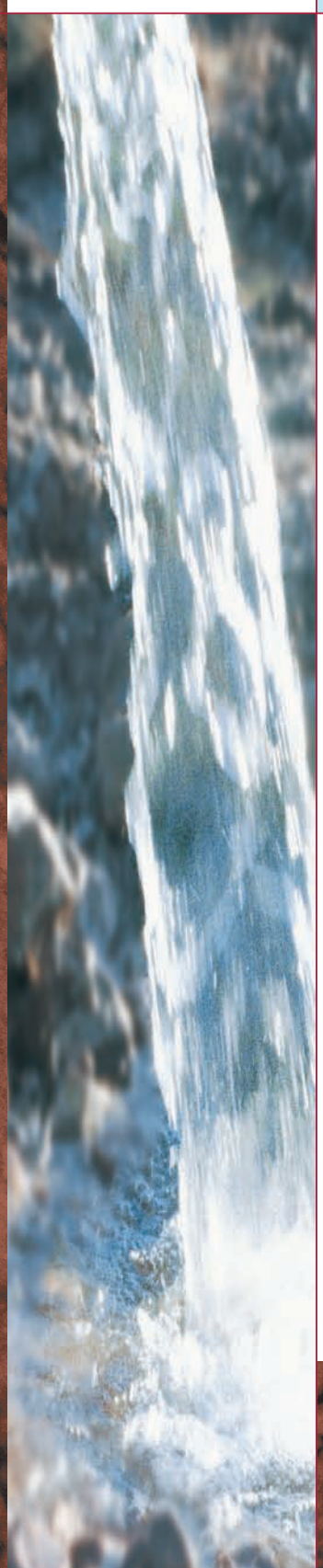

Rockwater
PROPRIETARY LIMITED

STYGOFAUNA SAMPLING FOR THE CENTRAL WEST COAL PROJECT

AVIVA CORPORATION LIMITED

OCTOBER 2007

REPORT FOR
AVIVA CORPORATION LIMITED

335.1/07/01

76 Jersey Street Jolimont 6014 Western Australia ABN: 43 008 804 653
Postal: PO Box 201 Wembley 6913 Western Australia
Ph: 61 8 9284 0222 Fax: 61 8 9284 1785
Email: consult@rockwater.com.au www.rockwater.com.au

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EXECUTIVE SUMMARY

Aviva Corporation Limited (Aviva) is investigating development of the Central West Coal Deposit (the project) located about 10 to 20 km south of Eneabba, Western Australia. The development will require construction of an open pit to extract coal from the Cattamarra Coal Measures and dewatering operations, as mining will extend below the water table.

Sampling for stygofauna in the vicinity of the Central West Coal Deposit was undertaken in January and May 2007 to identify whether stygofauna are present and whether any conservation significant species are likely to be impacted by the implementation of Aviva's proposal. In total, the sampling programme yielded 45 samples from 30 bores using stygofauna haul nets. Sedimentary rocks of both the superficial aquifer and the underlying Cattamarra Coal Measures, of Jurassic age, were sampled.

No fauna were recorded from the deep aquifer. Six of the fifteen bores sampled in January 2007 contained invertebrate fauna, with only three of these containing aquatic species. The aquatic fauna recovered from the bores included Crustacea (Copepoda), Acariformes (Prostigmata) and Diptera (Muscidae) with only one bore containing a recognized groundwater-dependent taxon; the probable stygophile cyclopoid copepod *Australoeucyclops* n. sp. 1. The taxon is not restricted to groundwater in the Eneabba region, having been recorded previously from the Swan Coastal Plain at Yanchep (Eberhard, 2004) and from the Leeuwin-Naturaliste region. Eight of the 30 bores sampled in May 2007 contained invertebrate fauna, comprising one terrestrial and four aquatic species. The aquatic fauna included an ostracod, a syncarid and a nematode not collected in January 2007, and additional specimens of the cyclopoid copepod *Australoeucyclops* n. sp. 1. Terrestrial invertebrates recorded from bores at Eneabba included Psocoptera, Collembola, Hemiptera, Isoptera and Coleoptera.

The most significant taxon recorded by the survey was an undescribed bathynellid syncarid, which are known obligate groundwater taxa (stygobites). The species is also a potential short-range endemic. An assessment of the conservation significance of the bathynellid syncarid is constrained by the limited knowledge of Bathynellidae in the region and can not be undertaken until the taxon is formally described.

The fauna identified from the shallow aquifer above the Central West Coal Deposit will be directly impacted by development of an open pit to extract the coal resource. A hydrogeological investigation is currently being conducted and will provide additional information on the effect of the project on stygofauna habitat. The formal EIA process

will identify any additional potential impacts to the deep and shallow aquifers that may occur should the project proposal be implemented.

INTRODUCTION

Aviva Corporation Limited (Aviva) is investigating development of the Central West Coal Project located about 10 to 20 km south of Eneabba and immediately west of the Brand Highway. The development will require construction of an open pit to extract coal from the Cattamarra Coal Measures and dewatering operations, as mining will extend below the water table.

Rockwater Pty Ltd was commissioned by Aviva to conduct a stygofauna survey in the vicinity of the proposed Central West Coal Deposit for the purpose of identifying whether stygofauna are a relevant environmental factor for the project and to identify any conservation significant species within aquifers likely to be impacted by the implementation of Aviva's proposal.

