

**APPENDIX C**  
**HYDROGEOLOGY AND GROUNDWATER CHEMISTRY DATA**

## GROUNDWATER TESTING

Attention: Angela Karsch

AMDEL LIMITED  
99 Mitchell Road  
CARDIFF NSW 2285

*E-mail To:*  
akarsch@amdel.com  
*cc:* enviro\_sydney@amdel.com

## CERTIFICATE OF ANALYSIS

**Report No:** S 06043931 sh                      **Report Date:** 4 October 2006  
**Date Received:** 28 September 2006                      **Date Tested:** 28 September 2006  
**Standing Order:** S046575

### RESULTS

**Sample Description**                                      **Order No.**  
Water Samples – 27.9.06                                      6E3092

Sample Description	Thermotolerant Coliforms CFU per 100ml M12.2	Coliforms CFU per 100ml M12.1	<i>E.coli</i> CFU per 100ml M12.2
SN: HQ1	2,400	3,000	800
SN: HQ2	90 (est)	3,700	90 (est)
SN: HQ3	320	3,000	320
SN: HQ4	60 (est)	2,600	40 (est)

Note: ‘<’ indicates Less than, ‘est’ indicates Estimate

**SELINA BEGUM** MAppSci, MAIFST  
CONSULTANT MICROBIOLOGIST



NATA accredited Laboratory Number 2766 and/or 2142.  
This document is issued in accordance with NATA's  
accreditation requirements. Accredited for compliance  
with ISO/IEC 17025. This document shall not be  
reproduced except in full.



The data pertains solely to the analytical and sampling procedure(s) used and the condition and homogeneity of the sample(s) as received. The data therefore may not be representative of the lot or batch or other samples. Consequently the data may not necessarily justify the acceptance or rejection of a lot or batch, a product recall or support legal proceedings. It is the responsibility of the client to provide all information relevant to the analysis requested. This report does not imply that Silliker Microtech Pty Ltd has been engaged to consult upon the consequences of the analysis and for any action that should be taken as a result of the analysis.

TGA Licence No: 152612

**ANALYTICAL SERVICES DIVISION**

ABN 30 008 127 802

Correspondence to:

PO Box 331

HUNTER REGIONAL MAIL

CENTRE NSW 2310

99 Mitchell Rd

CARDIFF NSW 2285

Telephone: (02) 4902 4800

Facsimile: (02) 4902 4899

**CERTIFICATE OF ANALYSIS**

Cover Page 1

Contents :

1. Cover Pages (3)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

**Report No.** : 6E3092

**Attention** : Mr Phil Clarke

**Client** : Pells Sullivan Meynink Pty Ltd  
: P O Box 173  
: TERRIGAL NSW 2260

**Samples** : 4

**Reference/Order** : PSM1059.TL1

**Project** : HORNSBY QUARRY

**Received Samples** : 29/09/06                      **Instructions** : 27/09/06

**Date Reported** : 10/10/06

PLEASE SEE FOLLOWING PAGES FOR METHOD LISTING AND RESULTS

**RESULTS**

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "#", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for < 10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been authorized by the NATA signatories listed in the method descriptions section on the following page.



**Anthony Crane**  
**Operations Manager**

Report No. : 6E3092

Cover Page 2

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.  
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

<u>Method</u>	<u>Description</u>	<u>Extracted</u>	<u>Analysed</u>	<u>Authorised</u>
E4970	Total Metals by ICP-MS	04/10/06	04/10/06	DLU 093
E4910	Total Metals by ICP-AES	03/10/06	05/10/06	APO 093
E4950	Mercury	04/10/06	04/10/06	DLU 093
E4870	Dissolved Metals by ICP-MS	04/10/06	04/10/06	DLU 093
E2380	Chloride	03/10/06	03/10/06	AGR 101
E2310	Total Alkalinity	03/10/06	03/10/06	AGR 101
E2350	BOD (5)	04/10/06	09/10/06	AGR 101
E2430	Conductivity	03/10/06	03/10/06	AGR 101
E2550	Nitrate-N	05/10/06	05/10/06	AGR 101
E2560	Nitrite-N	05/10/06	05/10/06	AGR 101
E2551	NOX	05/10/06	05/10/06	AGR 101
E2523	Grease and Oil (Gravimetric)	04/10/06	04/10/06	AGR 101
E2690	Total Dissolved Solids	03/10/06	03/10/06	AGR 101
E2740M	Hydrogen Sulphide	06/10/06	06/10/06	AGR 101
E2742	Sulphide (Dissolved)	04/10/06	04/10/06	AGR 101
E2720	Sulphate	03/10/06	03/10/06	AGR 101
E2670	Suspended Solids	29/09/06	29/09/06	AGR 101
E2600	pH	03/10/06	03/10/06	AGR 101
E2330	Ammonia as N	04/10/06	04/10/06	AGR 101

