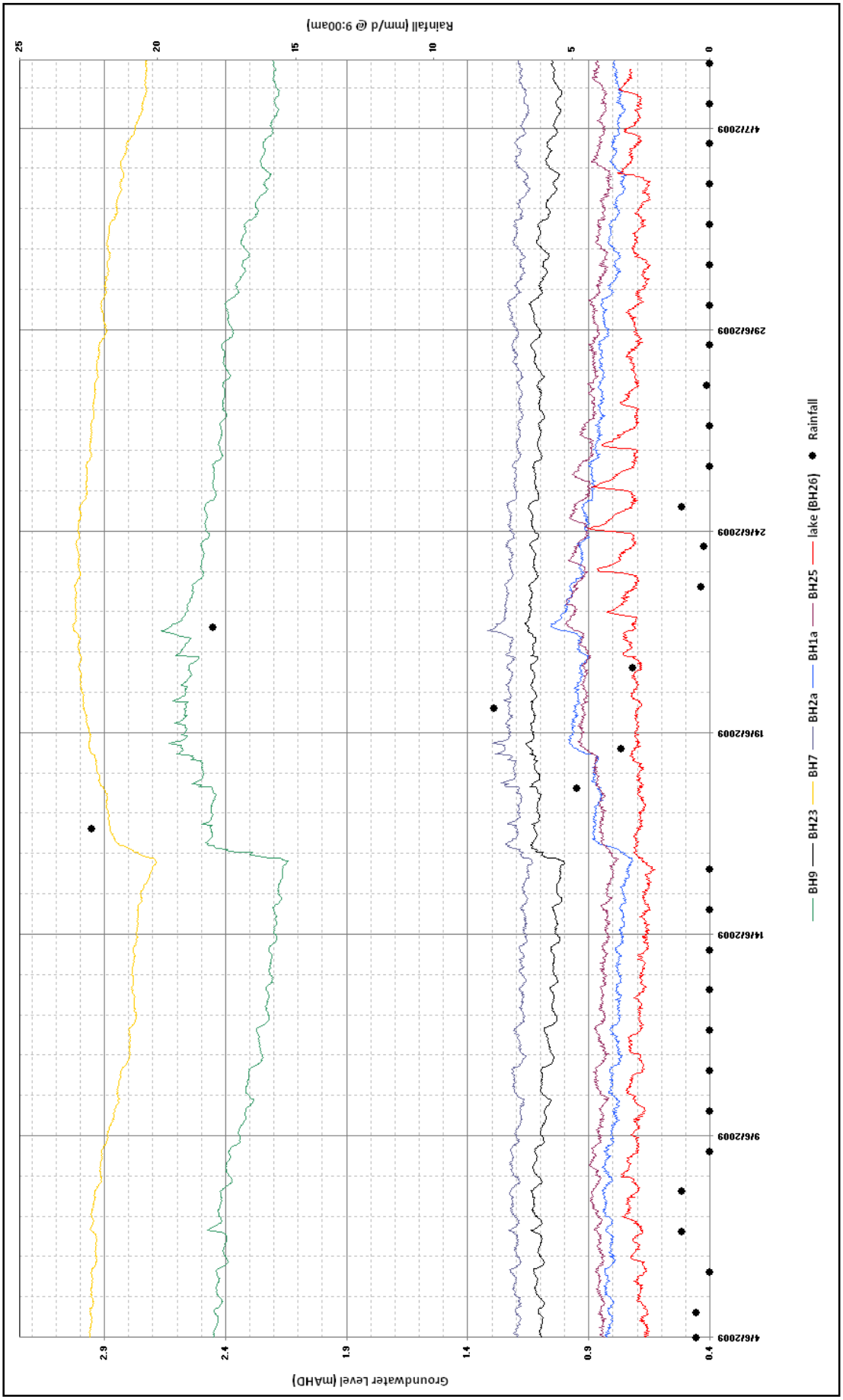
Note:
Image shows location of all installed GMBs to date (with a postfix of R). GMBs 1, 2, 2A and 26lLAKE are no longer available. GMB 201, 202 & 203 installed September 2012. GMB 110 forms part of groundwater model but not included in reporting.

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**SITE GROUNDWATER MONITORING BORES (GMBS) AND EXISTING SITE CONTOURS**	**Figure 3**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346



Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	BR	**RIVERSIDE GROUNDWATER LEVEL OBSERVATIONS: BORES 1A, 2A, 7, 9, 23, 25 AND 26 (Lake) PERIOD: 04/06/09 – 06/07/09**	**Figure 4**
Approved:	DMM		
Date:	22.11.2012		
Scale:	NA		Job No: P0902346

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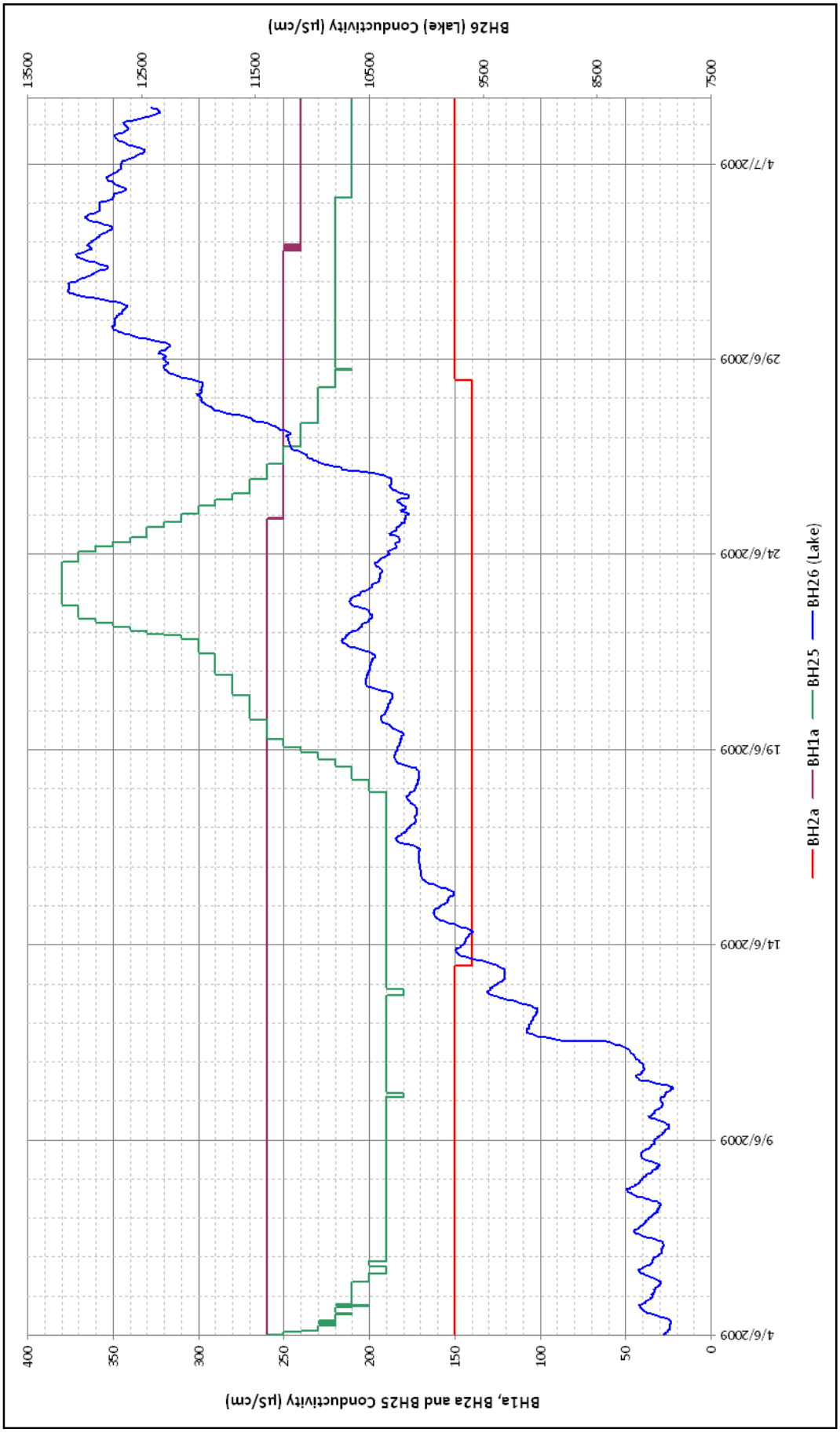

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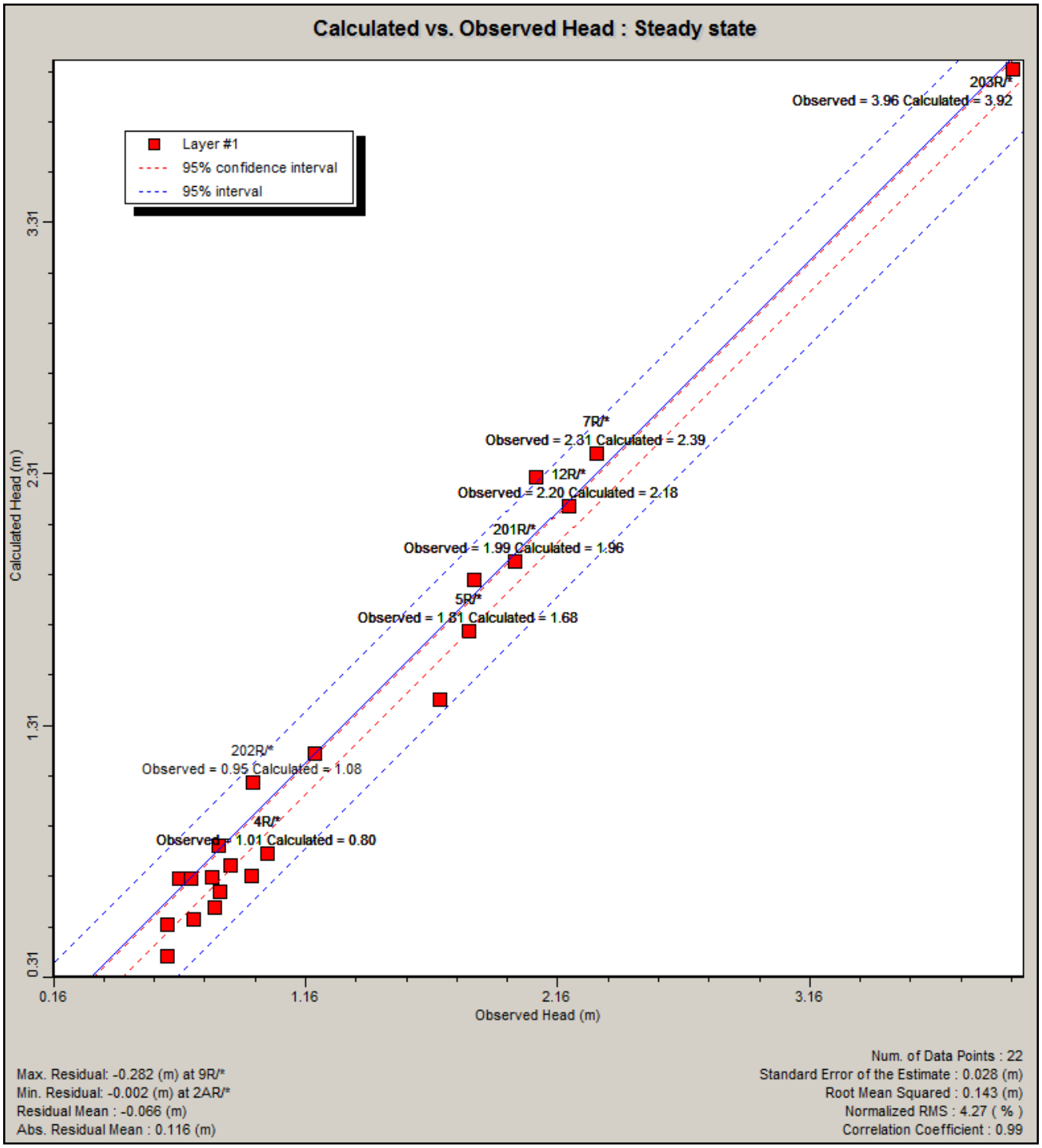
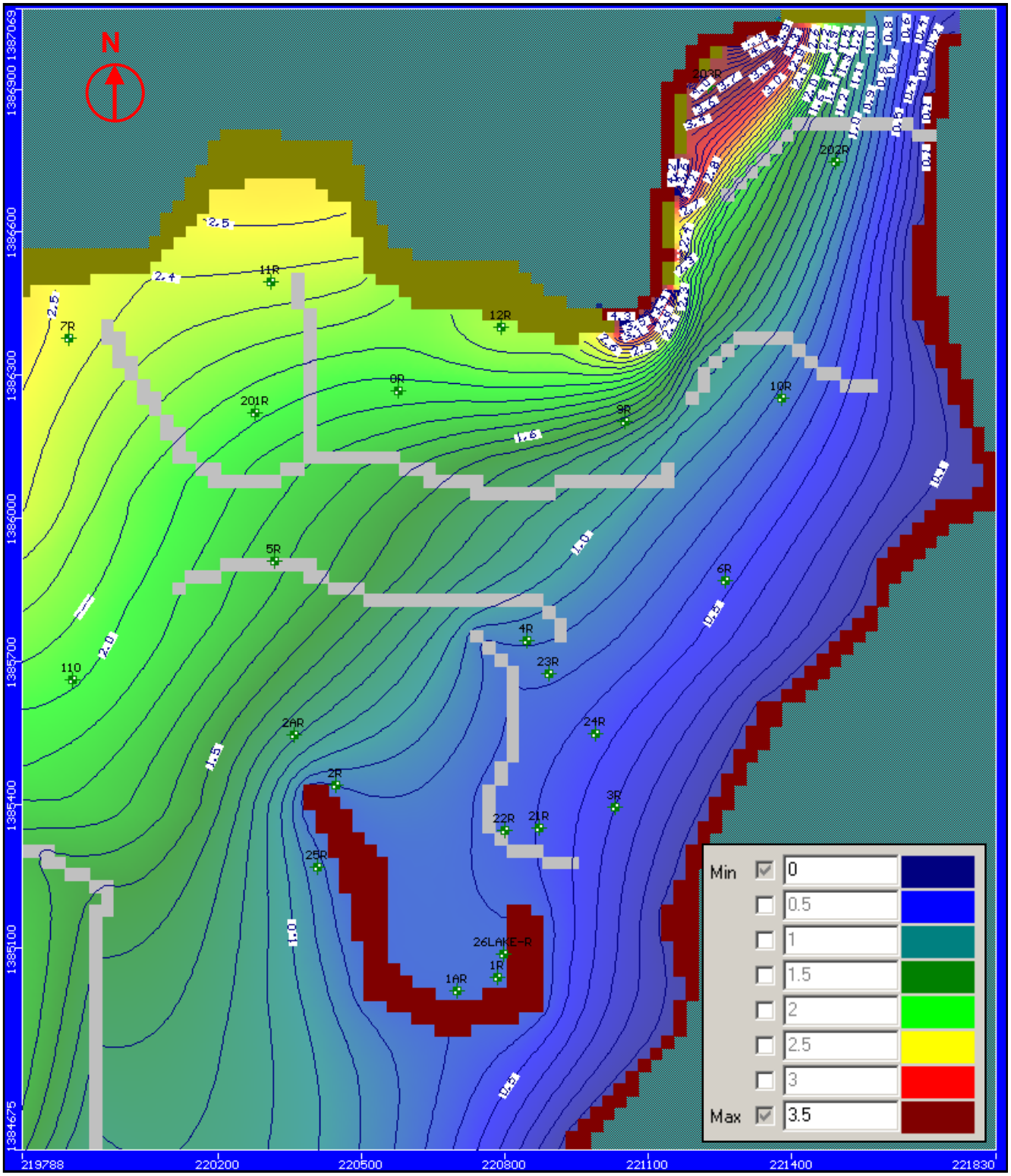
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	BR	**RIVERSIDE GROUNDWATER EC (µS/CM) OBSERVATIONS: BORES 1A, 2A, 25 AND 26 (Lake) PERIOD: 04/06/09 – 06/07/09**	**Figure 5**
Approved:	DMM		
Date:	22.11.2012		
Scale:	NA		Job No: P0902346



Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**M0 CALIBRATION**	**Figure 6**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346

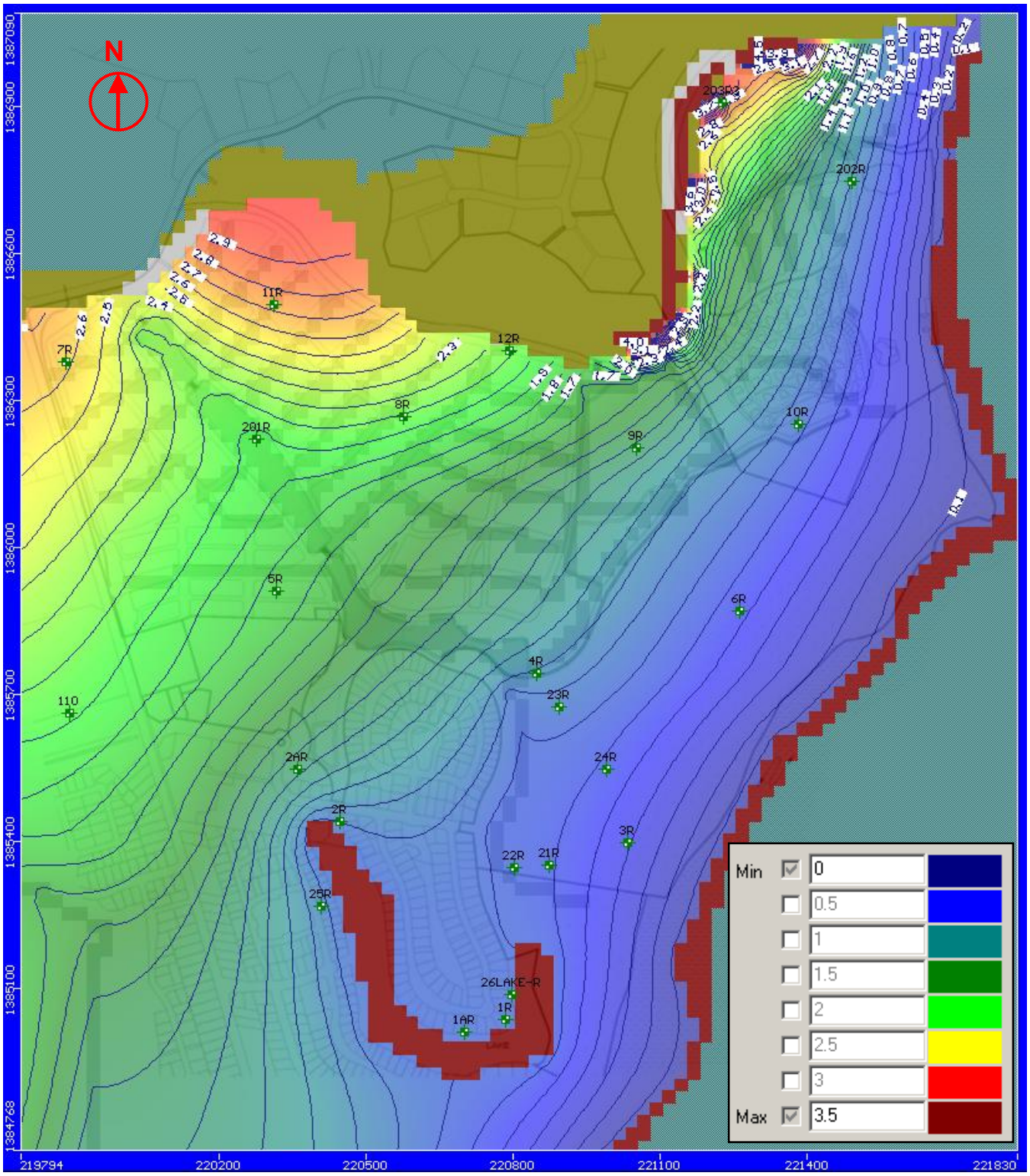


martens

Key

Blue lines - Head Equipotential
(0.1 m contour interval)

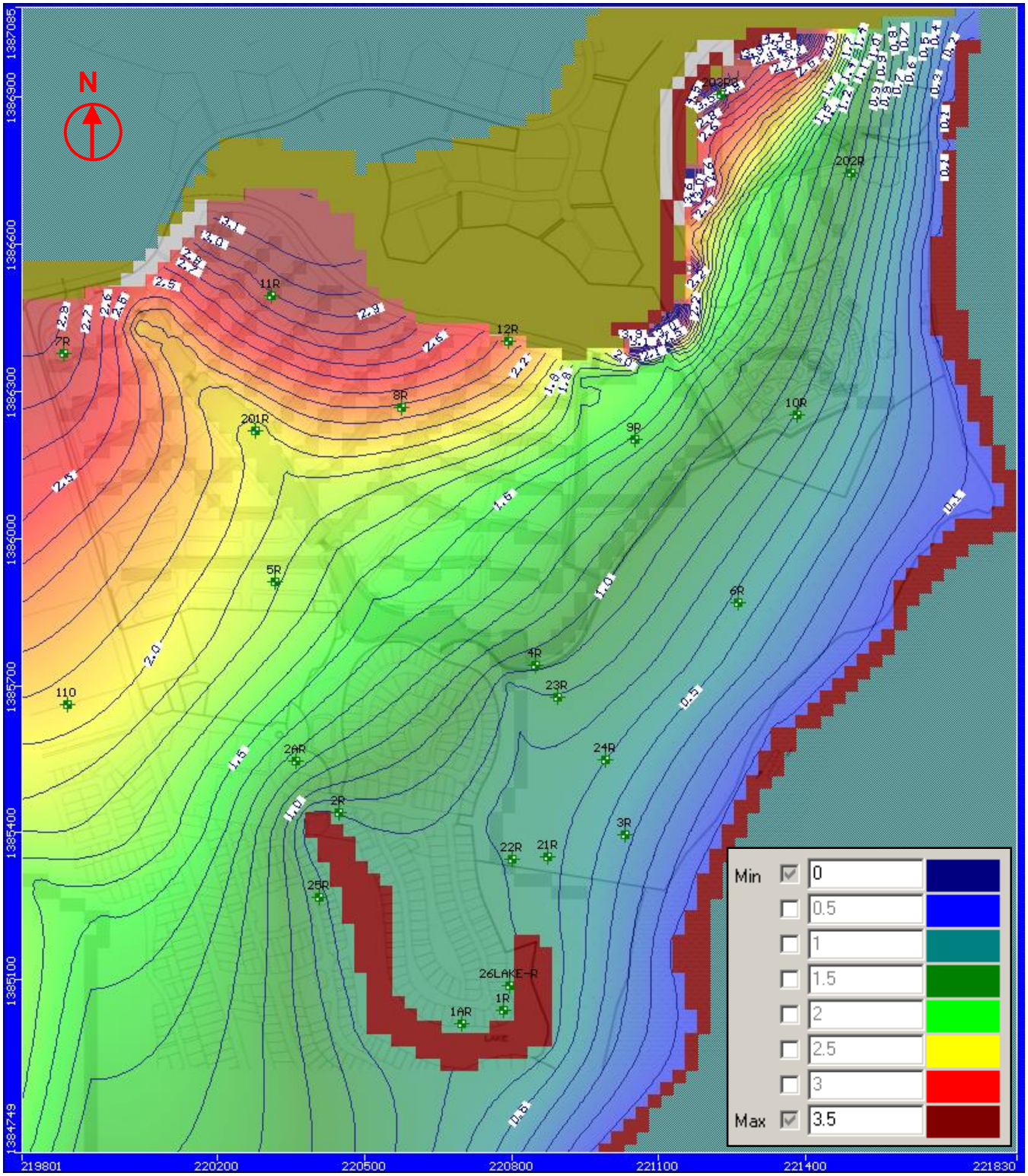
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	BR	**GROUNDWATER HEAD EQUIPOTENTIAL CONTOURS: M1a- EXISTING SITE, MEAN RAINFALL CONDITIONS**	**Figure 7**
Approved:	DMM		
Date:	22.11.2012		
Scale:	NA		Job No: P0902346



