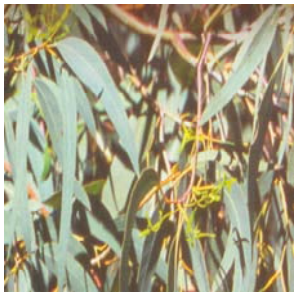
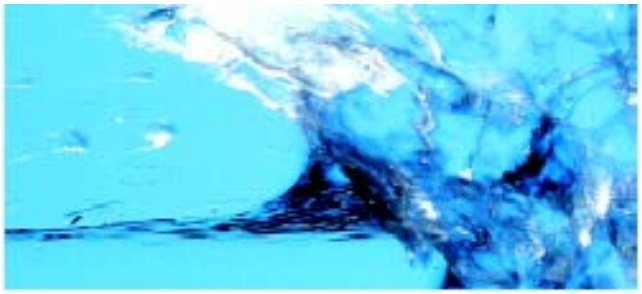
The Department of Water, Land and Biodiversity Conservation





Interim Report on Monitoring of Groundwater Bores in Aboriginal Trust Lands, South Australia. *Monitoring Period October 2003 to April 2004*

ADRIAN COSTAR AND LLOYD SAMPSON

Report DWLBC 2004/46

Government of South Australia

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Disclaimer

Foreword

South Australia's natural resources are fundamental to the economic and social wellbeing of the State. One of the State's most precious natural resources, water is a basic requirement of all living organisms 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 a resource to continue to meet the needs of users and the environment. Understanding the cause-and-effect relationship between the various stresses imposed on the natural resources is paramount to developing viable 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.

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

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Common SI Units

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

Common Abbreviations

Abbreviation		Name	Unit 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	$^{o}/_{oo}$
CFC	=	Chlorofluorocarbon *(parts per trillion volume)*	pptv
$\delta^{18}O$	=	Oxygen isotope composition	$^{o}/_{oo}$
^{14}C	=	Carbon-14 isotope *(percent modern Carbon)*	pmC
Ppm	=	Parts per million	
Ppb	=	Parts per billion	

ABSTRACT

Groundwater monitoring data from bores on Aboriginal lands (Anangu Pitjantjatjara Yankunytjatjara, Yalata, Nepabunna and Oak Valley) are summarised for the 6 month monitoring period October 2003 to April 2004.

In the Anangu Pitjantjatjara Yankunytjatjara Lands, aquifers at all communities, except Fregon, showed recharge and are generally restored to, or above, the levels recorded at their time of drilling. The only community for which there is any short term (5-10 years) concern is Indulkana, which has benefited from recharge to the older bores but now relies on larger supplies from the Indulkana Range bores whose aquifer was not recharged and where water levels are declining.

Water production has returned to extraction volumes similar to that which has been extracted historically. Limited data and some uncharacteristic trends in water level and pump rate make it difficult to determine the stability of the resource. No recharge observed.

The Yalata aquifer is unaffected by pumping, but the standing water level (SWL) appears to be declining by natural drainage. No recharge observed.

Oak Valley supplies have held up remarkably well, but are still regarded as fragile. Stringent water management is essential if the additional costs of importing water are to be avoided. No recharge observed.

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INTRODUCTION

Background

This report is an interim report covering a 6 month period from October 2003 to April 2004 for groundwater extraction bores on Aboriginal Trust Lands in South Australia. These Aboriginal Trust Lands include the Anangu Pitjantjatjara Yankunytjatjara Lands, the Nepabunna Mission, the Yalata Aboriginal Reserve and the Maralinga Tjarutja Lands (Fig. 1). Communities that reside within these lands rely predominantly on groundwater for their water supply. There are 12 Aboriginal communities that have their groundwater extraction bores monitored, namely Indulkana, Mimili, Fregon, Kenmore Park, Pukatja, Amata, Kalka, Pipalyatjara, Nepabunna, Yalata, Oak Valley and Umuwa (Table 1).

Monitoring of the standing water level (SWL), bore production and rainfall data contribute to the assessment of groundwater resource sustainability. Data contained in this report mainly focuses on the 6 month monitoring period stipulated above however bore extraction history since the start of monitoring is detailed in this report. The reader is referred to an earlier report that contains the results of geophysical logging of the bores and background bore information (Dodds and Sampson, 2000). Other reports contain discussions of specific downloads of data and equipment problems (Dodds and Sampson, 1999a, b, 2001; Sampson and Dodds, 2000). Publications that might assist with understanding the hydrogeology, in particular those concerning the search for water resources for particular communities, are listed in the References.

The program to monitor water supplies in the Aboriginal lands is run by the Resource Assessment Division of the Department of Water, Land and Biodiversity Conservation (DWLBC) under the auspices of the Department of State Aboriginal Affairs, which supplies funding and guidance. Areas undergoing bore monitoring are located in Figure 1.

Data

The basic data comprises hourly readings of the pump rate (L/s), the standing water level (SWL in metres) and, for one bore in each community, the rainfall (mm) for the 6 monthly monitoring period. The SWL and water production parameters are plotted on one graph. A second graph shows the daily rainfall at a bore near the same community.