The project will be referred for formal environmental impact assessment (EIA) under Section 38 of the Environmental Protection Act (1986). Sampling for stygofauna is required during the EIA process because development of the project has potential to impact on groundwater levels and/or groundwater quality in the vicinity of the mine.

The Environmental Protection Authority (EPA) has issued specific guidance for the consideration of stygofauna during EIA in Western Australia (EPA, 2003, 2007). The methodology applied to this investigation was developed in accordance with the 2003 EPA guidance statement (the 2007 Draft Guidance Statement 54a was issued subsequent to the commencement of the sampling programme) and considers the requirements of the EPA for assessment of stygofauna as a relevant environmental factor for the project. It involves collecting a sample set that is representative of aquifers affected by the project including an appropriate spread of sampling sites across the project area. The stygofauna investigation was designed in conjunction with a hydrogeological investigation of the Central West Coal Project, so that bores being constructed for groundwater monitoring would be suitable for stygofauna sampling. No new bores were installed solely for stygofauna sampling. The proposed sampling programme was reviewed and approved by the Department of Environment and Conservation (DEC) prior to being implemented. The following report presents the results of the investigation.

METHODOLOGY

The stygofauna sampling programme was undertaken in two phases and included existing bores and newly constructed groundwater monitoring bores in the vicinity of the proposed Central West Coal Project. The first phase of the programme involved sampling fifteen existing bores centred on the coal deposit. These included six farm bores, three disused production bores from a nearby decommissioned mineral sands mine (Iluka Resources Limited) and three pairs of deep piezometers installed by Aviva in the proposed pit area. Sampling was undertaken in the period 30 January to 2 February, 2007.

A second round of sampling was conducted in May 2007 and included most bores sampled during round 1. The exception being production bore EWP25, which was equipped with a small pump for stock watering. In addition, eleven of thirteen monitoring bores installed during a programme of test drilling in the vicinity of the deposit in November 2006 were sampled for stygofauna. These were suitable for stygofauna sampling following a resting period of six months after installation, to allow the bores to settle. All newly constructed bores were 'developed' following installation, meaning any contaminants were removed and water flow into the bore was improved. A total of 30 bores were sampled during phase 2.

Each bore was sampled as summarised below:

- prior to sampling, measure water level and basic water quality (including salinity, pH, dissolved oxygen and temperature);
- record bore depth and other construction details where available;
- collect biological samples using stygofauna sampling nets; and
- preserve samples in 100 % ethanol.

Stygofauna sampling nets with filter mesh sizes 50 µm and 150 µm and collar diameters of 47 to 147 mm were selected to accommodate the anticipated range of bore-casing diameters. Each net consists of a steel collar that supports a filter mesh, tapering to a hollow brass weight. A clear polycarbonate vial with bottom removed and replaced with 50 µm filter mesh was screwed into the brass weight to collect animals filtered by the 50 µm and 150 µm sampling nets. Nets were suspended by a carabineer and three trace wires attached to the steel collar.

Sampling nets were lowered into bores using fishing braid on a reel until they reached the bottom of the borehole where they were agitated to disturb sediment and any animals that may be present. Each biological sample was taken using four net-hauls of the stygofauna

sampling nets, made up of two hauls of each of the 50 µm and 150 µm sampling nets. For any equipped bores, a pumped water sample was filtered through a 50 µm net. Samples were stored in 120 mL polycarbonate vials and preserved using 100% (absolute) ethanol. To avoid contamination between sites, the sampling nets were thoroughly washed with a decontaminant solution and then rinsed with distilled water. All samples were forwarded to specialist stygofauna biologists for sorting and identification at the end of each phase of the sampling programme.

RESULTS

Sorting and Identification of individual specimens was undertaken by Dr Stefan Eberhard. Dr Eberhards lab results and a brief letter report accompanying the data for each sampling phase are provided in Appendix 1.

The locations of sites sampled during the 2007 stygofauna sampling programme at the Central West Coal Project are shown in Figure 1. All sites are likely to be within the zone of influence of groundwater-level drawdown due to dewatering of the proposed open pit.

In total 45 samples were taken from 31 sites, with both the superficial aquifer and underlying Cattamarra Coal Measures being sampled. With the exception of Collembola which are terrestrial epigeans (surface dwelling), no invertebrates were recovered from the deep bores in the Cattamarra Coal Measures. Invertebrate fauna recorded by phases 1 and 2 of the 2007 sampling programme are presented in Table 1. The results of sampling from the superficial aquifer (shallow bores) are discussed for each phase of the sampling programme by invertebrate groups.

The 15 bores sampled during phase one yielded aquatic fauna from three sites, including Crustacea (Copepoda), Acariformes (Prostigmata) and Diptera (Muscidae) with only one bore, EFB1, containing a recognized groundwater-dependent taxon. Although currently undescribed, the cyclopoid copepod *Australoeucyclops* n. sp. 1 recovered from bore EFB1 is not restricted to groundwater in the Eneabba region. It has been recorded previously from the Swan Coastal Plain at Yanchep (Eberhard, 2004) and from the Leeuwin-Naturaliste region.

Acariformes and Dipteran collections, each recorded from one bore in February, were facultative groundwater dwelling taxa (stygophiles) i.e. not restricted to the groundwater environment. Terrestrial invertebrates recovered from the samples including Collembola, Hemiptera, Isoptera and Coleoptera are not considered further.

Table 1. List of taxa recorded from the Central West Coal Project, their groundwater dependence, conservation status and occurrence across sampling sites.

