



Hydrogeological investigation of the Mount Lofty Ranges, progress report 5: Drilling phases 2.1 to 2.3: research and monitoring wells at Scott Creek, Balhannah, Willunga Fault, Lobethal, Eden Valley and Ashbourne

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Report DWLBC 2004/04





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### FOREWORD

South Australia's natural resources are fundamental to the economic and social well-being of the State. One of the State's most precious natural resources, water is a basic requirement of all living organisims and is one of the essential elements ensuring biological diversity of life at all levels. In pristine or undeveloped situations, the condition of water resources reflects the equilibrium between, rainfall, vegetation and other physical parameters. Development of these resources changes the natural balance and may cause degradation. If degradation is small, and the resource retains its utility, the community may assess these changes as being acceptable. However, significant stress will impact on the ability of the resource to continue to meet the needs of users and the environment. Understanding the cause and effect relationship between the various atresses imposed on the natural resources is paramount to developing effective management strategies. Reports of investigations into the availability and quality of water supplies throughout the State aim to build upon the existing knowledge base enabling the community to make informed decisions concerning the future management of the natural resources thus ensuring conservation of biological diversity.

**Brian Harris** 

Director, Knowledge and Information Division Department of Water, Land and Biodiversity Conservation

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# SI UNITS COMMONLY USED WITHIN TEXT

Name of unit	Symbol	Definition in terms of other metric units	
Millimetre	mm	10 <sup>-3</sup> m	length
Metre	m		length
Kilometre	km	10 <sup>3</sup> m	length
Hectare	ha	$10^4  \text{m}^2$	area
Microlitre	μL	10 <sup>-9</sup> m <sup>3</sup>	volume
Millilitre	mL	10 <sup>-6</sup> m <sup>3</sup>	volume
Litre	L	10 <sup>-3</sup> m <sup>3</sup>	volume
Kilolitre	kL	1 m <sup>3</sup>	volume
Megalitre	ML	10 <sup>3</sup> m <sup>3</sup>	volume
Gigalitres	GL	10 <sup>6</sup> m <sup>3</sup>	volume
Microgram	μg	10 <sup>-6</sup> g	mass
Milligram	mg	10⁻³ g	mass
Gram	g		mass
Kilogram	kg	10 <sup>3</sup> g	Mass

### Abbreviations Commonly Used Within Text

Abbreviation		Name	Units of measure
TDS	=	Total Dissolved Solids (milligrams per litre)	mg/L
EC	=	Electrical Conductivity (micro Siemens per centimetre)	μS/cm
PH	=	Acidity	
δD	=	Hydrogen isotope composition	°/ <sub>00</sub>
CFC	=	Chlorofluorocarbon (parts per trillion volume)	pptv
δ <sup>18</sup> Ο	=	Oxygen isotope composition	°/ <sub>00</sub>
<sup>14</sup> C	=	Carbon-14 isotope (percent modern Carbon)	pmC
Ppm	=	Parts per million	
Ppb	=	Parts per billion	

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# ABSTRACT

The second phase of drilling research and monitoring wells to assist with hydrogeological investigations in the Mount Lofty Ranges was carried out in three stages between March and May 2003. The first of these stages involved diamond coring at the Scott Bottom research site (1 well to ~ 100 m depth) and at a new site near Balhannah (2 wells to ~ 50 m depth) during March 2003. Diamond coring of what will ultimately be four new monitoring, and to a lesser extent, research wells along the Willunga Fault was then undertaken in May 2003 (total drilled depth ~ 330 m). The third and final stage of this program was also achieved in May 2003, with a total of 16 new wells drilled by rotary-hammer method. Of these 16 wells, ten were drilled (200 mm diameter, ~ 50 m depth) in close proximity to each another and the diamond-cored holes at Balhannah, and two were drilled (one 8" diameter to ~ 50 m, one 10" diameter to ~ 100 m) at each of Lobethal, Eden Valley and Ashbourne.

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# **1 INTRODUCTION**

The number of detailed groundwater investigations in the Mount Lofty Ranges (MLR) is rapidly growing now that the South Australian Government has released it's intent to prescribe the water resources of the region over the coming years. Construction of reliable water allocation plans as a result of these prescriptions will require a sound understanding of the hydrogeology, surface water hydrology and the interactions between surface water and groundwater resources.

Due to the inherent nature of fractured-rock aquifers in this part of the state, establishing the water allocation plans will require not only a review of historical data (which is almost absent for many areas of the MLR), but also a thorough application of the best available science to several representative catchments. This will provide "best estimates" of groundwater recharge rates and an idea of how groundwater flows through this extremely complex geological province.

The first phase of drilling new wells to facilitate groundwater investigations in the MLR was carried out at Scott Creek in March 2002 (James-Smith & Harrington, 2002). Preliminary field investigations at this site (Harrington, 2003) and a review of knowledge gaps and representative catchments for the rest of the MLR identified the need for an extra well at the Scott Creek site and the establishment of several other groundwater investigation sites. This report presents the locations, drilling specifications and results of Phase 2 drilling, which was divided into three stages:

- 1. Diamond coring: 1 well at Scott Creek, 2 wells near Balhannah
- 2. Diamond coring: 4 wells along the Willunga Fault
- 3. Rotary-hammer drilling: 10 wells at Balhannah, plus 2 wells near each of the towns of Lobethal, Eden Valley and Ashbourne.

Diamond coring at Scott Creek was undertaken for the purpose of mapping fracture locations near existing wells, which will ultimately facilitate the installation of a multi-level sampling device (Solinst<sup>®</sup>) recently purchased by the Groundwater Group. The Balhannah site was selected as the most suitable place to establish a research project to investigate groundwater flow and pollutant migration processes in the fractured meta-sediments. Two wells were cored at this site during phase 2.1 to enable fracture mapping between the 10 new rotary-hammer-drilled observation wells that were completed during phase 2.3 (below).

The four new wells along the Willunga Fault were constructed for several reasons. Firstly they were required to expand the Willunga Groundwater Basin observation well network to incorporate the surrounding fractured-rock aquifers (Sereda and Martin, 2000). Secondly, they will enable monitoring of water level changes caused by both climatic variability and anthropogenic activities, and the effects that these changes may have on spring-fed dams in the area (Clarke, 2001). Finally, the wells will provide ideal research sites for a separate project that is developing methods to estimate groundwater movement between the fractured-rock highlands and the sedimentary aquifers on the plains (i.e. the Willunga Basin).

Phase 2.3 saw the completion of 2 new wells near each of the towns of Lobethal, Eden Valley and Ashbourne (in addition to the 10 wells mentioned previously for the Balhannah "peppered" site). These three sites are located in different focus catchments for groundwater investigations, and it is envisaged that as funding becomes available through the prescription process, the wells will be tested, instrumented with piezometers and sampled for environmental tracers; thereby providing estimates of groundwater recharge rates and flow velocities in these parts of the MLR.

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### 2.1 Scott Bottom & Balhannah – diamond coring

Diamond coring at both Scott Creek and Balhannah during Phase 2.1 was undertaken by Coughlan Drilling Pty Ltd using a UDR 600 top-head-drive, air core rig with HQ3 pipe and split-tube core recovery equipment. The new well in Scott Creek catchment (Permit Number PN 61149) was drilled approximately 5 m SE of the "control" hole (PN 58095) at Scott Bottom (James-Smith and Harrington, 2002; Figure 20). Core recovery often approached (and sometimes exceeded) 100% throughout the Quaternary veneer sediments and the underlying Proterozoic meta-siltstone (Woolshed Flat Shale). Total depth drilled was 98.7 m and only 6.5 m of surface casing was required to prevent hole Strata encountered in this hole was primarily the Woolshed Flat Shale collapse. consisting of fine, grey, laminated meta-siltstone with pyrite and quartz veining (Appendix A). Fractures were ubiquitous throughout the core although tended to decrease in frequency with increasing depth. The only other feature of the core worthy of mention was a hard, white calcareous layer between approximately 60-74.5 m depth, often marble-like in appearance with inter-layered pale green - grey siltstone, extensive pyrite mineralisation and occasional fine sandy layers.

Core collected from the two wells at Balhannah (PN 61098 and PN 61105, Figure 1) displayed less variability in lithology than the Scott Creek site, however most fractures contained secondary mineralisation of either orange iron oxides, white carbonates (Figure 2a), green clay (possibly chlorite, Figure 2b) or pyrite. The main geological unit, a light- to dark-grey, slaty meta-siltstone (Figure 2c) was interpreted to be the Balhannah Shale Member of the Woolshed Flat Shale (Appendix B).

Both of these wells were drilled to  $\sim$  50 m total depth and completed as open holes, with 13.5 m and 10.5 m of 125 mm PVC surface casing for PN 61098 and PN 61105 respectively.

### 2.2 Willunga Fault – diamond coring

The four new water wells along Willunga Fault (Figure 3) were also continuously cored by Coughlan Drilling Pty Ltd to enable detailed logging of geology and fracture locations/orientations. Total depths ranged from 60 m and 70 m for wells PN 62012 and PN 62020 (respectively) up to 99 m for wells PN 61093 and PN 62019. The main lithology encountered was meta-siltstone of either the Saddleworth, Angepena or Elatina Formations (Appendix C). Well PN 61093 on Marshall Rd, Willunga will be used primarily to estimate groundwater fluxes across the fault. For this reason, the entire core was digitally photographed for future reference (Appendix D).



Figure 1. Location of new wells at Balhannah "Peppered Site" May 2003

Figure 2 (a, b) Fracture mineralisation at 19 m depth in core PN 61098, (c) typical section of Balhannah Shale Member in core PN 61105 (depth 17.5 – 20.6 m)



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### 2.3 Balhannah, Lobethal, Eden Valley & Ashbourne – rotaryhammer drilling

All rotary-hammer drilling was carried out by Frank Walsh Drilling (SA) Pty Ltd of Mount Barker. The first 10 wells were drilled (8" diameter) near the two cored holes at the Balhannah site (Figure 1). Total depths range from 49 to 56 m, and each well was completed as open hole with 200 mm ID steel surface casing. Drill cuttings were consistent with core observations from the Phase 2.1 drilling (Appendix B).

Two wells were then drilled near each of the towns of Lobethal, Eden Valley and Ashbourne (Figure 4). The first was a large-diameter (10") hole targeted at approximately 100 m depth while the second was drilled (8" diameter) several metres away to a total depth of up to 60 m. Strata consisted primarily of fractured meta-siltstone and sandstone at the three sites (Appendix E). Groundwater in each of these six wells was profiled for Electrical Conductivity (amongst other parameters) approximately two months after drilling using a YSI® down-hole sonde, the results of which are summarised graphically in Appendix F.



Figure 4. Location of new wells at A. Lobethal, B. Eden Valley and C. Ashbourne







400 Data Sources: DRILLHOLES: SA\_GEODATA Produced : Knowledge and Informat Department of Water, Date: Sectember 2003

nd and Bio



# **3 OUTCOMES AND FUTURE DIRECTIONS**

A summary of all wells drilled during Phase 2, their locations, completion details and groundwater characteristics (SWL and EC) is compiled in Table 1. At the time of writing this report, the Balhannah wells have already been surveyed - others will be done in the coming months.

The four new wells along Willunga Fault have been incorporated into the Willunga Basin observation well network, and it is envisaged that the 17 other wells drilled during this phase will soon be monitored for both water levels and salinity profiles on a routine basis by DWLBC staff.

Groundwater recharge and flow investigations at Scott Creek are ongoing, and the new well is planned to be instrumented with the Solinst® early 2004 to aid chemical and isotopic sampling as well as applied tracer tests. The new set of wells at Balhannah have already been utilised for a novel test to identify principal flow zones and characterise the site for future tests (report due early 2004). The Willunga wells have also received some early attention, with acoustic logging and regular sonding to identify fracture locations and behaviour. Finally, the three pairs of wells at Lobethal, Eden Valley and Ashbourne will be tested and completed as nested piezometers during 2004 to provide recharge estimates for Water Allocation Plans in the Eastern Mt Lofty Ranges.