Key

Blue lines - Head Equipotential
(0.1 m contour interval)

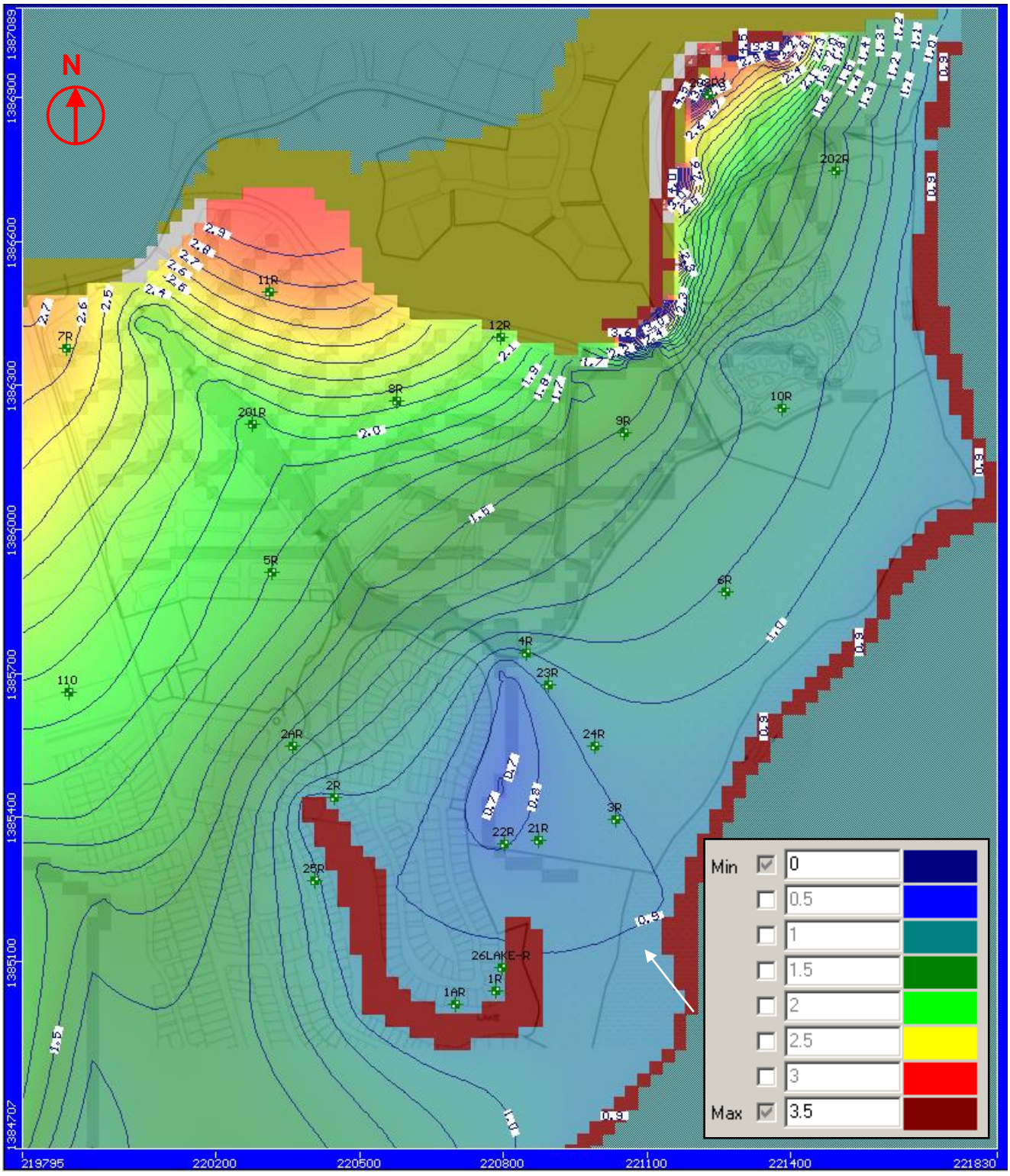
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	BR	**GROUNDWATER HEAD EQUIPOTENTIAL CONTOURS: M2a- DEVELOPED SITE, MEAN RAINFALL CONDITIONS**	**Figure 8**
Approved:	DMM		
Date:	22.11.2012		
Scale:	NA		Job No: P0902346



Key

Blue lines - Head Equipotential
(0.1 m contour interval)

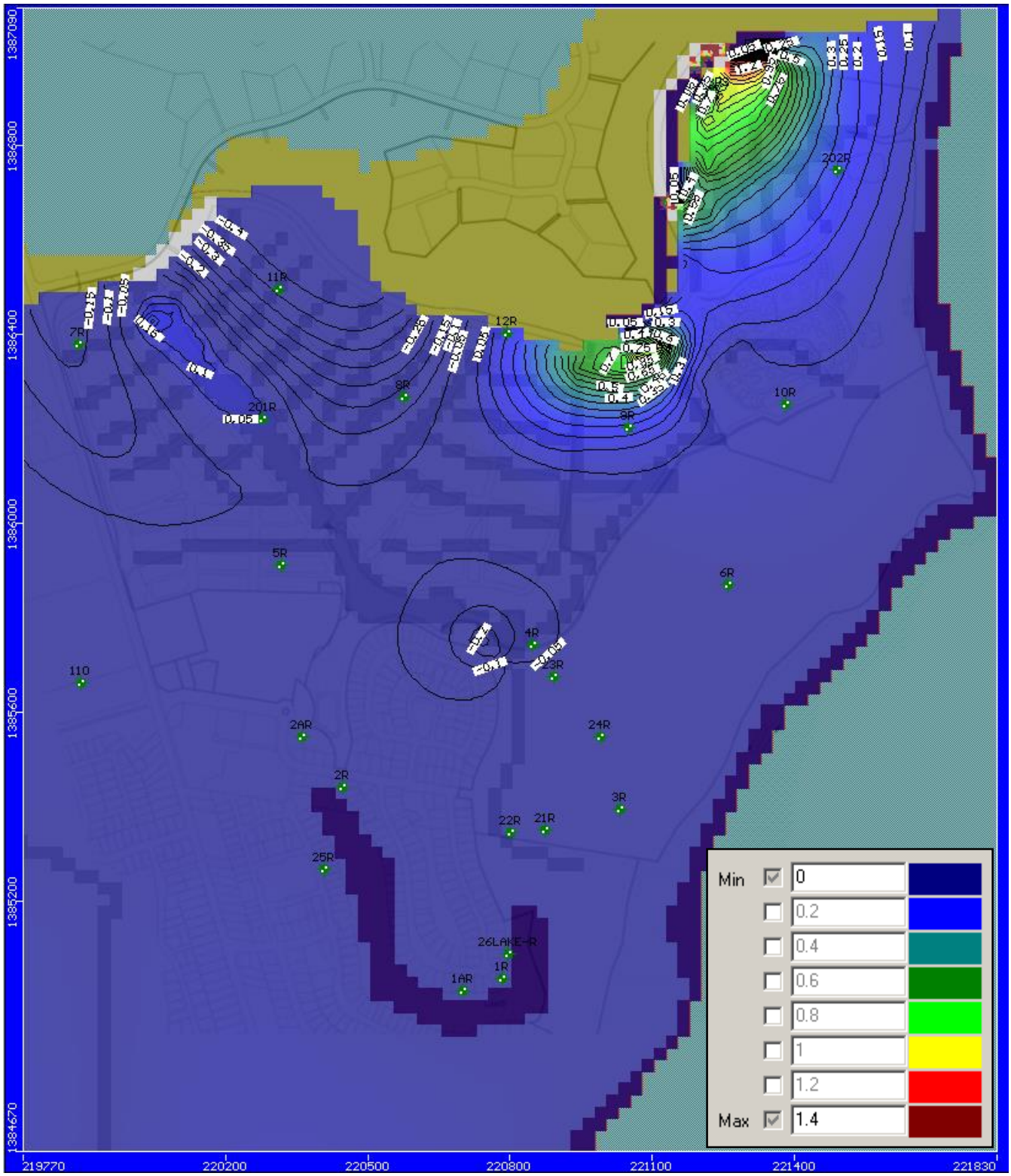
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	BR	**GROUNDWATER HEAD EQUIPOTENTIAL CONTOURS: M2b- DEVELOPED SITE, WET RAINFALL CONDITIONS**	**Figure 9**
Approved:	DMM		
Date:	22.11.2012		
Scale:	NA		Job No: P0902346



Key

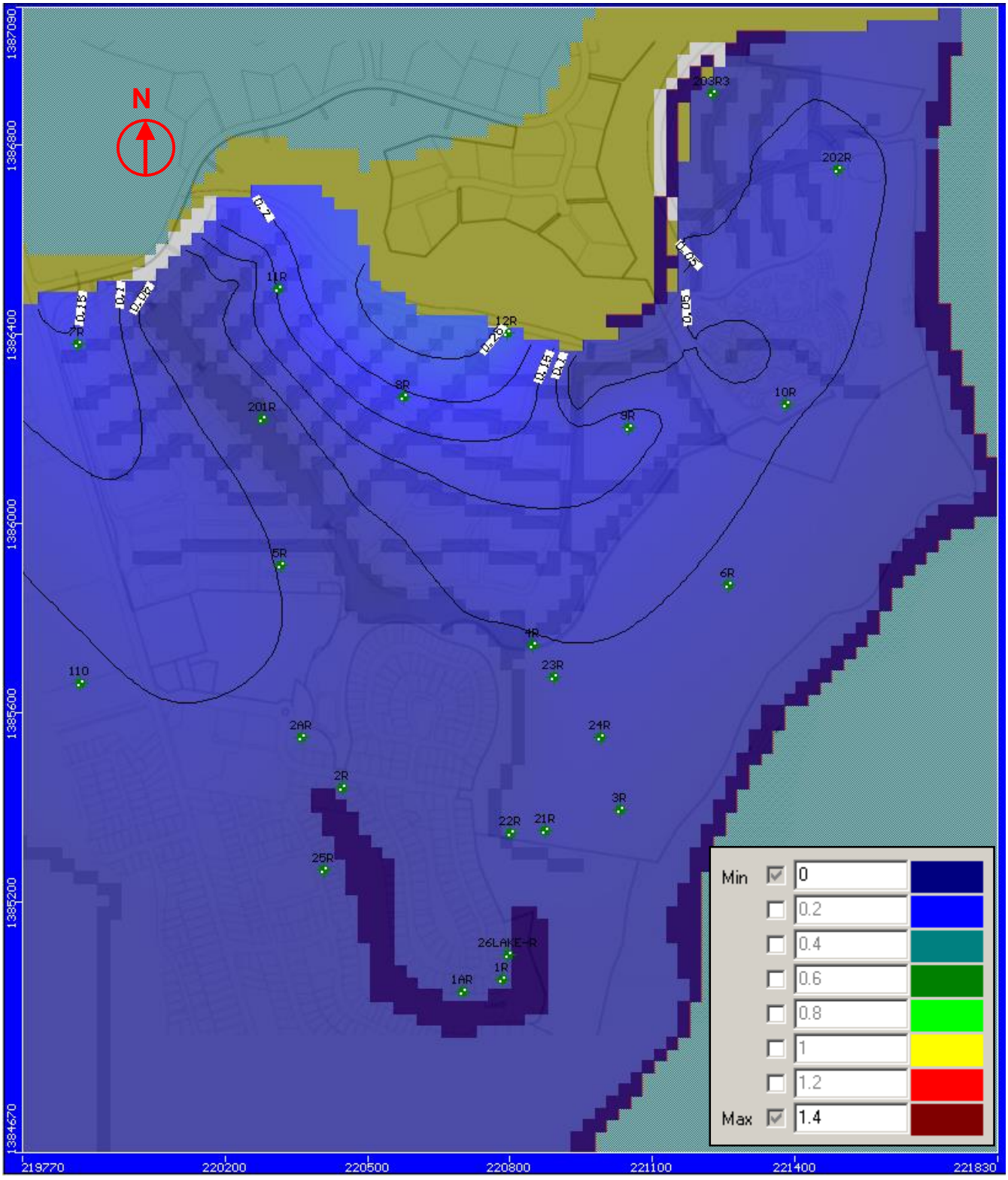
Blue lines - Head Equipotential
(0.1 m contour interval)

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	BR	**GROUNDWATER HEAD EQUIPOTENTIAL CONTOURS: M2c- DEVELOPED SITE, MEAN RAINFALL CONDITIONS WITH SEA LEVEL RISE**	**Figure 10**
Approved:	DMM		
Date:	22.11.2012		
Scale:	NA		Job No: P0902346



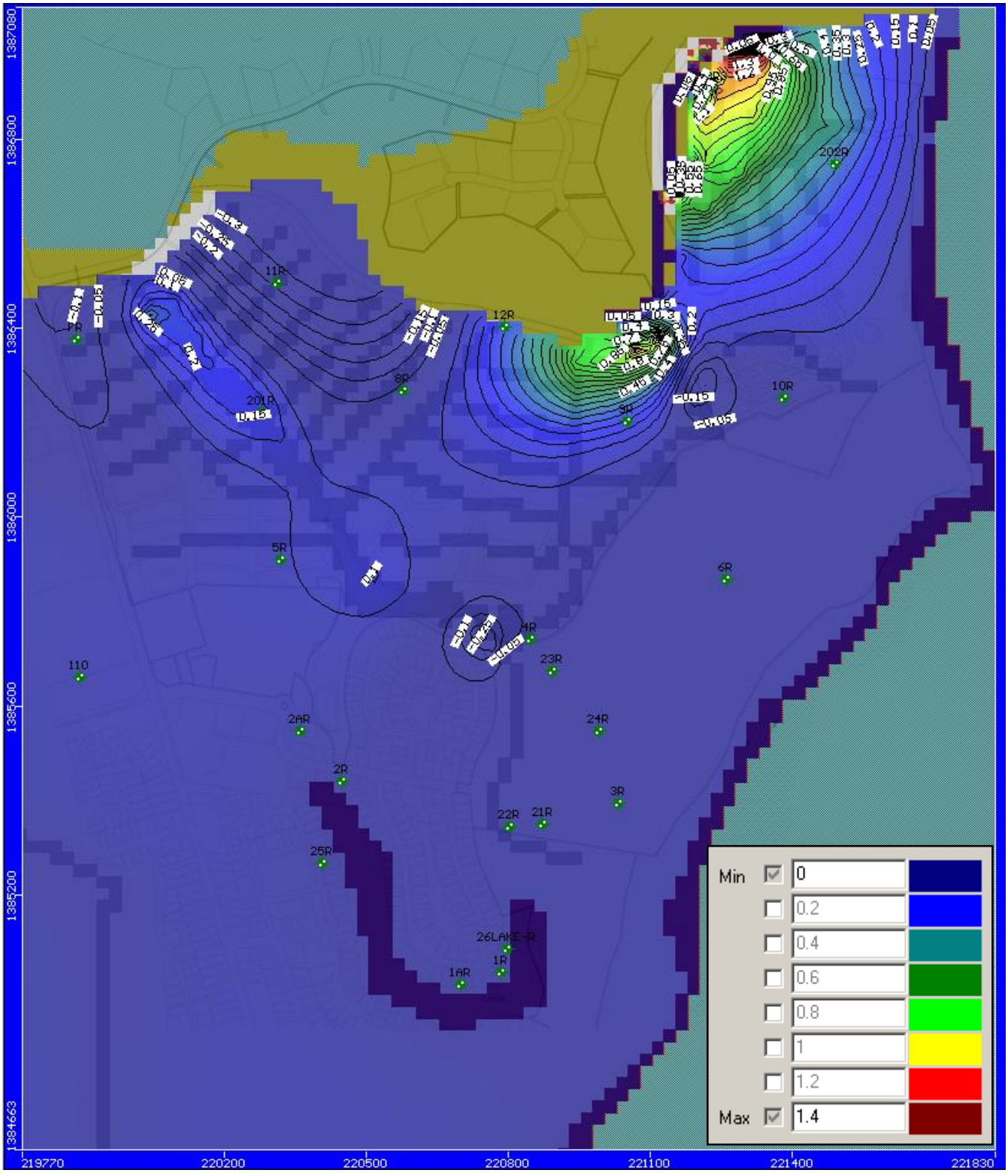
Key
Black lines - Drawdown contour (0.05 m contour interval)

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**GROUNDWATER HEAD EQUIPOTENTIAL DRAWDOWN PLOT BETWEEN DEVELOPED (M2a) AND EXISTING (M1a) WITH MEAN RAINFALL CONDITIONS**	**Figure 11**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346



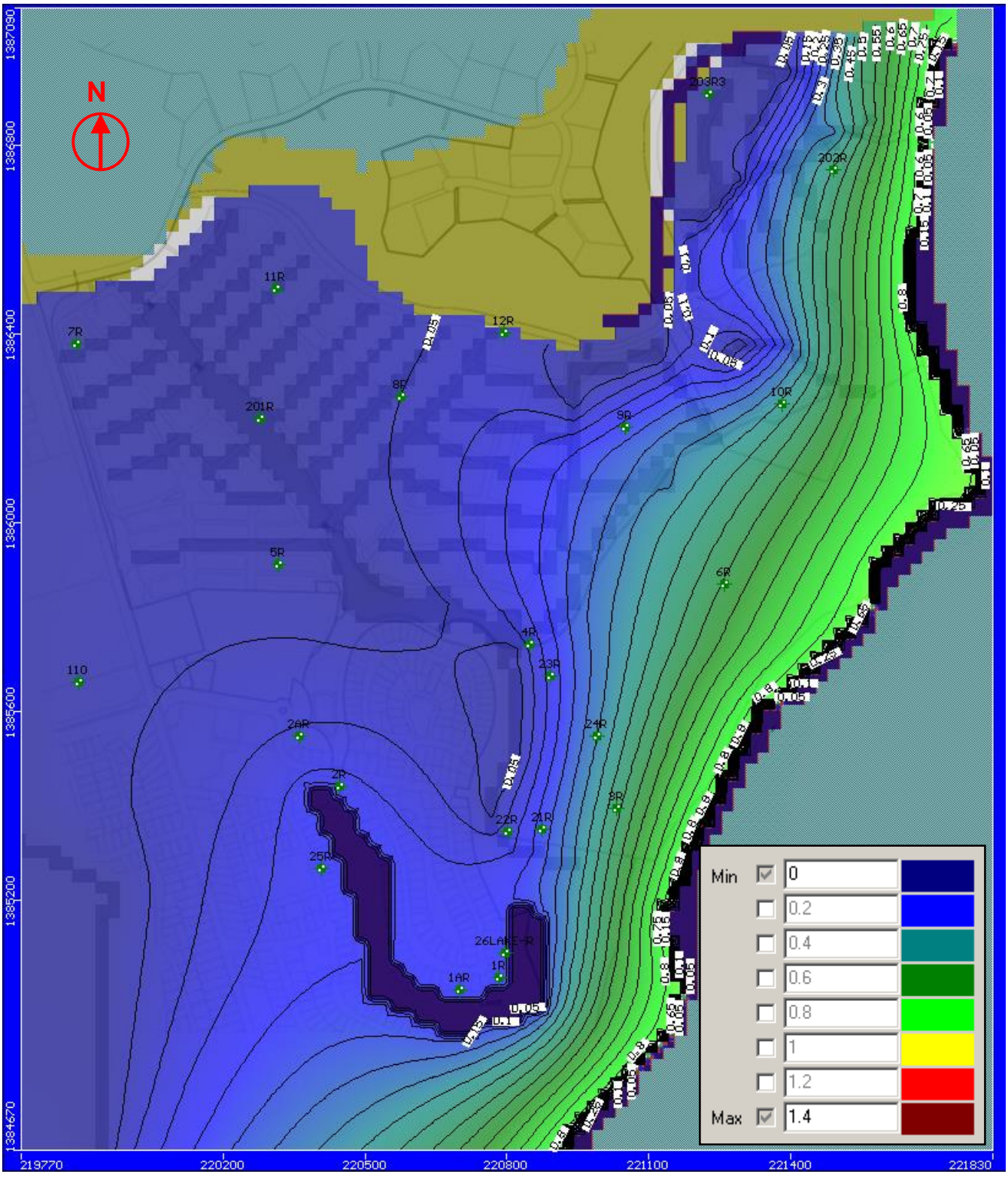
Key
Black lines - Drawdown contour (0.1 m contour interval)