NATA Signatories

(AGR) Alison Graham, (DBL) Dianne Blane, (DLU) Darrel Luck, (GTO) Greg Towers,  
(MAV) Merrin Avery, (NCO) Nathan Cooper, (WME) Melaine Wade, (LSC) Lachlan Schwarz  
(LSC) Laura Schofield, (APO) Annette Poulton



Job Number : 6E3092

Client : Pells Sullivan Meynink Pty Ltd

Reference : PSM1059.TL1

Project : HORNSBY QUARRY

Page 1 of 3

plus Cover Page

Analyte	Lab No	E287184	E287185	E287186	E287187
		HQ1	HQ2	HQ3	HQ4
	Sample Id	27.9.06	27.9.06	27.9.06	27.9.06
	PQL				
<b>E4970 Total Recoverable Metals in Waters</b>					
Aluminium	0.010	0.05	0.01	0.11	0.02
Arsenic	0.002	nd	nd	nd	nd
Cadmium	0.0005	nd	nd	nd	nd
Chromium	0.005	nd	nd	nd	nd
Copper	0.005	nd	nd	nd	nd
Lead	0.002	nd	nd	nd	nd
Manganese	0.005	nd	nd	0.012	nd
Nickel	0.005	nd	nd	nd	nd
Zinc	0.010	nd	0.02	nd	nd
<b>E4910 Total Recoverable Metals in Waters</b>					
Calcium	0.5	29	63	50	50
Iron	0.05	nd	nd	0.27	nd
Magnesium	0.5	41	37	54	53
Potassium	0.5	1.4	2.0	2.4	2.2
Sodium	0.5	73	59	64	63
<b>E4950 Total Recoverable Mercury in Water</b>					
Mercury	0.001	nd	nd	nd	nd
<b>E4870 Dissolved Metals in Waters</b>					
Manganese	0.001	nd	0.002	nd	nd

PQL = Practical Quantitation Limit  
 LNR = Samples Listed not Received  
 nd = < PQL  
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified  
 Waters : mg/L (ppm) unless otherwise specified in Method Header  
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 6E3092

Page 2 of 3

Client : Pells Sullivan Meynink Pty Ltd

plus Cover Page

Reference : PSM1059.TL1

Project : HORNSBY QUARRY

Analyte	Lab No	E287184	E287185	E287186	E287187
		HQ1	HQ2	HQ3	HQ4
	Sample Id	27.9.06	27.9.06	27.9.06	27.9.06
	PQL				
<b>E2380 Chloride in Water</b>					
Chloride	0.5	69	67	66	67
<b>E2310 Total Alkalinity in Water</b>					
Bicarbonate as CaCO3	10	240	240	200	200
Carbonate as CaCO3	10	nd	nd	nd	nd
Hydroxide as CaCO3	10	nd	nd	nd	nd
Alkalinity as CaCO3	20	240	240	200	200
<b>E2350 BOD in Water (5-Day)</b>					
BOD	2	< 2	< 2	nd	< 2
<b>E2430 Conductivity (uS/cm at 25.0 C)</b>					
Electrical Conductivity	20	780	840	920	920
<b>E2550 Nitrate as N in Water</b>					
Nitrate as N	0.04	0.97	0.61	nd	nd
<b>E2560 Nitrite as N in Water</b>					
Nitrite as N	0.02	nd	nd	nd	nd
<b>E2551 NOx in Water</b>					
NOx	0.02	0.98	0.61	nd	nd
<b>E2523 Grease &amp; Oil (Hexane)</b>					
Grease & Oil	5	nd	nd	nd	nd
<b>E2690 Total Dissolved Solids in Water</b>					
TDS	5	370	360	470	460

PQL = Practical Quantitation Limit  
 LNR = Samples Listed not Received  
 nd = < PQL  
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified  
 Waters : mg/L (ppm) unless otherwise specified in Method Header  
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 6E3092