Location	Permit No.	Unit No.	Easting	Northing	Total depth (m)	Geology	SWL (m)/(date)	EC (μS/cm)/(date)
Scott Bottom	61149	6627-1-0854	288055	6113753	98.7	WFS	0.63 (19/02/03)	2960-3230 (19/02/03)
Balhannah	61098	6628-2-1201	299411.263	6126187.461	50.0	BSM (WFS)	10.21 (17/04/03)	
	61105	6628-2-1200	299436.15	6126218.036	49.7	BSM (WFS)	7.68 (17/04/03)	
	61106	6628-2-1211	299430.134	6126210.576	48.7	BSM (WFS)	6.9 (10/07/03)	
	61107	6628-2-1205	299423.504	6126202.831	55.7	BSM (WFS)	7.71 (10/07/03)	
	61108	6628-2-1202	299431.672	6126193.57	48.6	BSM (WFS)	8.2 (10/07/03)	Highly variable
	61109	6628-2-1207	299422.729	6126189.015	55.6	BSM (WFS)	8.9 (10/07/03)	(between wells
	61110	6628-2-1210	299414.928	6126184.842	55.6	BSM (WFS)	9.23 (10/07/03)	and with
	61111	6628-2-1208	299405.146	61261179.66	55.5	BSM (WFS)	9.66 (10/07/03)	increasing depth)
	61112	6628-2-1206	299407.402	6126189.381	55.5	BSM (WFS)	9.13 (10/07/03)	
	61113	6628-2-1203	299416.854	6126195.834	55.6	BSM (WFS)	8.46 (10/07/03)	
	61114	6628-2-1204	299409.001	6126199.146	55.7	BSM (WFS)	8.57 (10/07/03)	
	61115	6628-2-1209	299410.649	6126208.984	55.5	BSM (WFS)	7.74 (10/07/03)	
Willunga Fault	61903	6627-10776	280090	6096735	100	Angepena Fm.	10.77 (05/08/03)	
	62012	6627-10777	278354	6094358	60	Elatina Fm.	17.88 (04/08/03)	
	62019	6627-10778	284228	6102553	99	Saddleworth Fm.	21.02 (01/08/03)	
	62020	6627-10775	285123	6104828	70	Saddleworth Fm.	38.83 (05/08/03)	
Lobethal	61094	6628-21219	308460	6136727	87.9	Saddleworth Fm.	24.68 (10/07/03)	
	61095	6628-21220	308459	6136738	55.5	Saddleworth Fm.	24.71 (10/07/03)	
Eden Valley	61092	6728-3485	324630	6162496	103.4	-	2.16 (10/07/03)	See sonde results
	61093	6728-3486	324634	6162496	60	-	3.45 (10/07/03)	Appendix F (18/07/03)
Ashbourne	61096	6627-10779	297574	6089780	96.6	-	9.27 (10/07/03)	
	61097	6627-10780	297576	6089786	48.7	-	8.90 (10/07/03)	

#### Table 1. Summary of borehole locations and characteristics, Mt Lofty Ranges Drilling Phase 2

BSM = Balhannah Shale Member of the WFS = Woolshed Flat Shale

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# 4 REFERENCES

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Harrington, G.A., 2003. Hydrogeological investigation of the Mount Lofty Ranges, Progress report 3: Borehole water and formation characteristics at the Scott Bottom research site, Scott Creek Catchment. In prep.

James-Smith, J.M. and Harrington, G.A., 2002. Hydrogeological investigation of the Mount Lofty Ranges, Progress report 1: hydrogeology and drilling phase 1 for Scott Creek catchment. *Report DWLBC 2002/17*.

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## 5 APPENDIX A



WATER WELL LOG FOR SCOTT CREEK (PHASE 2.1)

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The Department of Water, Land and Bio diversity Conservation

#### RESOURCE ASSESSMENT DIVISION – GROUNDWATER ASSESSMENT BRANCH WATER WELL LOG

**PROJECT:** MLR Groundwater Investigation

**PERMIT No.** 61149

UNIT No. 6627-1-0854

Well Locat	Name: ion:	SCOTT CO 350m N Sc	ORE NO. ott Botto	1 m Weir				、			Hundred: Noarl	unga	Section	<b>n:</b> 286		
Coord	linates:	(approxima	ate) 2880	DEPTH TO WATER CUT	3 N     Surfa       DEPTH TO       STANDING WATER	CE Eleva INTE	ation (n RVAL m)	n): Da	SUPPLY			SALINI	TY			
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	Method	EC (µS/cm @ 2	25°C)		Comment		
	SUN	IMARY	1	NA		0 110	100 117				2960 3230			Downhole son nearby we PN 58095 (19 (SWL ~ 0.6		
DEP'	TH (m)	GRAPHIC	ROCK	/SEDIMENT		CEO						Depth	CASING			
From	From To LOG NAME GEOLOGICAL DESCRIPTION										Formation/Age	Sample	Diam (mm)	From (m)	To (m)	
0	5.7	Alluvium Reddish brown and grey clay, calcareous in parts.									Quaternary		100	0	6.5	
5.7 6.4	6.4 98.7		Woo	olshed Flat Shale	Weathered grey siltsta iron oxide staining. Dark grey laminated to (frequent near surface)	one (phy meta-silt e) and m	dlitic te tstone.	xture) amongst lig Irregularly spaced ock (especially at	Burra Group (Proterozoic)							
	and pyrite throughout. Possible white, crystalline, meta-dolomite between 60 74.5 m depth, inter-layered pale green – grey siltstone.								1 60 to							
REM	ARKS:									I	DRILL TYPE: Diamond	COMP	LETED:	5 March 2	2003	
Contin aside	nuous dia from the	amond core core trays f	retrieved or subseq	from surface t uent mineralog	o final drilled depth. E gical and/or pore water	tight (8) chemica	small se al analys	ections of core we ses.	ere wax-dipped and	kept I	DRILL FLUID: Water	LOGGI	ED BY: C	. Harring	;ton	
											<b>TART:</b> 3 March 2003	SHEET	: 1 OF 1			

## 6 APPENDIX B



WATER WELL LOGS FOR BALHANNAH (PHASE 2.1 AND 2.3)

Hydrogeological investigation of the Mount Lofty Ranges, progress report 5: Drilling phases 2.1 to 2.3: research and monitoring wells at Scott Creek, Balhannah, Willunga Fault, Lobethal, Eden Valley and Ashbourne

												PROJECT:	Peppere	ed Site		
//						GROU	UNDW	ATER PROGRAM	Л			PERMIT No	. 61106			
<b>The</b> Wat	Departme	ent of l and				WA	ATER	WELL LOG				UNIT No. 6	628 - 21	211		
Co	nserva <sup>.</sup>	tion	Coordinate	es: E 299430.134	N 6126210.576 El. Surface(m) El. Ref. Point(m) Datum: AGI					GD 84	Hundred: C	nkapar	inga S	ec: PT4	4023	
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL m)		SUPPLY			TOTA	TAL DISSOLVED SOLIDS			
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		А	Analysis No.	
	SUM	MARY		24 31 34 EOH		31 34	24 32 34.5 48.7	0.006 0.75 1.5 1.5	Drilling Drilling Drilling 20 minutes	Airlift Airlift Airlift Airlift		1373 1160 1199 1250	625044 625045 625046 625047			
DEPT	Ή (m)	GRAPHIC	ROCK	COCK/SEDIMENT GEOLOGICAL DESCRIPTION							FODM		Depth	(	CASIN	G
From	То	LOG	I	NAME GEOLOGICAL DESCRIPTION							FORMA	ATION/AGE	Sample	Dia (mm)	From (m)	To (m)
0	3.2				Light brown, gravely s	ilty soi	l, grave	l to 5mm			QUATE	RNARY		200	0	6
3.2	6.7				Light brown silty soil											
6.7	10.2				Medium brown, silty clay, slightly calcareous											
10.2	13.7		WOOL	SHED	Light grey silt, grey laminated meta siltstone gravel to 15mm					ADELA	IDEAN					
13.7	17.2		FLAT	SHALE	Grey laminated meta si	iltstone	e gravel	to 10mm								
17.2	20.7				Grey laminated meta si	iltstone	e gravel	to 15mm, minor p	pyrite to 1mm.							
20.7	24.2				Grey laminated meta si	iltstone	e gravel	to 15mm								
24.2	27.7				Grey laminated meta si quartzite to 5mm	iltstone	e gravel	to 5mm, pyrite to	1mm, minor milky	y						
27.7	31.2				Grey laminated meta si	iltstone	gravel	to 15mm, Fe stain	ning, <5% milky qu	uartzite						
REMA Drillin	REMARKS: at 13 m added water to cuttings pipe to settle dust Drilling Contractor: Frank Walsh Drilling, Mt Barker									DRILL TY	PE: Hammer	COMPL	ETED 7/5	5/03		
									DRILL FL	UID: Air	LOGGE	D BY: J J	ames-Sm	ith		
									DATE		SHEET	1 OF 2				



**PROJECT:** Peppered Site

**PERMIT No. 61106** 

UNIT No. 6628 - 21211

DEPTH (m)		GRAPHIC	ROCK/SEDIMENT			Depth	(	CASINC	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
31.2	34.7			Grey laminated meta siltstone to 15mm with some Fe staining. Pyrite cubes and clusters to 10mm.					
34.7	38.2			Grey laminate meta siltstone to 15 mm with no Fe staining evident. Small pyrite cubes to 2mm.					
38.2	41.7			Grey laminated meta siltstone to 15 mm with no Fe staining evident. Pyrite flecks on meta siltstone to <1mm throughout. Minor milky quartzite.					
41.7	45.2			Grey laminated meta siltstone to 15 mm with no Fe staining evident. Pyrite flecks on meta siltstone to <1mm throughout. Minor milky quartzite.					
45.2	48.7			Grey laminated meta siltstone to 15 mm with no Fe staining evident. Minimal pyrite evident. More milky quartzite than in previous interval. EOH					
						SHEET	2 OF 2		

												<b>PROJECT:</b>	Peppere	ed Site		
						GROU	JNDW.	ATER PROGRAM	Л			PERMIT NO	o. 61107			
The Wa	Departme ter, Lanc	ent of and sity				<b>W</b> A	TER	WELL LOG				UNIT No. 6	628 - 21	205		
Co	nserva	tion	Coordinat	es: E 299423.504	N 6126202.831 El. Surface(m) El. Ref. Point(m) Datum: AGD 84						Hundred: Onkaparinga Sec: PT					
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	DEPTH TOINTERVALSTANDING WATER(m)				TOTAL DISSOLVED S				ED SOLIDS		
	AQ	UIFER		(m)	(m)	From	To L/sec Test length Method				ethod	mg/L		A	nalysis N	0.
	SUMMARY     27.5 35 50 EOH       DEPTH (m)     GRAPHIC     ROCK/SEDIMENT					50	27.5 35 51 55.7	0.006 0.08 0.6 0.4	Drilling Drilling Drilling 20 minutes	Airlift Airlift Airlift Airlift		1412 1334 1233 1210	625051 625052 625053 625054			
DEPT	TH (m)	GRAPHIC	IC ROCK/SEDIMENT GEOLOGICAL DESCRIPTION								FORM	TION/AGE	Depth	(	CASIN	3
From	То	LOG	]	NAME		ULU	LUUIC	AL DESCRIPTIC	<u>, , , , , , , , , , , , , , , , , , , </u>		PORM	TIONAOL	Sample	Dia (mm)	From (m)	To (m)
0	3.3				Light orange brown cla	ayey so	il, sligh	tly plastic and can	form small balls.		QUATE	RNARY		200	0	6
3.3	6.7				Light brown silty sandy soil. Sli9ghtly gravelly to <5mm weathered grey sandstone.											
6.7	10.2				Medium brown and grey sandy silty soil.											
10.2	13.7				Medium brown and grey weathered meta siltstone to $<5$ mm. Flecks of pyrite to $<1$ mm.											
13.7	17.2		WOOL FLAT	LSHED SHALE	Light Grey weathered	meta si	ltstone	to <5mm.			ADELA	IDEAN				
17.2	20.7		1 2/11		Medium grey laminate cubes to <1mm. Minor	d meta r milky	siltston quartz	e with minor Fe st ite.	taining. Minor pyri	te						
20.7	24.2		Medium grey laminated meta siltstone with minor pyrite to 3mm evident on siltstone.						on							
24.2     27.7     Medium grey laminated meta siltstone no pyrite evident on siltstone. Minor milky quartzite.								or								
REMARKS: at 10 m added water to cuttings pipe to settle dust Drilling Contractor: Frank Walsh Drilling, Mt Barker									DRILL TY	PE: Hammer	COMPL	ETED 8/5	/03			
				<i>6,</i> 2 <b>m</b>							DRILL FL	UID: Air	LOGGE	D BY: J Ja	ames-Sm	ith
									DATE		SHEET	1 OF 2				



**PROJECT:** Peppered Site

**PERMIT No. 61107** 

UNIT No. 6628 - 21205

DEPTH (m)		GRAPHIC	ROCK/SEDIMENT			Depth	0	CASINC	£
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
27.7	31.2			Medium grey laminated meta siltstone with minor Fe staining. Pyrite flecks on meta siltstone to 2mm. Minor pyrite on quartzite. <10% quartzite to 10mm. Very minor rose quartzite.					
31.2	34.7			Medium grey laminate meta siltstone with minor Fe staining. Very minor pyrite on milky quartzite.					
34.7	38.2			Medium grey laminated meta siltstone with minor Fe staining and pyrite cubic clusters to <5mm. Milky quartzite < 5%.					
38.2	41.7			Medium grey laminated meta siltstone with pyrite flecks and small cubes to <1m. Minor milky white quartzite.					
41.7	45.2			Medium grey laminated meta siltstone with minor Fe staining and with pyrite flecks and small cubes to <1mm. 5% milky quartzite.					
45.2	48.7			Medium grey laminated meta siltstone with very minor pyrite. No Fe staining. Minor milky quartzite.					
48.7	52.2			Medium grey laminated meta siltstone with minor Fe staining. 20% milky quartzite. Pyrite cubes to 1mm.					
52.2	55.7			Medium grey laminated meta siltstone with minor Fe staining and pyrite on siltstone. 20% milky quartzite. Pyrite cubes to 1mm. EOH					
	1	1	1	1		SHEET	2 OF 2	<u>ı                                    </u>	