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**GROUNDWATER HEAD EQUIPOTENTIAL DRAWDOWN PLOT BETWEEN DEVELOPED MEAN RAINFALL (M2a) &WET RAINFALL CONDITIONS (M2b)**	**Figure 12**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346



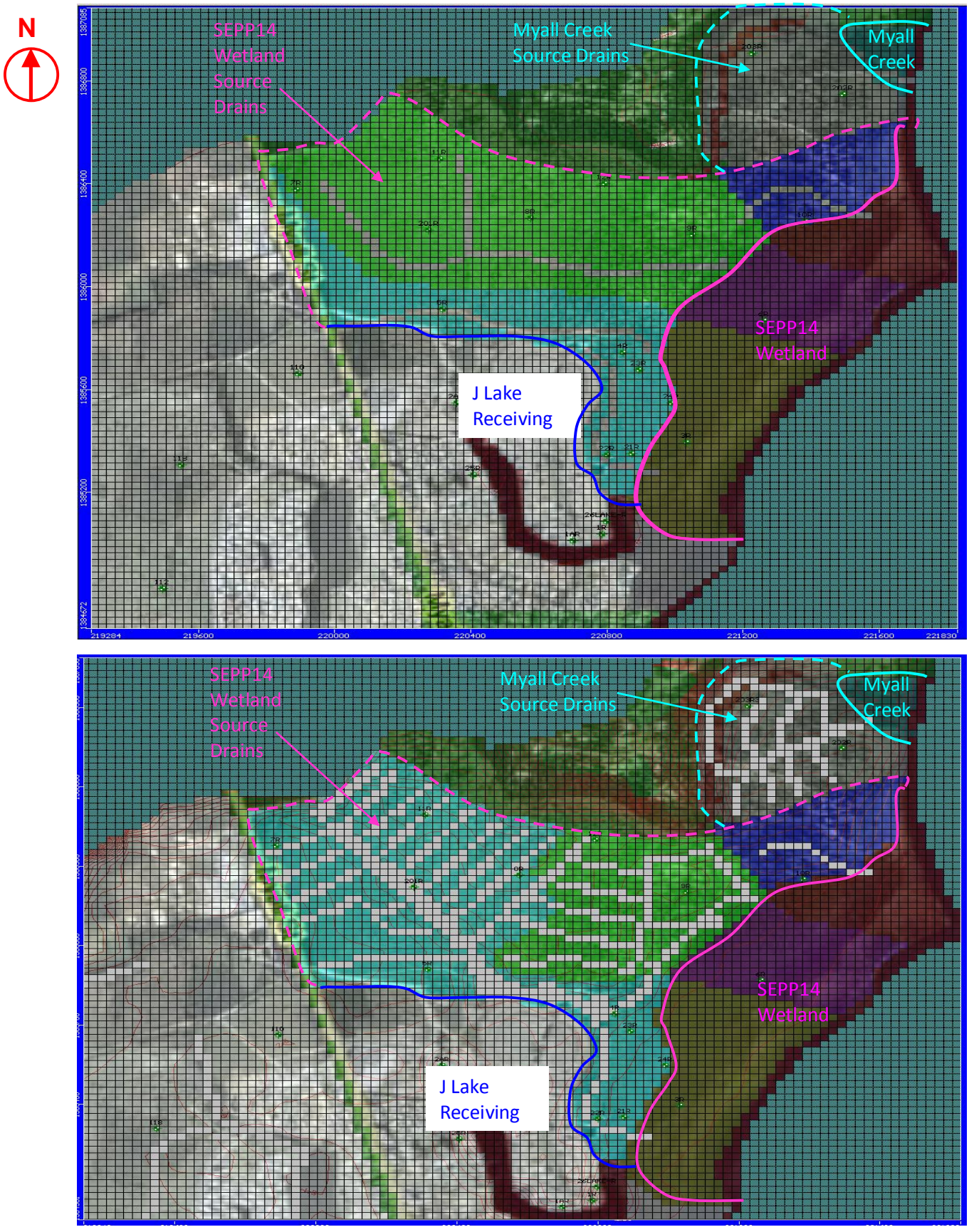
Key
Black lines - Drawdown contour (0.1 m contour interval)

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**GROUNDWATER HEAD EQUIPOTENTIAL DRAWDOWN PLOT BETWEEN DEVELOPED (M2c) & EXISTING (M1c) WITH MEAN RAINFALL CONDITIONS & SEA LEVEL RISE**	**Figure 13**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346



Key
Black lines - Drawdown contour (0.1 m contour interval)

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**GROUNDWATER HEAD EQUIPOTENTIAL DRAWDOWN PLOT BETWEEN DEVELOPED MEAN RAINFALL WITH (M2c) & WITHOUT (M2a) SEA LEVEL RISE**	**Figure 14**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346



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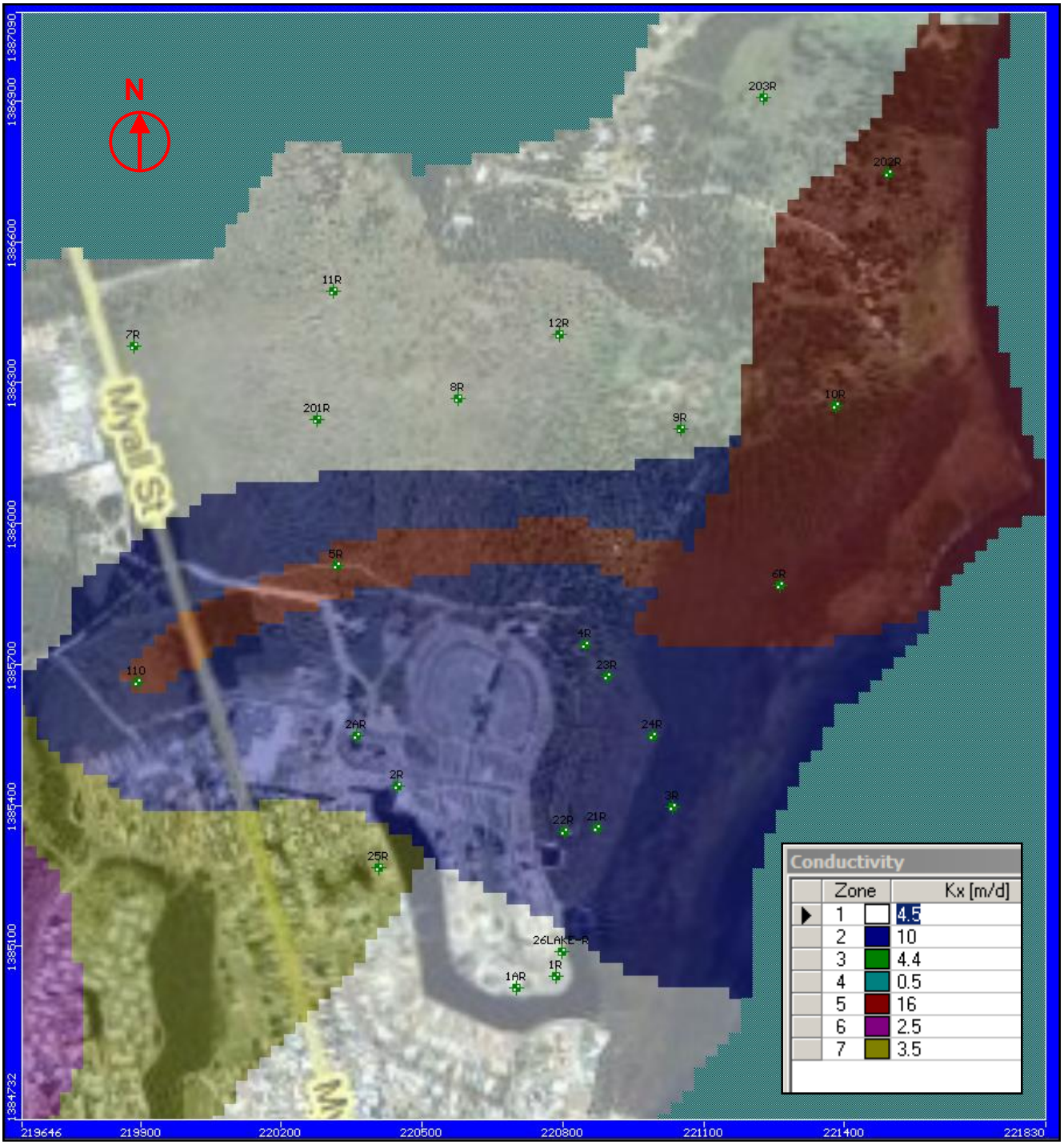
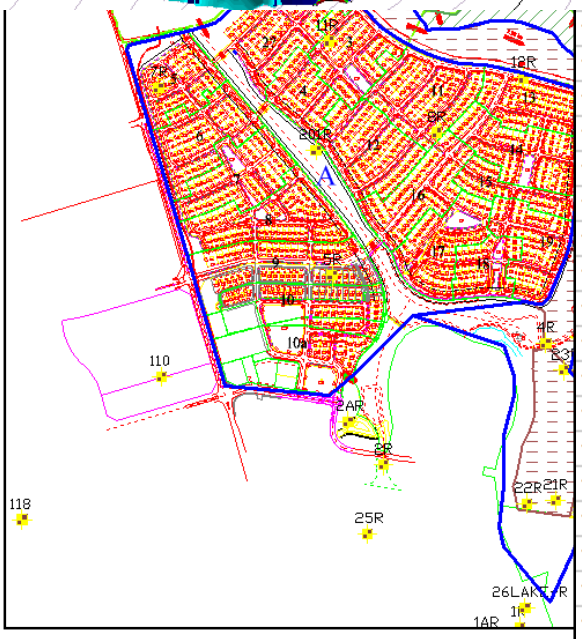
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**GROUNDWATER MODEL WATER BALANCE ZONES AND DRAINS**	**Figure 15**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346



martens

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	GMH	**GROUNDWATER MODEL HYDRAULIC CONDUCTIVITY ZONES**	**Figure 16**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346

N



-1.00	-0.95	magenta 088	
-0.95	-0.90	magenta 104	
-0.90	-0.85	magenta 120	
-0.85	-0.80	magenta 136	
-0.80	-0.75	magenta 152	
-0.75	-0.70	magenta 168	
-0.70	-0.65	magenta 184	
-0.65	-0.60	magenta 200	
-0.60	-0.55	magenta 216	
-0.55	-0.50	magenta 248	
-0.50	-0.45	red 088	
-0.45	-0.40	red 104	
-0.40	-0.35	red 120	
-0.35	-0.30	red 136	
-0.30	-0.25	red 152	
-0.25	-0.20	red 168	
-0.20	-0.15	red 184	
-0.15	-0.10	red 200	
-0.10	-0.05	red 216	
-0.05	0	red 248	

0	0.05	green 248	
0.05	0.10	green 216	
0.10	0.15	green 200	
0.15	0.20	green 184	
0.20	0.25	green 168	
0.25	0.30	green 152	
0.30	0.35	green 136	
0.35	0.40	green 120	
0.40	0.45	green 104	
0.45	0.50	green 088	
0.50	0.55	blue 248	
0.55	0.60	blue 216	
0.60	0.65	blue 200	
0.65	0.70	blue 184	
0.70	0.75	blue 168	
0.75	0.80	blue 152	
0.80	0.85	blue 136	
0.85	0.90	blue 120	
0.90	0.95	blue 104	
0.95	1.00	blue 088	
1.00	1.05	cyan 248	
1.05	1.10	cyan 216	
1.10	1.15	cyan 200	
1.15	1.20	cyan 184	
1.20	1.25	cyan 168	
1.25	1.30	cyan 152	
1.30	1.45	cyan 136	
1.45	1.50	cyan 120	
1.50	1.55	cyan 104	
1.55	300	cyan 088	

Martens & Associates Pty Ltd	ABN 85 070 240 890	**Environment |**	**chn**
Drawn:	GMH	**GROUNDWATER MODEL** **RECHARGE ZONES – EXISTING AND DEVELOPED CONDITIONS**	**Figure 17**
Approved:	DMM		
Date:	26.11.2012		
Scale:	NA		Job No: P0902346

Scale:	NA		Job No: P0902346

21 Attachment 6B – Groundwater Level Data

1 - lost or destroyed sometime between 2004 and 2007.
2 - installed by BR. 3 - ground elevations taken from Martens (july, 2009)

		1	1	1													2	2	2	2			
	GMB	GMB1	GMB2	GMB3	GMB4	GMB5	GMB6	GMB7	GMB8	GMB9	GMB10	GMB11	GMB12	GMB21	GMB22	GMB23	GMB24	GMB1A	GMB2A	GMB25	Lake 26	GMB201	GMB202	GMB203
	Ground level (mAHD)	1.020	2.370	0.845	2.045	2.608	0.861	2.963	2.598	2.859	1.490	3.395	3.261	1.026	1.095	1.111	0.834	1.708	2.479	1.798	0.492	2.740	3.690	5.140
	Concrete cap level (mAHD)	1.020	2.375	0.840	2.131	2.638	1.020	3.163	2.598	2.909	1.310	3.547	3.311											
Source	Date																							
	8/11/1994	0.570	0.850			1.488			1.388	1.459	0.700	1.837	1.951											
	24/11/1994	0.410	0.785	0.260		1.338		1.713	1.268	1.319		1.657	1.761											
	6/12/1994	0.300	0.735	0.300		1.268		1.593	1.188	1.319		1.597	1.621											
	22/12/1994	0.250	0.685	0.060		1.188		1.553	1.108	1.229	0.390	1.457	1.481											
	6/01/1995	0.650	0.835	0.720		1.298		1.733	1.258	1.449	0.620	1.437	1.591											
	21/02/1995	0.570	0.765	0.550		1.138		1.563	1.078	1.329	0.480	1.347	1.371											
	8/03/1995	0.240	1.525	0.550		1.658		2.568	0.728	1.159	0.760	2.047	2.332											
	14/03/1995	0.855	1.295	0.780		2.278		2.593	2.098	1.749	0.800	2.127	2.421											
	31/03/1995	0.595	1.020	0.660		1.713		2.243	1.578	1.549	0.615	1.952	1.921											
	19/04/1995	0.440	0.985	0.525		1.433		1.938	1.328	1.399	0.485	1.717	1.646											
	2/05/1995	0.370	0.800	0.250		1.363		1.803	1.218	1.329	0.395	1.562	1.486											
	17/05/1995	0.910	0.995	0.760		1.823		2.133	1.628	1.429	0.830	1.697	1.831											
	18/05/1995	0.930	1.375	0.760		2.328		2.403	2.258	1.699	0.910	2.237	1.601											
	19/05/1995	0.900	1.365	0.760		2.358		2.443	2.208	1.699	0.890	2.067	1.681											
Coffey (feb, 1996)	22/05/1995	0.925	1.795	0.790				2.703	2.458	1.859	1.110	2.257	2.761											
	23/05/1995	0.920	1.825	0.780		2.558		2.723	2.408	1.899	1.070	2.337	2.971											
	24/05/1995	0.920	1.715	0.780		2.538		2.733	2.368	1.859	1.030	2.337	3.051											
	25/05/1995	0.910	1.685	0.780		2.548		2.763	2.348	1.839	1.020	2.477	2.931											
	26/05/1995	0.920	1.695	0.770		2.548		2.743	2.368	1.829	1.050	2.447	2.951											
	21/06/1995	0.880	2.015	0.785				2.803	2.428	1.969	1.210	2.777	3.041											
	13/07/1995	0.710	1.965	0.760		2.228		2.713	2.188	1.939	1.230	2.747	2.721											
	26/07/1995	0.640	0.925	0.740		1.898		2.413	1.958	1.749	1.030	3.007	2.521											
	11/08/1995	0.580	0.825	0.720	1.071	1.608	0.670	2.183	1.778	1.719	0.970	1.967	2.261											
	28/08/1995	0.510		0.460	0.821	1.478	0.280	1.953	1.528	1.559	0.760	1.837	2.071											
	19/09/1995	0.600		0.740		2.328		2.423	2.328	1.869	1.160	2.377	2.491											
	20/09/1995	0.620		0.750	1.301	1.598	0.750	2.603	2.278	1.929	1.140		2.641											
	Late July 1994 - mid Nov 1994						0.500																	
	Late July 1994 - late Sept 1994				1.100																			
	7/04/2004			0.298	1.144	2.043	0.768	2.816	2.314	2.111	1.101	2.562	2.708											
Coffey (Oct, 2007)	11/05/2004			0.232	0.928	1.451		2.081	1.774	1.880	0.836	1.939	2.120	0.778	0.876	0.930	0.681							
	29/03/2007				0.823	1.303			1.534	1.657	0.541	1.689	1.655	0.813	0.826	0.760	0.628							
Martens & Associates (July, 2009)	04/06/2009 - 6/7/2009							2.891		2.375						1.270		0.838	1.198	0.872	0.708			
Martens & Associates (Early Sept 2012)	03/09/2012 or 04/09/2012			0.745	0.985	1.928	0.743	2.383	2.268	2.059	0.975	2.495	2.541	0.803	0.766	0.831	0.834	0.738		0.753				
Martens & Associates (Late Sept 2012)	25/09/2012 & 26/09/2012				0.905	1.748	0.563	2.233	2.098	1.959	0.890	2.295										2.08	1.00	4.11
Tattersall Lander (Oct 2012)	11/10/2012																					1.90	0.90	3.82
	Minimum Level (mAHD)	0.24	0.69	0.06	0.82	1.14	0.28	1.55	0.73	1.16	0.39	1.35	1.37	0.78	0.77	0.76	0.63	0.74	1.20	0.75	0.71	1.90	0.90	3.82
	Median Level (mAHD)	0.63	1.02	0.74	0.99	1.71	0.67	2.41	1.96	1.73	0.89	2.06	2.19	0.80	0.83	0.88	0.68	0.79	1.20	0.81	0.71	1.99	0.95	3.97
	Mean Level (mAHD)	0.66	1.24	0.61	1.01	1.81	0.61	2.31	1.83	1.69	0.86	2.08	2.20	0.80	0.82	0.95	0.71	0.79	1.20	0.81	0.71	1.99	0.95	3.97
	Maximum Level (mAHD)	0.93	2.02	0.79	1.30	2.56	0.77	2.89	2.46	2.38	1.23	3.01	3.05	0.81	0.88	1.27	0.83	0.84	1.20	0.87	0.71	2.08	1.00	4.11
	Min Depth (m) to GW	0.09	0.36	0.06	0.74	0.05	0.09	0.07	0.14	0.48	0.26	0.39	0.21	0.21	0.22	-0.16	0.00	0.87	1.28	0.93	-0.22	0.66	2.69	1.03
	Depth range	0.69	1.33	0.73	0.48	1.42	0.49	1.34	1.73	1.22	0.84	1.66	1.68	0.03	0.11	0.51	0.21	0.10	0.00	0.12	0.00	0.18	0.10	0.29
	Mean Depth (m) below Ground level	0.36	1.13	0.24	1.04	0.80	0.25	0.65	0.77	1.17	0.63	1.32	1.06	0.23	0.27	0.16	0.12	0.92	1.28	0.99	-0.22	0.75	2.74	1.18

estimated **median** based on visual observation of plot

mean from martens diver monitoring

Source	Sample date		GMB1	GMB2	GMB3	GMB4	GMB5	GMB6	GMB7	GMB8	GMB9	GMB10	GMB11	GMB12	GMB13	GMB21	GMB22	GMB23	GMB24	GMB1A	GMB2A	GMB25	Lake 26	Lake	GMB201	GMB202	GMB203
Coffey (Feb, 1996)	Average result 13/12/94 to 29/8/1995	pH	6.40	5.30	6.20			6.00				5.60	6.00	5.30													
		TDS (mg/L)	490.00	190.00	13900.00			1900.00				420.00	2300.00	220.00													
		Chloride (mg/L)	220.00	82.00	7600.00			1100.00				150.00	1200.00	60.00													
		Sulphate (mg/L)	33.00	16.00	1200.00			170.00				5.00	170.00	25.00													
		Magnesium (mg/L)	36.00	6.00	540.00			76.00				8.40	85.00	5.20													
		Calcium (mgLL)	9.00	1.20	160.00			33.00				7.20	22.00	2.20													
Coffey (Oct, 2007)	29/03/2007	pH				5.32								5.02		5.62	6.05	5.60	5.46								
		TDS (mg/L)				155.00								1210.00		11500.00	1350.00	212.00	2250.00								
		Chloride (mg/L)				50.40								64.60		5300.00	430.00	58.70	800.00								
		Sulphate (mg/L)				10.00								22.00		702.00	39.00	6.00	344.00								
		Magnesium (mg/L)				4.00								6.00		420.00	23.00	7.00	54.00								
		Calcium (mgLL)				2.00								2.00		126.00	11.00	3.00	31.00								
		EC (us/cm)				202.00								268.00		15500.00	1610.00	234.00	2730.00								
		TN (mg/L)				0.93								3.07		12.13	7.24	2.51	9.33								
		TP (mg/L)				0.14								0.76		1.38	0.79	0.32	1.12								
Coffey (Oct, 2007)	30/03/2007	pH									3.99													5.83			
		TDS (mg/L)									200.00													129.00			
		Chloride (mg/L)									34.40													37.40			
		Sulphate (mg/L)									13.00													12.00			
		Magnesium (mg/L)									3.00													3.00			
		Calcium (mgLL)									1.00													8.00			
		EC (us/cm)									178.00													182.00			
		TN (mg/L)									2.53													0.72			
		TP (mg/L)									1.00													0.08			
Martens and Associates (July, 2009)	6/07/2009	pH									4.30							5.70		6.20	5.10	5.60	6.30				
		TDS (mg/L)									96.00							180.00		170.00	120.00	160.00	11000.00				
		Chloride (mg/L)									37.00							65.00		30.00	50.00	25.00	5800.00				
		Sulphate (mg/L)									5.00							5.00		39.00	5.00	5.00	850.00				
		Magnesium (mg/L)									2.90							7.80		8.20	3.40	4.40	360.00				
		Calcium (mgLL)									0.30							3.60		5.60	1.20	3.60	110.00				
		EC (us/cm)									160.00							280.00		280.00	200.00	260.00	14000.00				
		TN (mg/L)									1.00							0.60		7.10	3.80	30.00	0.60				
		TP (mg/L)									1.90							0.05		6.10	2.80	1.20	0.05				
Martens and Associates (Sept, 2012)	4/09/2012	pH	6.7	6.20	6.30	6.40		5.80	4.00		6.10											6.30	7.30				
		TDS (mg/L)	7300	120.00	200.00	3500.00		200.00	160.00		2800.00											130.00	10000.00				
		Chloride (mg/L)	5500	75.00	49.00	1700.00		62.00	27.00		1300.00											36.00	4900.00				
		Sulphate (mg/L)	760	4.00	10.00	210.00		20.00	1.00		170.00											1.00	600.00				
		Magnesium (mg/L)	370	6.10	2.10	130.00		4.80	3.10		77.00											4.20	300.00				
		Calcium (mgLL)	110	2.40	0.90	49.00		2.80	0.50		18.00											4.20	97.00				
		EC (us/cm)	18000	320.00	260.00	6400.00		310.00	170.00		4700.00											240.00	16000.00				
		TN (mg/L)	2.2	1.90	1.90	0.90		1.90	2.80		0.70											5.30	0.90				
		TP (mg/L)	0.05	0.05	0.09	0.05		0.10	1.30		0.50											0.20	0.05				
Martens and Associates (Sept, 2012)	27/09/2012	pH			5.80	5.70	5.50	5.20	4.10	6.00	5.60													5.30	5.40	5.30
		TDS (mg/L)			180.00	4900.00	120.00	160.00	150.00	160.00	2700.00													65.00	1200.00	110.00
		Chloride (mg/L)			44.00	2900.00	38.00	71.00	29.00	53.00	1400.00													640.00	18.00	43.00
		Sulphate (mg/L)			10.00	360.00	7.00	24.00	1.00	3.00	180.00													26.00	5.00	5.00
		Magnesium (mg/L)			1.50	170.00	3.70	5.00	3.10	10.00	87.00													42.00	1.90	4.00
		Calcium (mgLL)			0.60	67.00	3.60	3.10	0.50	6.20	21.00													13.00	1.70	1.10
		EC (us/cm)			230.00	8400.00	200.00	320.00	170.00	300.00	4600.00													2000.00	110.00	190.00
		TN (mg/L)			1.10	1.20	3.00	1.60	1.90	1.60	0.70													9.90	3.30	4.10
		TP (mg/L)			0.05	0.05	0.20	0.30	1.30	0.10	0.07													1.20	0.30	0.60