Page 3 of 3  
plus Cover Page

Client : Pells Sullivan Meynink Pty Ltd

Reference : PSM1059.TL1

Project : HORNSBY QUARRY

Analyte	Lab No	E287184	E287185	E287186	E287187	
		HQ1	HQ2	HQ3	HQ4	
	Sample Id	27.9.06	27.9.06	27.9.06	27.9.06	
	PQL					
<b>E2740M Hydrogen Sulphide in Water</b>						
Hydrogen Sulphide (Calc.)	0.01	nd	nd	nd	nd	
Temperature (Used in calculati	1	20	20	20	20	
<b>E2740 Sulphide in Water</b>						
Sulphide (Dissolved)	0.1	nd	nd	nd	nd	
<b>E2720 Sulphate in Water</b>						
Sulphate	0.5	42	80	160	160	
<b>E2670 Suspended Solids in Water</b>						
Suspended Solids	5	nd	nd	18	nd	
<b>E2600 pH in Water</b>						
pH	0.1	8.1	7.7	8.3	8.3	
<b>E2330 Ammonia as N in Water</b>						
Ammonia as N	0.05	nd	nd	nd	nd	

PQL = Practical Quantitation Limit  
 LNR = Samples Listed not Received  
 nd = < PQL  
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified  
 Waters : mg/L (ppm) unless otherwise specified in Method Header  
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



**ANALYTICAL SERVICES DIVISION**

ABN 30 008 127 802

Correspondence to:

PO Box 331

HUNTER REGIONAL MAIL

CENTRE NSW 2310

99 Mitchell Rd

CARDIFF NSW 2285

Telephone: (02) 4902 4800

Facsimile: (02) 4902 4899

**CERTIFICATE OF ANALYSIS**

Cover Page 1

Contents :

1. Cover Pages (3)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

**Report No.** : 6E3092

**Attention** : Mr Phil Clarke

**Client** : Pells Sullivan Meynink Pty Ltd  
: P O Box 173  
: TERRIGAL NSW 2260

**Samples** : 4

**Reference/Order** : PSM1059.TL1

**Project** : HORNSBY QUARRY

**Received Samples** : 29/09/06      **Instructions** : 27/09/06

**Date Reported** : 10/10/06

PLEASE SEE FOLLOWING PAGES FOR METHOD LISTING AND RESULTS

**RESULTS**

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "#", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for < 10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been authorized by the NATA signatories listed in the method descriptions section on the following page.



**Anthony Crane**  
**Operations Manager**

Report No. : 6E3092

Cover Page 2

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.  
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

<u>Method</u>	<u>Description</u>	<u>Extracted</u>	<u>Analysed</u>	<u>Authorised</u>
E4970	Total Metals by ICP-MS	04/10/06	04/10/06	DLU 093
E4910	Total Metals by ICP-AES	03/10/06	05/10/06	APO 093
E4950	Mercury	04/10/06	04/10/06	DLU 093
E4870	Dissolved Metals by ICP-MS	04/10/06	04/10/06	DLU 093
E2380	Chloride	03/10/06	03/10/06	AGR 101
E2310	Total Alkalinity	03/10/06	03/10/06	AGR 101
E2350	BOD (5)	04/10/06	09/10/06	AGR 101
E2430	Conductivity	03/10/06	03/10/06	AGR 101
E2550	Nitrate-N	05/10/06	05/10/06	AGR 101
E2560	Nitrite-N	05/10/06	05/10/06	AGR 101
E2551	NOX	05/10/06	05/10/06	AGR 101
E2523	Grease and Oil (Gravimetric)	04/10/06	04/10/06	AGR 101
E2690	Total Dissolved Solids	03/10/06	03/10/06	AGR 101
E2740M	Hydrogen Sulphide	06/10/06	06/10/06	AGR 101
E2742	Sulphide (Dissolved)	04/10/06	04/10/06	AGR 101
E2720	Sulphate	03/10/06	03/10/06	AGR 101
E2670	Suspended Solids	29/09/06	29/09/06	AGR 101
E2600	pH	03/10/06	03/10/06	AGR 101
E2330	Ammonia as N	04/10/06	04/10/06	AGR 101

NATA Signatories

(AGR) Alison Graham, (DBL) Dianne Blane, (DLU) Darrel Luck, (GTO) Greg Towers,  
(MAV) Merrin Avery, (NCO) Nathan Cooper, (WME) Melaine Wade, (LSC) Lachlan Schwarz  
(LSC) Laura Schofield, (APO) Annette Poulton