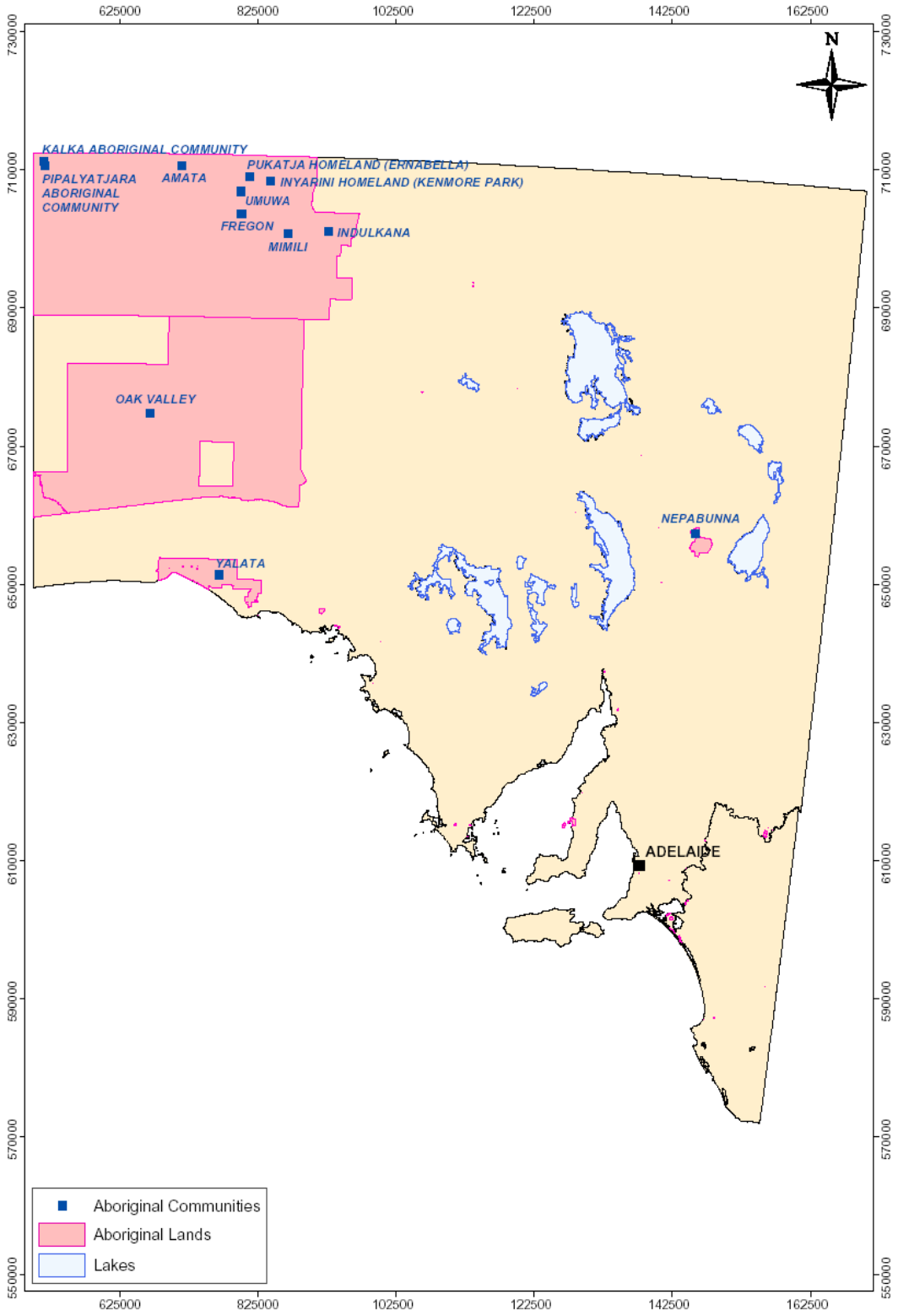


Figure 1. Locality map of Aboriginal communities

Table 1. Aboriginal community groundwater bore details

Community	Observation Number	Unit Number	MGA Zone	Easting	Northing	Bore Depth	Rain Gauge
Indulkana	IMB-19	5544-101	53	330840	7014140	68	x
	IMB-19A	5544-132	53	331319	7013947	79	
	IMB-25	5544-157	53	331370	7013138	30	
	IMB-26	5544-158	53	330377	7013867	48	
	IMB-27	5544-159	53	329666	7014334	40	
	IR-1	5544-172	53	329542	7013911	72	
	IR-2	5544-169	53	329050	7013740	90.7	
	IR-3	5544-170	53	328749	7013432	103.3	
	IR-4	5544-171	53	328169	7012862	78	
Mimili	M-1	5443-25	53	269729	7008487	35	
	M-3	5443-28	53	271836	7006240	60	x
	M-4	5443-60	53	269955	7008625	37	
Fregon	FRG-01	5344-09	53	205847	7036105	18.6	
	FRG-07	5344-31	53	205994	7036630	48	
	FRG-14	5344-47	53	206221	7036280	30	x
	FRG-E4	5344-19	53	205514	7037140	35	
	FRG-64	5344-64	53	205420	7040968	35	
Kenmore Park	KP-6	5345-67	53	244927	7085811	30	
	KP-7	5345-68	53	244636	7085905	36	x
	KP-98	5345-98	53	243464	7088576	30	
Pukatja (Ernabella)	E-12	5345-12	53	213785	7090702	22.9	
	E-42	5345-33	53	213677	7091076	21	x
	E-44	5345-85	53	213275	7092088	16.5	
	E-45	5345-84	53	213550	7091861	30	
	E97B	5345-114	53	211718	7084803	42.5	
	E97G	5345-119	53	212292	7084766	37	
	E97K	5345-123	53	212565	7084989	37	
	E97L	5345-124	53	210941	7084661	31	
Amata	A-17	5145-84	52	714029	7106252	34.5	x
	A-26	5145-19	52	714304	7107766	39	
	A-109	5145-109	52	713680	7106307	55	
Kalka	KA-1	4745-78	52	515227	7111815	40.5	
	KA-2	4745-94	52	515567	7111815	60	
	KA-3	4745-85	52	516806	7111255	40	x
	KA-137	4745-137	52	514353	7112419	55.5	
Pipalyatjara	PIP-95	4745-95	52	512115	7106569	36.8	x
	PIP-MD13	4745-92	52	517309	7106242	43	
	PIP-96	4745-96	52	513232	7106313	36.8	
Nepabunna	N-101	6636-101	54	305958	6614738	64	
	N-149	6636-149	54	304232	6615393	120	x
Yalata	YT-2	5235-15	52	766186	6516425	72	
	YT-3	5235-18	52	766527	6516737	73	
Oak Valley	OV-2	4939-2	52	637489	6747659	15	
	OV-7	4939-7	52	643028	6747874	33	x
	OV-8	4939-8	52	643672	6748398	31	