Value is less than laboratory PQL

22 Attachment 6C – Groundwater Quality Data

Source	Sample date		GMB1	GMB2	GMB3	GMB4	GMB5	GMB6	GMB7	GMB8	GMB9	GMB10	GMB11	GMB12	GMB13	GMB21	GMB22	GMB23	GMB24	GMB1A	GMB2A	GMB25	Lake 26	Lake	GMB201	GMB202	GMB203
Coffey (Feb, 1996)	Average result 13/12/94 to 29/8/1995	pH	6.40	5.30	6.20			6.00				5.60	6.00	5.30													
		TDS (mg/L)	490.00	190.00	13900.00			1900.00				420.00	2300.00	220.00													
		Chloride (mg/L)	220.00	82.00	7600.00			1100.00				150.00	1200.00	60.00													
		Sulphate (mg/L)	33.00	16.00	1200.00			170.00				5.00	170.00	25.00													
		Magnesium (mg/L)	36.00	6.00	540.00			76.00				8.40	85.00	5.20													
		Calcium (mgLL)	9.00	1.20	160.00			33.00				7.20	22.00	2.20													
Coffey (Oct, 2007)	29/03/2007	pH				5.32								5.02		5.62	6.05	5.60	5.46								
		TDS (mg/L)				155.00								1210.00		11500.00	1350.00	212.00	2250.00								
		Chloride (mg/L)				50.40								64.60		5300.00	430.00	58.70	800.00								
		Sulphate (mg/L)				10.00								22.00		702.00	39.00	6.00	344.00								
		Magnesium (mg/L)				4.00								6.00		420.00	23.00	7.00	54.00								
		Calcium (mgLL)				2.00								2.00		126.00	11.00	3.00	31.00								
		EC (us/cm)				202.00								268.00		15500.00	1610.00	234.00	2730.00								
		TN (mg/L)				0.93								3.07		12.13	7.24	2.51	9.33								
		TP (mg/L)				0.14								0.76		1.38	0.79	0.32	1.12								
Coffey (Oct, 2007)	30/03/2007	pH									3.99													5.83			
		TDS (mg/L)									200.00													129.00			
		Chloride (mg/L)									34.40													37.40			
		Sulphate (mg/L)									13.00													12.00			
		Magnesium (mg/L)									3.00													3.00			
		Calcium (mgLL)									1.00													8.00			
		EC (us/cm)									178.00													182.00			
		TN (mg/L)									2.53													0.72			
		TP (mg/L)									1.00													0.08			
Martens and Associates (July, 2009)	6/07/2009	pH									4.30							5.70		6.20	5.10	5.60	6.30				
		TDS (mg/L)									96.00							180.00		170.00	120.00	160.00	11000.00				
		Chloride (mg/L)									37.00							65.00		30.00	50.00	25.00	5800.00				
		Sulphate (mg/L)									5.00							5.00		39.00	5.00	5.00	850.00				
		Magnesium (mg/L)									2.90							7.80		8.20	3.40	4.40	360.00				
		Calcium (mgLL)									0.30							3.60		5.60	1.20	3.60	110.00				
		EC (us/cm)									160.00							280.00		280.00	200.00	260.00	14000.00				
		TN (mg/L)									1.00							0.60		7.10	3.80	30.00	0.60				
		TP (mg/L)									1.90							0.05		6.10	2.80	1.20	0.05				
Martens and Associates (Sept, 2012)	4/09/2012	pH	6.7	6.20	6.30	6.40		5.80	4.00		6.10											6.30	7.30				
		TDS (mg/L)	7300	120.00	200.00	3500.00		200.00	160.00		2800.00											130.00	10000.00				
		Chloride (mg/L)	5500	75.00	49.00	1700.00		62.00	27.00		1300.00											36.00	4900.00				
		Sulphate (mg/L)	760	4.00	10.00	210.00		20.00	1.00		170.00											1.00	600.00				
		Magnesium (mg/L)	370	6.10	2.10	130.00		4.80	3.10		77.00											4.20	300.00				
		Calcium (mgLL)	110	2.40	0.90	49.00		2.80	0.50		18.00											4.20	97.00				
		EC (us/cm)	18000	320.00	260.00	6400.00		310.00	170.00		4700.00											240.00	16000.00				
		TN (mg/L)	2.2	1.90	1.90	0.90		1.90	2.80		0.70											5.30	0.90				
		TP (mg/L)	0.05	0.05	0.09	0.05		0.10	1.30		0.50											0.20	0.05				
Martens and Associates (Sept, 2012)	27/09/2012	pH			5.80	5.70	5.50	5.20	4.10	6.00	5.60													5.30	5.40	5.30
		TDS (mg/L)			180.00	4900.00	120.00	160.00	150.00	160.00	2700.00													65.00	1200.00	110.00
		Chloride (mg/L)			44.00	2900.00	38.00	71.00	29.00	53.00	1400.00													640.00	18.00	43.00
		Sulphate (mg/L)			10.00	360.00	7.00	24.00	1.00	3.00	180.00													26.00	5.00	5.00
		Magnesium (mg/L)			1.50	170.00	3.70	5.00	3.10	10.00	87.00													42.00	1.90	4.00
		Calcium (mgLL)			0.60	67.00	3.60	3.10	0.50	6.20	21.00													13.00	1.70	1.10
		EC (us/cm)			230.00	8400.00	200.00	320.00	170.00	300.00	4600.00													2000.00	110.00	190.00
		TN (mg/L)			1.10	1.20	3.00	1.60	1.90	1.60	0.70													9.90	3.30	4.10
		TP (mg/L)			0.05	0.05	0.20	0.30	1.30	0.10	0.07													1.20	0.30	0.60

Value is less than laboratory PQL

23 Attachment 6D – Hydraulic Conductivity Test Results

Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

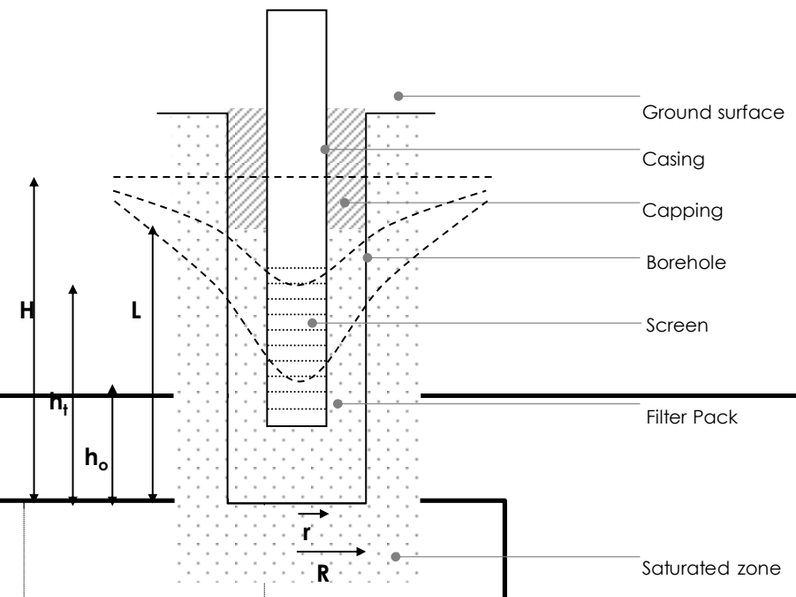
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB1a**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

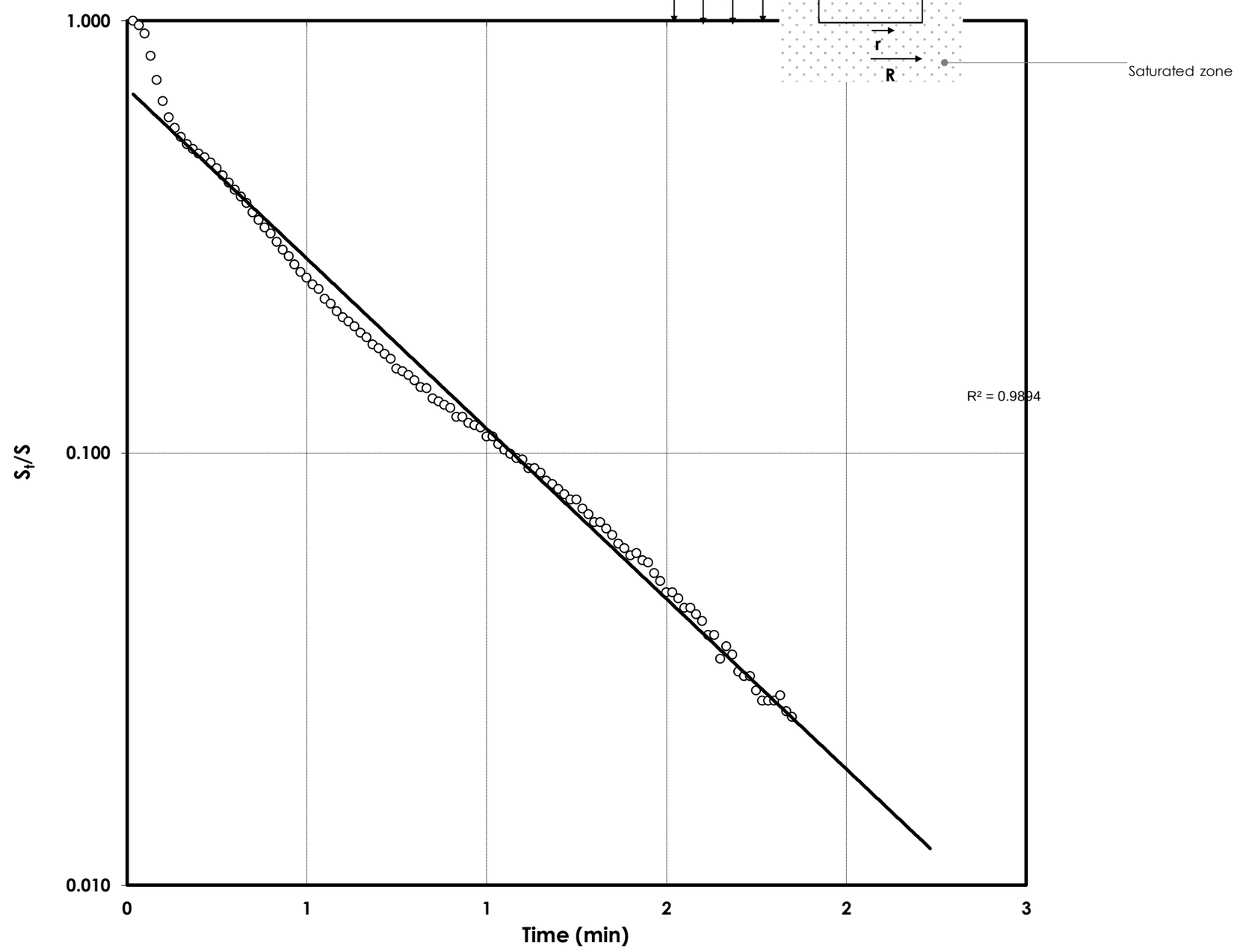
FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**11.13**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**12.48**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**1.00**	m
T_o - Length of characteristic time	**0.35**	minutes
K_{sat} - Saturated hydraulic conductivity	**6.50**	m/d



DATA PLOT



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Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

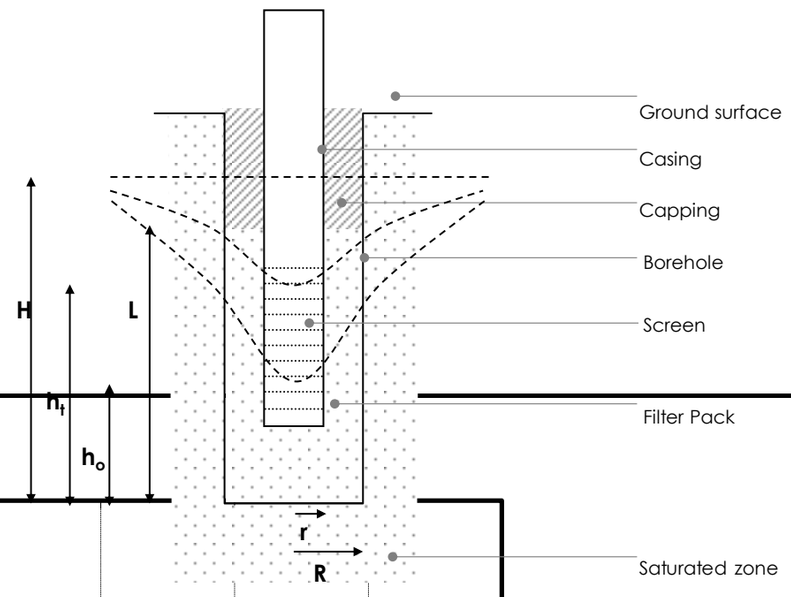
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB3**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**15.00**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**15.55**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.12**	minutes
K_{sat} - Saturated hydraulic conductivity	**11.71**	m/d



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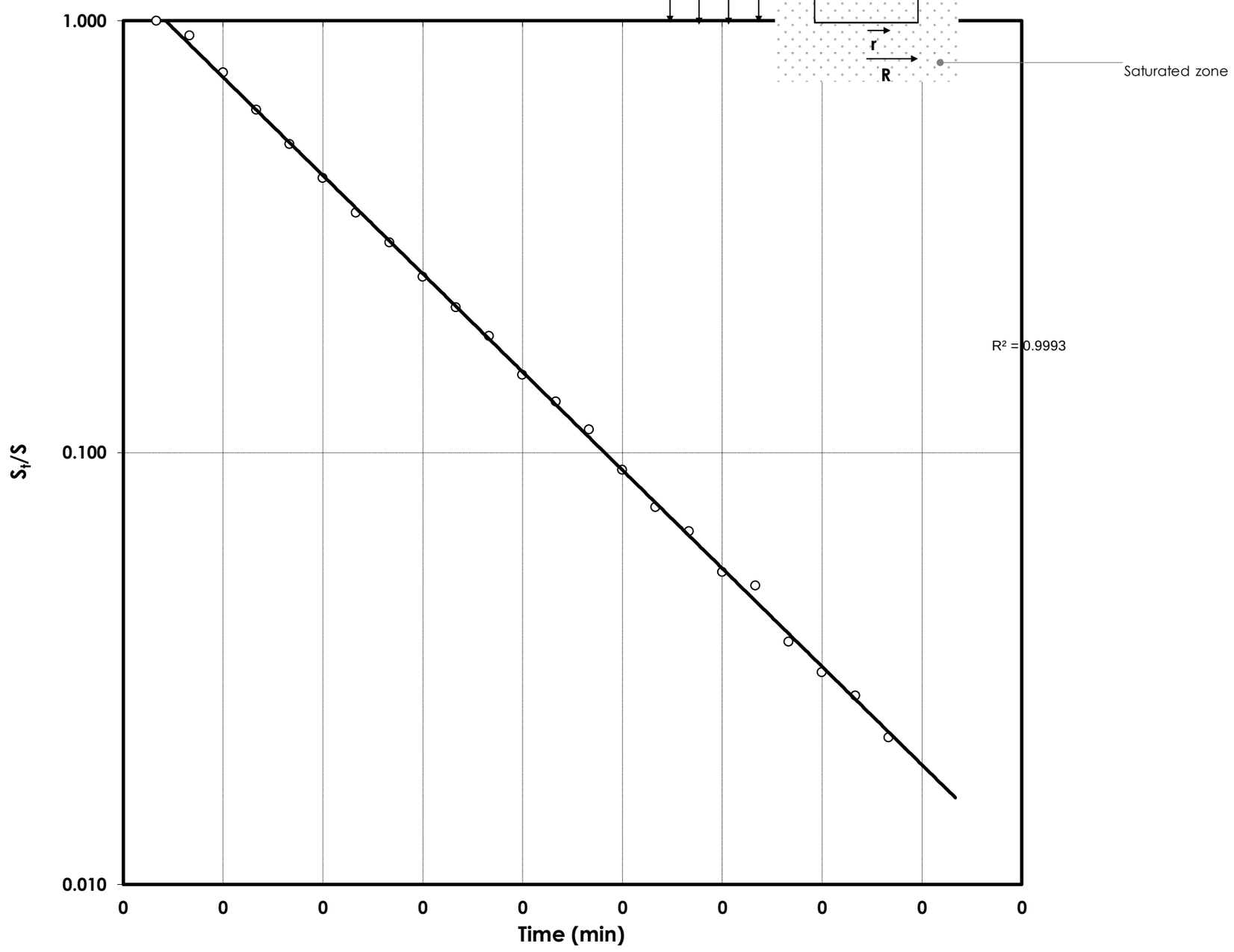

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Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

martens consulting engineers

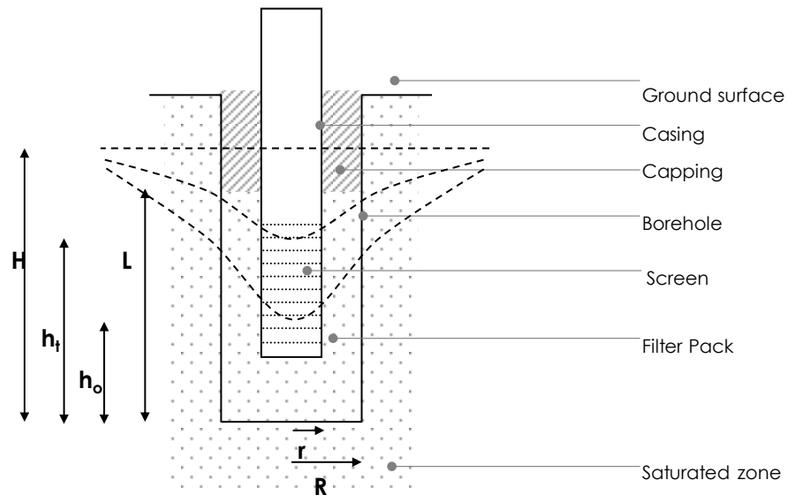
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB4**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**13.60**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**15.00**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.10**	minutes
K_{sat} - Saturated hydraulic conductivity	**13.12**	m/d



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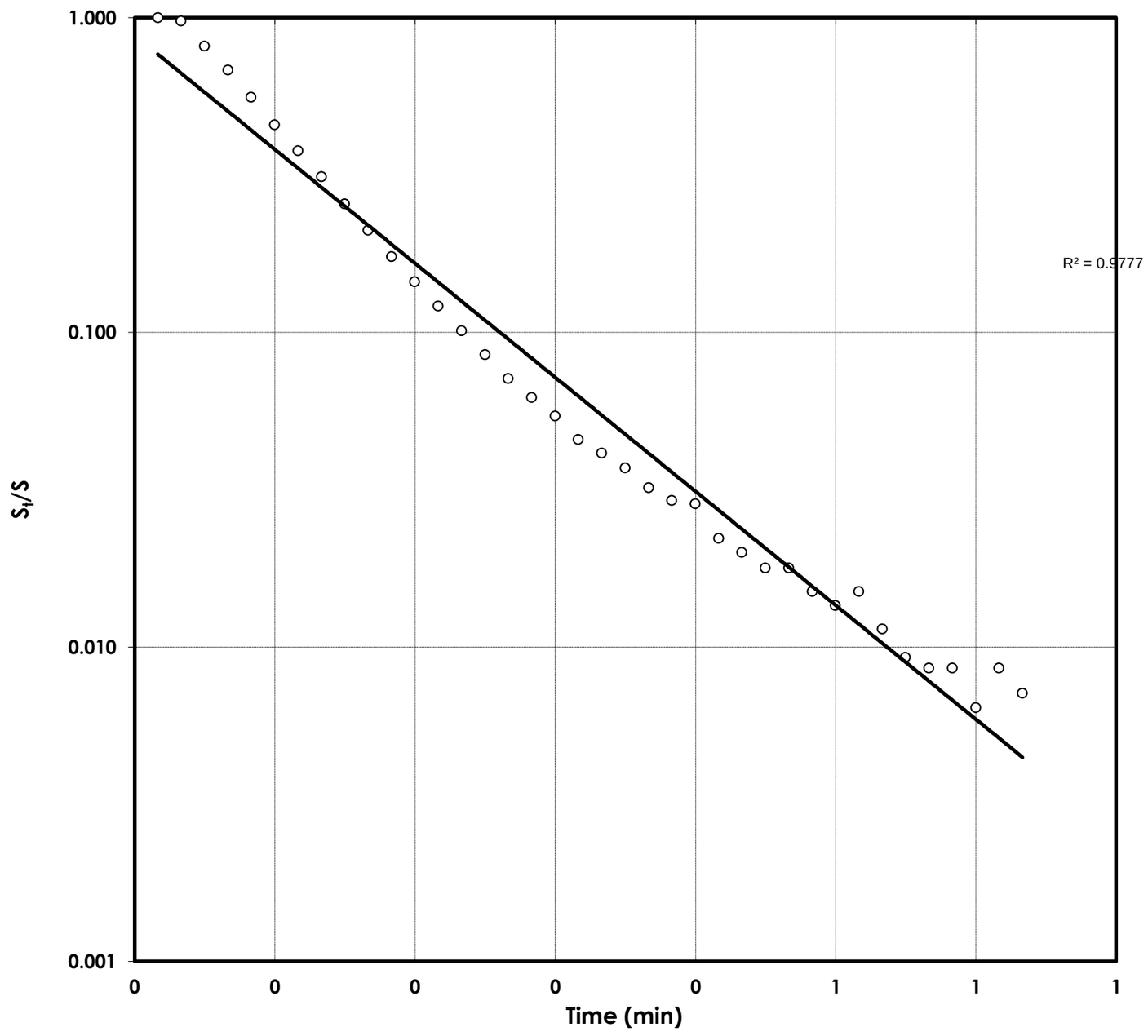