Job Number : 6E3092

Client : Pells Sullivan Meynink Pty Ltd

Reference : PSM1059.TL1

Project : HORNSBY QUARRY

Page 1 of 3

plus Cover Page

Analyte	Lab No	E287184	E287185	E287186	E287187
		HQ1	HQ2	HQ3	HQ4
	Sample Id	27.9.06	27.9.06	27.9.06	27.9.06
	PQL				
<b>E4970 Total Recoverable Metals in Waters</b>					
Aluminium	0.010	0.05	0.01	0.11	0.02
Arsenic	0.002	nd	nd	nd	nd
Cadmium	0.0005	nd	nd	nd	nd
Chromium	0.005	nd	nd	nd	nd
Copper	0.005	nd	nd	nd	nd
Lead	0.002	nd	nd	nd	nd
Manganese	0.005	nd	nd	0.012	nd
Nickel	0.005	nd	nd	nd	nd
Zinc	0.010	nd	0.02	nd	nd
<b>E4910 Total Recoverable Metals in Waters</b>					
Calcium	0.5	29	63	50	50
Iron	0.05	nd	nd	0.27	nd
Magnesium	0.5	41	37	54	53
Potassium	0.5	1.4	2.0	2.4	2.2
Sodium	0.5	73	59	64	63
<b>E4950 Total Recoverable Mercury in Water</b>					
Mercury	0.001	nd	nd	nd	nd
<b>E4870 Dissolved Metals in Waters</b>					
Manganese	0.001	nd	0.002	nd	nd

PQL = Practical Quantitation Limit  
 LNR = Samples Listed not Received  
 nd = < PQL  
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified  
 Waters : mg/L (ppm) unless otherwise specified in Method Header  
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 6E3092

Page 2 of 3

Client : Pells Sullivan Meynink Pty Ltd

plus Cover Page

Reference : PSM1059.TL1

Project : HORNSBY QUARRY

Analyte	Lab No	E287184	E287185	E287186	E287187
		HQ1	HQ2	HQ3	HQ4
	Sample Id	27.9.06	27.9.06	27.9.06	27.9.06
	PQL				
<b>E2380 Chloride in Water</b>					
Chloride	0.5	69	67	66	67
<b>E2310 Total Alkalinity in Water</b>					
Bicarbonate as CaCO3	10	240	240	200	200
Carbonate as CaCO3	10	nd	nd	nd	nd
Hydroxide as CaCO3	10	nd	nd	nd	nd
Alkalinity as CaCO3	20	240	240	200	200
<b>E2350 BOD in Water (5-Day)</b>					
BOD	2	< 2	< 2	nd	< 2
<b>E2430 Conductivity (uS/cm at 25.0 C)</b>					
Electrical Conductivity	20	780	840	920	920
<b>E2550 Nitrate as N in Water</b>					
Nitrate as N	0.04	0.97	0.61	nd	nd
<b>E2560 Nitrite as N in Water</b>					
Nitrite as N	0.02	nd	nd	nd	nd
<b>E2551 NOx in Water</b>					
NOx	0.02	0.98	0.61	nd	nd
<b>E2523 Grease &amp; Oil (Hexane)</b>					
Grease & Oil	5	nd	nd	nd	nd
<b>E2690 Total Dissolved Solids in Water</b>					
TDS	5	370	360	470	460

PQL = Practical Quantitation Limit  
 LNR = Samples Listed not Received  
 nd = < PQL  
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified  
 Waters : mg/L (ppm) unless otherwise specified in Method Header  
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Attention: Angela Karsch

AMDEL LIMITED  
99 Mitchell Road  
CARDIFF NSW 2285

*E-mail To:*  
*akarsch@amdel.com*  
*cc: enviro\_sydney@amdel.com*

## CERTIFICATE OF ANALYSIS

**Report No:** S 06043931 sh                      **Report Date:** 4 October 2006  
**Date Received:** 28 September 2006                      **Date Tested:** 28 September 2006  
**Standing Order:** S046575

### RESULTS

**Sample Description**                      **Order No.**  
Water Samples – 27.9.06                      6E3092

Sample Description	Thermotolerant Coliforms CFU per 100ml M12.2	Coliforms CFU per 100ml M12.1	<i>E.coli</i> CFU per 100ml M12.2
SN: HQ1	2,400	3,000	800
SN: HQ2	90 (est)	3,700	90 (est)
SN: HQ3	320	3,000	320
SN: HQ4	60 (est)	2,600	40 (est)

Note: ‘<’ indicates Less than, ‘est’ indicates Estimate

**SELINA BEGUM MAppSci, MAIFST  
CONSULTANT MICROBIOLOGIST**



NATA accredited Laboratory Number 2766 and/or 2142.  
This document is issued in accordance with NATA's  
accreditation requirements. Accredited for compliance  
with ISO/IEC 17025. This document shall not be  
reproduced except in full.