												<b>PROJECT:</b>	Peppere	d Site		
						GROU	JNDW.	ATER PROGRAM	Λ			PERMIT No	o. 61108			
<b>The</b> Wa	Departme ter, Land	ent of d and				WA	TER	WELL LOG				UNIT No. 6	628 - 21	202		
Co	nserva	tion	Coordinat	tes: E 299431.672	N 6126193.57 El.	Surface(	m)	El. Ref. P	coint(m)	Datum: AC	GD 84	Hundred: Onkaparinga Sec: I			ec: PT4	4023
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL n)		SUPPLY			TOTA	AL DISSOLVED SOLIDS			
	AQ	UIFER		(m)	(m)	From	То	To L/sec Test length Method				mg/L		Analysis No.		
	SUMMARY     21       28     39.7       EOH					28	21 31 39.7 48.6	0.15 0.23 0.35 0.25	Drilling Drilling Drilling 20 minutes	Airlift Airlift Airlift Airlift		1692 1653 1513 1485	625055 625056 625057 625058			
DEPI	TH (m)	GRAPHIC	ROCK/SEDIMENT CEOLOGICAL DESCRIPTION								FODI		Depth	(	CASIN	3
From	То	LOG	NAME GEOLOGICAL DESCRIPTION								FORMA	ATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
0	3.3				Light orange brown sil	ty soil.	Minor	gravel of light gre	ey sandstone.		QUATE	RNARY		200	0	6
3.3	6.6				Light brown silty soil.	Slightl	y sand	у.								
6.6	10.1				Medium brown silty soil. Slightly clayey in part with clay dark brown to dark grey.											
10.1	13.6				Medium dark borwn sa silty soil.	Medium dark borwn sandy silty soil. Toward 13.6 m soil change to medium grey silty soil.										
13.6	17.1		WOOI FLAT	LSHED SHALE	Medium grey and light	grey la	iminate	ed meta siltstone gr	ravel.		ADELA	IDEAN				
17.1	20.6		TLAT	SHALL	Medium grey laminate 50% milky quartzite. I Minor pyrite fragments	d meta Fe stain s.	siltston ing evi	e with weathered dent on both meta	(very soft) meta siltstone and quar	iltstone. tzite.						
20.6	24.1		Medium grey meta laminated siltstone with minor Fe staining. Minor pyrite to mm and very minor milky quartzite							rite to 2						
REMARKS: Drilling Contractor: Frank Walsh Drilling, Mt Barker										DRILL TY	PE: Hammer	COMPL	ETED 8/5	/03		
Added	foam at	28 m to lift	cuttings	5.							DRILL FL	UID: Air	LOGGE	O BY: J J	ames-Sm	ith
										DATE SHEET 1 OF 2						



**PROJECT:** Peppered Site

**PERMIT No. 61108** 

UNIT No. 6628 - 21202

DEPTH (m)		GRAPHIC	ROCK/SEDIMENT			Depth	(	CASIN	G
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
24.1	27.6			Medium grey meta laminated siltstone. Minor pyrite to 2 mm and very minor milky quartzite.					
27.6	31.1			Medium grey meta laminated siltstone. Minor pyrite on siltstone. No quartzite.					
31.1	34.6			Medium grey meta laminated siltstone. Minor pyrite on siltstone. Very minor quartzite.					
34.6	38.1			Medium grey meta laminated siltstone. Very minor quartzite.					
38.1	41.6			Medium grey meta laminated siltstone. Minor pyrite flecks on siltstone. <20% milky quartzite. Minor pyrite cubes and clusters to 5mm.					
41.6	45.1			Medium grey meta laminated siltstone. Minor pyrite flecks on siltstone. <5% milky quartzite. Minor pyrite to 1mm.					
45.1	48.6			Medium grey meta laminated siltstone. Minor pyrite flecks on siltstone. <5% milky quartzite. Minor pyrite to 1mm. EOH					
	l	<u>I</u>	1	1		SHEET	2 OF 2		L

												<b>PROJECT:</b>	Peppere	ed Site		
						GROU	JNDW	ATER PROGRAM	Л			PERMIT NO	o. 61109			
<b>The</b> Wa	Departme ter, Land	ent of and				<b>W</b> A	TER	WELL LOG				UNIT No. 60	628 - 212	207		
Co	nserva	tion	Coordinate	es: E 299422.729	N 6126189.015 El.	Surface(	m)	El. Ref. P	oint(m)	Datum: AC	GD 84	Hundred: O	nkapari	nga S	ec: PT4	4023
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL n)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	M	ethod	mg/L		А	nalysis N	ю.
	SUM	IMARY		21 EOH			21 55.6	0.25 0.23	Drilling 20 minutes	Airlift Airlift		1737 1558		62510 62510	0 1	
DEPT	ГН (m)	CRADUIC	ROCK										Depth	(	CASIN	G
From	То	LOG		NAME		GEO	LOGIC	CAL DESCRIPTIC	DN		FORMA	ATION/AGE	Core Sample	Dia	From	To
0	3.3				Light orange brown sil	ty soil.	Minor	gravel of light gre	ey sandstone and i	milky	QUATE	RNARY		200	0	6
					quartzite.											
3.3	6.6				Light brown silty soil.	Slight	ly sand	у.								
6.6	10.1				Medium brown silty so grey. Minor grey lami	oil. Slignated n	ghtly cl neta sili	ayey in part with c tstone gravel to 3m	elay dark brown to 1m.	o dark						
10.1	13.6				Medium dark brown sa	undy sil	ty soil.	Slightly damp.								
13.6	17.1		WOOL FLAT	LSHED SHALE	Medium grey laminate stained. Very minor p	d meta yrite fle	siltstor ecks on	ne and milky white siltstone.	quartzite. Both I	Fe	ADELA	IDEAN				
17.1	20.6				Medium grey laminate	d meta	siltstor	ne with minor Fe st	taining.							
20.6	24.1				Medium grey meta lam and very minor milky o	inated quartzit	siltstor æ	ne with minor Fe st	taining. Pyrite to 2	2 mm						
REMA	ARKS: E	KS: Drilling Contractor: Frank Walsh Drilling, Mt Barker										PE: Hammer	COMPL	ETED 9/5	5/03	
											DRILL FL	UID: Air	LOGGE	D BY: J J	ames-Sm	ith
											DATE		CUEET	1.05.2		
											DATE		SHEET	1 OF 2		



**PROJECT:** Peppered Site

**PERMIT No. 61109** 

UNIT No. 6628 - 21207

DEPT	Ή (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASINC	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
24.1	27.6			Medium grey meta laminated siltstone minor Fe staining. Cubic pyrite on siltstone to 3 mm and very minor clear and milky quartzite.					
27.6	31.1			Medium grey meta laminated siltstone minor Fe staining. Cubic pyrite and flecks to 4 mm and minor milky quartzite. Very minor rose quartzite.					
31.1	34.6			Medium grey meta laminated siltstone minor Fe staining. Cubic pyrite and flecks to 4 mm and minor milky quartzite.					
34.6	38.1			Medium grey meta laminated siltstone minor Fe staining. Cubic pyrite and flecks to 3 mm and minor milky quartzite.					
38.1	41.6			Medium grey meta laminated siltstone minor Fe staining. Cubic pyrite and flecks to 4 mm. Slightly more milky quartzite than above interval.					
41.6	45.1			Medium grey meta laminated siltstone minor Fe staining. Minor pyrite and flecks and minor milky quartzite.					
45.1	48.6			Medium grey meta laminated siltstone minor Fe staining. Minor pyrite and flecks and minor milky quartzite.					
48.6	52.1			Medium grey meta laminated siltstone minor Fe staining. Very minor pyrite and flecks and minor milky quartzite to <5mm. Minor flecks of pyrite on quartzite.					
52.1	55.6			Medium grey meta laminated siltstone minor Fe staining. Very minor pyrite and flecks and minor milky quartzite to 10mm. Minor flecks of pyrite on quartzite EOH					
		<u> </u>				SHEET	2 OF 2	<u> </u>	

												PROJECT:	Peppere	ed Site		
						GROU	JNDW	ATER PROGRAM	1			PERMIT N	o. 61110			
<b>The</b> Wa	Departme ter, Lanc	ent of d and				WA	ATER	WELL LOG				UNIT No. 6	628 - 21	210		
Co	nserva	tion	Coordinat	es: E 299414.928	N 6126184.842 El.	Surface(	(m)	El. Ref. Po	pint(m)	Datum: AC	GD 84	Hundred: O	nkapari	nga S	ec: PT4	4023
				DEPTH TO	DEPTH TO STANDING WATER	INTE	RVAL		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	М	ethod	mg/L		А	nalysis N	0.
	SUM	IMARY		21 28 EOH		28	21 29.5 55.6	0.006 0.15 0.23	Drilling Drilling 20 minutes	Airlift Airlift Airlift		1205 1272 1328		62510 62510 62510	2 3 4	
DEPT	ГН (m)	GRAPHIC	ROCK	/SEDIMENT							FORM		Depth	(	CASIN	3
From	То	LOG	]	NAME		GEO	LOGIC	CAL DESCRIPTIO	N		FORMA	ATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
0	3.3				Light orange brown sil	ty soil.	Slight	ly gravely with ligh	ht grey quartzite a	nd	QUATE	RNARY		200	0	6
					sandstone. Non-calcar	eous.										
3.3	6.6				Light brown silty soil.	Slight	ly sand	у.								
6.6	10.1				As above. Less sandy											
10.1	13.6				Medium brown silty so gravel.	oil. Slig	htly cla	ayey in part with da	ark brown clay. N	ίο						
13.6	17.1				Medium brown. Grey grey meta siltstone to	silty saı 10mm.	ndy soil	l. Minor gravel of	grey brown sands	tone and						
17.1	20.6		WOOL	LSHED	Medium grey laminate	d meta	siltstor	ne. Weathered in p	arts. Very minor	pyrite.	ADELA	IDEAN				
20.6	24.1		TLAI	SHALE	Medium grey laminate white quartzite. Some	d meta Fe stai	siltstor ning on	ne. Minor pyrite cu 1 siltstone.	ibes to 2mm. Ver	y minor						
REMA	ARKS:	1			1						DRILL TY	PE: hammer	COMPL	ETED 9/5	/03	
											DRILL FL	UID: air	LOGGE	D BY: J J	ames-Sm	ith
								DATE		SHEET	1 OF 2					



**PROJECT:** Peppered Site

PERMIT No. 61110

UNIT No. 6628 - 21210

DEPT	CH (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASIN	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
24.1	27.6			As above. Pyrite cubes to 2mm. Very minor white quartzite. Some Fe staining on siltstone.					
27.6	34.6			Grey laminated meta siltstone. No Fe staining. Very minor pyrite to <2mm. Minor white quartzite < 2mm.					
34.6	38.1			Grey laminated meta siltstone. Fe staining evident. More pyrite flecks than previous interval.					
38.1	41.6			As above. Less pyrite but cubes to 3mm. More white/milky quartzite approximately 3% to 10mm.					
41.6	52.1			As above. Minor pyrite flecks. Minor quartzite.					
52.1	55.6			As above. Less pyrite. 3-5 % white/milky quartzite of <3mm. EOH					
	1	1	1	1		SHEET	2 OF 2	1	<u>I</u>

								PROJECT:	Peppere	d Site						
1						GROU	ATER PROGRAM	[			PERMIT No	o. 61111				
<b>The</b> Wa	Departm ter, Land	ent of d and				WA	ATER	WELL LOG				UNIT No. 60	528 - 212	208		
Bi	o diver <b>nserva</b>	sity tion	Coordinate	es: E 299405.146	n 61261179.66 ei.	Surface(	(m)	El. Ref. Po	vint(m)	Datum: AG	GD 84	Hundred: O	nkapari	nga S	ec: PT4	4023
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL m)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	М	ethod	mg/L		A	nalysis N	0.
	SUM	IMARY		18 EOH			18 55.5	0.35 0.35	Drilling 20 minutes	Airlift Airlift		1748 1642		62519 62520	9 0	
DEP	ГН (m)	GRAPHIC	ROCK	/SEDIMENT									Depth	(	CASING	G
From	То	LOG	1	NAME		GEO	LOGIC	CAL DESCRIPTIO	N		FORM	ATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
0	3.25				Light orange brown so	il. Cla	yey in p	parts with orange/gr	rey clay. Gravel t	o 20	QUATE	RNARY		200	0	6
	mm of pink quartzite. Minor grey laminated meta siltstone with Fe staining															
3.25	6.5				Light brown silty soil.	Very s	slightly	sandy.								
6.5	10				Light brown/orange sil	ty soil.	Very	minor grey siltstone	e gravel.							
10	13.5				Medium brown silty sa siltstone <10 mm with	ndy so Fe stai	il. Slig ning.	htly gravely. Grav	el of laminated m	eta						
13.5	17		WOOL	SHED	Weathered laminated g	rey me	eta siltst	tone. Fe staining.	Pyrite cubes to < 3	3mm.	ADELA	IDEAN				
17	20.5		I LAT,	SIALL	Grey laminated meta si	iltstone	with n	ninor pyrite flecks.	15-20% milky qu	artzite.						
20.5	24				Grey laminated meta si 4mm. Fe staining on s	iltstone iltstone	e. Abur e. Milk	idant pyrite specks y white quartzite w	and some cubes u with dissolution fea	p to atures.						
2427.5Grey laminated meta siltstone. Abundant pyrite specks and some cubes up to 4mm. Minor Fe staining on siltstone.									p to							
REMA	MARKS:										DRILL TY	PE: hammer	COMPLI	ETED 12/	/5/03	1
													LOGGEI	) BY: J J	ames-Smi	ith
											DATE		SHEET	1 OF 2		