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Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

Note - logger not used. Data quality poor. Permeability probbaly higher than test indicates

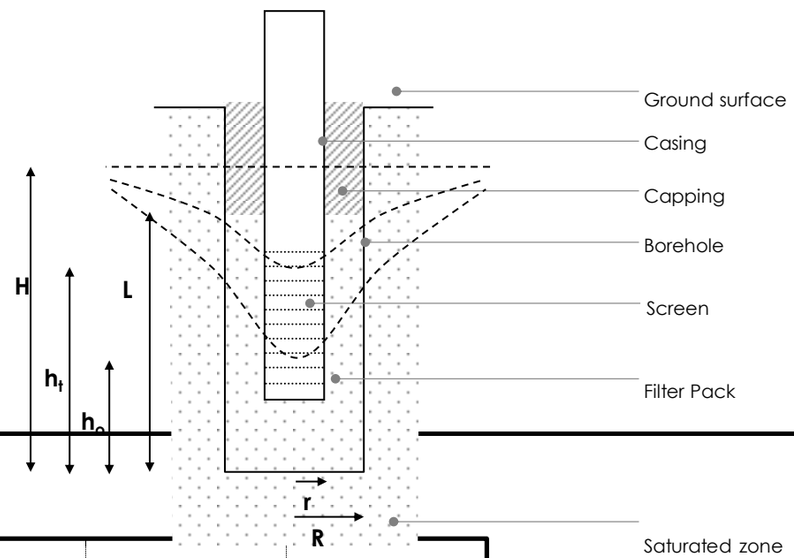
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**25.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**G. Harlow**
Borehole Ref	**GMB5 (2)**	Data Analysis	**G. Harlow**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**13.17**	mBTOP
h_o - Water level reading at time = 0 (mH2O pressure)	**14.34**	mBTOP
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.07**	minutes
K_{sat} - Saturated hydraulic conductivity	**18.42**	m/d



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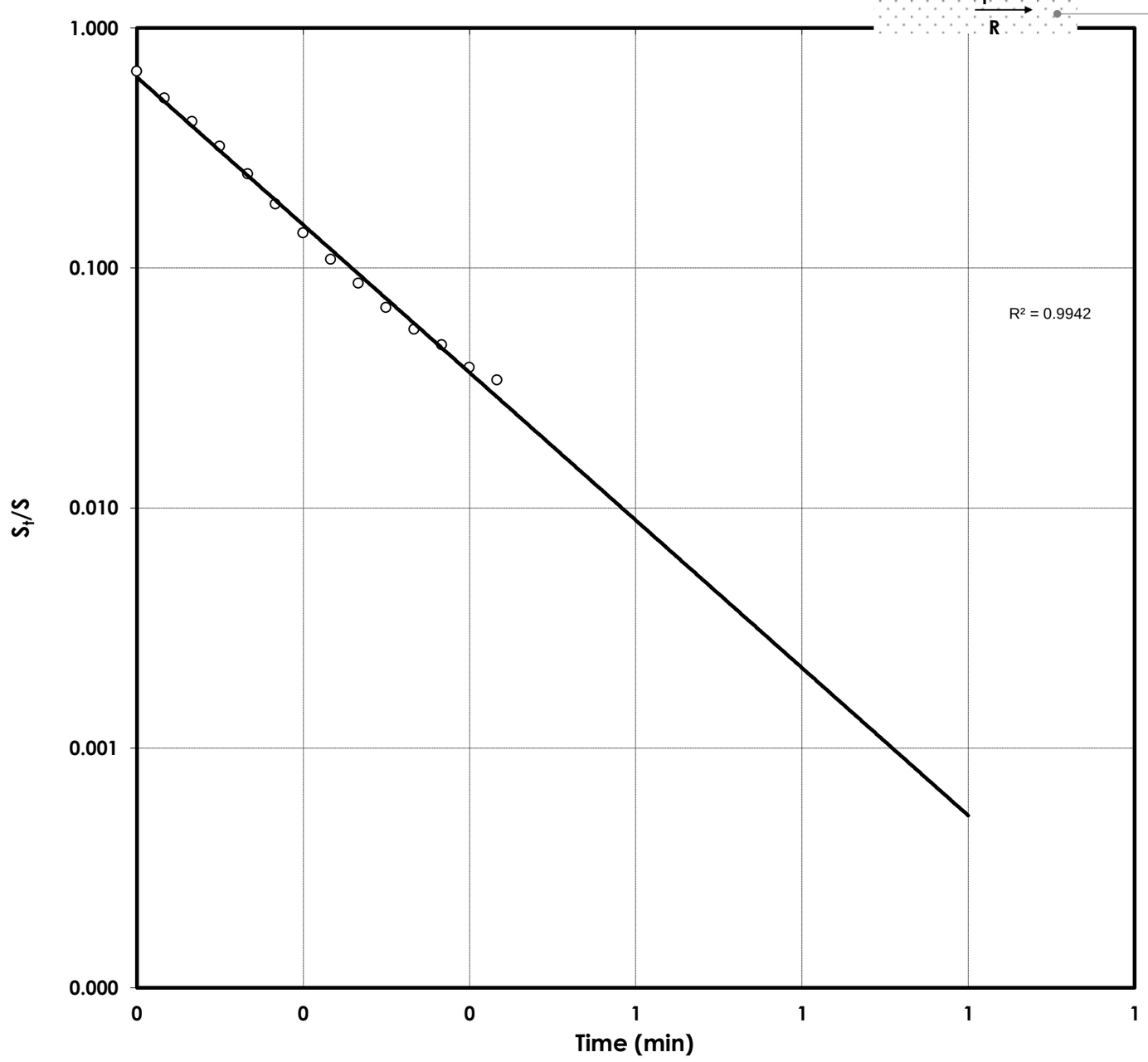

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Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

Note - logger not used. Data quality poor. Permeability probbaly higher than test indicates

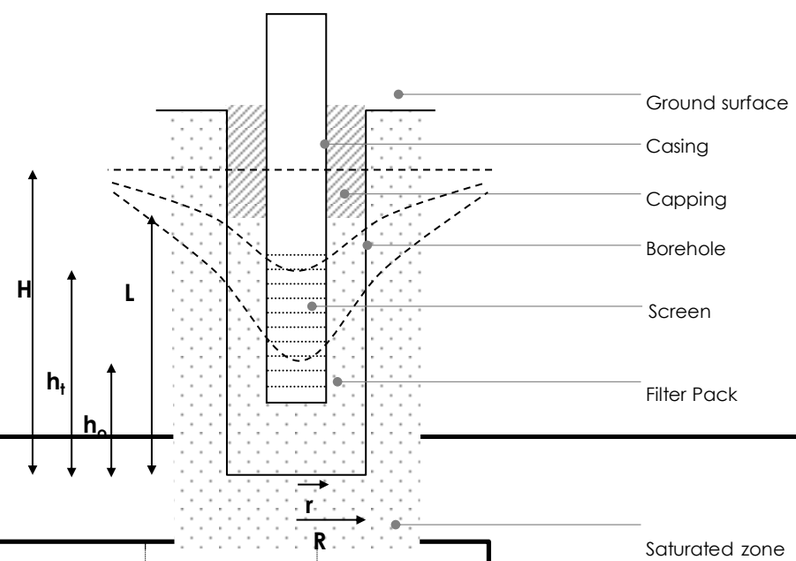
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**25.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**G. Harlow**
Borehole Ref	**GMB6 (2)**	Data Analysis	**B. Rose & G. Harlow**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**14.47**	mBTOP
h_o - Water level reading at time = 0 (mH2O pressure)	**15.17**	mBTOP
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.08**	minutes
K_{sat} - Saturated hydraulic conductivity	**16.99**	m/d



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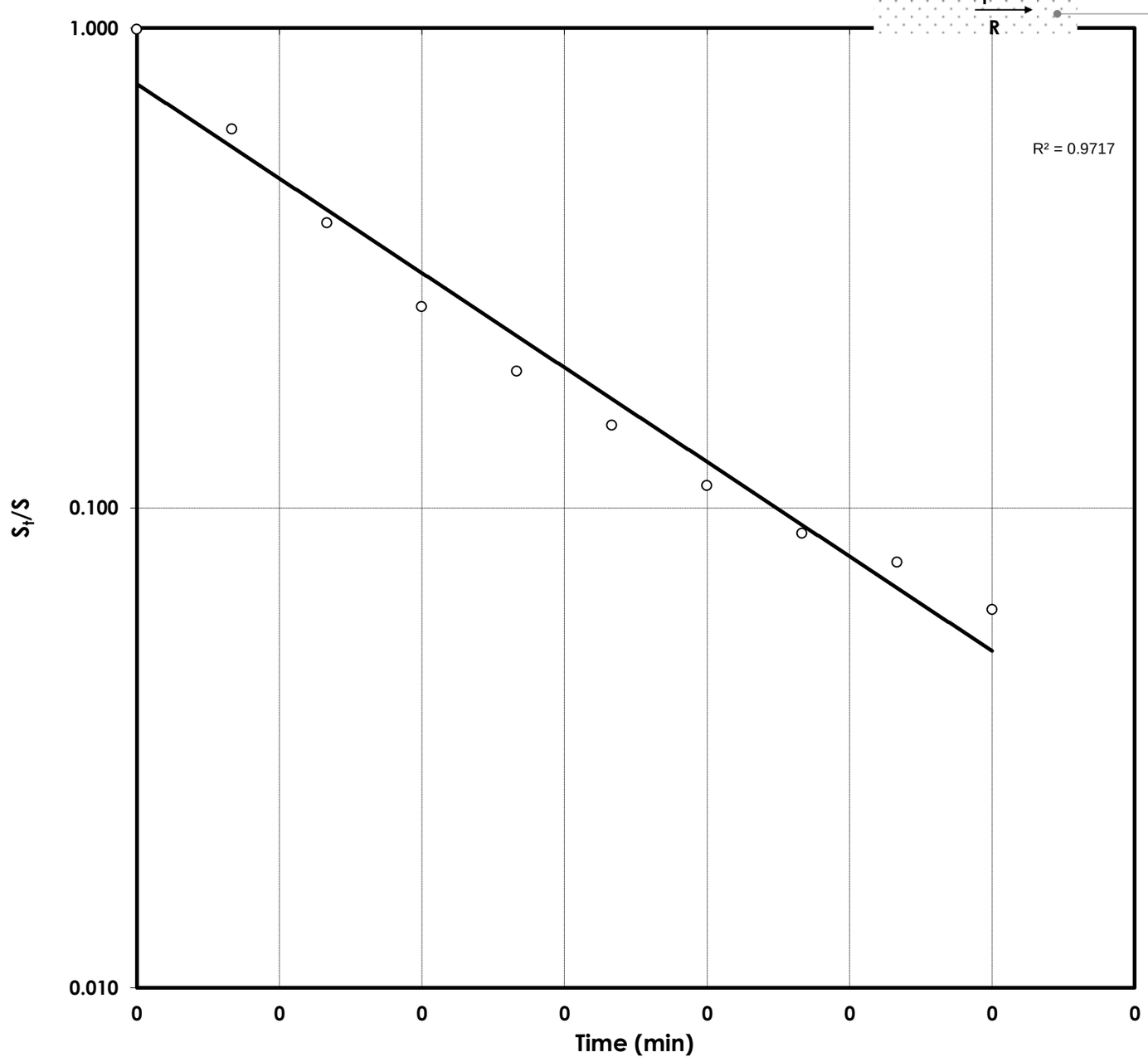

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Method ST-13 Revised 7.3.2007

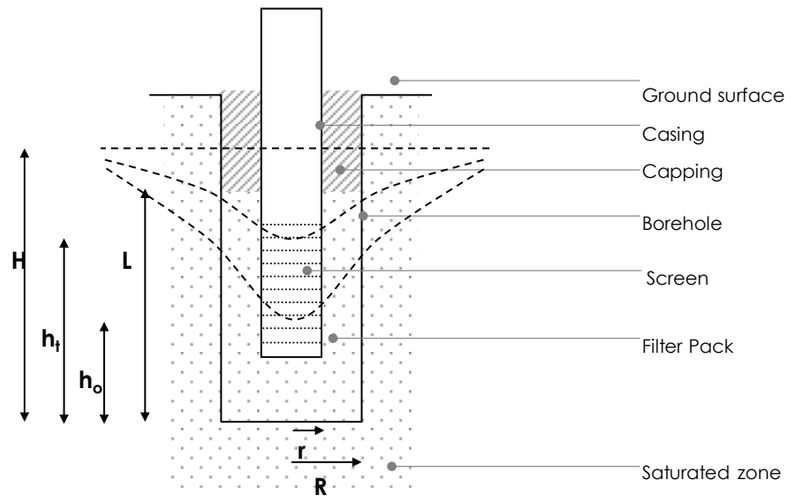
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**03.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB7**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**14.24**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**15.45**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.31**	minutes
K_{sat} - Saturated hydraulic conductivity	**4.38**	m/d



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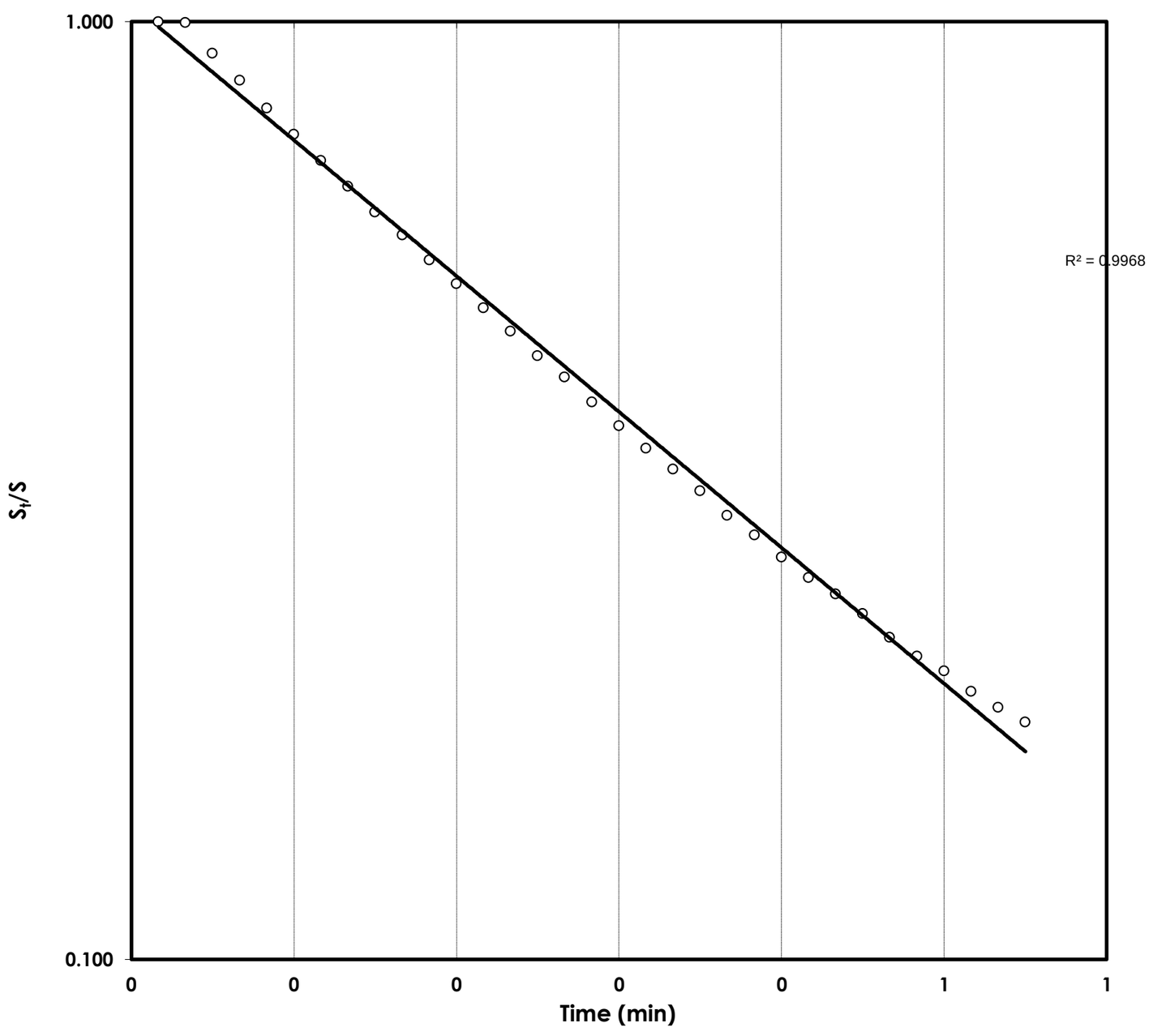

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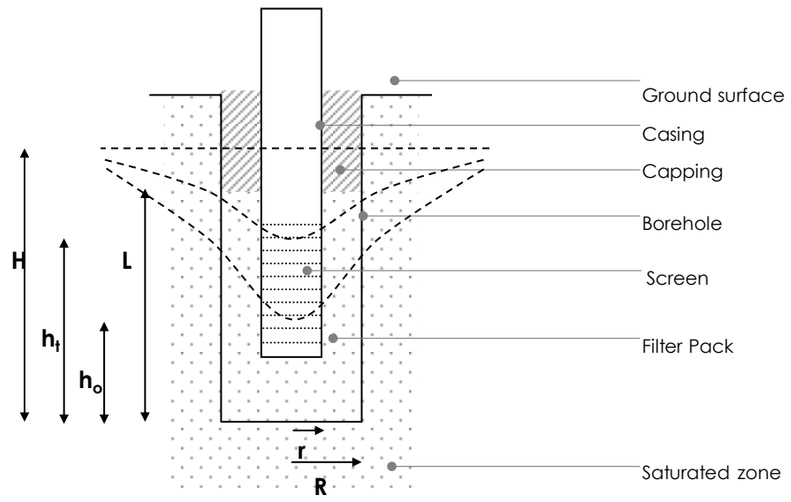
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**03.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB8**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**13.19**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**12.96**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.39**	minutes
K_{sat} - Saturated hydraulic conductivity	**3.49**	m/d



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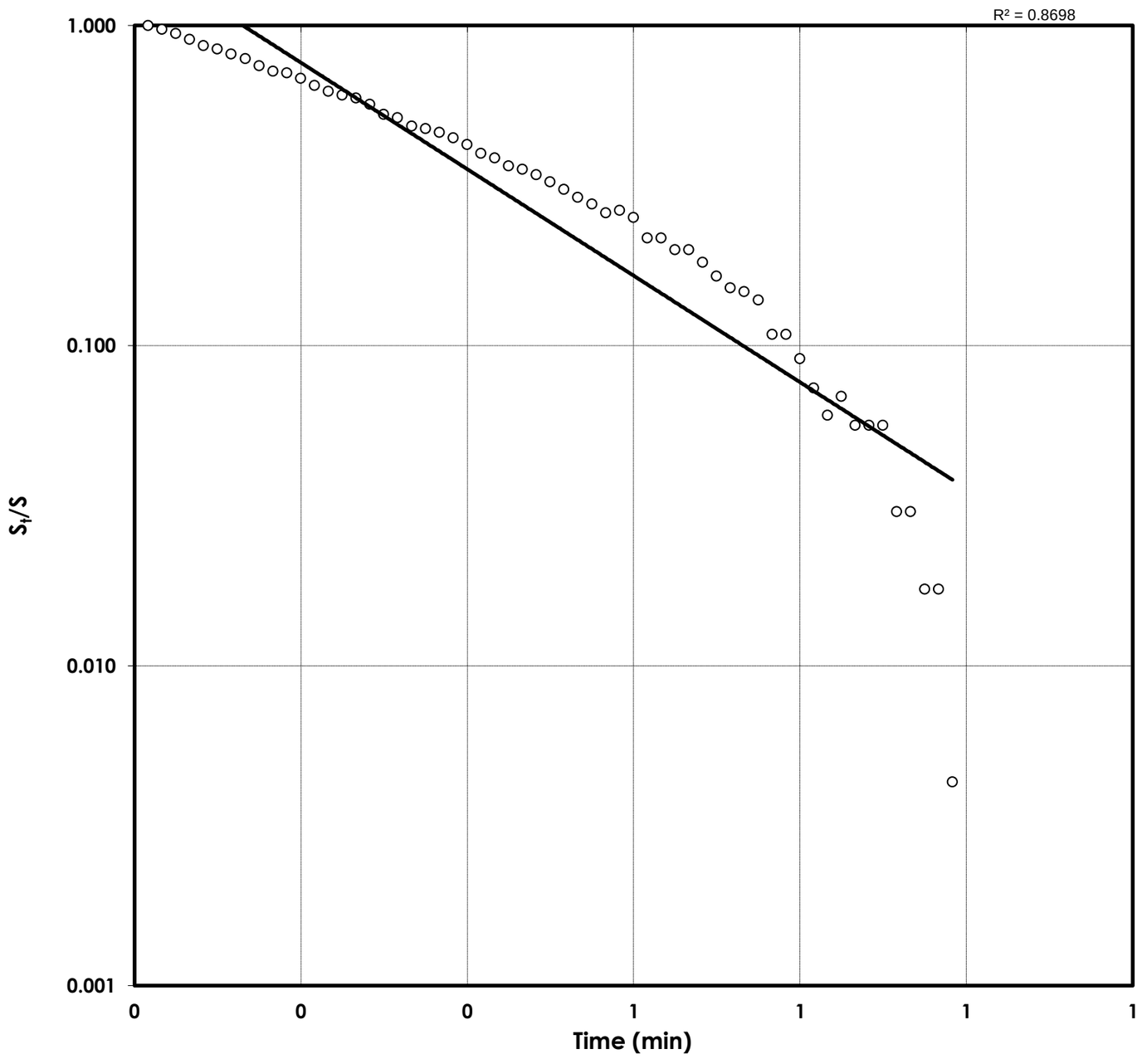