The data pertains solely to the analytical and sampling procedure(s) used and the condition and homogeneity of the sample(s) as received. The data therefore may not be representative of the lot or batch or other samples. Consequently the data may not necessarily justify the acceptance or rejection of a lot or batch, a product recall or support legal proceedings. It is the responsibility of the client to provide all information relevant to the analysis requested. This report does not imply that Silliker Microtech Pty Ltd has been engaged to consult upon the consequences of the analysis and for any action that should be taken as a result of the analysis.

TGA Licence No: 152612

**HORNSBY QUARRY WATER QUALITY DATA (SITE 44)**

LAB	Chem ID	SITE ID	SPLIT	DATE	Day	Month	Year	FAECAL COLIFORMS (org/100ml)	AMMONIA (mg/L)	NOX (mg/L)	TOTAL NITROGEN (mg/L)	Total Kjeldahl Nitrogen as N	TOTAL PHOSPHORUS (mg/L)	SS (mg/L)	CHL A (ug/L)
AWT		44	O	20/04/2004	20	4	2004	8	0.005	0.005	0.17		0.007	1	
AWT		44	O	19/08/2004	19	8	2004	3	0.005	0.005	0.16		0.01	1	1.9
AWT		44	O	15/09/2004	15	9	2004	2	0.005	0.005	0.17		0.009	1	1.6
ALS	20054420	44		19/10/2005	19	10	2005	0.5	0.02	0.097	0.5	0.5	0.005	3	2.5

Phys Id	SITE ID	SPLIT	DATE	Day	Month	Year	TIME	Depth	TEMPERATURE (C)	CONDUCTIVITY (us/cm)	TURBIDITY (ntu)	DISSOLVED OXYGEN (mg/l)	DISSOLVED OXYGEN (sat)	pH	ALKALINITY (mg/l)	SALINITY (ppt)	WEATHER	WET/DRY
	44	O	19/08/2004	19	8	2004	10.2	0m	11.25	1	0	12.5	114.1	7.95		0.48	sunny	wet
	44	O	19/08/2004	19	8	2004	10.2	2m	11	1	1.4	12.5	114.3	7.96		0.48	sunny	wet
	44	O	19/08/2004	19	8	2004	10.2	4m	10.78	1	1.6	12.7	115.1	7.94		0.49	sunny	wet
	44	O	19/08/2004	19	8	2004	10.2	6m	10.38	1	2	13.2	118.1	7.89		0.49	sunny	wet
	44	O	19/08/2004	19	8	2004	10.2	8m	10.24	1	2.1	12.5	111	7.85		0.5	sunny	wet
	44	O	19/08/2004	19	8	2004	10.2	10m	10.23	1	2	11.7	103.8	7.86		0.5	sunny	wet
	44	O	19/08/2004	19	8	2004	10.2	12m	10.23	1	1.9	11	97.4	7.88		0.5	sunny	wet
	44	O	15/09/2004	15	9	2004	10	13	11.44	1	1.2	8.4	76.8	8.14		0.51	overcast	dry
	44	O	15/09/2004	15	9	2004	10	12	11.44	1	0	8.4	76.7	8.14		0.51	overcast	dry
	44	O	15/09/2004	15	9	2004	10	10	11.43	1	0	8.3	75.9	8.14		0.51	overcast	dry
	44	O	15/09/2004	15	9	2004	10	8	11.57	1	0	9.7	89.8	8.27		0.51	overcast	dry
	44	O	15/09/2004	15	9	2004	10	6	12.32	1	0	10.8	100.7	8.32		0.49	overcast	dry
	44	O	15/09/2004	15	9	2004	10	4	14.74	1	0	10.4	102.9	8.45		0.49	overcast	dry
	44	O	15/09/2004	15	9	2004	10	2	14.85	1	0	10.6	105.1	8.47		0.49	overcast	dry
	44	O	15/09/2004	15	9	2004	10	0	14.87	1	0	10.7	105.7	8.48		0.49	overcast	dry
	44		19/10/2005	19	10	2005	8.3		18.37	1	0	10.6	114.3	8.48		0.51	overcast	dry
	44		19/10/2005	19	10	2005		1m	18.37	1								
	44		19/10/2005	19	10	2005		2m	18.34	1								
	44		19/10/2005	19	10	2005		3m	18.34	1								
	44		19/10/2005	19	10	2005		4m	18.32	1								
	44		19/10/2005	19	10	2005		5m	18.32	1								
	44		19/10/2005	19	10	2005		6m	17.93	1								
	44		19/10/2005	19	10	2005		7m	17.45	1								
	44		19/10/2005	19	10	2005		8m	16.2	1								
	44		19/10/2005	19	10	2005		9m	15.35	1								
	44		19/10/2005	19	10	2005		10m	15.1	1	4.1	11.5	114.1	8.26		0.5		
	44		19/10/2005	19	10	2005		11m	14.69	1								
	44		19/10/2005	19	10	2005		12m	14.46	1								
	44		19/10/2005	19	10	2005		13m	14.23	1								
	44		19/10/2005	19	10	2005		14m	14.1	1								
	44		19/10/2005	19	10	2005		15m	14	1								
	44		19/10/2005	19	10	2005		16m	14	1	10.7							
	44		19/10/2005	19	10	2005		17m	13.97	1	11	5.7	55	8.26		0.48		
	44		19/10/2005	19	10	2005		18m	13.97	1								
	44		19/10/2005	19	10	2005		19m	14	1								