**PROJECT:** Peppered Site

PERMIT No. 61111

UNIT No. 6628 - 21208

DEPT	'H (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASING	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
27.5	31			Grey laminated meta siltstone. Minor pyrite cubes to 2mm and specks on siltstone. Minor white quartzite. Minor Fe staining.					
31	38			As above. Pyrite to 4mm. Minor Fe staining.					
38	41.5			As above. Less quartzite. More pyrite flecks. Minor Fe staining.					
41.5	52			As above. Minor pyrite cubes to 1mm. Minor Fe staining. Minor milky/white quartzite.					
52	55.5			As above. More quartzite approximately 5%. Very minor pink milky and white quartzite. EOH					
						SHEET	2 OF 2		

												<b>PROJECT:</b>	Peppere	d Site		
//						GROU	JNDW	ATER PROGRAM	Л			PERMIT NO	o. 61112			
<b>The</b> Wa	Departme	ent of and				WA	TER	WELL LOG				UNIT No. 60	528 - 212	206		
Co	nserva	tion	Coordinate	es: E 299407.402	N 6126189.381 El.	Surface(	m)	El. Ref. P	oint(m)	Datum: AC	GD 84	Hundred: O	nkapari	nga So	ec: PT4	4023
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL n)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	М	ethod	mg/L		A	nalysis N	0.
	SUM	IMARY		19.5 22 EOH		22	19.5 23 55.5	0.9 3.2 2.3	Drilling Drilling 20 minutes	Airlift Airlift Airlift		1216 1284 1272		62520 625202 625202	1 2 3	
DEPT	Ϋ́Η (m)	GRAPHIC	ROCK	/SEDIMENT		CEO			NT.		FORM		Depth	0	CASIN	3
From	То	LOG	]	NAME		GEO.	LOGIC	CAL DESCRIPTIC	DN		FORMA	ATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
0	3.25				Orange/pink brown cla pink stained quartzite.	yey saı Clayey	ndy soil / in par	l. Angular gravel : t of deep orange st	>10mm of sandsto iff clay.	one and	QUATE	RNARY		200	0	6
3.25	6.5				Light brown and light o	orange	silty so	il. Slightly sandy.								
6.5	10				Light brown silty soil.	Minor	clumps	s of grey/orange cl	ay <10mm.							
10	13.5				Medium brown silty sa staining to 10mm. Mir	ndy so or mil	il. Gra ky quar	vel of grey lamina tz gravel.	ted meta siltstone	with Fe						
13.5	17				Grey sandy silt. Minor	grey l	aminate	e meta siltstone gra	avel. Weathered in	n part.						
17	20.5		WOOL FLAT	LSHED SHALE	Fe stained laminated m Fe stained to 10mm.	eta silt	stone.	Minor pyrite to 1n	nm. Minor milky	quartzite	ADELA	IDEAN				
20.5	24				Fe stained laminated m zone. Minor white qua	eta silt rtzite.	stone to	o 30mm. Very min	nor pyrite. Large	fracture						
REMA	RKS:		I		1						DRILL TY	PE: Hammer	COMPL	ETED 13/	5/03	1
											DRILL FL	UID: Air	LOGGEI	O BY: J Ja	ames-Sm	ith
											DATE		SHEET	1 OF 2		



**PROJECT:** Peppered Site

**PERMIT No. 61112** 

UNIT No. 6628 - 21206

DEPT	°H (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASING	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
24	27.5			As above. Large pieces to <80 mm.					
27.5	31			Medium grey laminated meta siltstone. Pyrite flecks and cubes to 1mm. Minor milky white quartzite. Very minor pink quartzite to 3mm.					
31	34.5			As above. More pyrite cubes to 3mm. Slightly more pink than previous interval quartzite to 10mm. Fe staining evident on siltstone. Minor milky white quartzite.					
34.5	38			As above. Less pyrite flecks and few cubes to <2mm. Some pyrite evident on quartzite. Minor milky to white quartzite. No pink quartzite. Some Fe staining on both siltstone and quartzite.					
38	41.5			As above. No pyrite on siltstone or quartzite.					
41.5	48.5			As above. Slightly more milky/ white quartzite.					
48.5	52			50% white to milky quartzite to 10mm. 50% laminated grey meta siltstone. Very minor pyrite cubes to 1mm. Very minor Fe staining on quartzite and siltstone.					
52	55.5			60% white to milky quartzite. 2% ink quartzite to 10mm. Grey laminated meta siltstone and light grey friable laminate micaceous siltstone. Minor pyrite clusters to 3mm. EOH					
				·		SHEET	2 OF 2		

												PROJECT:	Peppere	ed Site		
/						GROU	JNDW	ATER PROGRAM	/[			PERMIT No	). 61113			
<b>The</b> Wa	Departme ter, Lanc	and				WA	ATER	WELL LOG				UNIT No. 66	528 - 212	203		
Co	nserva	tion	Coordinate	es: E 299416.854	N 6126195.834 El.	Surface(	(m)	El. Ref. P	oint(m)	Datum: AC	GD 84	Hundred: O	nkapari	nga S	ec: PT4	4023
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL m)		SUPPLY			TOTA	AL DISSO	LVED SO	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	M	ethod	mg/L		Α	nalysis N	0.
	SUM	IMARY		28 31 EOH		28 31	28.5 31.5 55.6	0.06 0.6	Drilling Drilling 20minutes	Airlift Airlift Airlift		1289 1266 1284		62520 62520 62520	4 5 6	
DEPT	°H (m)	GRAPHIC	ROCK	/SEDIMENT		CEO					FORM		Depth	(	CASIN	G
From	То	LOG	]	NAME		GEO	LOGIC	AL DESCRIPTIO	2IN		FORMA	ATION/AGE	Sample	Dia (mm)	From (m)	To (m)
0	3.3				Orange silty sandy soil	. Clay	ey in pa	arts of orange/grey	clay. Minor grav	vel of	QUATE	RNARY		200	0	6
					minky and pink quartzi	le.										
3.3	6.6				Orange/brown silty soi	l. Min	or grav	el to 20mm of lam	inated grey meta	siltstone.						
6.6	10.1				Light brown silty sand	y soil.	10% gi	avel of quartzite a	nd meta siltstone	<10mm.						
13.6	17.1		WOOL FLAT	SHED SHALE	Laminated grey meta s staining on siltstone.	iltstone ⁄Iinor p	e. Very oyrite to	minor white and a 2mm.	clear quartzite. M	linor Fe	ADELA	IDEAN				
17.1	20.6				As above. Less quartz	ite.										
20.6	31.1				As above. Laminated	meta si	ltstone	to 30mm. Minor J	pyrite to 3mm.							
31.1	34.6				As above. Pyrite fleck staining on siltstone.	s. Min	or milk	y/white quartzite t	o 5mm. Minor Fo	e						
34.6	38.1				As above. Less quartz	ite. Mo	ore pyri	te flecks. Less Fe	staining.							
REMA	RKS:										DRILL TY	PE: Hammer	COMPL	ETED 13	5/03	
											DRILL FL	UID: Air	LOGGE	D BY: J J	ames-Sm	ith
											DATE		SHEET	1 OF 2		



**PROJECT:** Peppered Site

**PERMIT No. 61113** 

UNIT No. 6628 - 21203

DEPT	'H (m)	GRAPHIC	ROCK/SEDIMENT			Depth	0	CASING	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
38.1	41.6			As above. Minor pink quartzite to 5mm. Pyrite to 2mm. Minor Fe staining.					
41.6	52.1			Laminated grey meta siltstone. Pyrite to 1mm. Minor Fe staining. No pink quartzite.					
52.1	55.6			50% white and milky quartzite to 10mm. 50% laminated grey meta siltstone with minor Fe staining and pyrite to 1mm. Friable in part. EOH					
	-			·		SHEET	2 OF 2		

												PROJECT:	Peppere	ed Site		
/						GROU	JNDW	ATER PROGRAM	1			PERMIT NO	o. 61114			
<b>The</b> Wa	Departme	ent of and				<b>W</b> A	TER	WELL LOG				UNIT No. 60	628 - 212	204		
Co	nserva <sup>s</sup>	tion	Coordinate	es: E 299409.001	N 6126199.146 El.	Surface(	m)	El. Ref. Po	pint(m)	Datum: AC	GD 84	Hundred: O	nkapari	nga S	ec: PT4	4023
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL n)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		A	nalysis N	о.
				24			24	0.03	Drilling	Airlift		1233		62520	7	
	SUM	IMARY		53 FOH		53	54 55 7	1.9	Drilling 20 minutes	Airlift		1194		62520	8	
				Lon			55.1	1.9	20 minutes	7 111111		1171		02020	0	
DEPI	°H (m)	GRAPHIC	ROCK	/SEDIMENT		GEO		AL DESCRIPTIO	IN I		FORM		Depth	(	CASIN	3
From	То	LOG	]	NAME		ULU.	LUUIC	AL DESCRIPTIO	11		PORM	TION/AOL	Sample	Dia (mm)	From (m)	To (m)
0	3.35				Orange silty/sandy soil	. Clay	ey in pa	arts, when broken o	clay deep orange n	nottled	QUATE	RNARY		200	0	6
					with some grey. Minor	r white	quartzi	te to 10mm.								
3.35	6.7				Orange/light brown silt meta siltstone and whit	ty sand e quart	y soil. zite.	Minor gravel to 10	mm of grey lamir	nated						
6.7	10.2				Light brown silty sandy siltstone and white qua	y soil. rtzite.	Minor	gravel <10mm of 1	aminated grey me	ta						
10.2	13.7				Medium brown/orange siltstone with Fe staining	silty sang.	andy so	il. Minor gravel <	10mm of laminate	ed meta						
13.7	17.2		WOOL FLAT	LSHED SHALE	Grey silt and weathered Minor pyrite to 1mm.	d lamin	ated gr	ey meta siltstone.	Fe stained and fria	able.	ADELA	IDEAN				
17.2	20.7				Weathered laminated g stained Minor Fe pyrite cubes	rey me to 2mm	ta siltst n. Mino	one and hard lamin or white quartzite t	nated siltstone. Bo o 1mm.	oth Fe						
REMA	RKS:		I		<u> </u>						ייי דיומת	DEt Hommer	COMPT		15/02	
											DRILL IY	PE: Hammer	COMPL	EIED 14/	3/03	
											DRILL FL	UID: Air	LOGGE	D BY: J J	ames-Sm	ith
											DATE		SHEET	1 OF 2		



**PROJECT:** Peppered Site

PERMIT No. 61114

UNIT No. 6628 21204

DEPT	°H (m)	GRAPHIC	ROCK/SEDIMENT			Depth	0	CASIN	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
20.7	24.2			Laminated grey meta siltstone with minor Fe staining. Minor pyrite to 1mm.			()	()	(,
24.2	27.7			As above. Minor pyrite to 4mm. Very minor Fe staining. Minor white quartzite to 10mm.					
27.7	34.7			As above. Slightly more white milky quartzite ~ 1%. Minor pyrite to 2mm.					
34.7	38.2			Grey laminated meta siltstone. Minor Fe staining. Very minor white quartzite to 5mm. Minor pyrite to 1mm.					
38.2	45.2			As above. Minor white quartzite to 10mm. Very minor pyrite to 1mm. Some pyrite evident on white quartzite.					
45.2	48.7			Laminated grey meta siltstone with minor Fe staining. 40% white/milky quartzite to 10mm. Minor pink quartzite to 5mm. Very minor pyrite flecks					
48.7	55.7			Light grey laminated meta siltstone almost sandstone (coarser grained). Minor grey siltstone. 1% quartzite to 5mm. Very minor pink quartzite. EOH					
	•			·		SHEET	2 OF 2	•	•

												<b>PROJECT:</b>	Peppere	d Site		
						GROU	JNDW.	ATER PROGRAM	1			PERMIT NO	o. 61115			
<b>The</b> Wa	Departme ter, Lanc	ent of d and				WA	TER	WELL LOG				UNIT No. 60	628 - 212	209		
Co	odiver nserva	tion	Coordinat	es: E 299410.649	N 6126208.984 El.	Surface(	m)	El. Ref. Po	pint(m)	Datum: AC	GD84	Hundred: O	nkapari	nga So	ec: PT4	4023
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL n)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		Aı	nalysis N	0.
	SUM	IMARY		21 35 45 EOH		21 45	22 46 55.5	0.01 0.13 2.3 1.9	Drilling Drilling Drilling 20 minutes	Airlift Airlift Airlift Airlift		1340 1311 1138 1172		625209 625210 62521 625212	9 ) 1 2	
DEPT	ГН (m)	GRAPHIC	ROCK	/SEDIMENT	N		EODM		Depth	0	CASIN	3				
From	The (III)     GRAPHIC LOG     ROCK/SEDIMENT NAME     GEOLOGICAL DESCRIPTION										FURMA	ATION/AGE	Sample	Dia (mm)	From (m)	To (m)
0 3.25 6.5 10 13.5 20.5	<ul> <li>3.25</li> <li>6.5</li> <li>10</li> <li>13.5</li> <li>20.5</li> <li>27.5</li> </ul>		WOOI FLAT	LSHED SHALE	Orange silty sandy soil open. Minor milky qua Light brown and light of to <5mm. Light brown and media Grey silty sandy soil. I grey laminated meta si Weathered and hard gr staining. Laminated grey meta s quartzite to 10mm. Ve	. Partly artzite t orange um brov Minor 1 ltstone. ey lami iltstone ery mino	y claye o 10mi silty sa wn silty nedium nated r nated r to 30n or pyrit	y. Clay deep orang n. ndy soil. Very min v sandy soil. n brown sandy soil neta siltstone. Min nm. Minor Fe stain e to 1mm.	ge and grey when nor white/milky qu . Minor gravel <1 nor pyrite to 1mm. ning. Minor milky	broken uartzite 0mm of . Fe y white	QUATE	RNARY IDEAN		200	0	6 6
REMA	ARKS:	1				DRILL TY	PE: Hammer	COMPL	ETED 15/	5/03						
											DRILL FL	UID: Air	LOGGEI	O BY: J Ja	ames-Sm	ith
											DATE		SHEET	1 OF 2		