TAXON	Groundwater dependence*	Conservation status	SITE CODE																																			COMMENTS
			CWO11P	CWO10P	CWO13P	CWO12P	CWO15P	CWO14P	CWO35P	CWO36P	CWO39P	CWO40P	CWO41P	CWO42P	CWO43P	CWO44P	CWO45P	CWO48P	CWO49P	EFB1	EFB10	EFB11	EFB2	EFB3	EFB4	EFB5	EFB6	EFB7	EFB8	EFB9	EWP21	EWP24	EWP25	
CRUSTACEA																																						
Malacostraca																																						
Copepoda																																						
Australoeucyclops n. sp	A_1	W																		1																		1 specimen dissected on slide, 2 specimens in alcohol
Cyclopoid copepodid (juv.)	A_2	W																		1																		
Ostracoda																																						
Cypridae sp.																																						
Sarscypridopsis sp. (?*ochracea*)	N_1	W																				1																Dead on Collection
Syncarida																																						
Bathynellidae sp.1	A_3	X																					1															
UNIRAMIA																																						
Collembola	N	-																1	1						1											1	Terrestrial, not stygofauna
INSECTA																																						
Isoptera																																						
Isoptera sp. (terr. Ep.)	N	-		1																																		Terrestrial, not stygofauna
DIptera																																						
Muscidae sp. (terr. Ep.)	N	-																							1													Larvae, not stygofauna
Coleoptera																																						
Coleoptera sp. (terr. Ep.)	N	-																					1		1													Terrestrial, not stygofauna
Psocoptera																																						
Psocoptera sp (terr. Ep.)	N	-																		1																		Dead on Collection
Hemiptera sp. (terr. Ep.)	N	-																																			1	Terrestrial
NEMATODA																																						
Nematoda sp.1	U	X		1																								1									
ACARIFORMES																																						
Prostigmata	N	-																						1													1 Adult, not stygobitic
Trombidioidea	N	-																							1												1 Larva, not stygobitic
TOTAL TAXA			0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	2	1	4	0	0	1	0	0	0	0	2	

Legend/Explanation of Codes

A Recognised stygobite (groundwater dependence confirmed)
N Taxon not confined to the groundwater environment (stygophile)/ Non-stygal taxon (terrestrial or surface aquatic habitat)
U uncertain dependence on groundwater
W Taxon locally common and/or of widespread distribution
X Conservation status unknown
* Numerical identifier in subscript for Figure 1

Sampling for stygofauna during phase two included 30 bores. Invertebrate fauna was recovered from 9 bores, although only four bores contained aquatic invertebrates. The aquatic fauna recorded included an ostracod, a nematode and a syncarid not recorded previously in phase one. In addition, the copepod *Australoeucyclops* n. sp. 1 was recorded at bore EFB1 where it had been recorded previously in February, along with a cyclopoid copepodid which is likely a juvenile specimen of the same taxon (S. Eberhard, pers. comm.). A terrestrial epigean (surface-dwelling) species (Psocoptera) was also recorded.

Nematodes were collected from two bores, EFB7 and CW010P, in May 2007. The taxonomy of the Nematoda in Western Australia is too poorly described to comment on a specimen sampled from bore CW010P. The EPA's draft technical appendix pertaining to stygofauna (EPA, 2007) acknowledges the limitations of taxonomy for Nematoda in Western Australia. Identification to species level is generally required to understand an individual's ecological dependence on groundwater and to assess its conservation significance; an exception being the Syncarida, which are all obligate groundwater taxa (stygobites).

The bathynellid syncarid, Bathynellidae sp. 1, recorded from bore EFB2 in May 2007 is a known stygobite meaning it is restricted to the groundwater environment. This taxon is likely to have a restricted distribution range and consequently, is likely to warrant higher conservation significance. For EIA purposes it should be treated as a potential short-range endemic species. The taxonomy and distribution of the bathynellids and other Syncarida from Western Australia is very poorly known. While several species of parabathynellids have recently been described from the Kimberley and Yilgarn, no bathynellids from the southwest have been described (Eberhard, 2007b). Given that the Eneabba specimen is a new taxon, an assessment of its conservation significance is constrained by the limited knowledge of Bathynellidae in the region.

The four ostracod specimens collected from EFB11 in May 2007 were sent to Dr Ivana Karanovic in Tasmania for further taxonomic verification. The specimens were identified as *Sarscypridopsis* sp. (Family Cypridae, Subfamily Cypridopsinae) but further identification to species level was not possible, due to the specimens being disintegrated. It is possible that they belong to *Sarscypridopsis ochracea* which is not an obligate groundwater dwelling taxon (stygobite). If this taxon is a new species, it is not likely to be a short-range endemic as Dr Karanovic has recorded the same form in surface waters and wells in the Murchison region, Pilbara region and in the eastern states.

SUMMARY AND RECOMMENDATIONS

Sampling for stygofauna was undertaken from 31 bores over two seasons (mid summer and late autumn) in the vicinity of the Central West Coal Deposit near Eneabba, Western Australia. Forty five samples in total were collected. Both the sandy superficial aquifer and underlying Cattamarra Coal Measures were sampled although no stygofauna was recovered from the deeper formation. The most significant taxon recorded by the survey was an undescribed bathynellid syncarid, which are known obligate groundwater taxa (stygobites). The species is also a potential short-range endemic.

The superficial aquifer from which the undescribed bathynellid syncarid was recorded overlies the Central West Coal Deposit and as such, the fauna identified from the aquifer will be directly impacted by the development of Aviva's Central West Coal Deposit.