	OV-9	4939-9	52	643972	6750299	32	
	OV-10	4939-10	52	640187	6754701	17	
Umuwa	UMB-149 (Sunfarm 2001F)	5345-149	53	202241	7068502	43.3	x

Datum: GDA94

Water production doubled this period (October 2003 to April 2004) compared to that of the previous monitoring period (April to October 2003). Production still primarily comes from the Range bores with some 97% of the communities water supply produced from bores IR1 and IR2.

During this period 138.6 mm of rain fell with a maximum intensity of 17.4 mm/hr, recorded in mid February.

IMB19

Standing water levels (SWL) remained steady until February 2004 where water levels rose slightly (0.06 m) by the end of the monitoring period. This slight rise was most likely due to a reduction in the frequency of pumping. There is no obvious recharge to aquifers following rainfall events.

IMB19A

Water levels rose slightly (0.08 m) in this bore until the water level probe failed towards the end of March 2004.

IMB25

Not enough data was recorded to comment on the stability of water levels in this bore due to a battery failure that occurred in mid-November 2003.

IMB26

The bore is known to be artesian. Water level readings are taken manually every 6 months. Note: No manual water level readings were recorded for this bore during the October 2003 to April 2004 monitoring period.

IMB27

The SWL shows an overall decline of 0.6 m, which is attributed to natural drainage. This effect is not observed in any other bores, except for a slight decline in IR1, and needs to be investigated further.

The SWL shows the combined effects of drainage and recharge events. The overall decline (0.6 m) in SWL is attributed to natural drainage.

IR1

This bore was the main contributor to the community producing approximately 13 500 kL. The non-pumping SWL fell by approximately 1.3 m until early February 2004 where water

levels stabilised. Noise in the data logger is evident at two stages in the data, mid-November 2003 and at the end of March 2004. It is likely this interference is caused by electrical strikes.