**PROJECT:** Peppered Site

**PERMIT No. 61115** 

UNIT No. 6628 - 21209

DEPT	ΨH (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASING	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
27.5	31			As above. More quartzite ~5%. Milky white quartzite to 10mm. Minor pyrite to 3mm on siltstone.					
31	45			As above. Cubes of pyrite to 3mm. Very minor pink quartzite to 3mm.					
45	48.5			Light grey weathered laminated coarser grained possibly sandstone. Some friable. Some speckled with green chlorite. Pyrite to 3mm. Minor quartzite to 20mm.					
48.5	55.5			As above but no chlorite evident. EOH					
	1	1	1	1		SHEET	2 OF 2	1	1

											PROJECT: M	LR Grou	ndwater	Investi	gation
The De Water	partment , Land a	of nd		RESOURC	E ASSESSMENT DIV WA	ISION ATEF	– GRO <b>R WE</b> I	UNDWATER ASS LL LOG	SESSMENT BRAN	NCH	PERMIT No.	61098			
Cons	ervati	on									UNIT No. 662	8-2-1201			
Well N Locati Coord	Name: ion: linates:	PEPPER C Roadside re E 299411.	ORE NO eserve, G 263 N 6	). 1 reenhill Rd. 2ki §126187.461	n W Balhannah Surfa	ace Ele	evation	( <b>m</b> ): 356.57 m	Datum: AG	D84	Hundred: Onk	aparinga	Secti	on: 402	3
		UIFER		DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL m)		SUPPLY			SALIN	ITY		
	~~ <b>x</b>			(m)	(m)	From	То	L/sec	Test length	Metho	d EC (µS/cm @	25°C)		Comment	t
	SUM	IMARY				Down 1	hole soi 7/4/200	nde on 3							
DEPT	TH (m)	GRAPHIC	ROCK	/SEDIMENT		Depth		CASIN	3						
From	То	LOG	1	NAME	Formation/Age	Core Sample	Diam	From	То						
0	2.7		A	lluvium	Brown gravely clay ov	erlying	g orange	e sandy clay			Quaternary	-	(mm) 125	(m) 0	(m) 13.5
2.7	6.1				Orange clay containing	g bould	ers of g	grey, weathered sand	dy siltstone.						
6.1	50.0		Balha Ma Woo	annah Shale ember of olshed Flat Shale	Light grey laminated n staining; quartz veins a grey, highly fractured (	neta-sil und pyr (weathe	tstone. ite com ered?) s	Fractures througho mon. Bedding char late-like zones.	out, some with iron otic in parts. Sever	oxide ral dark	Burra Group (Proterozoic)				
REMA	ARKS:									]	DRILL TYPE: Diamond	СОМРІ	LETED: 9	March 2	.003
Contin aside f	uous dia from the	mond core a core trays for	retrieved or subseq	from surface to uent mineralog	final drilled depth. Th ical and/or pore water c	ree (3) hemica	small s al analy	sections of core wer ses.	e wax-dipped and	kept	DRILL FLUID: Water	LOGGE	ED BY: G	. Harring	ton
		·	1		*		5			;	START: 6 March 2003	SHEET	: 1 OF 1		

											PROJECT: M	LR Grou	ndwater	Investi	gation
The De Water	partment , Land a	t of Ind		RESOURC	CE ASSESSMENT DIV W	ISION ATEF	– GRO R WEI	UNDWATER AS L <b>LOG</b>	SESSMENT BRAN	NCH	PERMIT No.	61105			
Cons	ervati	on									UNIT No. 662	28-2-1200	I		
Well N Locati Coord	Name: ion: linates:	PEPPER C Roadside re E 299436.	ORE NO eserve, G 15 N 61	). 2 reenhill Rd. 2k  26218.036	m W Balhannah	Surfac	e Eleva	tion (m): 353.662	2 m Datum: AC	GD84	Hundred: Onk	aparinga	Secti	on: 402	.3
	AO	UIFER		DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	ERVAL m)		SUPPLY			SALIN	ITY		
	~~ <b>x</b>			(m)	(m)	From	То	L/sec	Test length	Method	EC (µS/cm @	25°C)		Commen	t
	SUM	IMARY		NA				Down 1	hole soi 7/4/200	nde on 13					
DEPT	ГН (m)	GRAPHIC	ROCK	/SEDIMENT			Depth	(	CASIN	G					
From	То	LOG	1	NAME		GEO	LOGIC	AL DESCRIPTIC	DN		Formation/Age	Core Sample	Diam (mm)	From (m)	To (m)
0	2.1		A	lluvium	Brown clay, calcareou	s in par	ts.				Quaternary		125	0	10.5
<ul><li>2.1</li><li>2.2</li><li>10.2</li></ul>	<ul><li>2.2</li><li>10.2</li><li>49.7</li></ul>		Balha Ma Woo	annah Shale ember of blshed Flat Shale	Light grey clay. Grey weathered meta- throughout sticky brow Light grey to black lar throughout, some with Minor rose quartz tow highly fractured (weat	siltston vn clay ninated i iron oy ards ba hered?)	e boulde meta-si xide stai se. Bed slate-lil	ers with iron oxide ltstone. Closely-s ning; quartz veins ding chaotic in pa ke zones.	e staining dispersed spaced fractures s and pyrite commo urts. Numerous dark	n. grey,	Burra Group (Proterozoic)				
REMA Contir aside f	MARKS: tinuous diamond core retrieved from surface to final drilled depth. Three (3) small sections of core were wax-dipped and kept de from the core trays for subsequent mineralogical and/or pore water chemical analyses. <b>DRILL FLUID:</b> Water <b>START:</b> 9 March 2003													0 March . Harring	2003 ton

# 7 APPENDIX C



WATER WELL LOGS FOR WILLUNGA FAULT (PHASE 2.2)

Report DWLBC 2004/04

Hydrogeological investigation of the Mount Lofty Ranges, progress report 5: Drilling phases 2.1 to 2.3: research and monitoring wells at Scott Creek, Balhannah, Willunga Fault, Lobethal, Eden Valley and Ashbourne

						GROU	JNDW.	ATER PROGRAM	1			PROJECT: Investigation	Spring l n	Fed Da	m	
The	Departm	ent of				WA	ATER	WELL LOG				PERMIT N	o. 61903			
Bio	odiver nserva	sity tion	~								_	UNIT No. 6	627-1077	6		
			Coordinate	es: E 280090 N 6096	5735	]	El. Surfac	e (m)	El. Ref. Point (m)		Datum:	Hundred: W	Villunga	Sec: 30	5	
				DEPTH TO	DEPTH TO STANDING WATER	INTE	RVAL m)		SUPPLY			TOT	AL DISSO	LVED SO	DLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	M	ethod	mg/L		А	nalysis N	ю.
	SUM	IMARY														
	5011															
DEPT	TH (m)	GRAPHIC	ROCK	/SEDIMENT					Depth	(	CASIN	G				
From	To     GRAPHIC     ROCK/SEDIMENT       To     LOG     NAME   GEOLOGICAL DESCRIPTION											ATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
0	0.5		CLAY		Sticky chocolate/brown	n clay.	laita ma	dulas (Highly was	thered hadreals)				Cont,	100	0	12
0.3 1.5	6		CLAT		Light grey rubbly clay,	, carboi	naceous	kaolinite, some fi	ne weathered siltste	one						
6	7.0		CLAN		throughout.		1									
o 7.9	10.5		SILTS'	ΓΟΝΕ	As above with sull on Weathered fine-grained	ve gree d siltsto	n ciay. one, ligi	nt purple/grev. Sac	charoidal appearan	ce. iron	Angener	าล				
					staining throughout fra	ctures.	,8-		······································		Formatio	on?				
10.5	12		SILTS	ΓONE	As above, light brown	to grey	in colo	our and finely bedd	ed. Bedding plane							
12	16.5		SII TST	TONE	fractures, iron stained t	fracture	es.	a aray/brown Nu	marque frectures p	arallal						
12	10.5		SILIS	IONE	to bedding.	SILSIOI	ie orang	ge/grey/brown. Nu	merous mactures pa	araner						
16.5	16.8		CLAY		Weathered clay zone, t	erra co	tta red.									
16.8	24		SILTS	ΓΟΝΕ	Massive grey/black sil	tstone.	Beddin	g and veins all ~45	5°. Fractures paralle	el to						
24	27		CII TC	TONE	bedding, white and ora	nge mi	neraliza	ation along fracture	es.							
24	21			IUNE	staining in fractures.		ige/010		cialization and ffor	L						
27	30		SILTS	ΓONE	Quartz											
DEMA	DKC. N	(	C		veins approximately pa	arallel t	o beddi	ng plane, iron stai	ning in fractures.							
KEWIA	akko: N	iarsnall KO.	Core di	gnany photograj	piled.						DRILL TY Diamond-I	PE: Rotary	COMPL	ETED		
											DRILL FL	UID: Water	LOGGE	D BY: D.	Wohling	
											DATE		SHEET	1 OF 2		



PROJECT: Spring Fed Dam Investigation

**PERMIT No. 61903** 

UNIT No. 6627-10776

#### Hundred: Willunga Sec: 305

DEPT	CH (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASING	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
30	34		SILTSTONE	As above. Siltstone colouring from olive green/grey to pink purple to dark grey to					
				purple layering.					
34	37		SILTSTONE	As above. Grey/brown to olive green siltstone. Iron stained fractures, bedding					
				plane ~45° quartz veins approximately parallel to bedding. Secondary fracturing					
	10			$\sim 90^{\circ}$ to bedding. More highly weathered at 34.7 and 35.5m.					
37	43		SILTSTONE	As above. Grey/brown to olive green to purple siltstone. Dendrict mineralization					
12	10			in fractures.					
43	46		SILISIONE	As above. More weathered zone at 43.5 to 44.8m. Changing to a more					
10	50			predominately pink/brown siltstone.					
40	52		SILISIONE	As above. Pink/brown to grey/brown. weathered clay zone at 50m.					
52	55		SILISIONE	As above. Clay weathered zone at 52.5 and 55m. Secondary fracturing					
55	65 1		SII TSTONE	As above. Grow/brown to clive groop to purple/grow lewared siltetone. More					
55	05.4		SILISIONE	As above. Grey/blowin to onve green to purple/grey layered shistone. More					
65 /	68 5		SII TSTONE	Highly weathered claves siltetone, brown to clive green/gress					
68 5	73		SILTSTONE	Brown/grey to purple/grey to olive green/grey siltstone. Quartz veins parallel to					
00.5	15		SILISIONL	bedding Main fracturing parallel to bedding Secondary fracturing at right angle					
				to bedding. Minor iron staining and dendrict mineralization in fractures					
73	76		SILTSTONE	Very weathered grey siltstone. Cavity noted in core tray from 74 to 74 5m					
			5121510112	Largely weathered quartz rich sample above cavity.					
76	78		SILTSTONE	Highly weathered grey/olive green to brown siltstone.					
78	79		SILTSTONE	Olive green/grey to brown/grey/purple siltstone. Dendrict mineralization and iron					
				staining along fractures, saccharodal appearance, quartz veins.					
79	85		SILTSTONE	As above. Brown/grey/purple siltstone. Highly weathered clay zones from 80.5 to					
				82m, 82 to 83.4m and 84 to 84.3m, with quartz rock at 82m.					
85	91		SILTSTONE	As above. Turning to olive green. Weathered clay at 88m.					
91	97		SILTSTONE	As above. Brown/grey siltstone. Highly weathered in parts and some massive					
				quartz.					
97	100		SILTSTONE	Very little return. Clayey with some massive quartz.					
				END OF HOLE 100m.					
	1	1	I	1		GLIDDE	2.05.2	1	<u> </u>
	78 79 79 85 85 91 91 97 97 100					SHEET	2 OF 2		

						GROU	JNDW.	ATER PROGRAM	[			PROJECT: Investigation	Spring I n	Fed Da	n	
The	Departme	ent of				WA	TER	WELL LOG				PERMIT N	o. 62012			
Bi	o diver nserva	sity		E 070254 NL 600		``						UNIT No. 6	627-1077	7		
			Coordinate	es: E 278354 N 609	4358 EI. Surface (	m)		EI. Kel. Point (m)	Datum:			Hundred: W	Villunga	Sec: 70	2	
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (r	RVAL n)		SUPPLY			TOT	AL DISSO	LVED SO	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	М	ethod	mg/L		А	nalysis N	lo.
	SUM	IMARY														
	2011															
DEPT	ГН (m)	GRAPHIC	ROCK	/SEDIMENT							FORM		Depth	(	CASIN	G
From	То	LOG	l	NAME		GEO	LOGIC	AL DESCRIPTIO	N		FORMA	ATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
03	3		CLAY CLAY		Chocolate brown clay	overlyii e grave	ng oran ly nodu	gey reddish plastic	clay. eathered shale plate	elv)			Cont.	100	0	9
C	0		CLITT		Reddish brown weathe	red sha	le friab	le and clayey in pa	rts, some quartzite.							
6	9		SAND	STONE	Light brown with pale	olive g	reen ba	nds fine sandstone	with very thin mic	aceous	Elatina H	Formation?				
					beds. Numerous fractur has thick white clay in	res prec fractur	lomina e up to	tely along bedding. 2-3mm across. Sor	Some vertical to b ne perpendicular to	edding						
9	14.7		SAND	STONE	bedding, black staining Purple brown fine sand	g in frac Istone la	ctures ( aminate	query: iron oxide, r	nanganese oxide?? hout predominately	) Zalong						
-					bedding, some vertical	Black	stainin	g along most fractu	re walls. Clay in p	arts,						
14.7	19.1		SHALI		Greyish weathered roch	k in the	form c	of gritty clay.								
19.1 20	20 22.6		SHALI SHALI		Grey/white grey weath Pale yellow/brown wea	ered sh athered	ale. shale,	very clayey in parts	5.							
22.6	25.5		SHALI		Orangey yellow sticky	clay/w	eathere	d shale.								
29.1	31.1				Pale yellow/brown grit	ty clay	(weath	ered rock), highly of	calcareous.							
REMA	EMARKS: Taylors Hill Rd.										DRILL TY Diamond-I	PE: Rotary	COMPL	ETED		<u> </u>
											DRILL FL	UID: Water	LOGGEI	D BY: D.	Wohling	5
											DATE		SHEET	1 OF 2		