The taxonomy of the bathynellids from Western Australia is very poorly known; there have been no bathynellids described from the southwest. The bathynellid syncarid recorded at the site has not been recorded elsewhere to date and without being formally described, it is not possible to assess the conservation significance of this taxon.

Sampling work undertaken by the WA Museum in the Eneabba area (Laurentiis, Pesce et al 2001) identified stygofauna (copepods, bathynellids and oligochaetes) from 3 of 13 bores sampled, all of which were either in or underlying the Tamala limestone. Although the geology of the Eneabba area reported by Laurentiis *et al* (2001) differs from the superficial sands reported here, it is recommended that the bathynellid specimen recovered from bore EFB2 be compared with the WA Museum's 2001 bathynellid specimen(s), as this is the nearest known location of a syncarid collection to the project area.

Subsequent to the comparison of syncarid specimens from the WA Museum's 2001 collections with Aviva's 2007 specimen, a regional sampling programme should be designed and implemented to investigate the distribution of the undescribed bathynellid syncarid recorded from the project area. Regional sampling should be undertaken in the saturated superficial formations (sands) west of the Gingin Scarp within 10 to 20 km of the project site. Prior to commencement of any further sampling, the results of the sampling programme (Phases 1 and 2) should be discussed with the DEC.

Dated: 18 October 2007 **Rockwater Pty Ltd**

N C P Evelegh
Principal Environmental Scientist

REFERENCES

Eberhard, S. M. (2004). Ecology and hydrology of a threatened groundwater-dependent ecosystem: the Jewel Cave karst system in Western Australia. PhD thesis Murdoch University.

Eberhard, S. M. (2007a). Eneabba Stygofauna Survey January–February 2007. Consultants laboratory report and data from the sorting and identification of stygofauna samples, dated April 2007.

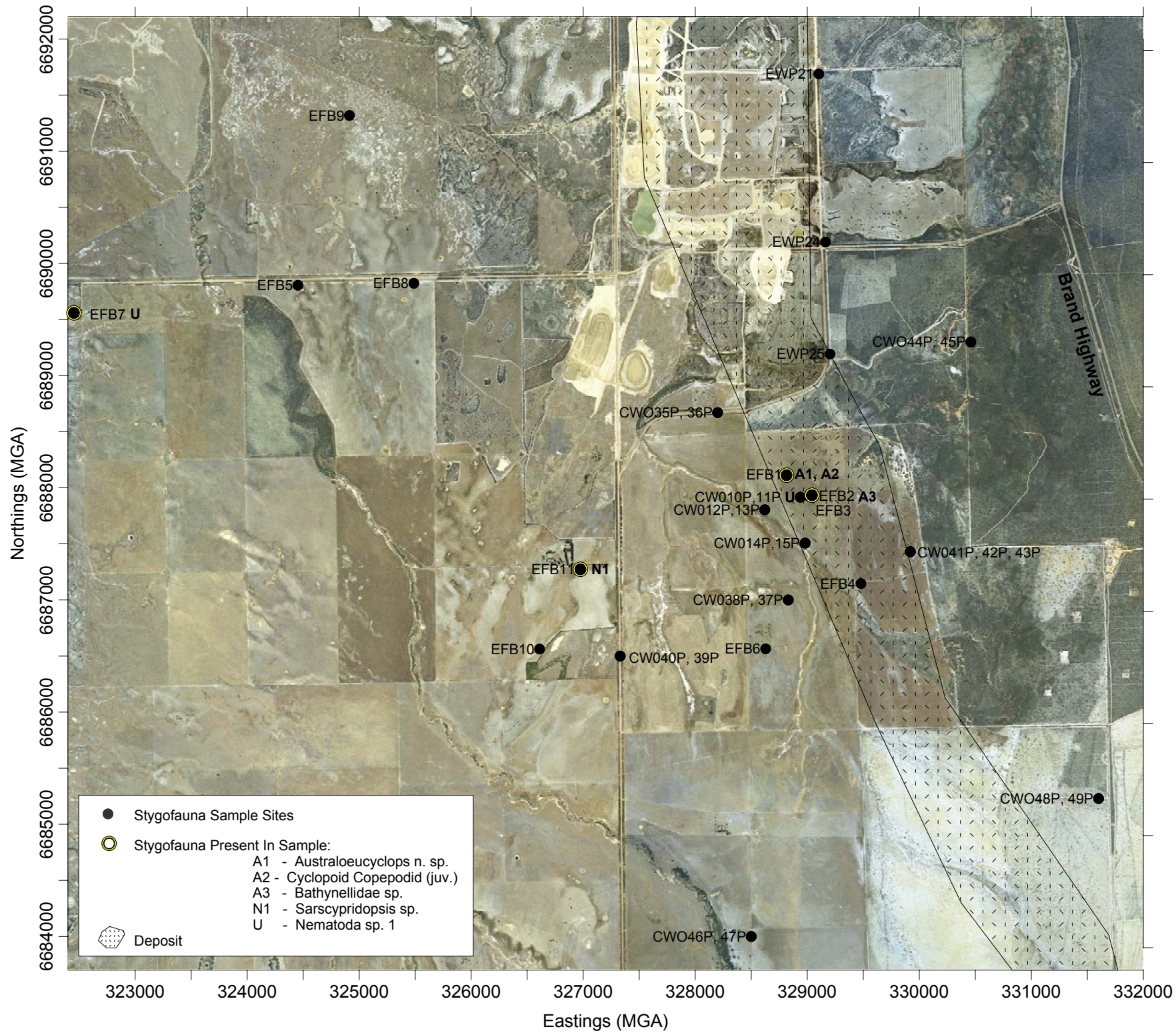
Eberhard, S. M. (2007b). Eneabba Stygofauna Survey May 2007. Consultants laboratory report and data from the sorting and identification of stygofauna samples, dated July 2007.