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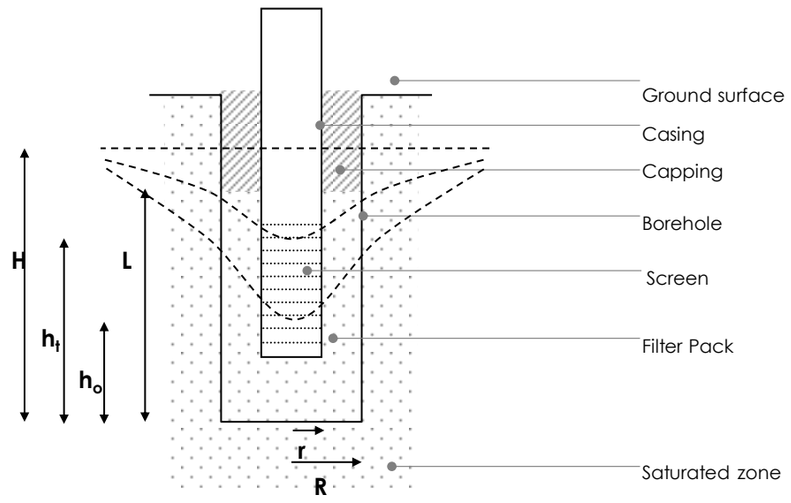
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB9**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**15.37**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**16.07**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.30**	minutes
K_{sat} - Saturated hydraulic conductivity	**4.54**	m/d



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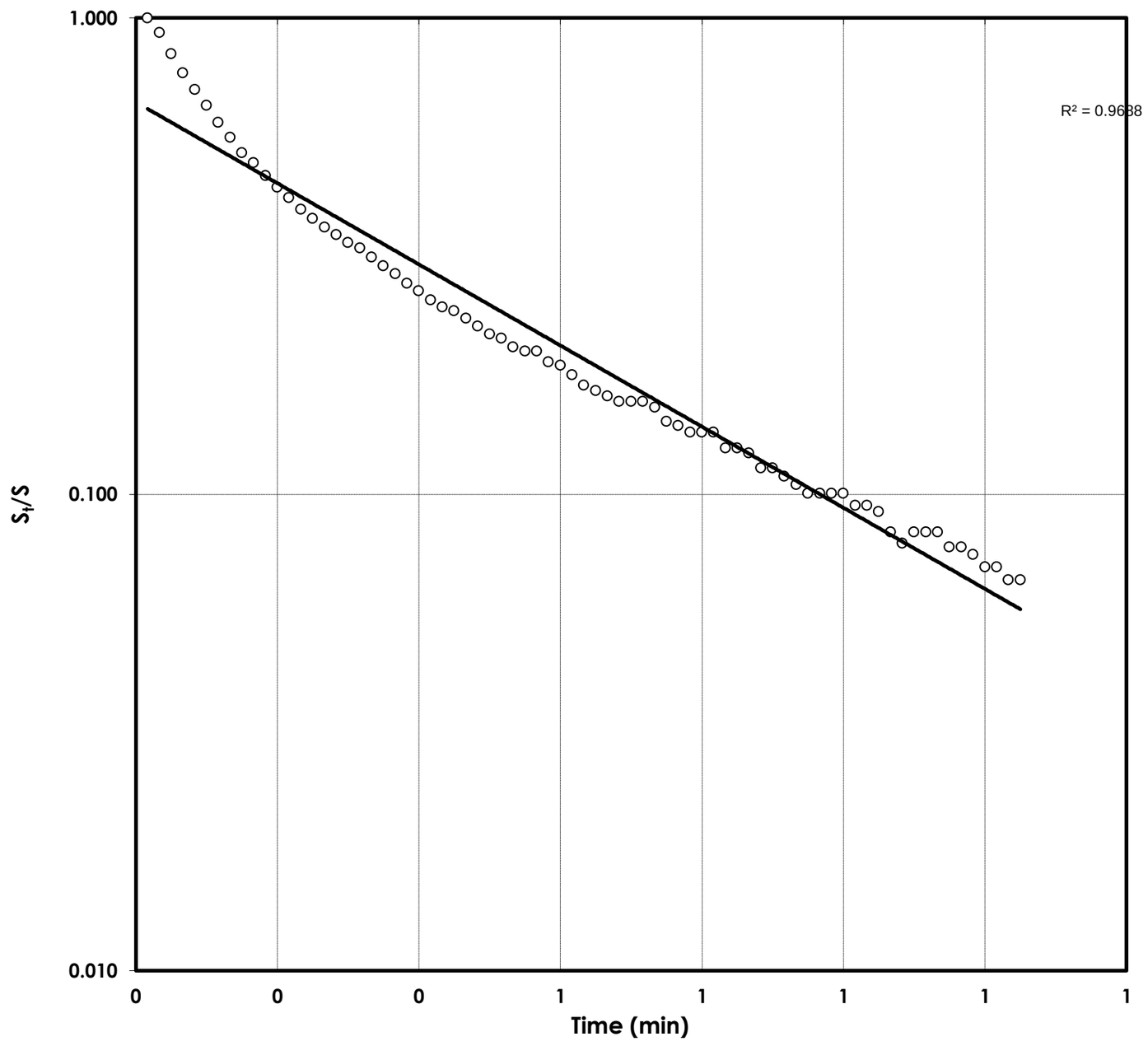

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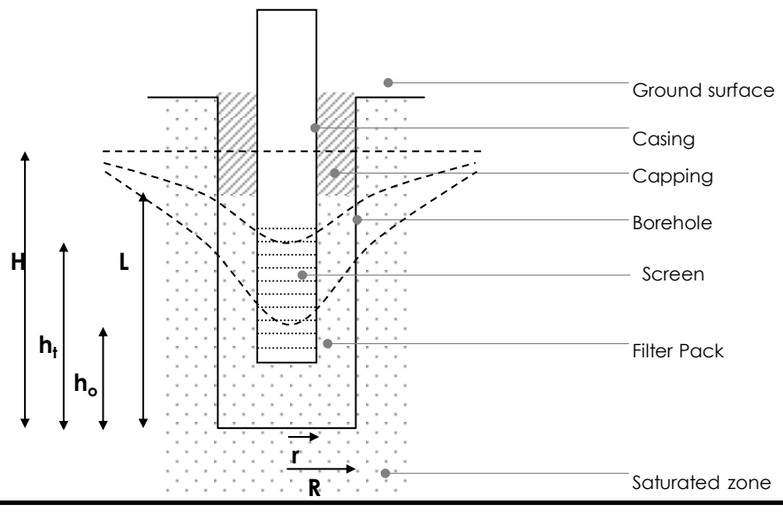
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB10**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**11.22**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**11.90**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.08**	minutes
K_{sat} - Saturated hydraulic conductivity	**16.62**	m/d



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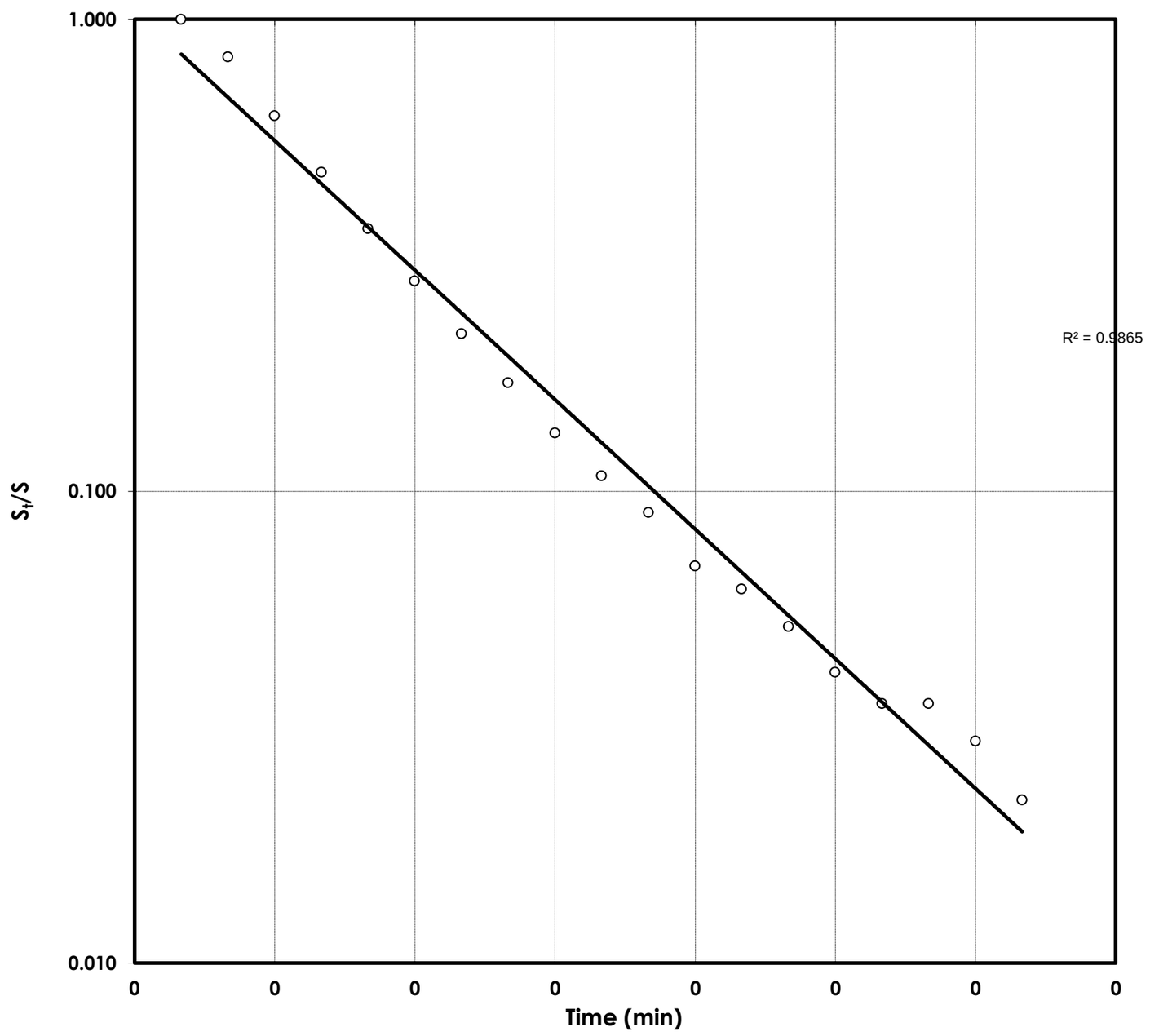

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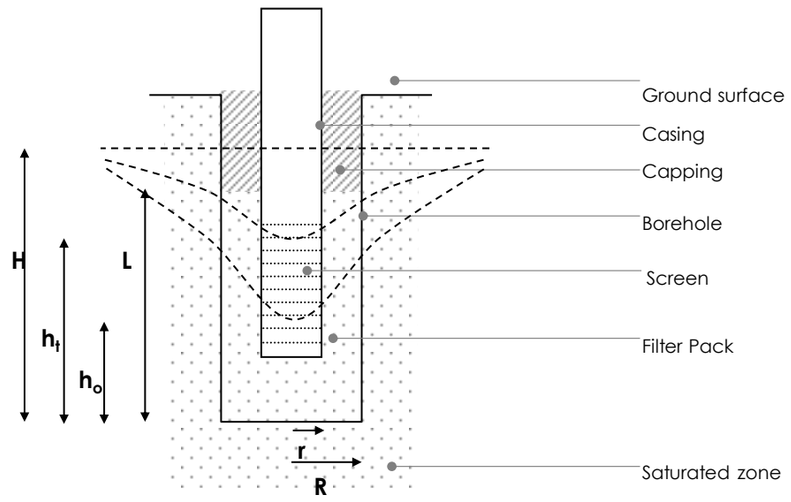
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB11**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**13.90**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**14.71**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.44**	minutes
K_{sat} - Saturated hydraulic conductivity	**3.10**	m/d



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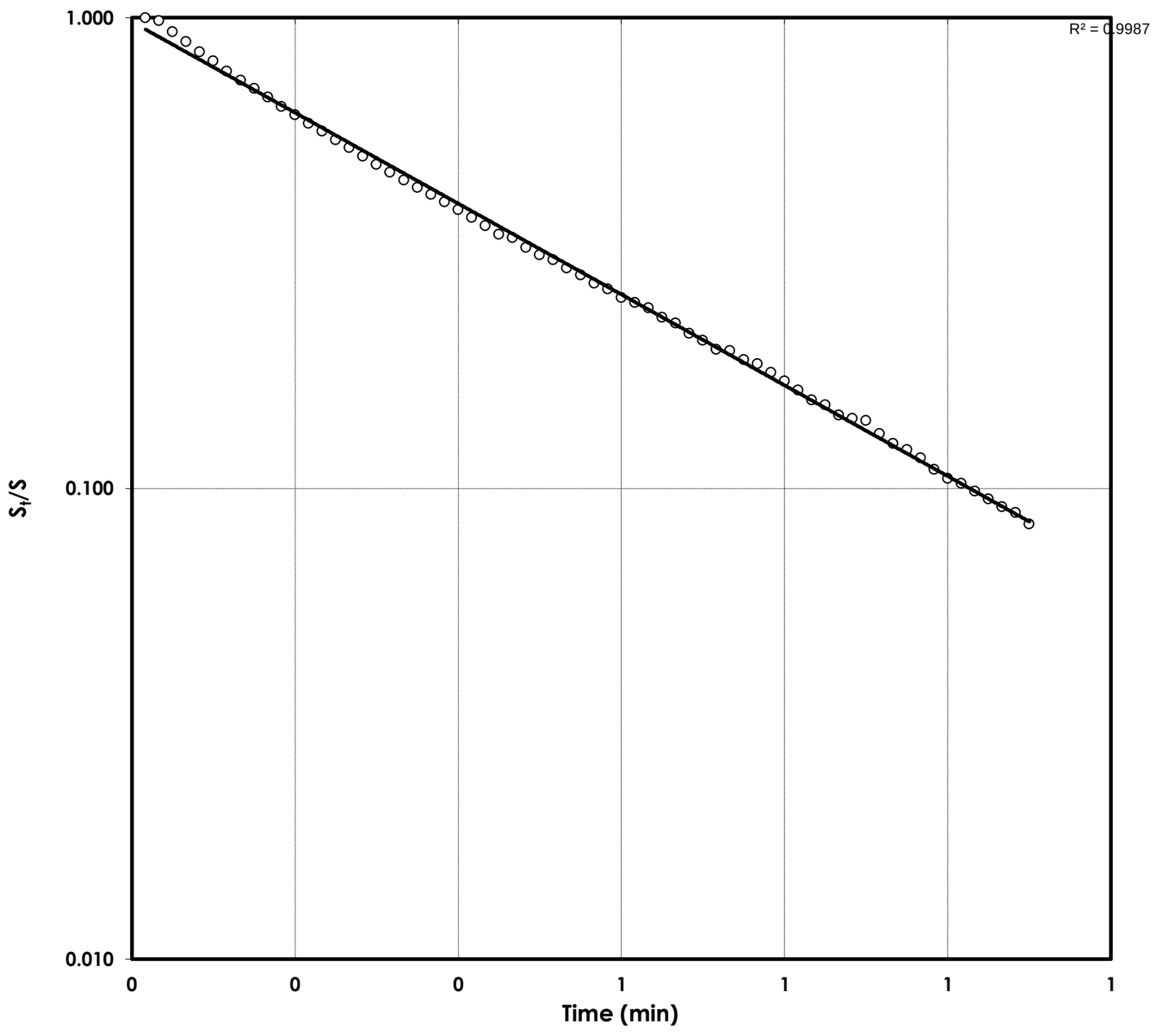

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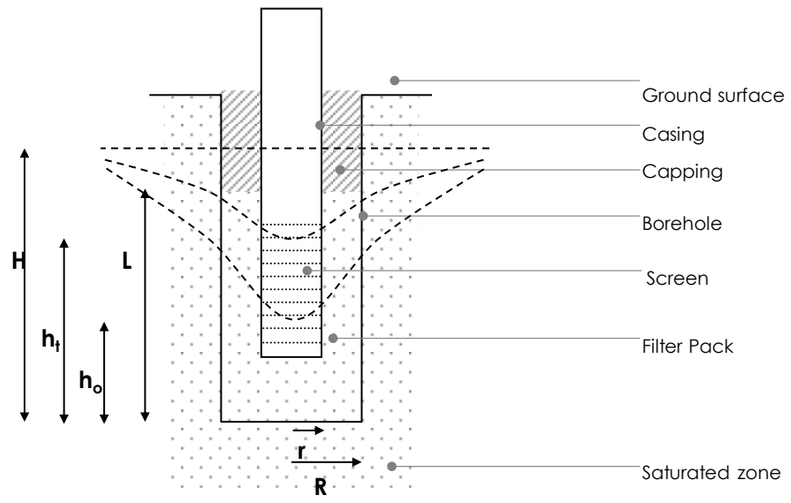
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB12**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**12.00**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**13.07**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.29**	minutes
K_{sat} - Saturated hydraulic conductivity	**4.77**	m/d



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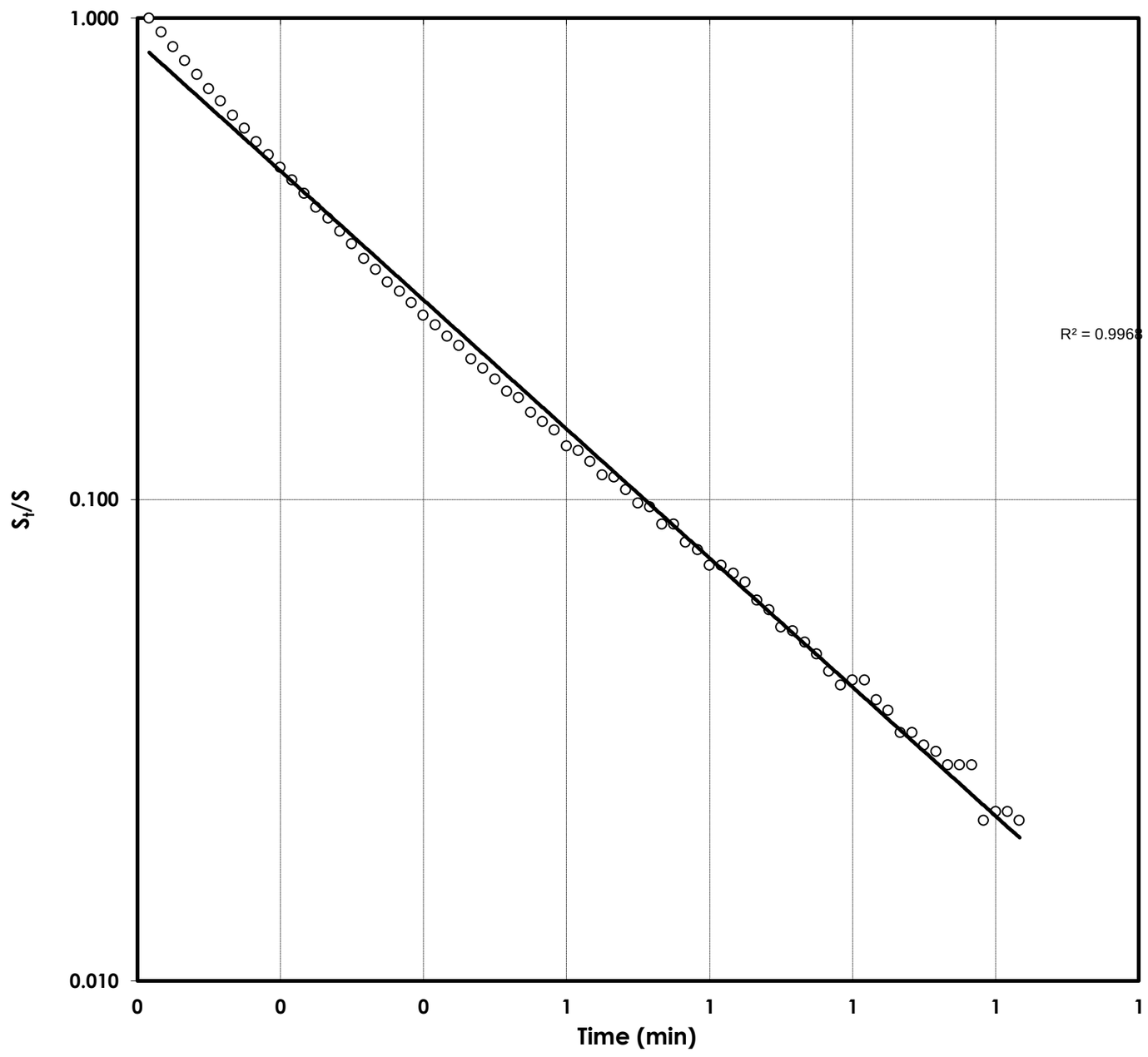