PROJECT: Spring Fed Dam Investigation

**PERMIT No. 62012** 

UNIT No. 6627-10777

Hundred: Sec:

DEPT	H (m)	GRAPHIC	ROCK/SEDIMENT			Depth	C	CASINC	ť
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FURMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
31.1	37		SHALE	Grey to purple grey laminated shale, calcareous in parts. Fractures throughout,					
37	40.3		SANDSTONE	Weathered calcareous, carbonaceous light grey sandstone. Vuggy porosity with some quartzite. Highly pitted dark green mineral coating near quartzite, rubble zone below.					
40.3	41.3		SILTSTONE	Mildly calcareous, light grey siltstone.					
41.3	47		SILTSTONE	Darker grey calcareous siltstone. Fractures in bedding, thick white carbonaceous deposits in bedding, some fractures perpendicular to bedding. Clay in parts at 45m. Some lighter grey horizons. Orange iron staining along fractures.					
47	51.3		SILTSTONE	Light grey metasiltstone layered massive in parts. Some fractures parallel and perpendicular, iron staining along fractures.					
51.3	51.8		SILTSTONE	As above. But highly weathered, clayey in parts. Thick white calcite deposits, some reddy/brown.					
51.8	56.8		SILTSTONE	Darker grey metasiltstone massive in parts, bedding plane fractures. Some brown layering. Olive green vertical trace through the core. At 54.2 to 54.3m, lenticular					
56.8	60		SILTSTONE	light pink carbonaceous layers. Some calcite in fractures. Light grey metasiltstone highly calcareous. At 57m, vuggy carbonaceous. Pink lenticular layers throughout. At 59.5m, highly fractured including vertical fracture, pale yellow grey highly calcareous. White deposits along fine fractures that have perpendicular bedding. EOH 60m					
						SHEET	2 OF 2		

The Wa Bii Co	Departme ter, Land o d i v e r nserva	ent of d and sity tion	Coordinate	es: E 284228 N 61	02553 El. Surface (m	GROU WA	UNDW ATER	ATER PROGRAM WELL LOG El. Ref. Point (m)	[ Datum:			PROJECT: Investigatio PERMIT N UNIT No. 6 Hundred: V	Spring I n o. 62019 627-1077 Villunga	Fed Dar 8 S	n ec: 531	
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL m)		SUPPLY			тот	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		А	nalysis N	0.
	SUM	IMARY														
DEPT	ГН (m)	GRAPHIC	ROCK	/SEDIMENT		GEO	LOGIC	AL DESCRIPTIO	N		FORM	ATION/AGE	Depth Core	(	CASIN	G
From	То	LOG	]	NAME		0L0	Loon				i oiuin		Sample	Dia (mm)	From (m)	To (m)
0 0.5 2 3 6 9 14 18 21 24 27 30	0.5 2 3 6 9 14 18 21 24 27 30 33	/ickhams H	CLAY CLAY META CLAY META META META META META	SILTSTONE SILTSTONE SILTSTONE SILTSTONE SILTSTONE SILTSTONE SILTSTONE	Red/brown clay, minor Light brown weathered Light brown clay with Weathered light brown sandy clay, sub-angula Light brown clay with in size. Weathered light grey n clay. Weathered light grey n % of light brown clay. Weathered grey metasi As above with clay lay As above with quartz s 30% cloudy quartz. Light brown weathered metasiltstone at 30m. Weathered grey metasi clay.	metas l metas l metas veathe /grey n r. weathe netasilt netasilt ltstone er at 22 and at l metas ltstone	iltstone iltstone red me netasilt ered sul stone – stone – – iron 2m. Mi 24m – iltstone , cloud	e fragments. e and clay, majority tasiltstone fragmen stone fragments. Cl p-angular metasiltsto iron stained along iron stained fractures. nor clay throughout medium grained sul e and clay, minor clay y quartz at 33m. So	brown/grey clay. ts. loudy quartz at 5m. one fragments up t fractures and light res, quartz seams. I t. b-angular to sub-ro ear quartz. Darker me sandy light bro	. Minor o 2cm brown Large unded. brown wn	Saddlew Formatio	orth on?	Cont.	100	0	24.5
KEMA	AKKS: W	(ickhams H	111 Kd.								DRILL TY Diamond-l	PE: Rotary	COMPLI	ETED		
											DRILL FL	UID: Water	LOGGEI	OBY: D.	Wohling	
											DATE		SHEET	1 OF 2		

GROUNDWATER PROGRAM WATER WELL LOG CONTINUATION SHEET       PERMIT No. 627.0073       UNT No. 6627.0073       The ROCK/SEDIMENT NAME     GEOLOGICAL DESCRIPTION       PORMATION/AGE     Days NAME       To 100     OPRIATION/AGE     Days NAME       To 100     PORMATION/AGE     Days Name       CASING To 100     PORMATION/AGE     Days Name       A METASULTSTONE Sample     CASING Tom 100       A METASULTSTONE Sample     CASING Tom 100 <td <="" colspan="2" th=""><th></th><th></th><th></th><th></th><th></th><th></th><th>PROJECT:</th><th>Spring F</th><th>ed Dam</th><th>Investig</th><th>;ation</th></td>	<th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>PROJECT:</th> <th>Spring F</th> <th>ed Dam</th> <th>Investig</th> <th>;ation</th>								PROJECT:	Spring F	ed Dam	Investig	;ation
UNIT No. 6627-10775       DEPIFITION     UNIT No. 6627-10778       DEPIFITION     CONTINUATION SHEET       DEPIFITION     ORALTION:AGE     DEPIFITION       TOTAL TRANSTATIONE       DARK brown metasilistone, minor clay, Cloudy quartz seam at 33m.       TOTAL TRANSTATIONE       GREAD TRANSTATIONE       GREAD TRANSTATIONE       GREAD TRANSTATIONE       GREAD TRANSTATIONE       Contranstation of the more clay, Cloudy quartz seam at 33m.       TOTAL TRANSTATIONE       GREAD TRANSTATIONE       GREAD TRANSTATIONE       GREAD TRANSTATIONE       TOTAL TRANSTATIONE       GREAD TRANSTATIONE       GREAD TRANSTATIONE       GREAD TRANSTATIONE       LINE TOTAL       <th colspan="2</td> <td>The</td> <td>Donautim</td> <td>PERMIT N</td> <td>o. 62019</td> <td></td> <td></td> <td></td>	The	Donautim	PERMIT N	o. 62019									
Induced: Willinga     Sec: 531       DEPTITION     Or APPINC     CASING       To     Dark     CASING       33     36     METASILTSTONE     Grey metasilistone, minor clay. Cloudy quartz lens at 38m.     Grey to brown metasilistone with minor brown clay.     Light brown weatherd metasilistone.     Light brown weatherd metasilistone.     METASILTSTONE     Light brown coarse quart gravel at 9.5.     Kin Hard Light grey/blue metasilistone.       34     54     METASILTSTONE     Hard blue/grey metasilistone.     METASILTSTONE     Kin Hard blue/grey metasilistone.     METASILTSTONE	Wa B i	ter, Land odiver	d and sity		CONTINUATION SHEET		UNIT No. 6	627-1077	8				
DEFTH INT       GRAPHIC       Deft NAME       CASING         rom       To       To       NAME       GEOLOGICAL DESCRIPTION       Form AT 0       Image Notes       Image N	Co	nserva	tion				Hundred:	Willunga	S	ec: 531			
FromToL003NAMEEncrementationDistributionSampleIndFromTo3336METASILISTONEDark brown metasilistone quint geam at 33m.Grey to brown metasilistone quint geam at 33m.Grey to brown metasilistone with minor brown clay.International action of the second geam at 33m.International actional act	DEP	ГН (m)	GRAPHIC	ROCK/SEDIMENT	GEOLOGICAL DESCRIPTION	FORMA	ATION/AGE	Depth Core	(	CASING	3		
33       30       METASLISTONE       Grey to brown metasilistone with minor brown clay. Minor quarz lens al 38n.         39       42       METASLISTONE       Grey to brown metasilistone with minor brown clay.         42       45       METASLISTONE       Light brown to grey metasilistone with minor brown clay.         44       45       48       METASLISTONE       Light brown to grey metasilistone Britle, coarse quarz gravel at 44.5m.         45       48       METASLISTONE       Light brown to grey metasilistone Britle, coarse quarz gravel at 45.556m.         51       54       METASLISTONE       Hard blue grey metasilistone with weathered brown metasilistone at 55.56m.         57       60       METASLISTONE       Hard blue grey metasilistone highly weathered at 58.0         60       63       METASLISTONE       Hard blue grey metasilistone highly weathered clay at 61.8m.         63       66       METASLISTONE       Hard blue grey weathered metasilistone, pight weathered clay at 65.56m.         72       78       METASLISTONE       Grey weathered metasilistone, highly weathered clay at 65.56m.         72       78       METASLISTONE       Grey weathered metasilistone, pigtit in pars.         72       78       METASLISTONE       Grey weathered metasilistone, pigtit in pars.         74       METASLISTONE       Grey weathered metasilistone	From	To	LOG	NAME METASH TSTONE	Dark brown motocilitations, minor alay. Cloudy quartz soom at 22m			Sample	Dia (mm)	From (m)	10 (m)		
	<ul> <li>33</li> <li>36</li> <li>39</li> <li>42</li> <li>45</li> <li>48</li> <li>51</li> <li>54</li> <li>57</li> <li>60</li> <li>63</li> <li>66</li> <li>72</li> <li>78</li> <li>81</li> <li>84</li> <li>87</li> <li>90</li> </ul>	30 39 42 45 48 51 54 57 60 63 66 72 78 81 84 87 90 99		METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE METASILISTONE	<ul> <li>Datk brown metasilistone, finitio clay. Cloudy quartz seam at 55th.</li> <li>Grey metasilistone with minor brown clay. Minor quartz lens at 38m.</li> <li>Grey to brown metasilistone with minor brown clay.</li> <li>Light brown to grey metasilistone.</li> <li>As above – coarse quartz gravel at 50.5m.</li> <li>Hard light grey/blue metasilistone.</li> <li>Hard blue/grey metasilistone with weathered brown metasilistone at 55-56m.</li> <li>Hard blue/grey metasilistone highly weathered at 58m.</li> <li>Blue/grey metasilistone highly weathered at 58m.</li> <li>Blue/grey metasilistone highly weathered at 58m.</li> <li>Blue/grey metasilistone, large % cloudy, quartz at 61.8m.</li> <li>Light blue/grey weathered metasilistone, highly weathered clay at 65m.</li> <li>Grey weathered metasilistone, pyritic and phyllitic in parts.</li> <li>Weathered grey metasilistone, pyritic.</li> <li>As above with clay throughout (highly weathered grey metasilistone).</li> <li>Grey weathered metasilistone with quartz veins, dark grey at 84m.</li> <li>Grey metasilistone.</li> <li>Grey metasilistone to weather brown metasilistone turning to clay.</li> <li>END OF HOLE 99m.</li> </ul>								
								SHEET	2 OF 2		<u> </u>		

												PROJECT: Investigation	Spring l n	Fed Dar	n	
						GROU	JNDW	ATER PROGRAM	[			PERMIT N	o. 62020			
Wa Bio	Departmo ter, Lanc odiver	and sity				••1						UNIT No. 6	627-1077	'5		
Co	nserva	tion	Coordinate	es: E 285123 N 61	04828 El. Surface (m	ı)		El. Ref. Point (m)	Datum:			Hundred: K	uitpo Se	c: 1642		
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL n)		SUPPLY			TOT	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		A	nalysis N	ю.
	SUM	IMARY														
DEPT	CH (m)	GRAPHIC	ROCK	/SEDIMENT				FORM		Depth	(	CASIN	G			
From	То	LOG	I	NAME		FURMA	ATION/AGE	Sample	Dia (mm)	From (m)	To (m)					
0 1 3 6 9 12 15 16 18 24 33 39 40 51 54	DEPTH (m)         GRAPHIC LOG         ROCK/SEDIMENT NAME         GEOLOGICAL DESCRIPTION         FO           0         1         3         GEOLOGICAL DESCRIPTION         FO           0         1         3         METASILTSTONE         Brown/red clay.         Sau           3         6         METASILTSTONE         Highly weathered light brown metasiltstone.         Sau           6         9         METASILTSTONE         Weathered brown/grey to light grey metasiltstone.         Fo           9         12         METASILTSTONE         As above, clay in patches.         Fo           16         18         METASILTSTONE         As above, light brown to light grey metasiltstone, quartz seams.         Light brown to light grey metasiltstone, quartz veins, minor clay and iron stained fractures.           24         33         METASILTSTONE         As above, light brown metasiltstone, weathered at 33m. Some light brown clay.           39         40         METASILTSTONE         As above, lighter brown metasiltstone, iron stained.           40         51         METASILTSTONE         Highly weathered orange/brown metasiltstone.           51         54         METASILTSTONE         Gerey weathered orange/brown metasiltstone, iron stained.										Saddlew Formatic	orth on?	Cont.	125	0	5
REMA	RKS: T	oops Hill Ro	d.			DRILL TY	PE:	COMPL	ETED		I					
								Kotary	LOCCE	ח⊦פער	Wohling					
											DKILL FL		LUGGEI	J D I : D.	woning	
											DATE:		SHEET	1 OF 1		