IR2

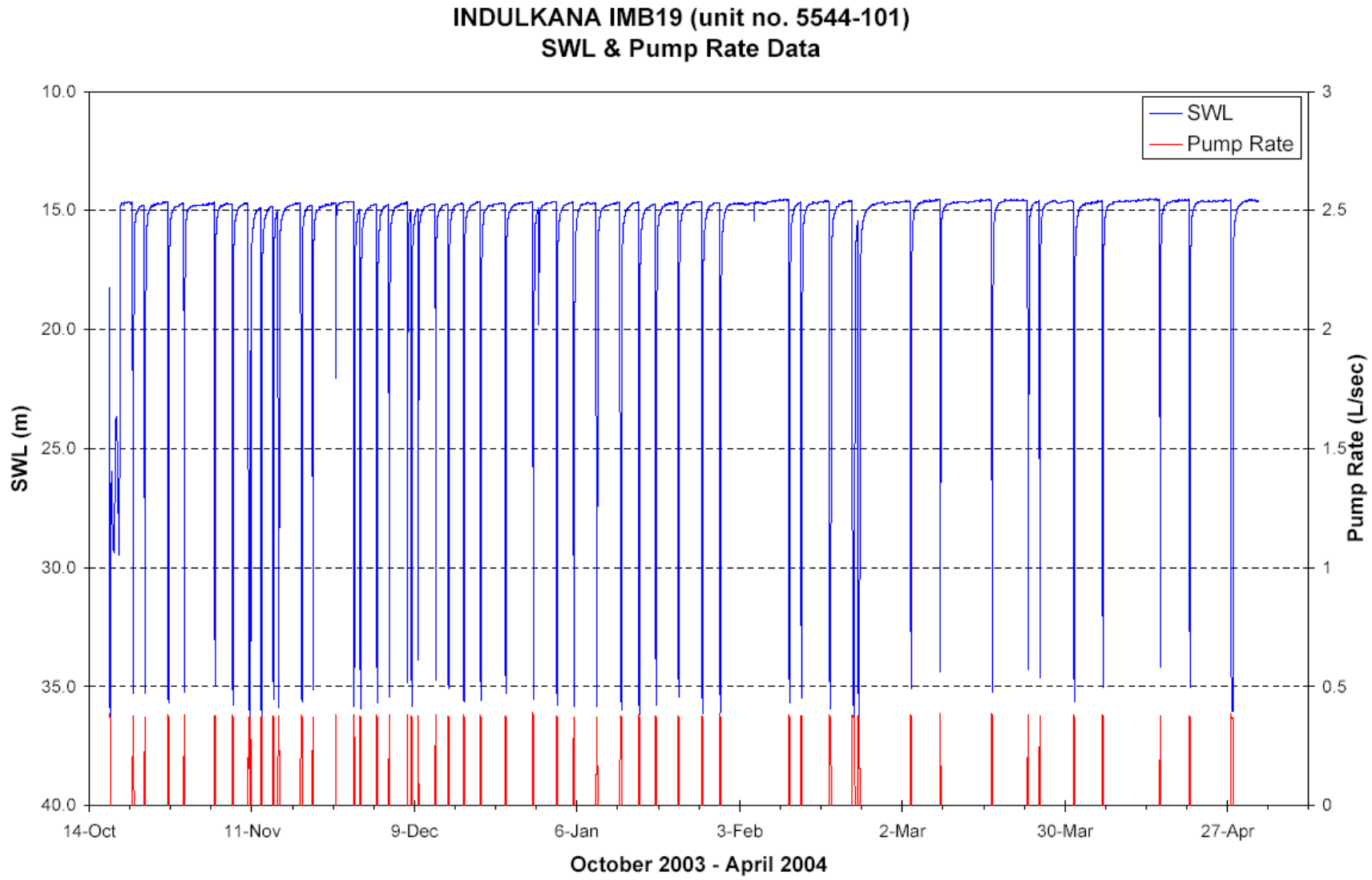
Water extraction in this bore was also high at 10 000 kL. SWLs dropped approximately 4 m over the monitoring period. Variations in water levels during the monitoring period were attributed to variations in the intensity of pumping. Unlike the previous monitoring period, technical staff were able to take a manual SWL reading and therefore the water level probe was able to be calibrated at the end of this monitoring period. Noise in the data record noted in IR1 was also evident in IR2 therefore electrical interference is the most probable cause.