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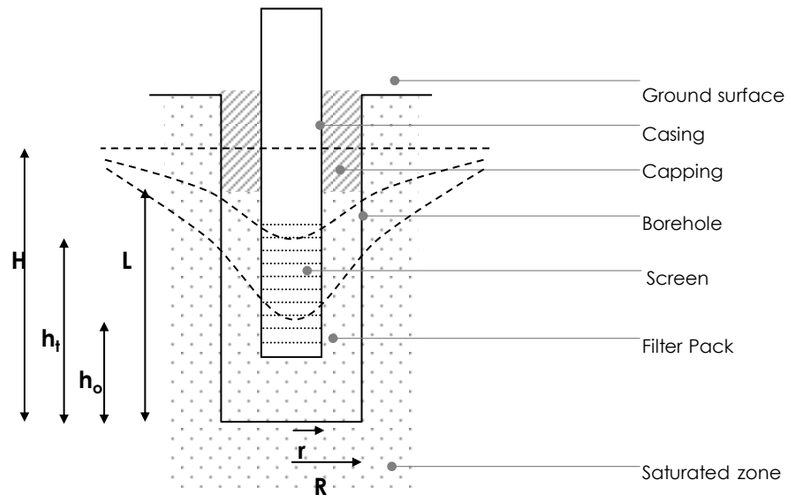
PROJECT DETAILS

Project	P902346 - Riverside	Test Date	04.09.12
Project Ref	P902346JS31V01	Field Testing	B. Rose and G. Harlow
Borehole Ref	GMB21	Data Analysis	B. Rose
Method	Hvorslev (1981)	Reviewed	Dr D. Martens

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	12.11	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	13.27	mH2O
r - Casing radius	0.030	m
R - Bore radius	0.030	m
L - Length of open screen	2.00	m
T_o - Length of characteristic time	0.14	minutes
K_{sat} - Saturated hydraulic conductivity	9.78	m/d



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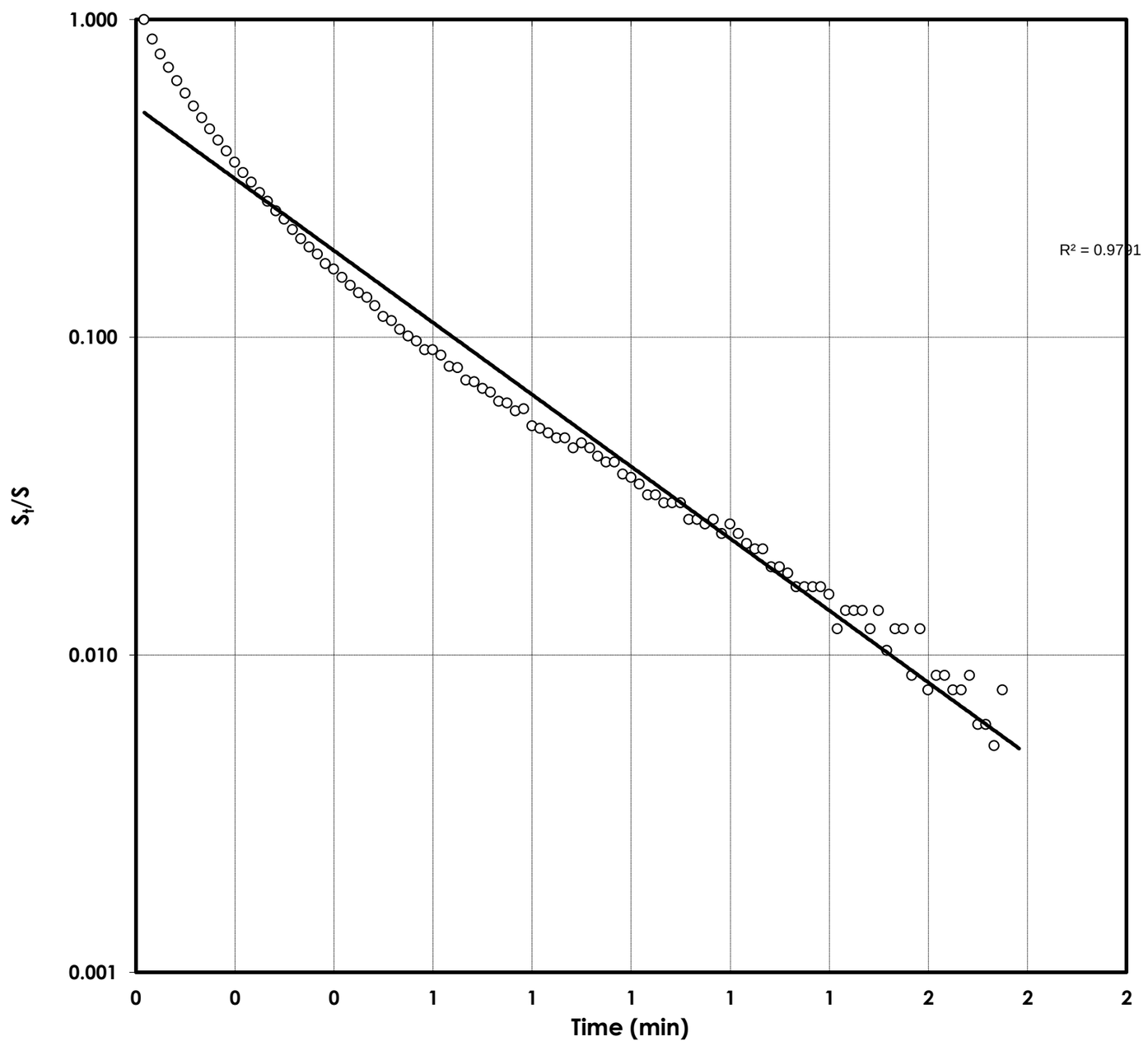

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Method ST-13 Revised 7.3.2007

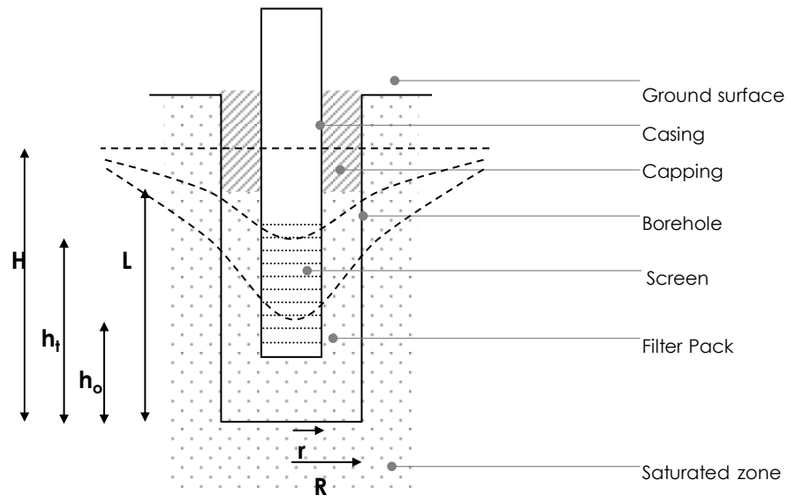
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB22**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**12.04**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**13.20**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.20**	minutes
K_{sat} - Saturated hydraulic conductivity	**6.70**	m/d



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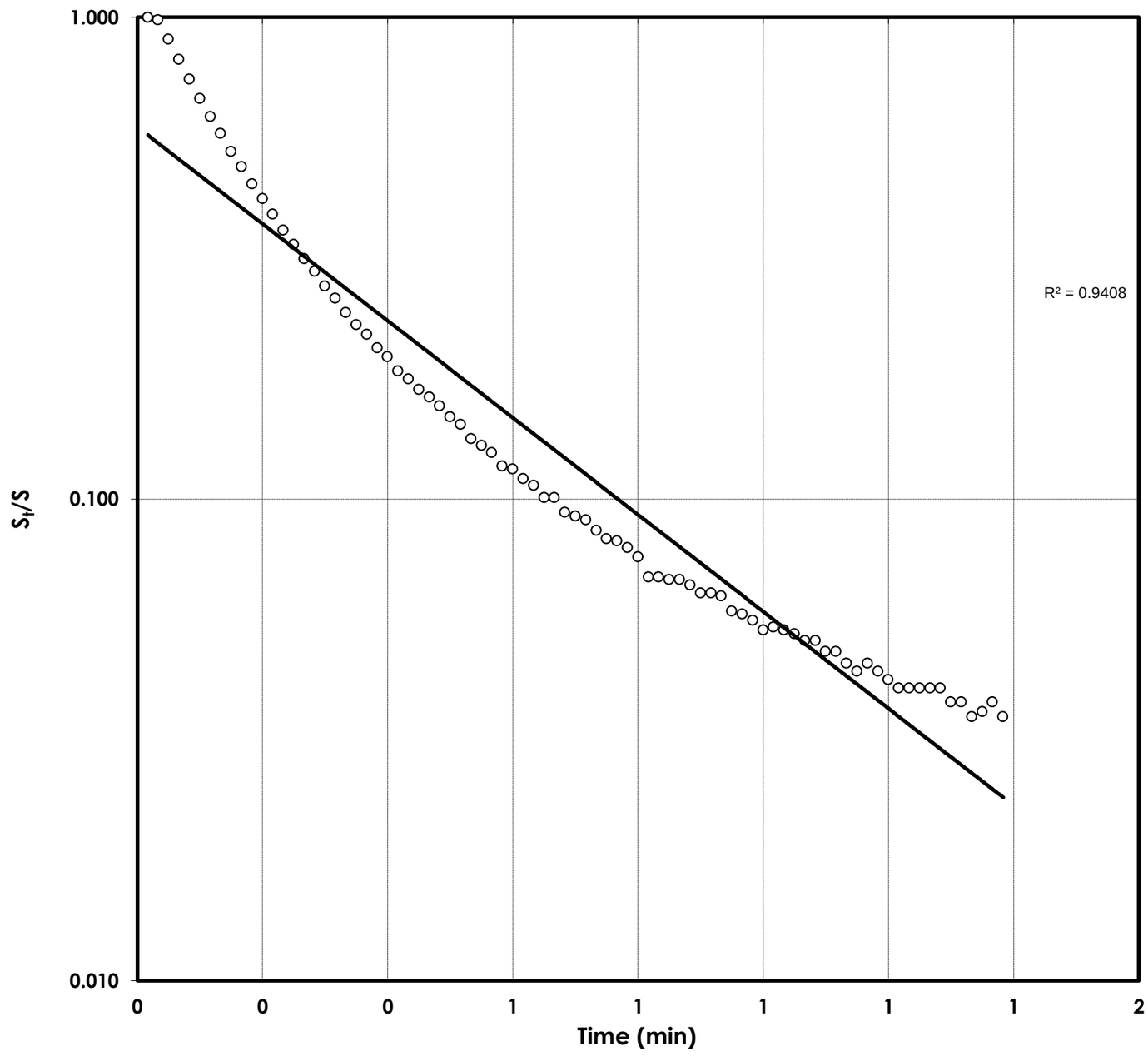

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Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

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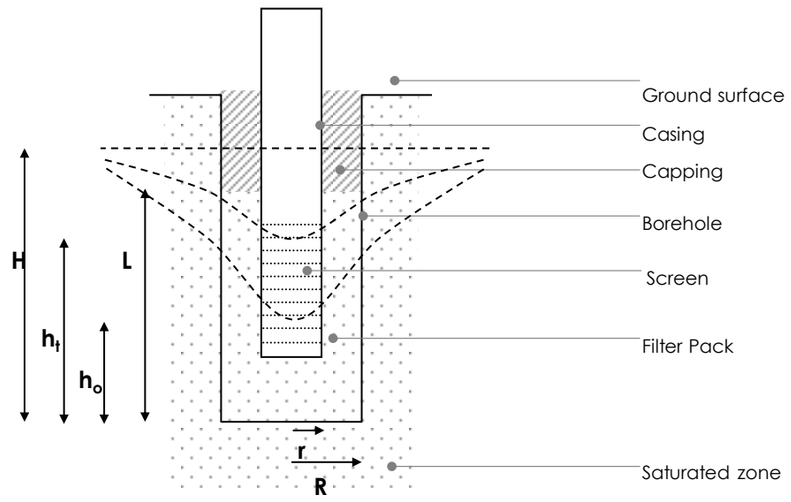
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB23**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**12.14**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**13.04**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.16**	minutes
K_{sat} - Saturated hydraulic conductivity	**8.60**	m/d



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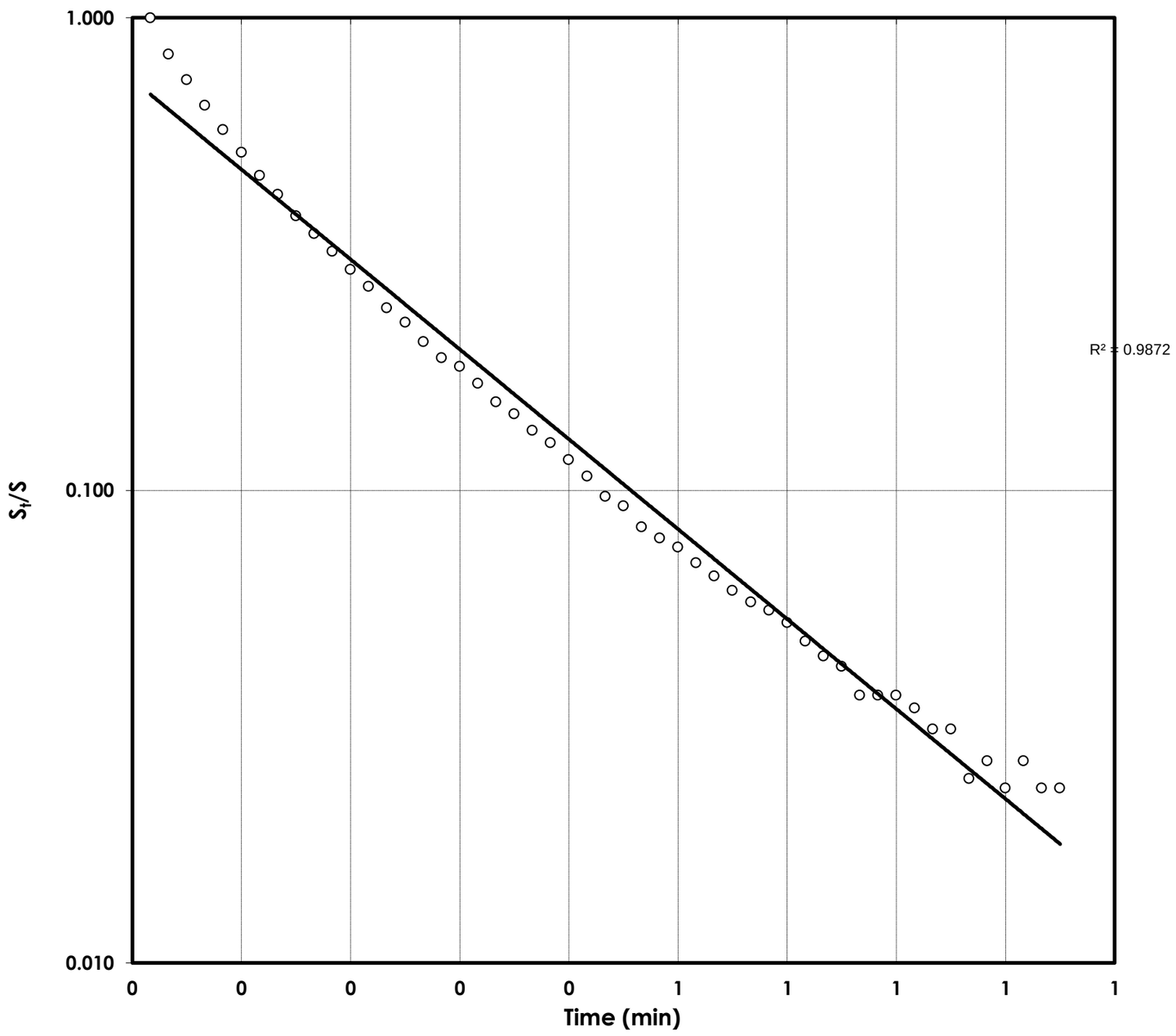

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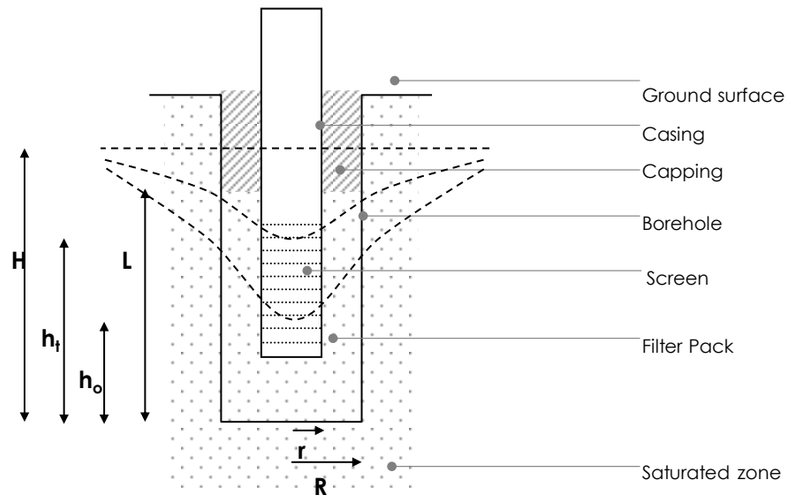
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB24**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**11.84**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**13.01**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**2.00**	m
T_o - Length of characteristic time	**0.15**	minutes
K_{sat} - Saturated hydraulic conductivity	**8.94**	m/d



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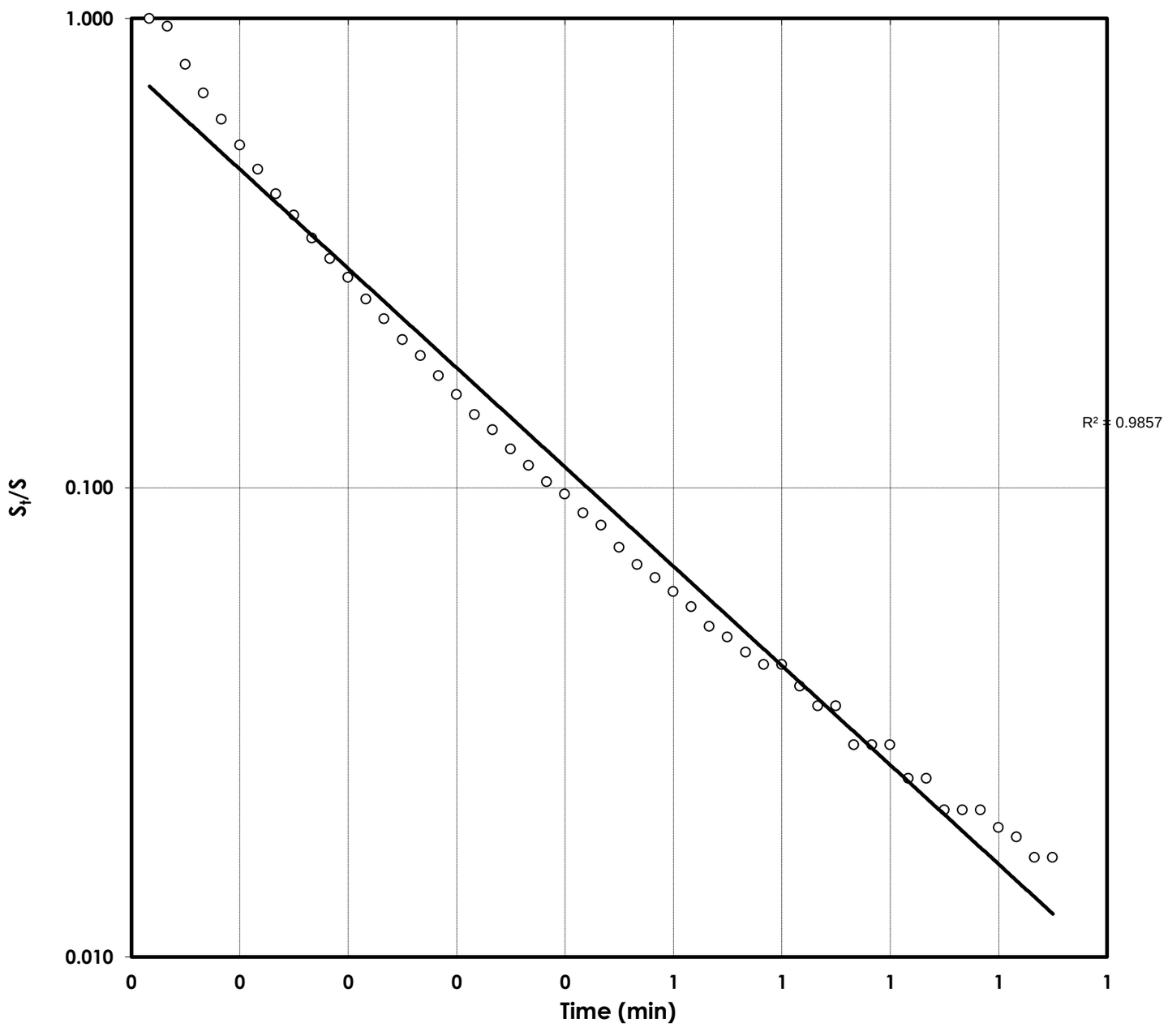

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Method ST-13 Revised 7.3.2007

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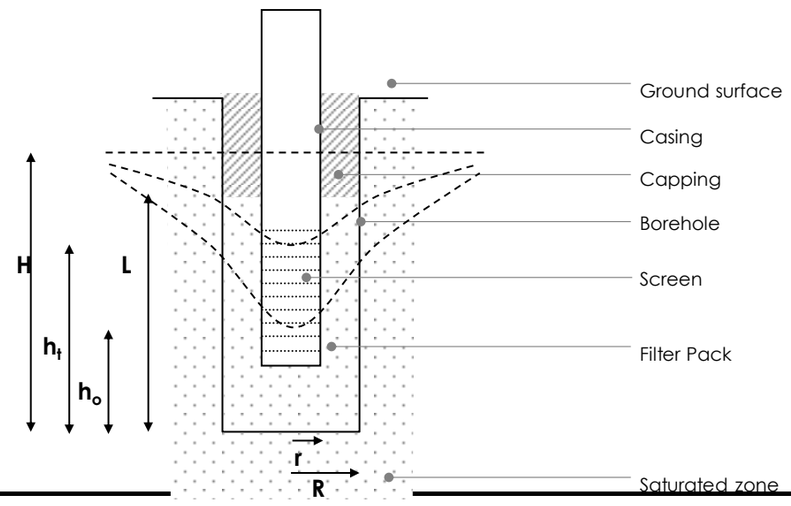
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**04.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**B. Rose and G. Harlow**
Borehole Ref	**GMB25**	Data Analysis	**B. Rose**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