## 8 APPENDIX D



PHOTOGRAPHS OF CORE FROM WELL P/N 61093 (WILLUNGA)

Report DWLBC 2004/04

Hydrogeological investigation of the Mount Lofty Ranges, progress report 5: Drilling phases 2.1 to 2.3: research and monitoring wells at Scott Creek, Balhannah, Willunga Fault, Lobethal, Eden Valley and Ashbourne









## 9 APPENDIX E



### WATER WELL LOGS FOR LOBETHAL, EDEN VALLEY, ASHBOURNE

Hydrogeological investigation of the Mount Lofty Ranges, progress report 5: Drilling phases 2.1 to 2.3: research and monitoring wells at Scott Creek, Balhannah, Willunga Fault, Lobethal, Eden Valley and Ashbourne

											PROJECT:	Ashbou	rne Reo	ch. Hole	e #1
					GRO	UNDW	ATER PROGRAM	А			PERMIT N	o. 61096			
<b>The</b> Wa	Departm ter, Land	ent of d and			WA	ATER	WELL LOG				UNIT No. 6	627-1072	79		
Co	odiver nserva	tion	Coordinates: E 297574	.00 N 6089780.00	El. Surfa	ce(m)	El. Ref. P	Point(m)	Datum:		Hundred: K	ondopa	ringa	Sec: S	91
			DEPTH WATER	TO DEPTH TO CUT STANDING WATER	INTE	ERVAL m)		SUPPLY			TOT	AL DISSO	LVED SO	OLIDS	
	AQ	UIFER	(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		А	nalysis N	0.
	SUM	IMARY	34 46 84 EOH		27 41 84	34 46 85 96.6	0.06 0.25 1.9 1.9	Drilling Drilling Drilling 15 minutes	Airlift Airlift Airlift Airlift						
DEPT	TH (m) GRAPHIC ROCK/SEDIMENT GEOLOGICAL DESCRIPTION									FORM		Depth	(	CASING	3
From	In (iii)     GRAPHIC     ROCK/SEDIMENT       LOG     NAME   GEOLOGICAL DESCRIPTION									FURM	ATION/AGE	Sample	Dia (mm)	From (m)	To (m)
0 3.3 6.6 10.1 27.6 31.1	<ul> <li>3.3</li> <li>6.6</li> <li>10.1</li> <li>27.6</li> <li>31.1</li> <li>34.6</li> </ul>			Overall red brown silt grained sand. Very mOverall pale yellow ar grey laminated weatherMedium grey meta silt broken with fingers.Medium grey laminate Some pieces almost slMedium grey laminate some pieces almost slMinor milky quartzite phyllite with Fe staining staining on quartzite or	y sandy inor rec ad light pred silt tstone < ed meta ate like to 2mm previous ng. Son n meta	soil. C l clay. grey fin stone w 5mm. siltstor with vo siltstor with vo s. sinterva ne with	Clumps of cream/li Non calcareous. ne/medium silty sa vith Fe staining. So Abundant Fe stain ne up to 15mm. So ery flat dominant c ne up to 15mm. So ery flat dominant c al. Chunks to 30m greenish appearan e.	ght brown moist i and. Minor gravel oft and friable. aing, weathered ar ome faces with Fe cleavage plane. ome faces with Fe cleavage plane. V anm. Possible dark ace possibly chlor	e staining. e staining. e staining. e staining. ery grey tite. Fe				254	0	10.5
REMA	ARKS:		1		DRILL TY	PE: Hammer	COMPL	ETED 12	/6/03	<u>.                                    </u>					
Did no	ot airlift f	for 20 minut	tes as water from ai	lifting would have overflow	ved hole	ding de	pression.			DRILL FL	LUID: Air	LOGGE	D BY: J J	ames-Sm	ith
										DATE		SHEET	1 OF 2		



PROJECT: Ashbourne Rech. Hole #1

PERMIT No. 61096

UNIT No. 6627 - 10779

#### Hundred: Kondoparinga Sec: S91

DEPT	TH (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASIN	G
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
34.6	41.6			As above with chunks to 15mm.					
41.6	45.1			As above with chunks to 10 mm. Minor milky white quartzite to 1mm.					
45.1	48.6			As above. No quartzite evident. Some chunks to 30mm.					
48.6	66.1			Coarser grained than previous interval. Chunks to 10mm. Possible dark grey phyllite with Fe staining. Some with greenish appearance possibly chlorite. Fe staining on quartzite on meta siltstone. Minor milky quartzite to 1mm.					
66.1	69.6			As above. Chunks to 20 mm. Slightly more white/milky quartzite to 2mm.					
69.6	72.1			As above. Chunks to 30 mm. Less quartzite.					
72.1	79.1			As above. Chunks to 10mm.					
79.1	82.6			As above. Chunks to 30 mm.					
82.6	89.6			A above. Chunks to 20 mm.					
89.6	93.1			As above. More quartzite approximately 5% to 5 mm.					
93.1	96.6			As above. Very minor quartzite. EOH					
									<u> </u>
						SHEET	2 OF 2		

												PROJECT:	Ashbou	rne Reo	h. Hole	e #2
						GROU	UNDW	ATER PROGRAM	[			PERMIT N	o. 61097			
<b>The</b> Wa	Departme	ent of d and				WA	<b>ATER</b>	WELL LOG				UNIT No. 6	627 - 107	780		
Co	nserva	tion	Coordinate	es: E 297576.00	n 6089786.00	El. Surfa	ace(m)	El. Ref. Point	(m)	Datum	:	Hundred: K	Condopai	ringa	Sec: S	91
				DEPTH TO	DEPTH TO STANDING WATER	INTE	RVAL		SUPPLY			TOT	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	М	ethod	mg/L		А	nalysis N	0.
	SUM	IMARY		25 35 EOH		35	25 37 48.7	0.03 0.25 0.25								
DEPT	Ϋ́Η (m)	GRAPHIC	ROCK	/SEDIMENT		GEO			N		FORM		Depth	(	CASING	3
From	Dm     To     LOG     NAME       3.35     Overall red brown silty sandy soil. Clumps of cream/brown moist medium										FURMA	ATION/AGE	Sample	Dia (mm)	From (m)	To (m)
0	3.35 Overall red brown silty sandy soil. Clumps of cream/brown moist medium grained sandy clay. Very minor red clay. Non-calcareous.									n				200	0	8.3
2.25	67					n a fi	no/mod	ium ciltu cond. Mir	on anoval of frich	10						
5.55	0.7				orange brown fine grai	ned sai	ndstone		for graver of finab	le						
6.7	10.2				Medium grey laminate Some parts friable. Ve	d weath ery min	hered n or pyrit	neta siltstone to 10n te to 1mm.	nm. Some Fe stai	ning.						
10.2	13.7				Grey laminated meta s	iltstone	e with F	e staining to 20mm	. Some parts slate	e like.						
13.7	17.2				As above. Some coars	er grai	ned phy	vllite.								
17.2	24.2				Mainly grey phyllite to	20 mr	n with ]	Fe staining.								
24.2	27.7				As above. Chunks to <	< 10mn	n.									
REMA	RKS:					_	_				DRILL TY	PE: Hammer	COMPL	ETED 13	6/03	
											DRILL FL	UID: Air	LOGGEI	D BY: J J	ames-Smi	ith
											DATE		SHEET	1 OF 2		

						PROJECT:	Ashbou	rne Reo	ch. Hole	e #2
				GROUNDWATER PROGRAM WATER WELLING		PERMIT N	o. 61097			
Th W B	e Departm ater, Lan odiver	<b>ent of</b> d and sit v		CONTINUATION SHEET		UNIT No.	6627 - 10	780		
C	onserva	tion				Hundred: K	londopai	ringa	Sec: S9	1
DEF	TH (m)	GRAPHIC	ROCK/SEDIMENT	GEOLOGICAL DESCRIPTION	FORMA	ATION/AGE	Depth Core	(	CASING	3
From	To	LOG	NAME				Sample	Dia (mm)	From (m)	To (m)
27.7	34.7			As above. Chunks to 15 mm						
34.7	38.2			As above. Chunks to 50 mm						
38.2	45.2			As above. Chunks to 10 mm.						
45.2	48.7			As above. Very minor white quartzite. EOH						
		ı		·			SHEET	2 OF 2	L	L

												PROJECT:	Eden Va	alley Re	ch. Ho	le #1
//						GROU	JNDWAT	ER PROGRAM	/			PERMIT No	o. 61092			
<b>The</b> Wa	Departme ter, Lanc	and				WA	ATER W	ELL LOG				UNIT No. 67	728 - 348	85		
Co	nserva	tion	Coordinate	es: E 324630.00	N 6162496.00 El. Su	rface(m)		El. Ref. P	oint(m)	Datum:		Hundred: Ju	ıtland	S	ec: PT4	41
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INT	TERVAL (m)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER		(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		A	nalysis N	0.
	SUM	IMARY		75 90 EOH		69 83	76 90 103.9	0.13 0.4 1.5	Drilling Drilling 20 minutes	Airlifti Airlifti Airlifti	ng ng ng	1378 1322 1485		62521 62521 62521	3 4 5	
DEPI	CH (m)	GRAPHIC	ROCK	/SEDIMENT		GEO		DESCRIPTIO	N		FORM		Depth	(	CASIN	3
From	То	LOG	]	NAME		<b>JN</b>		FURIVIA	ATION/AGE	Sample	Dia (mm)	From (m)	To (m)			
0	3.2				Fine medium brown sa of grey biotite meta sar	ite content. Minor	gravel				200	0	60			
3.2	6.4				Fine medium brown gr gravel of grey biotite n	ey sano neta san	d with high ndstone wi	n biotite and mu th Fe staining.	<i>l</i> inor							
6.4	9.9				Fine medium grained g grey meta sandstone gr	rey sar avel to	nd with hig 10mm. M	h biotite and m Iinor pink quar	uscovite content. tzite.	Brown						
9.9	13.4				Grey meta sandstone to quartzite to 3mm.	o 10mn	n. High bi	otite and musco	ovite content. Pinl	ĸ						
13.4	16.4				Grey meta sandstone to quartzite to 10mm.	o 10mn	n. High bi	otite and musco	ovite content. Min	or pink						
16.4	19.4				50% grey meta sandstor quartzite.	ink										
19.4	19.4     29.9     50% Dark grey and 50% green meta sandstone. Some with pink quartzite banding.															
REMA	ARKS: 58	8m and 75m	used fo	oam to lift cuttin	ıgs						DRILL TY	PE: Hammer	COMPL	ETED 23/	5/03	
											DRILL FL	UID: Air	LOGGE	D BY: J J	ames-Sm	ith
						DATE		SHEET	1 OF 3							



						PROJECT:	Eden Va	alley Re	ech. Ho	le #1
				GROUNDWATER PROGRAM		PERMIT N	o. 61092			
The Wa	Departme ter, Land	and sitv		CONTINUATION SHEET		UNIT No.				
Co	nservat	tion				Hundred: J	utland	S	ec: PT4	41
DEP	TH (m)	GRAPHI	ROCK/SEDIMENT	GEOLOGICAL DESCRIPTION	FORMA	ATION/AGE	Depth Core	(	CASING	J
From	То	C LOG	NAME				Sample	Dia (mm)	(m)	10 (m)
75.4	78.9			50% dark grey laminated meta silt stone. 30% pink grey meta sandstone. 20% green grey slightly calcareous meta sandstone. All three have minor banding.						
78.9	9 82.4 4 85.9			60% dark grey laminated meta silt stone. 20% pink grey meta sandstone. 20% green grey slightly calcareous meta sandstone. Orange brown calcareous precipitation on some surfaces. Minor pink grey quartzite.						
82.4	85.9			Dark grey and green grey meta siltstone. Minor milky and pink quartzite. Some Fe staining. Minor banding. Very minor orange brown calcareous precipitate.						
85.9	96.4			Mainly dark grey meta sandstone. Minor milky quartzite. Minor grey green meta sandstone.						
96.4	99.9			Mainly dark grey meta sandstone. Pinky and milky quartzite. Minor grey green meta sandstone.						
99.9	103.4			Mainly dark grey meta sandstone. Rose quartzite to <10mm. Minor grey green meta sandstone. EOH						
							SHEET	3 OF 3		