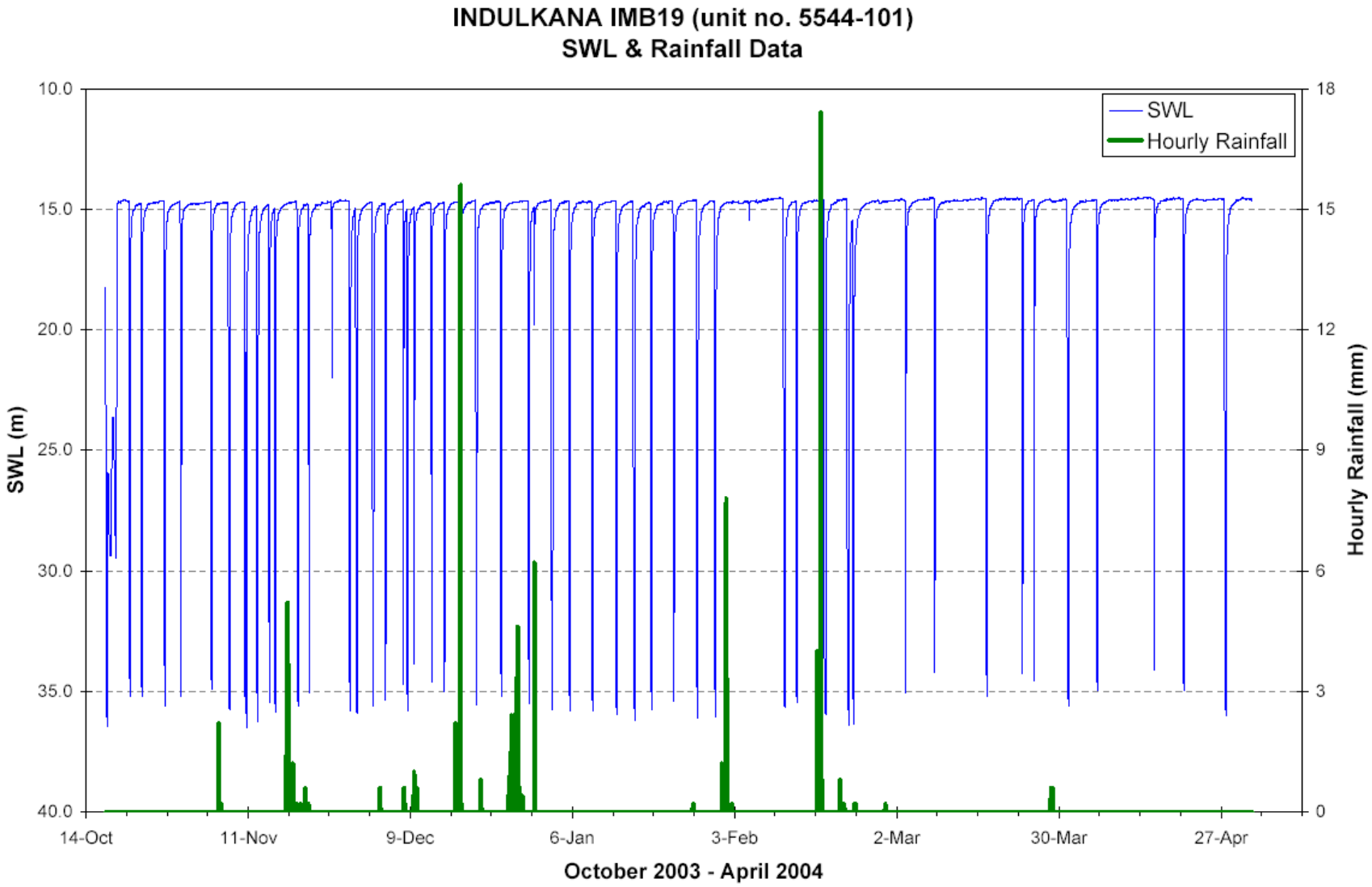
IR3

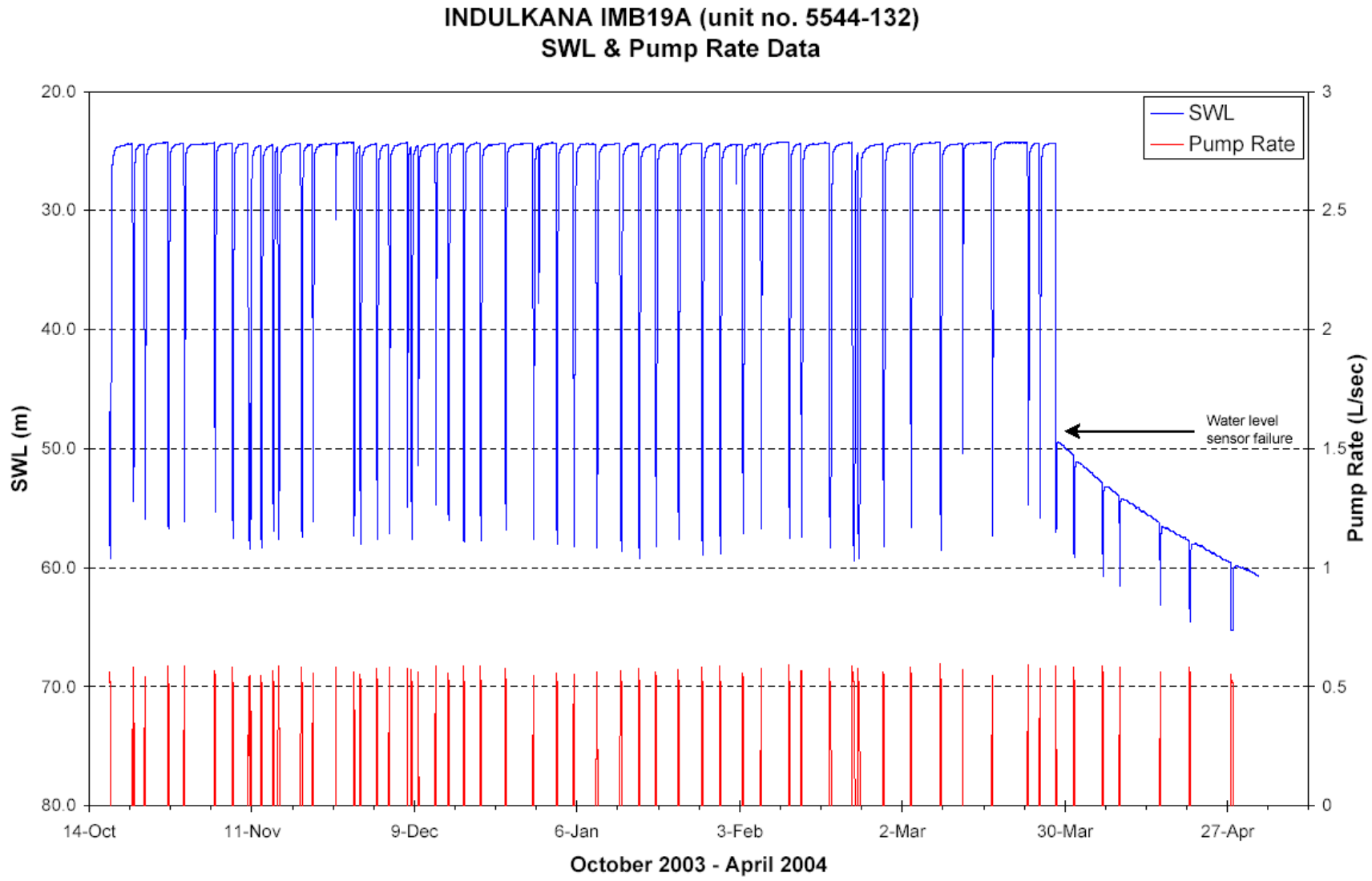
The SWL shows an overall decline of 0.2 m, which is attributed to natural drainage. This effect is not observed in any other bores and needs to be investigated further