FIELD TEST DATA

Screened material - clay

FACTOR	Enter Data	Unit
H - Initial water level reading (mH2O pressure)	**11.65**	mH2O
h_o - Water level reading at time = 0 (mH2O pressure)	**13.42**	mH2O
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**1.00**	m
T_o - Length of characteristic time	**0.64**	minutes
K_{sat} - Saturated hydraulic conductivity	**3.55**	m/d



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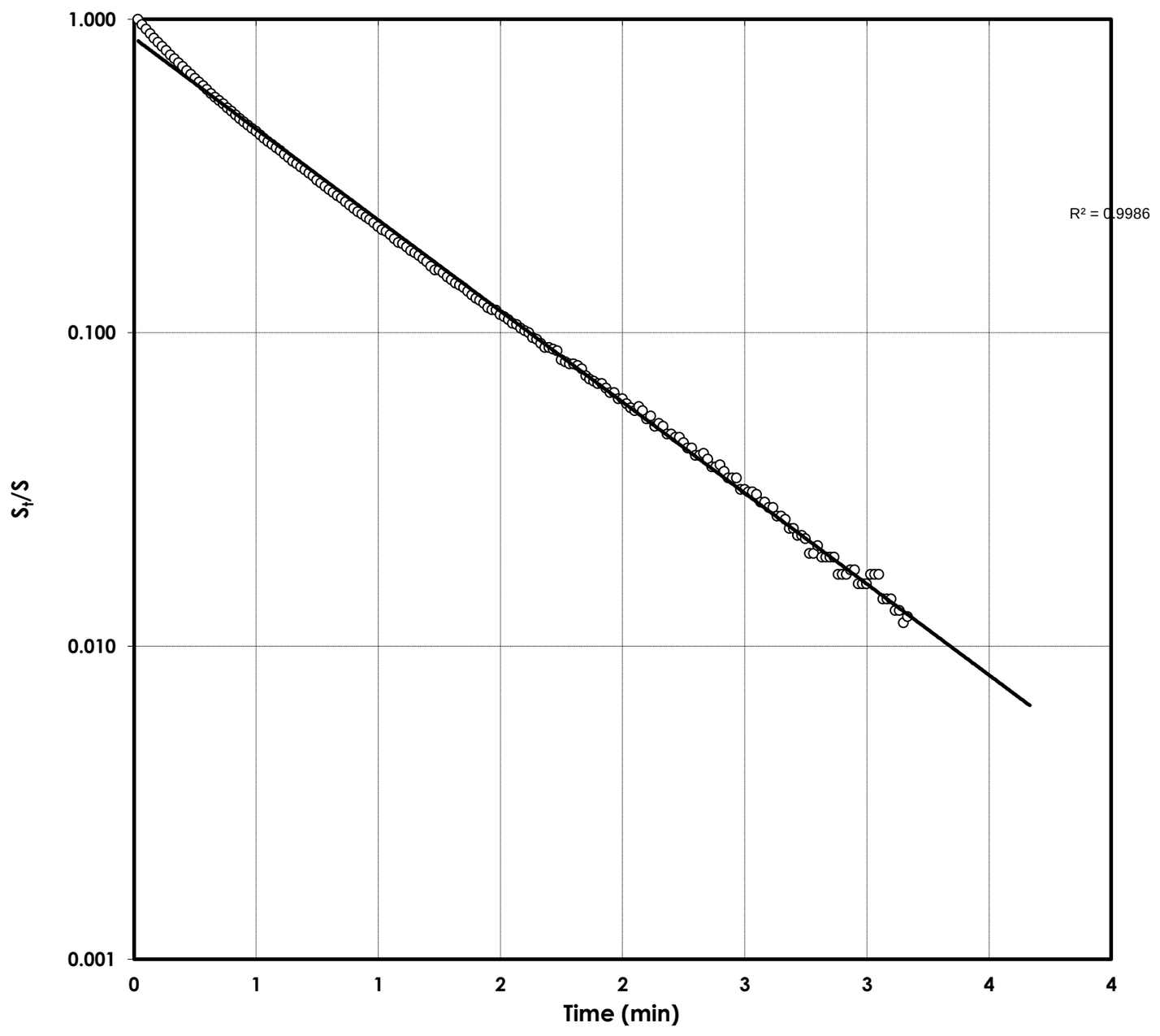

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Note - logger not used. Data quality poor. Permeability probbaly higher than test indicates

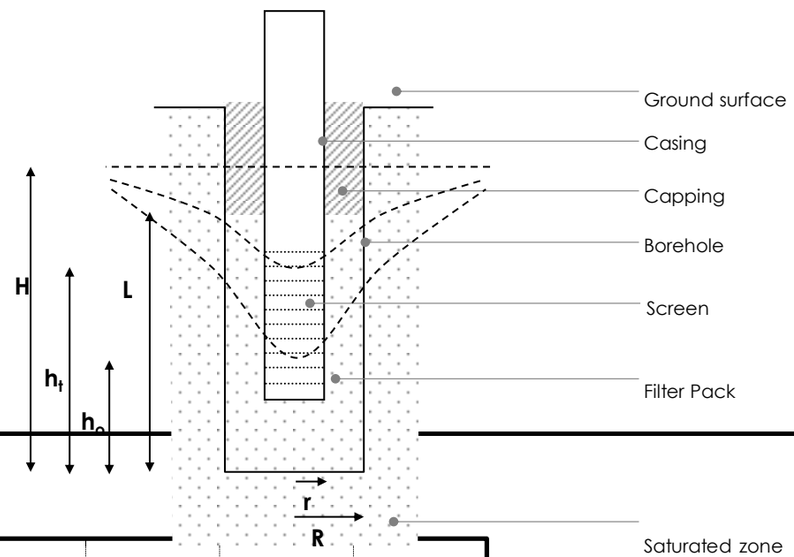
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**26.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**G. Harlow**
Borehole Ref	**GMB201 (2)**	Data Analysis	**G. Harlow**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

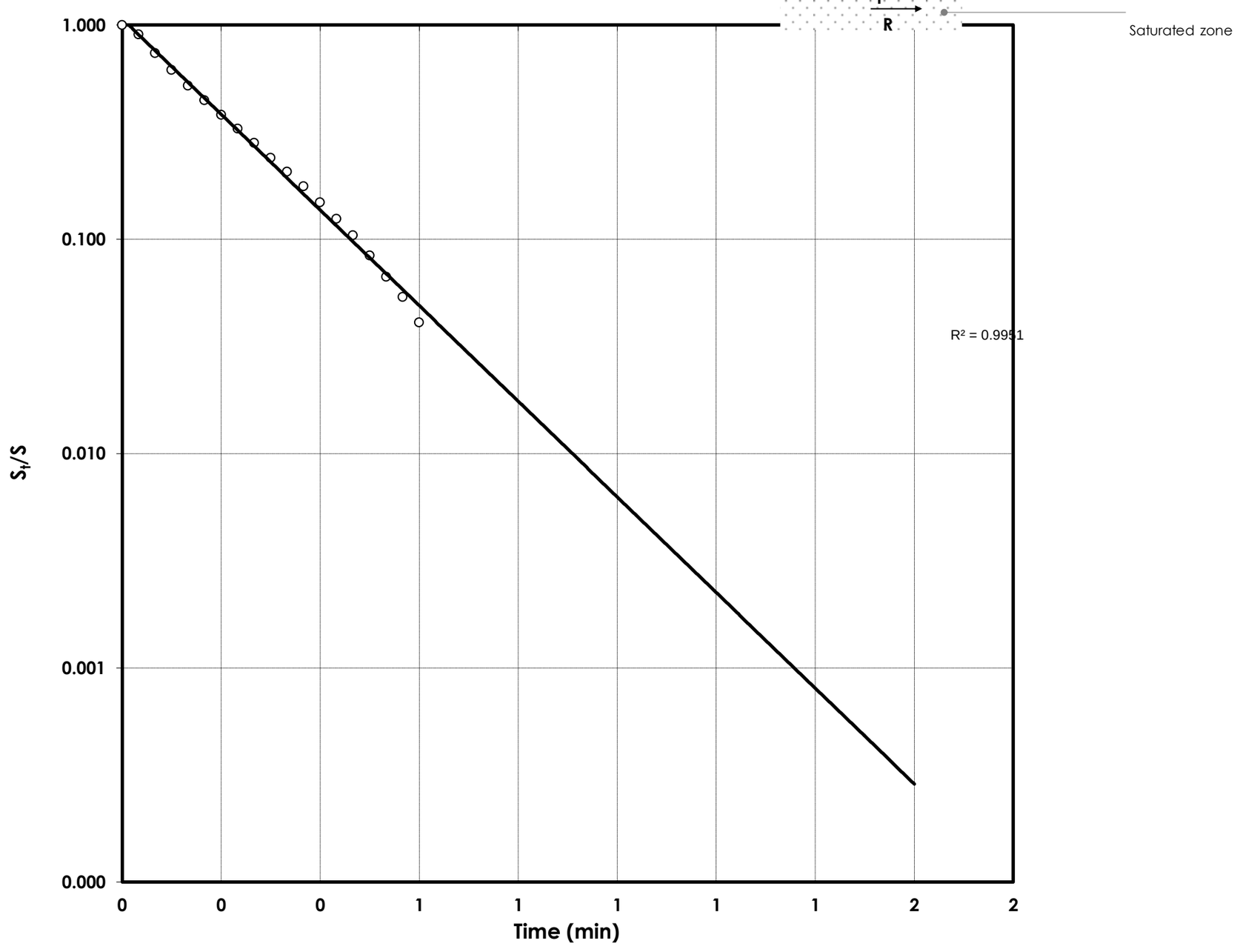
FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**13.91**	mBTOP
h_o - Water level reading at time = 0 (mH2O pressure)	**14.84**	mBTOP
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**3.00**	m
T_o - Length of characteristic time	**0.21**	minutes
K_{sat} - Saturated hydraulic conductivity	**4.81**	m/d



DATA PLOT



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Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

Note - logger not used. Data quality poor. Permeability probbaly higher than test indicates

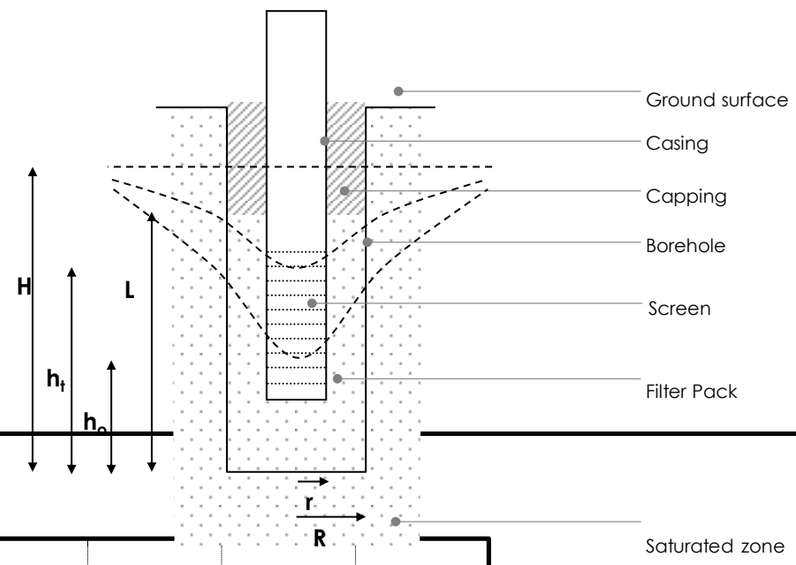
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**26.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**G. Harlow**
Borehole Ref	**GMB202 (2)**	Data Analysis	**G. Harlow**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

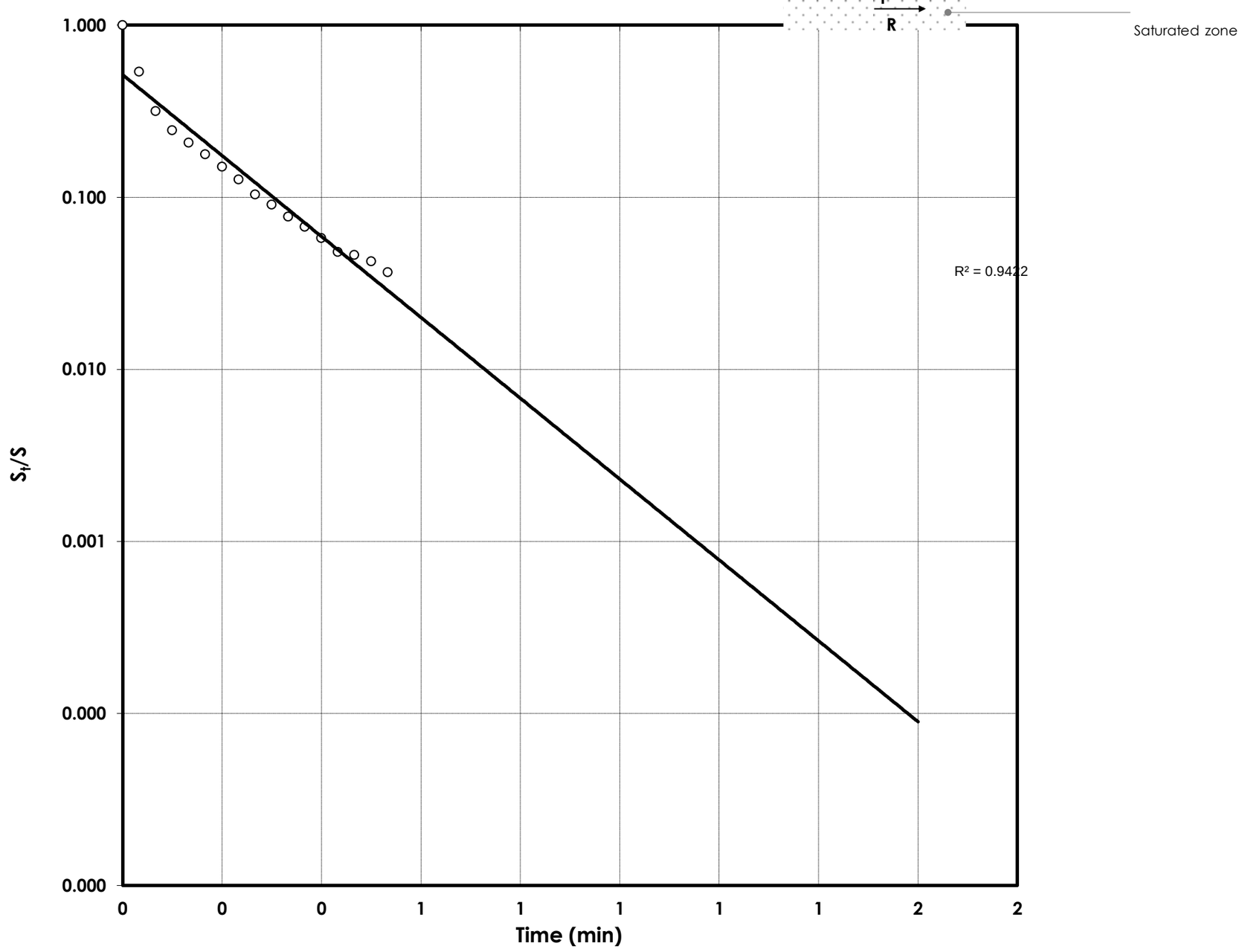
FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**13.07**	mBTOP
h_o - Water level reading at time = 0 (mH2O pressure)	**13.59**	mBTOP
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**3.00**	m
T_o - Length of characteristic time	**0.06**	minutes
K_{sat} - Saturated hydraulic conductivity	**16.33**	m/d



DATA PLOT



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Single Bore Slug Test (Rising or Falling)

Method ST-13 Revised 7.3.2007

Note - logger not used. Data quality poor. Permeability probbaly higher than test indicates

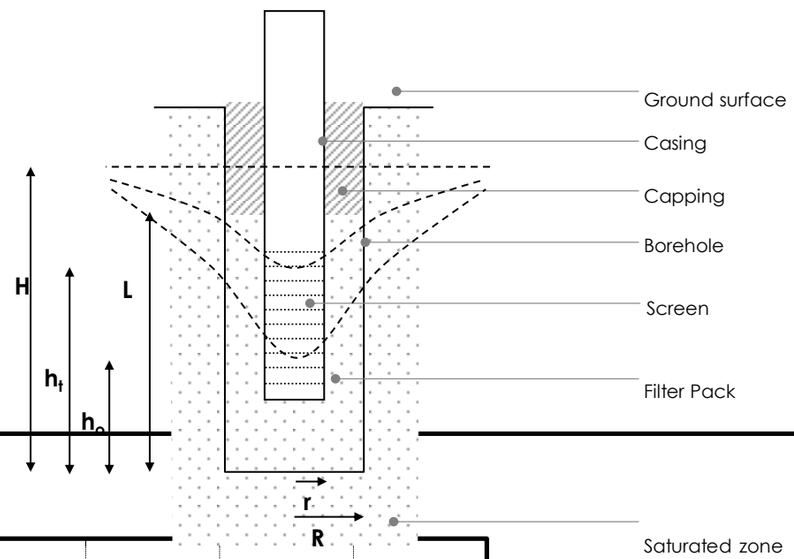
PROJECT DETAILS

Project	**P902346 - Riverside**	Test Date	**26.09.12**
Project Ref	**P902346JS31V01**	Field Testing	**G. Harlow**
Borehole Ref	**GMB203**	Data Analysis	**G. Harlow**
Method	**Hvorslev (1981)**	Reviewed	**Dr D. Martens**

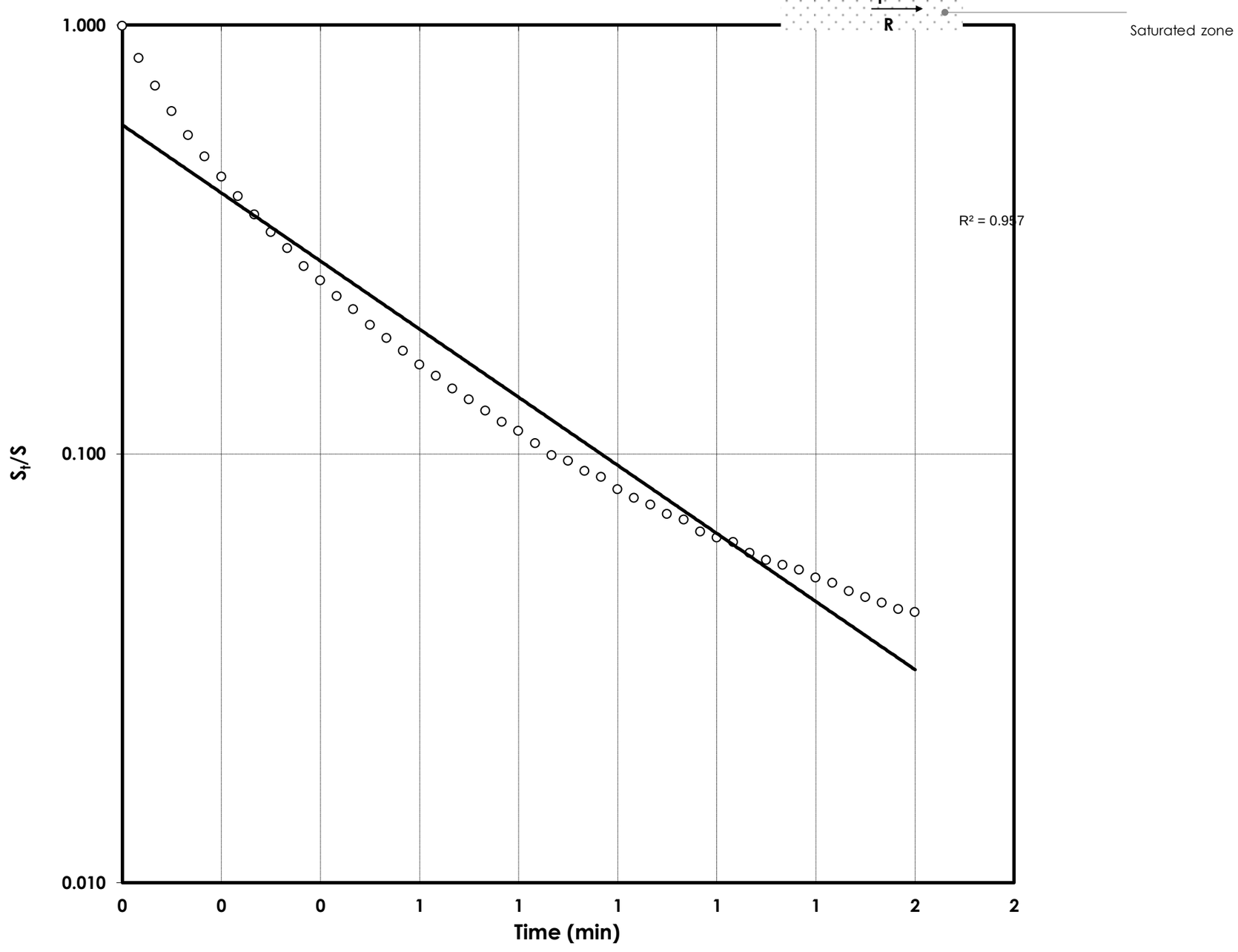
FIELD TEST DATA

Screened material - clay

FACTOR	**Enter Data**	**Unit**
H - Initial water level reading (mH2O pressure)	**13.76**	mBTOP
h_o - Water level reading at time = 0 (mH2O pressure)	**15.14**	mBTOP
r - Casing radius	**0.030**	m
R - Bore radius	**0.030**	m
L - Length of open screen	**3.00**	m
T_o - Length of characteristic time	**0.25**	minutes
K_{sat} - Saturated hydraulic conductivity	**3.97**	m/d



DATA PLOT



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24 Attachment 7 – Concept Drainage Layout Design and Flood Assessment (Tattersall Lander Pty Ltd)