## PIEZOMETER





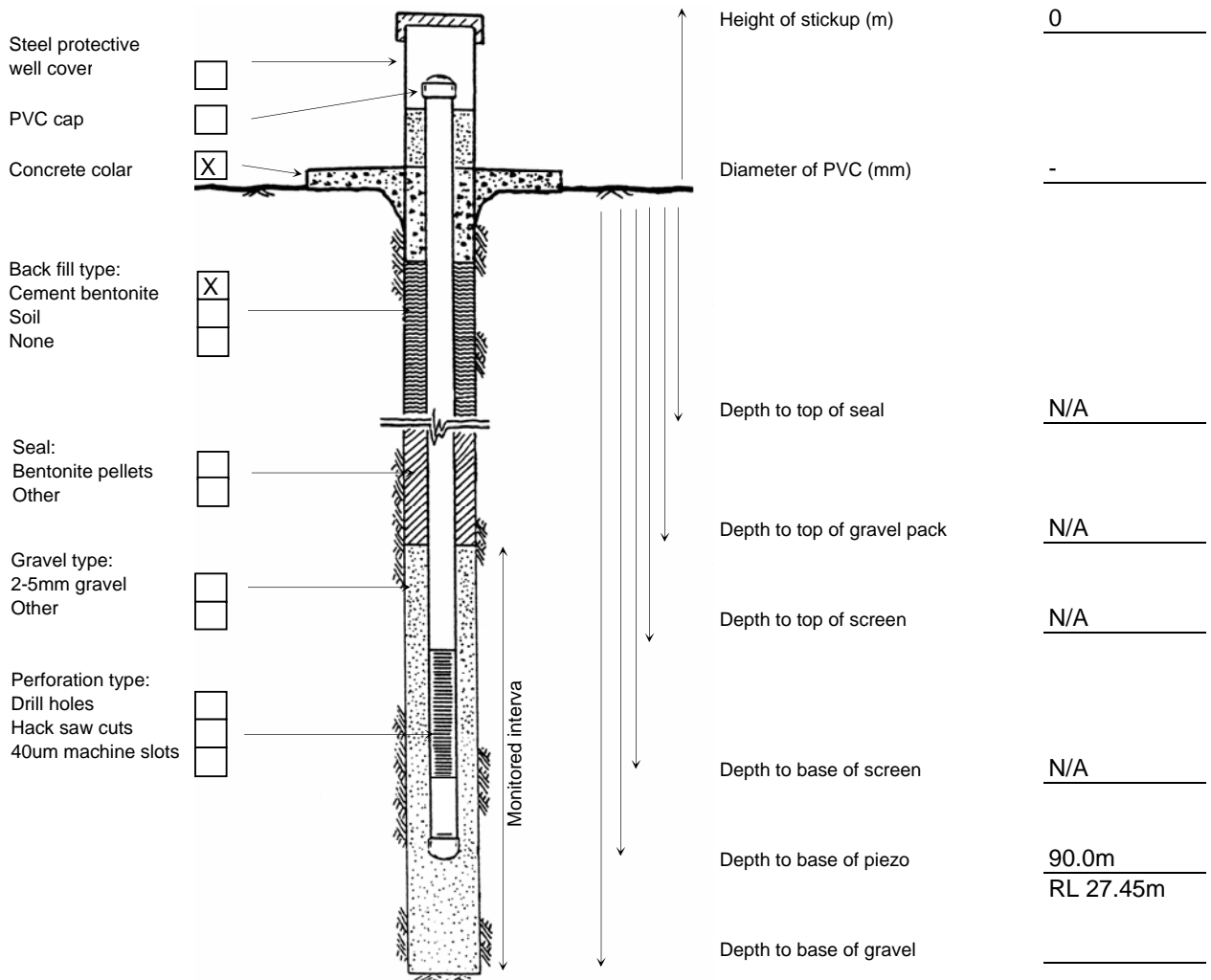
### PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH HQ1  
PIEZOMETER: Vibrating Wire Piezometer Model 1200/700  
COLLAR EASTING: 322916.2  
COLLAR NORTHING: 6269635.9  
COLLAR RL(m): 105.4  
DATUM: AHD