Environmental Protection Authority (2003). Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986). Consideration of subterranean fauna in groundwater and caves during impact assessment in Western Australia, No. 54, December 2003.

Laurentiis, P. D., Pesce,G. L. and Humphreys, W. F. (2001). Copepods from ground waters of Western Australia, VI. Cyclopidae (Crustacea: Copepoda) from the Yilgarn Region and the Swan Coastal Plain. *Records of the Western Australian Museum* Supplement **64:** 115–131.

FIGURES

Figure 1



I://335.1/Surfer/Aviva Stygo Locality1.srf

CLIENT: Aviva Corporation PROJECT: Eneabba Stygofauna Sampling DATE: October 2007 Dwg. No: 335.1/07/1-1	STYGOFAUNA SAMPLING LOCALITY PLAN & RESULTS Rockwater Pty Ltd

APPENDIX 1

Subterranean Ecology

Scientific Environmental Services

ABN 61 973 518 568

11 Dillenia Way, Greenwood WA 6024, Perth, Australia

Phone: Int - 61 (0)8 9343 4141

Mobile: Int: 61 (0)401 436 968

www.subterraneanecology.com.au Email: info@subterraneanecology.com.au

Nick Evelegh
Rockwater Pty Ltd
Perth, WA

Re: Eneabba Stygofauna Survey January-February 2007

Dear Nick,

Please see overleaf (and attached as Excel spreadsheet) the results of the sorting and identification of the 18 vials from 16 sites collected from Eneabba January-February 2007.

Invertebrate fauna was recovered from six of the 16 sites sampled. At three sites the fauna comprised terrestrial species, and only three sites (EFB1, EFB3, EFB4) contained aquatic species.

The aquatic taxa recorded included Crustacea (Copepoda), Acariformes (Prostigmata), and Diptera (Muscidae).

The cyclopoid copepod *Australoeucyclops* n. sp. 1 collected at Eneabba is the same undescribed species as recorded in the Yanchep Caves and from limestone springs in the Leeuwin-Naturaliste region (T. Karanovic pers. comm., Eberhard 2004). The genus *Australoeucyclops* includes one other described species, *A. karaytugi* Karanovic recorded from the surface pool of a spring in the Pilbara (Karanovic 2006).

None of the Acariformes were obviously stygomorphic (showing physical adaptations to subterranean life). Muscid dipterans have aquatic larval stages while the adults are terrestrial winged insects.

None of the identified taxa appear to be restricted to groundwater in the Eneabba region.

Yours Sincerely,

Dr Stefan Eberhard
Subterranean Ecology

References

Eberhard, S.M. (2004) Ecology and hydrology of a threatened groundwater-dependent ecosystem: the Jewel Cave karst system in Western Australia. PhD thesis Murdoch University. http://wwwlib.murdoch.edu.au/adt/browse/view/adt-MU20051010.141551

Karanovic, T. (2006) Subterranean copepods (Crustacea, Copepoda) from the Pilbara Region in Western Australia. *Records of the Western Australian Museum Supplement* No. 70: 1-239.

Eneabba Stygofauna Survey January-February 2007

Subterranean Ecology specimen identifications April 2007

Site name	Easting	Northing	Date	Taxon 1	Identification	No. spec.	Lab No.	Slide No.	Comments
AMW1 d (CW011P)			01-Feb-07	NIL FAUNA					
AMW15 (CW010P)			31-Jan-07	Isoptera			na		terrestrial, not stygofauna, not collected
AMW2 (CW012P)			01-Feb-07	NIL FAUNA					
AMW2 (CW013P)			01-Feb-07	NIL FAUNA					
AMW35			31-Jan-07	NIL FAUNA					
AMW3d (CW015P)			31-Jan-07	NIL FAUNA					
EF85			01-Feb-07	NIL FAUNA					
EFB1	328819	6687117	31-Jan-07	Copepoda: Cyclopoida	*Australoeucyclops* n. sp. 1	1	seLN131	seS064	1 spec dissected on slide, 2 spec in alcohol
EFB2	329040	6687930	31-Jan-07	Coleoptera	Gen et sp. Indet.	1	na		terrestrial, not stygofauna, not collected
EFB5			02-Feb-07	NIL FAUNA					
EFB6	329013	6687927	02-Feb-07	NIL FAUNA					
EWP21			01-Feb-07	NIL FAUNA					
EWP24			02-Feb-07	NIL FAUNA					
EWP25			02-Feb-07	Collembola	Gen et sp. Indet.		na		terrestrial, not stygofauna, not collected
				Hemiptera	Gen et sp. Indet.		na		terrestrial, not collected
Ex Windmill 3 (EFB3)	329013	6687927	31-Jan-07	Acariformes: Prostigmata	Eupodididae?	1	seLN110		1 adult, not stygobitic
Ex Windmill 4 (EFB4)	329479	6687145	01-Feb-07	Acariformes: Trombidioidea	Gen et sp. Indet.	1	seLN109		1 larva, not stygobitic
				Coleoptera	Gen et sp. Indet.	4	na		terrestrial, not stygofauna, not collected
				Collembola	Gen et sp. Indet.	1	na		terrestrial, not stygofauna, not collected
				Diptera: Muscidae	Gen et sp. Indet.	2	na		larvae, not stygofauna, not collected

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Nick Evelegh
Rockwater Pty Ltd
Perth, WA

Re: Eneabba Stygofauna Samples Batch 2 collected May 2007

Dear Nick,

Please see overleaf the results of the sorting and identification of the 2nd batch of samples (28 sites) collected from Eneabba May 2007. For ease of comparison (also in attached Excel spreadsheet), the taxa list includes all species from both sample events.