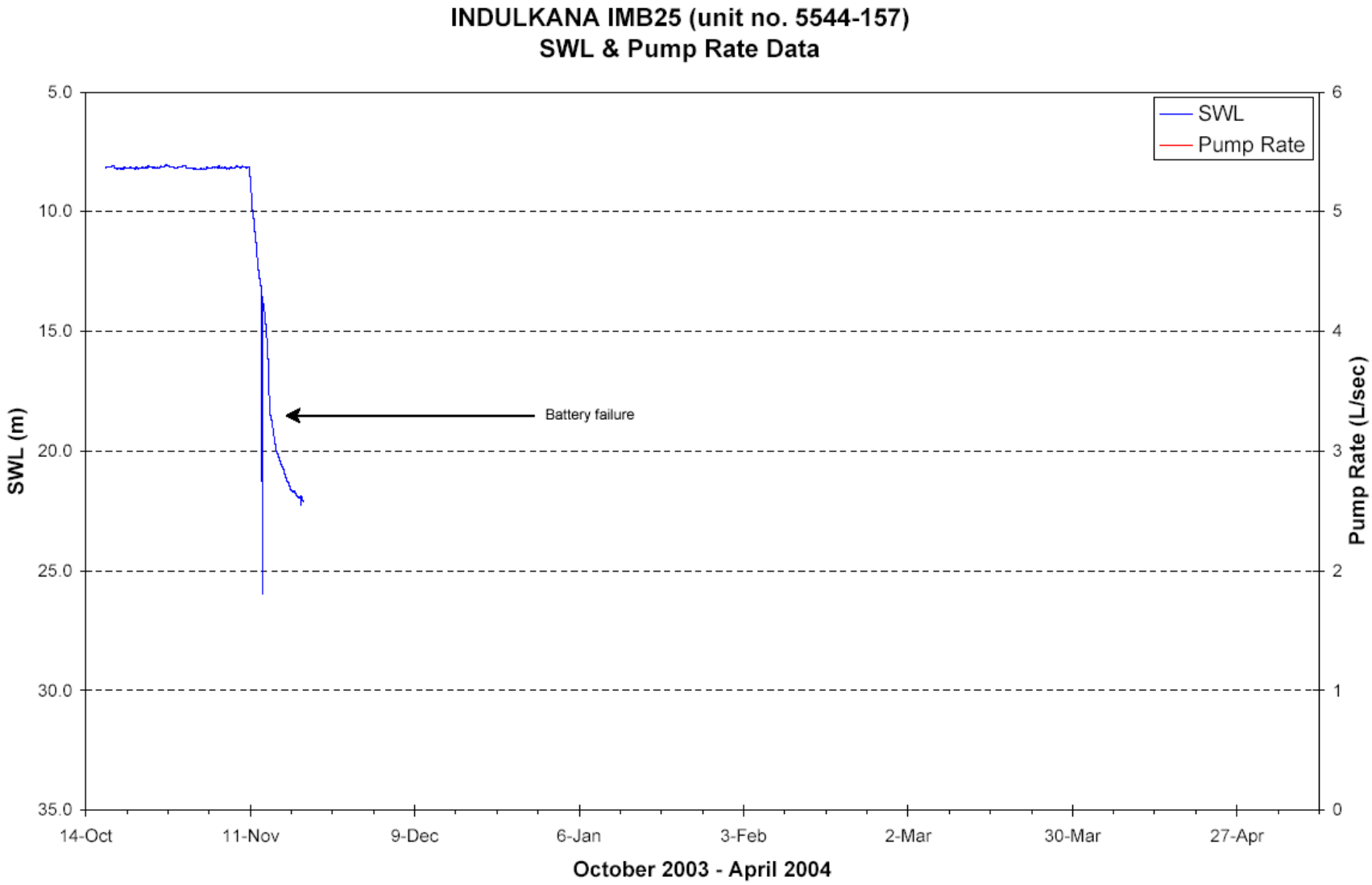
Prognosis:

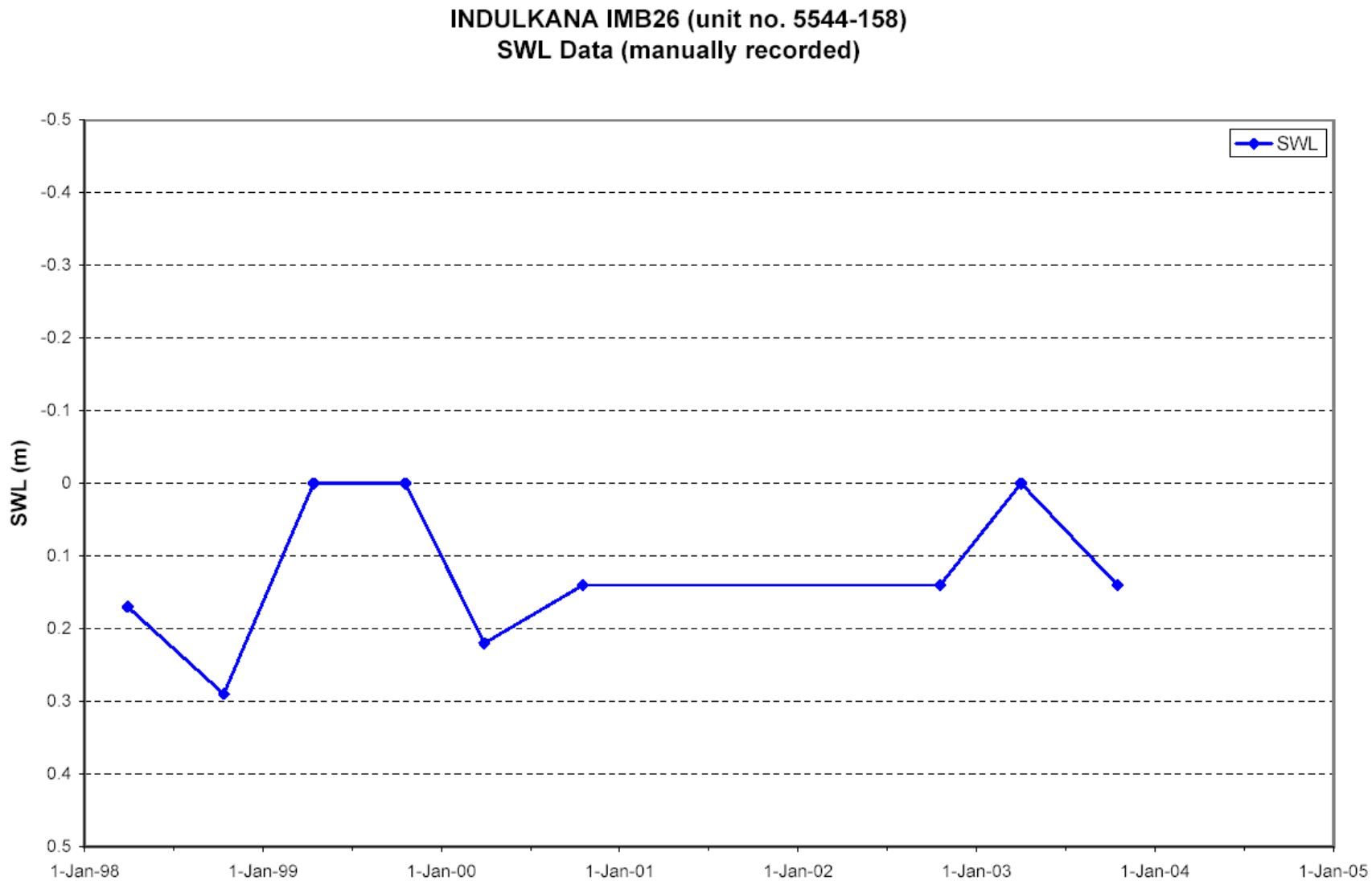
IR3 shows little long-term variation, which is still encouraging for the sustainability of the Indulkana Range bores although it could also mean that IR3 is isolated from other Range bores; further investigation is required. Stabilisation of water levels in IR1 and recovery of non-pumping water levels in IR2 is attributed to reduction in the intensity of production towards the end of the monitoring period rather than recharge from rainfall. This rate of pumping is therefore sustainable.