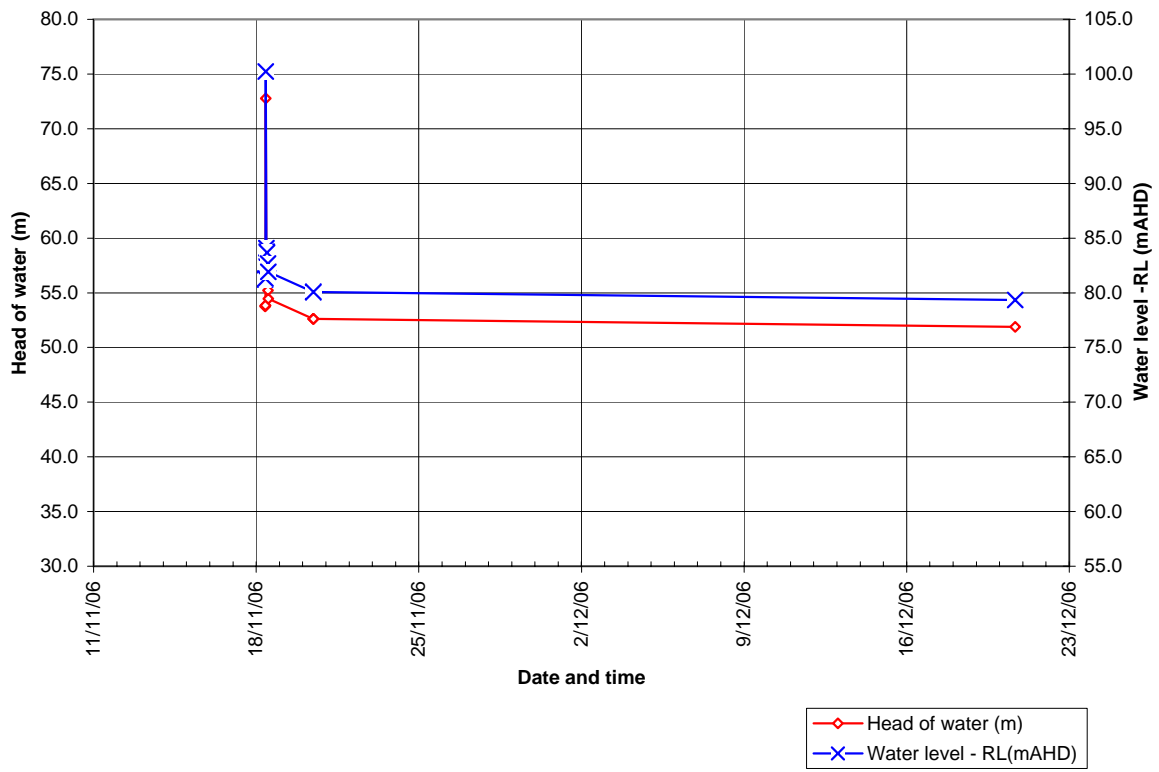
DRILLING CONTRACTOR: McDermotts  
RIG: -  
DEPTH OF HOLE (m): 90.65m  
BOREHOLE INCLINATION: 60°  
PIEZO INSTALLATION DATE: 17-18/11/06  
SUPERVISED BY: RS/BC

Tick boxes

Complete dimensions if appropriate



COMMENTS Vibrating wire piezometer fully erased in bentonite-cement grout and buried below gravel road. Wires run to edge of road, in a trench, approximately 100mm-150mm below surface and are then hidden in long grass in labeled waterproof container (see attached photos).