Twenty-one invertebrate specimens comprising five taxa were recovered from eight of the 28 sites sampled. One of these taxa (Psocoptera) was a terrestrial epigean (terr. Ep) species, the other four were aquatic. The aquatic fauna included ostracods and syncarids not collected in round one, plus additional specimens of the probable stygophile (Sp) copepod *Australoeucyclops* n. sp. 1 collected previously. The bathynellid syncarids are stygobites (Sb). The taxonomy of the bathynellids (cf. parabathynellids) is very poorly known in Western Australia. While several species of parabathynellids have recently been described from the Kimberley and Yilgarn, no bathynellids from southwest WA have been described.

The ostracods, which may be candonids, may also be stygobitic (Sb). The nearest known location for a described stygobitic candonid, *Acandona memoria* Karanovic is the Brockman River. If the collection site (EFB11) lies within the zone of influence of the project proposal then further identification of the candonid ostracod will require specialist taxonomic input, which can be sought if requested. The taxonomy of the Nematoda is too poorly described to comment on their degree of groundwater dependence.

For EIA purposes the stygobitic morpho-species (viz. the syncarids and ?candonid) collected at Eneabba should be treated as potential short-range endemic species, and the copepod as a local population.

Yours Sincerely,

Dr Stefan Eberhard
Subterranean Ecology

16th July 2007

Eneabba Stygofauna Samples Batch 2 May 2007: ***Subterranean Ecology*** specimen identifications July 2007

					Batch 2 May 2007							
Phylum	**Class**	**Order**	**Identification**	site	AMW1d	AMW1s	AMW2d	AMW2s	AMW3d	AMW3s	CW035P	CW036P
				date	2/05/2007	2/05/2007	2/05/2007	2/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007
Nematoda			Nematoda sp. 1 (EN)		N	1	N	N	N	N	N	N
Chelicerata			Acarina (terr. Ep.)		L		L	L	L	L	L	L
Uniramia		Collembola	Collembola (terr. Ep.)		N		N	N	N	N	N	N
	Insecta	Isoptera	Isoptera sp.(terr. Ep.)									
		Diptera	Muscidae sp. (terr. Ep.)		F		F	F	F	F	F	F
		Coleoptera	Coleoptera sp. (terr. Ep.)		O		O	O	O	O	O	O
		Psocoptera	Psocoptera sp. (terr. Ep.)		U		U	U	U	U	U	U
			Hemiptera sp. (terr. Ep.)		I		I	I	I	I	I	I
Crustacea	Malacostraca	Syncarida	Bathynellidae sp. 1 (EN) (Sb)		D		D	D	D	D	D	D
		Copepoda	*Australoeucyclops* n. sp. (Sp)									
			Cyclopoid copepodid (juv.)									
		Ostracoda	?Canonidae sp. (Sb?)									
			Vial tracking numbers		**Batch 2 May 2007**							
Phylum	**Class**	**Order**		site	AMW1d	AMW1s	AMW2d	AMW2s	AMW3d	AMW3s	CW035P	CW036P
				date	2/05/2007	2/05/2007	2/05/2007	2/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007
Nematoda			Nematoda sp. 1 (EN)			seLN426						
Chelicerata			Acarina (terr. Ep.)									
Uniramia		Collembola	Collembola (terr. Ep.)									
	Insecta	Isoptera	Isoptera sp.(terr. Ep.)									
		Diptera	Muscidae sp. (terr. Ep.)									
		Coleoptera	Coleoptera sp. (terr. Ep.)									
		Psocoptera	Psocoptera sp. (terr. Ep.)									
			Hemiptera sp. (terr. Ep.)									
Crustacea	Malacostraca	Syncarida	Bathynellidae sp. 1 (EN) (Sb)									
		Copepoda	Australoeucyclops n. sp. (Sp)									
			Cyclopoid copepodid (juv.)									
		Ostracoda	Ostracoda									
			tot vials			1						

Eneabba Stygofauna Samples Batch 2 May 2007: ***Subterranean Ecology*** specimen identifications July 2007