												PROJECT:	Eden Va	alley Re	ch. Ho	le #2
						GROU	UNDW	ATER PROGRAM	Л			PERMIT N	o. 61093			
The D Wat	Departmen er, Land	and				<b>W</b> A	<b>ALEK</b>	WELL LOG				UNIT No. 6'	728 - 348	6		
Con	iservat	ion C	oordinat	tes: E 324634.00	N 6162496.00 El.	Surface(	(m)	El. Ref. Point(m)	Datum:			Hundred: J	utland	Se	ec: PT4	41
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (	RVAL m)		SUPPLY			TOT	AL DISSO	LVED SC	LIDS	
	AQU	J <b>IFER</b>		(m)	(m)	From	То	L/sec	Test length	M	ethod	mg/L		A	nalysis N	io.
	SUMI	MARY		56 EOH			56 60	0.03 0.03	Drilling 20 minutes	Airlifti Airlifti	ng ng					
DEPT	H (m)	GRAPHIC	ROC	CK/SEDIMENT	I						FORM		Depth	(	CASIN(	G
From	То	LOG		NAME	1	GEU	)LOGI	CAL DESCRIPTIC	JN		FORMA	ATION/AGE	Core Sample	Dia (mm)	From (m)	To (m)
0	3.13     Fine to medium brown sand with black and white mica throughout. M meta sandstone to 2mm									or grey				200 155 slotted	0	6 61
3.13	6.25				Grey and brown fine s sandstone and quartzi	or gravel of grey n	neta									
6.25	9.75				Grey and brown fine stained quartzite.	grained	l sand.	Meta sandstone to	) 30mm . Minor pi	nk						
9.75	13.25				Medium grey medium content, both muscov	n graine	ed lami biotite	nated meta sandsto . Minor grey clay.	one with high mica	ı						
13.25	16.75				Grey meta laminated sandstone to 10mm.	sandsto Minor	one with grey cl	h high mica conten ay.	ıt. Minor pink/ora	nge						
16.75	5.75 20.25 Sandstone to 10mm. Minor grey clay. Grey meta sandstone with high mica content. Some parts with high schi 15% pink brown meta sandstone.															
REMA	RKS:		<u> </u>								DRILL TY	PE: Hammer	COMPLI	ETED		
Foam u Hole ur	sed at 55 istable, tl	at 55m ble, therefore slotted casing used.									DRILL FL	UID: Air	LOGGEI	DBY: J Ja	ames-Sm	ith
				-							DATE		SHEET	1 OF 2		

The Department of Water, Land and Biodiversity Conservation

#### GROUNDWATER PROGRAM WATER WELL LOG CONTINUATION SHEET

PROJECT: Eden Valley Rech. Hole #2

PERMIT No. 61093

UNIT No. 6728 - 3486

Hundred: Jutland Sec: PT41

DEPT	ſH (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASIN	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
20.25	23.75			As above. Very minor orange/red band in grey meta sandstone.					
23.75	27.25			Grey meta sandstone to 10 mm. Fine grained with less muscovite present than previous interval.					
27.25	34.25			As above to 20 mm. Very minor orange/red bands. Minor Fe staining.					
34.25	37.75			Overall light grey to green/grey in colour. Light grey meta sandstone to 5mm with white/milky quartzite to 2mm. Dark grey meta sandstone. Some stiff light grey clay.					
37.75	41.25			Dark grey laminated meta siltstone to 5mm Finer grained than aboveMinor Fe stain.					
41.25	48.25			Light grey meta sandstone and dark grey meta siltstone to 5mm. 50% pink and milky quartzite.					
48.25	51.75			Light grey, pink grey and dark grey meta siltstone to 5mm. Some Fe staining. Pink and white/grey quartzite.					
51.75	55.25			Light grey and medium grey meat siltstone to 30 mm. Minor Fe staining. Greenish appearance on light grey meta siltstone possibly chlorite.					
55.25	60			Light grey and medium grey meta siltstone to 30 mm. Minor Fe staining. Greenish appearance on light grey meta siltstone possibly chlorite. Lamination evident on medium grey meta siltstone. EOH					
						SHEET	2 OF 2		

												<b>PROJECT:</b>	Lobetha	l Recha	arge H	ole #1
//						GROU	JNDW	ATER PROGRAM	/			PERMIT No	). 61094			
<b>The</b> Wat	Departme	and				WA	ATER	WELL LOG				UNIT No. 66	528 - 212	219		
Cor	nserva	sity tion	Coordinate	es: E 308460.00	N 6136727.00	El. Sur	face(m)	El. Ref.	Point(m)	Datum:		Hundred: O	nkapari	nga So	ec: PT	5101
				DEPTH TO WATER CUT	DEPTH TO STANDING WATER	INTE (1	RVAL n)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AO	UIFER		(m)	(m)	From	То	L/sec	Test length	M	ethod	mg/L		A	nalysis N	о.
	X			45		45	46	0.63	Drilling	Airlift		1446		62521	6	
	SUM	MARY		49		49	56	0.56	Drilling	Airlift						
	0011			60.5 82		60.5 92	61 85	3.2	Drilling	Airlift						
				85 FOH		05	85 87 9	19	20 minutes	Airlift						
DEPT	H (m)	CPAPHIC	ROCK	/SEDIMENT		I	01.9	17	20 minutes	Timit			Depth	0	CASIN	G
From	То	LOG	Noon N	NAME		GEO	LOGIC	AL DESCRIPTIO	DN		FORMA	ATION/AGE	Core Sample	Dia (mm)	From	To (m)
0	3.25     Light orange fine sandy silty soil. Minor deep red stiff clay. Minor w									e/pale				305	0	6
					grey stiff clay. Minor	dark gr	ey meta	al siltstone to <5m	m.	1				255	0	42
3.25	6.5				Very light brown silty/ to 10mm.	fine saı	ndy soi	l. Very minor grey	y sandstone friable	e gravel						
6.5	10				Light brown silty/very	fine sa	ndy soi	l. No gravel.								
10	13.5				Light brown to medium siltstone, friable to 10 r	n pink s nm. M	sandy s Iore sar	ilty soil. Minor gr nd than previous in	avel of grey meta iterval.							
13.5	17		SADDI FORM	LEWORTH ATION	Pinky brown clayey sar with iron staining, sligh	ndy soi ntly lan	1. Grav ninated	vel to 100 of weath	ered grey meta sil	tstone	ADELA	IDEAN				
17       20.5         Light pink brown sandy silt soil. Gravel of grey laminated meta siltstorstaining to 20mm.									ated meta siltstone	with Fe						
20.5 24 Pinky grey sand. Minor gravel to 20mm of dark grey hard and also weather laminated meta siltstone.									hered							
REMA	RKS: Fi	ank Walsh	Drilling	(driller Paul)							DRILL TY	PE: Hammer	COMPL	ETED 3/6	/03	
											DRILL FL	UID: Air	LOGGE N Ramn	D BY: J Ja ners	ames-Sm	ith &
						DATE		SHEET	1 OF 3							



PROJECT: Lobethal Recharge Hole #1

**PERMIT No. 61094** 

UNIT No. 6628 - 21219

DEPT	TH (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASING	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
24	27.5			Medium pink brown sand. Minor gravel of laminated meta siltstone to 20mm. Very minor pyrite to 1mm.					
27.5	31			Grey pink sand. Very minor gravel of brown grey weathered laminated meta silstone to 30mm. Very friable.					
31	34.5			Medium grey laminated meta siltstone. Minor pale grey/white phylitic weathered gravel to 10mm.					
34.5	38			Dark grey brown laminated meta siltstone to 10 mm, friable in parts. Minor pyrite.					
38	41.5			Dark grey brown laminated meta siltstone gravel to 10mm. Minor milky quartzite.					
41.5	45			As above. Pyrite specks on some faces of meta siltstone. Minor green flecks possible chlorite?					
45	48.5		WOOLSHED FLAT SHALE	Dark grey laminated meta siltstone gravel to 10mm. Light grey meta siltstone that has a slightly green appearance, probably due to chlorite.	ADELAIDEAN				
48.5	52			As above with less light grey meta siltstone.					
52	55.5			As above. Pyrite cubes to 1mm.					
55.5	57.7			Dark grey laminated meta siltstone to 10 mm. Dark green laminated meta siltstone to 10mm, possibly chloritic. 50% green meta siltstone.					
57.7	59.9			As above. Pyrite evident on both grey and dark green metasiltstone.					
	•		·	·		SHEET	2 OF 3	<u> </u>	



PROJECT: Lobethal Recharge Hole #1

**PERMIT No. 61094** 

UNIT No. 6628 - 21219

DEPT	CH (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASIN	3
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
59.9	63.4			As above.					
63.4	66.9			As above. Less dark green fragments. Approximately 1/3 dark green fragments and 2/3 dark grey.					
66.9	70.4			As above. Minor green fragments.					
70.4	73.9			As above.					
73.9	77.4			As above.					
77.4	80.9			As above. More pyrite.					
80.9	84.4			As above, larger fragments up to 20 mm. Very minor milky quartzite. Pyrite layering on some fragments. Very minor iron staining.					
84.4	87.9			As above. No quartzite fragments or iron staining. EOH					
			·	•		SHEET	3 OF 3		

											PROJECT:	Lobetha	l Recha	arge H	ole #2
					GRO	UNDW	ATER PROGRAM	/			PERMIT N	o. 61095			
<b>The</b> Wa	Departm ter, Land	ent of d and			WA	ATER	R WELL LOG				UNIT No. 6	528 - 212	220		
Bi	nserva	sity tion	Coordinates: E 308459.00	N 6136738.00 EI.	Surface	(m)	El. Ref. P	oint(m)	Datum:		Hundred: O	nkapari	nga S	ec: PT	5101
			DEPTH TO WATER CU	DEPTH TO T STANDING WATER	INTE (	RVAL m)		SUPPLY			TOTA	AL DISSO	LVED SC	OLIDS	
	AQ	UIFER	(m)	(m)	From	То	L/sec	Test length	Me	ethod	mg/L		A	nalysis N	lo.
	SUM	IMARY	38 45 EOH		38 45	42 49 56	2.3 5.7 6.3	Drilling Drilling 20 minutes	Airlift Airlift Airlift						
DEP	ГН (m)	GRAPHIC	ROCK/SEDIMENT		CEO					FORM		Depth	0	CASIN	G
From	То	LOG	NAME		GEO	LOGI	CAL DESCRIPTIC	)IN		FORMA	TION/AGE	Sample	Dia (mm)	From (m)	To (m)
0	3.25	Grey, brown orange and red orange mottle grey clay. Minor dark grey siltstone to 10 mm. Clay soft and malleable.											200 150 150	0 0 8	6 8 56
3.25	6.5			Light orange silty fine	ay. No gravel.					slotted	0	20			
6.5	10.0			Pink brown silty sand s 10mm.	soil. N	Ioderat	e dark grey lamina	ted meta siltstone	gravel to						
10.0	13.5			Light orange silty fine	sand.	Minor	grey stiff plastic cl	ay. No gravel.							
13.5	17			Light orange silty fine pink brown sand towar	sand. ds 17n	Very m n.	ninor grey stiff plas	tic clay. Change	to finer						
17	20.5			Fine pink brown sand.	Minor	r grey b	brown weathered sa	indstone gravel to	10mm.						
20.5       24       SADDLEWORTH FORMATION       Mainly medium grained light brown sand. Gravel of weathered grey meta sandstone and brown stained quartzite and grey meta siltstone. Very minor par grey clay.									ta 10r pale	ADELA	IDEAN				
REMA	ARKS:									DRILL TY	PE: Hammer	COMPL	ETED 29/	/5/03	
										DRILL FL	UID: Air	LOGGE	D BY: J J	ames-Sm	ith
										DATE		SHEET	1 OF 2		



PROJECT: Lobethal Recharge Hole #2

PERMIT No. 61095

UNIT No. 6628 - 21220

DEPT	ГН (m)	GRAPHIC	ROCK/SEDIMENT			Depth	(	CASIN(	G
From	То	LOG	NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Sample	Dia (mm)	From (m)	To (m)
24	31		WOOLSHED	Dark grey laminated meta siltstone with some weathered gravel to 10mm	ADELAIDEAN				
31	34.5		FLAT SHALE	Dark grey laminated meta siltstone. Minor milky quartzite. Very minor Fe staining on meta siltstone. Minor green chlorite.					
34.5	38			Dark grey laminated meta siltstone. Minor milky quartzite. Very minor Fe staining on meta siltstone. Minor green chlorite. Fracture zone, large gravel to 50 mm					
38	41.5			Dark grey laminated meta siltstone. Milky quartzite.to 20mm Very minor Fe staining on meta siltstone. Morer green chlorite.					
41.5	45			Dark grey laminated meta siltstone to 10mm Minor milky and pink quartzite. Fe staining on meta siltstone.					
45	48.5			Dark grey laminated meta siltstone to 10mm Minor milky and pink quartzite. Fe staining on meta siltstone.					
48.5	52			Dark grey laminated meta siltstone to 10mm Minor milky and pink quartzite. Fe staining on meta siltstone. High contamination of clay from upper layers.					
52	55.5			Dark grey laminated meta siltstone to 10mm Minor milky and pink quartzite. Fe staining on meta siltstone. High contamination of clay from upper layers. EOH					
						SHEET	2 OF 2		

## 10 APPENDIX F



#### SONDE RESULTS FOR LOBETHAL, EDEN VALLEY, ASHBOURNE

Report DWLBC 2004/04

Hydrogeological investigation of the Mount Lofty Ranges, progress report 5: Drilling phases 2.1 to 2.3: research and monitoring wells at Scott Creek, Balhannah, Willunga Fault, Lobethal, Eden Valley and Ashbourne



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