**Hornsby Shire Council**  
**Former CSR Quarry & Associated Lands**

**PIEZOMETER RECORD**  
**BH HQ1**

<b>PSM1059.TR1</b>	<b>Figure C1</b>
--------------------	------------------



**Pells Sullivan Meynink Pty Ltd**



# VIBRATING WIRE PIEZOMETER

## MODEL 1200

The Geotechnical Systems **Vibrating Wire Piezometer** has been designed to remotely measure fluid pressures in earthen masses.

## APPLICATIONS

Pore pressure measurement in fully and partially saturated soils in compacted fills, embankments boreholes and standpipes.



## OPERATING PRINCIPLE

Geotechnical Systems Vibrating Wire Piezometers are based on the simple principle of resonance. The instrument consists of a vibrating wire element connected to a sensitive diaphragm. Electromagnetic coils located nearby 'pluck' the wire causing it to vibrate at its natural resonant frequency. A change in pressure causes a deflection of the diaphragm that in turn alters the tension in the wire and the resonant frequency.

The electromagnetic coils are used to convert this frequency change into an electrical output with the same frequency as that of the wire. For each frequency there is a corresponding pressure. Unlike conventional strain gauges, the vibration frequency in a Vibrating Wire Piezometer is not affected by changes in lead wire resistance. This means water penetration, temperature variations and contact resistance do not affect the output signal. Geotechnical Systems' Vibrating Wire Piezometers also offer excellent zero stability.

The piezometer is read using a digital readout unit model 9120 or a data logger model 9125. Readings can be in either frequency squared or period. Calibration data is provided with each instrument to permit the calculation of pore pressure.

The piezometer is fabricated from stainless steel components, selected to minimise thermal effects and electron beam welded together to ensure a hermetically sealed cavity for the vibrating wire element. The vibrating wire element is held in place using an extremely high pressure swaging technique. Each piezometer is laser marked with serial numbers and pressure ratings. A variety of filter permeabilities is available to meet different application requirements. The standard filter size is 40 micron pore diameter.



ISO 9002 Lic 4022  
Standards Australia

**GEO TECHNICAL SYSTEMS AUSTRALIA PTY. LTD.**

Specialists in Geotechnical Instrumentation

ACN 006 720 887  
ABN 28 006 720 887





## SPECIAL FEATURES

- Long term stability
- High resolution
- Remote readout capability
- Very sensitive
- Hermetically sealed
- Stainless steel construction
- Rugged construction
- Not affected by long cable lengths

SPECIFICATION	Vibrating Wire Piezometer	Model 1200
Pressure ranges (kPa)	250,350,700,2000,3500,5000	
Over range	1.5 x rated pressure	
Resolution	0.025% full scale	
Accuracy	<± 0.5% full scale	
Operating temperature	-20 to +65 degrees C	
Filters sintered stainless steel	0.5 and 40 micron	
Dimensions	22mm diameter, 136mm length	
Weight	0.2 kg	

## PERFORMANCE

Each piezometer is extensively tested over its working range prior to shipment.

Individual calibration data sheets are supplied with each piezometer. Geotechnical Systems calibration equipment is traceable to international standards.

## COMPATIBILITY

The Geotechnical Systems Vibrating Wire Piezometers are compatible with most commercially available readout units. They require low voltage square wave excitation with swept frequency. Please contact the factory if in doubt.

## ORDERING INFORMATION

When ordering Geotechnical Systems Vibrating Wire Piezometers, please specify the following.

1. Model number and pressure range.
2. Cable length (allow 2% extra).
3. Whether thermistor option is required.
4. Whether detailed calibration certificate is required.

*Because Geotechnical Systems is continually improving its products and processes, information contained within this brochure is subject to change without notice.*

Because Geotechnical Systems is continually improving its products and processes, information contained within this brochure is subject to change without notice.

For more information or to discuss your application, contact...

1/72 Bayfield Road  
Bayswater  
VIC 3153  
Australia

**GEO**TECHNICAL SYSTEMS AUSTRALIA PTY. LTD.

Specialists in Geotechnical Instrumentation

ACN 006 720 887  
ABN 28 006 720 887



Phone  
+61 3 9720 5950  
Fax  
+61 3 9720 5942  
E-mail