Identification	CW039P	CW040P	CW041P	CW042P	CW043P	CW044P	CW045P	CW048P	CW049P	EFB1
	1/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007	3/05/2007	3/05/2007	3/05/2007	3/05/2007	2/05/2007
Nematoda sp. 1 (EN)	N	N	N	N	N	N	N			
Acarina (terr. Ep.)	L	L	L	L	L	L	L			
Collembola (terr. Ep.)	N	N	N	N	N	N	N	1	1	
Isoptera sp.(terr. Ep.)										
Muscidae sp. (terr. Ep.)	F	F	F	F	F	F	F			
Coleoptera sp. (terr. Ep.)	O	O	O	O	O	O	O			
Psocoptera sp. (terr. Ep.)	U	U	U	U	U	U	U			
Hemiptera sp. (terr. Ep.)	I	I	I	I	I	I	I			
Bathynellidae sp. 1 (EN) (Sb)	D	D	D	D	D	D	D			
Australoeucyclops n. sp. (Sp)										11
Cyclopoid copepodid (juv.)										1
?Canonidae sp. (Sb?)										
Vial tracking numbers										
	CW039P	CW040P	CW041P	CW042P	CW043P	CW044P	CW045P	CW048P	CW049P	EFB1
	1/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007	3/05/2007	3/05/2007	3/05/2007	3/05/2007	2/05/2007
Nematoda sp. 1 (EN)										
Acarina (terr. Ep.)										
Collembola (terr. Ep.)										
Isoptera sp.(terr. Ep.)										
Muscidae sp. (terr. Ep.)										
Coleoptera sp. (terr. Ep.)										
Psocoptera sp. (terr. Ep.)										
Hemiptera sp. (terr. Ep.)										
Bathynellidae sp. 1 (EN) (Sb)										
Australoeucyclops n. sp. (Sp)										seLN429, seS069
Cyclopoid copepodid (juv.)										seLN430, seS070
tot vials										2

Eneabba Stygofauna Samples Batch 2 May 2007: ***Subterranean Ecology*** specimen identifications July 2007

Identification	EFB10	EFB11	EFB2	EFB3	EFB4	EFB5	EFB6	EFB7	EFB8	EFB9	EPW21	EWP24
	4/05/2007	4/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007	4/05/2007	4/05/2007
Nematoda sp. 1 (EN)				N		N	N	1	N	N	N	N
Acarina (terr. Ep.)				L		L	L		L	L	L	L
Collembola (terr. Ep.)				N		N	N		N	N	N	N
Isoptera sp.(terr. Ep.)												
Muscidae sp. (terr. Ep.)				F		F	F		F	F	F	F
Coleoptera sp. (terr. Ep.)				O	1	O	O		O	O	O	O
Psocoptera sp. (terr. Ep.)	D.O.C.			U		U	U		U	U	U	U
Hemiptera sp. (terr. Ep.)				I		I	I		I	I	I	I
Bathynellidae sp. 1 (EN) (Sb)			4	D		D	D		D	D	D	D
Australoeucyclops n. sp. (Sp)												
Cyclopoid copepodid (juv.)												
?Canonidae sp. (Sb?)		D.O.C.										
Vial tracking numbers												
	EFB10	EFB11	EFB2	EFB3	EFB4	EFB5	EFB6	EFB7	EFB8	EFB9	EPW21	EWP24
	4/05/2007	4/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007	2/05/2007	2/05/2007	3/05/2007	3/05/2007	4/05/2007	4/05/2007
Nematoda sp. 1 (EN)								seLN428				
Acarina (terr. Ep.)												
Collembola (terr. Ep.)												
Isoptera sp.(terr. Ep.)												
Muscidae sp. (terr. Ep.)												
Coleoptera sp. (terr. Ep.)												
Psocoptera sp. (terr. Ep.)	seLN431											
Hemiptera sp. (terr. Ep.)												
Bathynellidae sp. 1 (EN) (Sb)			seLN427									
Australoeucyclops n. sp. (Sp)												
Cyclopoid copepodid (juv.)												
		seLN432										
tot vials	1	1	1					1				

APPENDIX 2

Appendix 2- Water Quality Data Bore Details

Bore	Date	Bore Depth	Aquifer	Screened Interval	Diameter	Easting	Northing	Water Level	Casing Hgt	Temp	DO%	DO	pH	SPCond	Salinity	Comments
		(m bgl)		(m bgl)	(mm)	(WGS 84)		m (btc)	m (agl)	C	Sat	mg/L	Units	mS/cm	g/l TDS	
CW014P	31.1.07	12	shallow	6 - 12	50	328981	6687507	1.06	0.6	24.51	40.6	3.33	6.33	4.984		URS bore
CW015P	31.1.07	34.3	deep	28.3 - 34.3	50	328764	6687953	0.73	0.78	23.32	21.2	1.75	7.13	10.8	6.13	URS bore
EFB1	31.1.07	21.84	n/a	n/a	100	328819	6688117	8.18	0.26	24	75.8	6.38	5.46	0.2969	0.19	old farm bore
CW010P	31.1.07	22	shallow	18-22	100	329081	6688068	11.855	0.79	23.34	62.7	5.32	5.57	0.4135	0.2647	URS bore
CW011P	31.1.07	96	deep	90-96	100	329074	6688069	8.55	0.74	22.78	59.7	5.0	6.93	8.024	5.135	URS bore
EFB2	31.1.07	29.6	n/a	n/a	90 mm	329040	6687930	10.12	0.6	23.21	22.1	1.89	5.83	0.7766	0.497	old farm bore
EFB3	31.1.07	27.37	n/a	n/a	100	329013	6687927	9.62	0.22	22.41	13.3	1.15	7.06	1.091	0.6985	old farm bore
CW013P	1.2.07	84	deep	78 - 84	50	328621	6687804	0.72	0.8	22.32	49.2	4.06	7.34	15.33	9.821	URS bore
EFB4	1.2.07	27.22	n/a	n/a	100	329479	6687145	5.7	0.12	22.64	4.5	0.39	7.67	1.342	0.8586	old farm bore
EWP21	1.2.07	107	deep	49.97-103.83*	200	329100	6691686	5.05	0.42	22.98	38.8	3.31	7.04	2.98	1.9	* over 3 intervals
EWP25	1.2.07	134	deep	59.15-130.83*	200	329198	6689189	4.52	0.09	23.21	26.5	2.21	6.54	4.66	2.92	*over 3 intervals
CW012P	1.2.07	30	shallow	24 - 30	50	328621	6687804	0.81	0.82	22.25	61.2	5.27	7.12	3.11	1.99	URS bore
CWO10P	1.5.07	22	shallow	18-22	100	329081	6688068	11.73	0.82	22.47	18.5	1.61	6.63	0.412	0.264	URS bore
CWO11P	1.5.07	96	deep	90-96	100	328938	6687916	8.53	0.74	22.6	18.4	1.54	7.15	7.89	0.5055	URS bore
CWO14P	1.5.07	12	shallow	6 - 12	50	328981	6687507	7.51	0.6	22.94	17.8	1.5	6.39	5.28	0.03382	URS bore
CWO15P	1.5.07	34.3	deep	28.3 - 34.3	50	328764	6687953	5.31	0.78	23.66	7.5	0.55	7.23	10.47	6.866	URS bore
CWO12P	1.5.07	30	shallow	24 - 30	50	329119	6687661	13.87		22.31	40.3	3.46	6.99	3.086	1.969	URS bore
CWO13P	1.5.07	84	deep	78 - 84	50	328621	6687804	12.3	0.8	22.3	7.1	0.59	7.2	15.18	9.71	URS bore
CW040P	1.5.07	42	deep	36 - 42	50	328819	6687129	1.04	0.5	24.22	58.6	4.8	6.7	5.529	3.537	Rockwater bore
CW041P	1.5.07	16	shallow	10 - 16	50	328822	6687129	1.58	0.51	24.67	57.9	4.72	4.88	4.652	2.978	Rockwater bore
CW038P	1.5.07	36	shallow	30 -36	50	330290	6689217	8.3	0.67	22.9	14	1.2	6.62	1.53	0.981	Rockwater bore
EFB5	2.2.07	65.55	n/a	n/a	90	324454	6689805	artesian	0	22.76	7.5	0.63	7.31	5.58	3.58	old farm bore
EFB6	2.2.07	26.07	n/a	n/a	130	328628	6686564	8.51	0.34	24.05	17.2	1.43	5.88	3.5	2.22	old farm bore
EWP24	2.2.07	92	deep	37.62-88.83	200	329163	6690191	5.04	0.55	24.73	37.3	3.07	6.69	2.77	1.78	*over 4 intervals
EFB7	3.5.07	n/a	n/a	n/a	100	322453	6689564	n/a	n/a	19.62	32	2.87	7.74	3.961	2.535	equipped bore; 40L pumped sample
EFB8	3.5.07	n/a	n/a	n/a	n/a	325488	6689823	artesian	0	22.96	20.6	1.72	7.3	5.5	3.516	old farm bore; 40 L sample taken
EFB5	4.5.07	65.55	n/a	n/a	90	324454	6689805	artesian	0	21.6	8.3	0.17	7.42	4.838	3.11	old farm bore
EFB10	4.5.07	18.5	n/a	n/a	100	326610	6686562	3.35	0.5	24.61	18.7	1.56	7.1	0.416	0.266	old farm bore
EFB9	4.5.07	47.96	n/a	n/a	100	324913	6691319	artesian	0.36	24.4	6.8	0.56	7.35	5.319	3.409	old farm bore
EFB11	4.5.07	21.55	n/a	n/a	80	326971	6687273	1.55	0.2	24.34	14.8	1.21	7.5	5.739	3.672	old farm bore
CW035P	4.5.07	48	deep	42-48	50	328221	6688637	1.63	0.91	23.52	46.9	3.9	6.48	5.83	3.73	Rockwater bore
CW036P	4.5.07	25	shallow	18-24	50	328224	6688637	2.94	0.64	24.13	15.6	1.28	5.83	7.061	4.519	Rockwater bore
EWP21	4.5.07	107	deep	49.97-103.83*	200	329103	6691689	5.14	0.42	22.18	30.9	2.65	7.34	2.959	1.894	*over 3 intervals
EFB4	4.5.07	27.22	n/a	n/a	100	329479	6687145	5.7	0.12	22.95	8.4	0.72	7.8	1.337	0.856	old farm bore
EWP24	4.5.07	92	deep	37.62-88.83	200	329163	6690191	5.04	0.34	24.09	38.5	3.2	7.19	2.727	1.745	*over 4 intervals
CW043P	4.5.07	30	shallow	29-30	50	330024	6687361	1.75	0.96	22.72	43.4	3.67	5.83	3.071	1.969	Rockwater bore
CW042P	4.5.07	87	deep	73-79	50	330023	6687363	1.75	0.96	22.94	11.9	11.01	6.53	3.293	2.108	Rockwater bore
CW049P	4.5.07	30	shallow	22-28	50	331676	6685257	25.08	0.77	21.56	55.7	4.88	5.65	1.418	0.907	Rockwater bore
CW048P	4.5.07	54	deep	38-44	50	331678	6685256	24.97	0.71	21.52	36.2	3.12	5.54	1.322	0.846	Rockwater bore
CW045P	4.5.07	24	shallow	18-24	50	328541	6684141	8.67	0.76	23.14	33.5	2.84	5.53	2.346	1.5	Rockwater bore
CW044P	4.5.07	48	deep	37-43	50	328541	6684139	8.73	0.6	23.16	28.2	2.39	5.51	2.4	1.3	Rockwater bore

n/a = not available