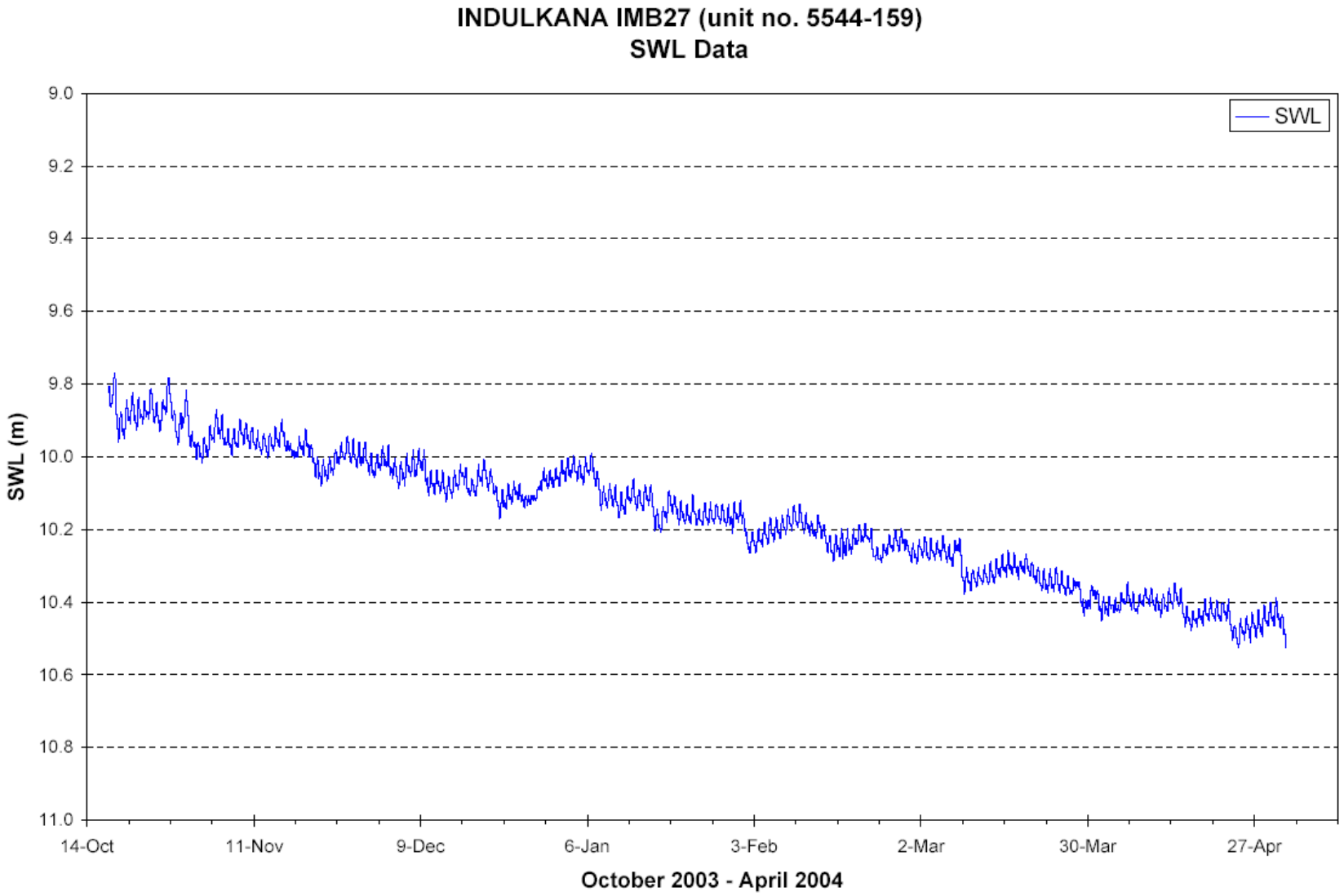

INDULKANA IMB19 (unit no. 5544-101)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
3
2.5
2
1.5
1
0.5
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

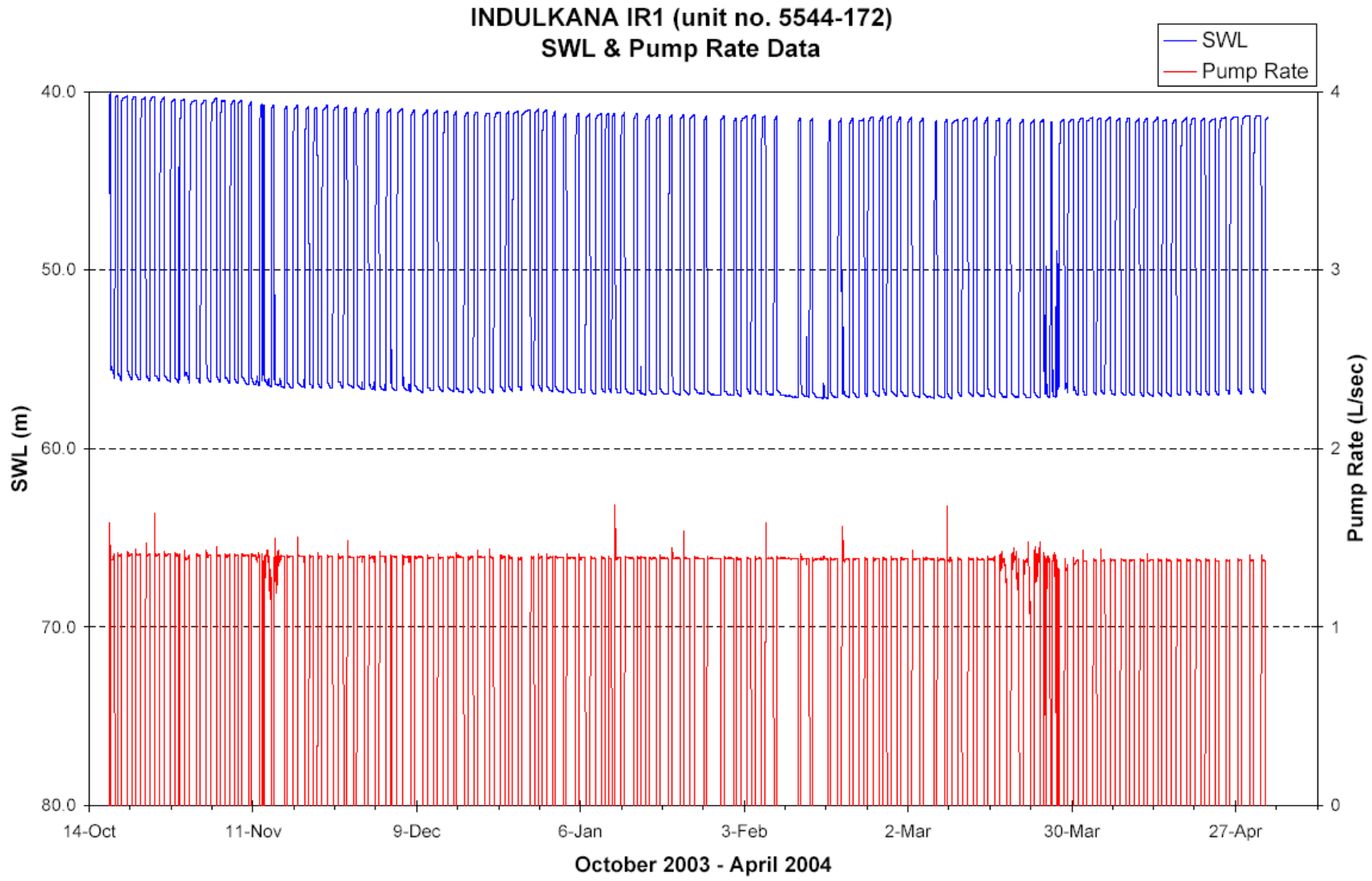

INDULKANA IMB19 (unit no. 5544-101)
SWL & Rainfall Data
SWL
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
18
15
12
9
6
3
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

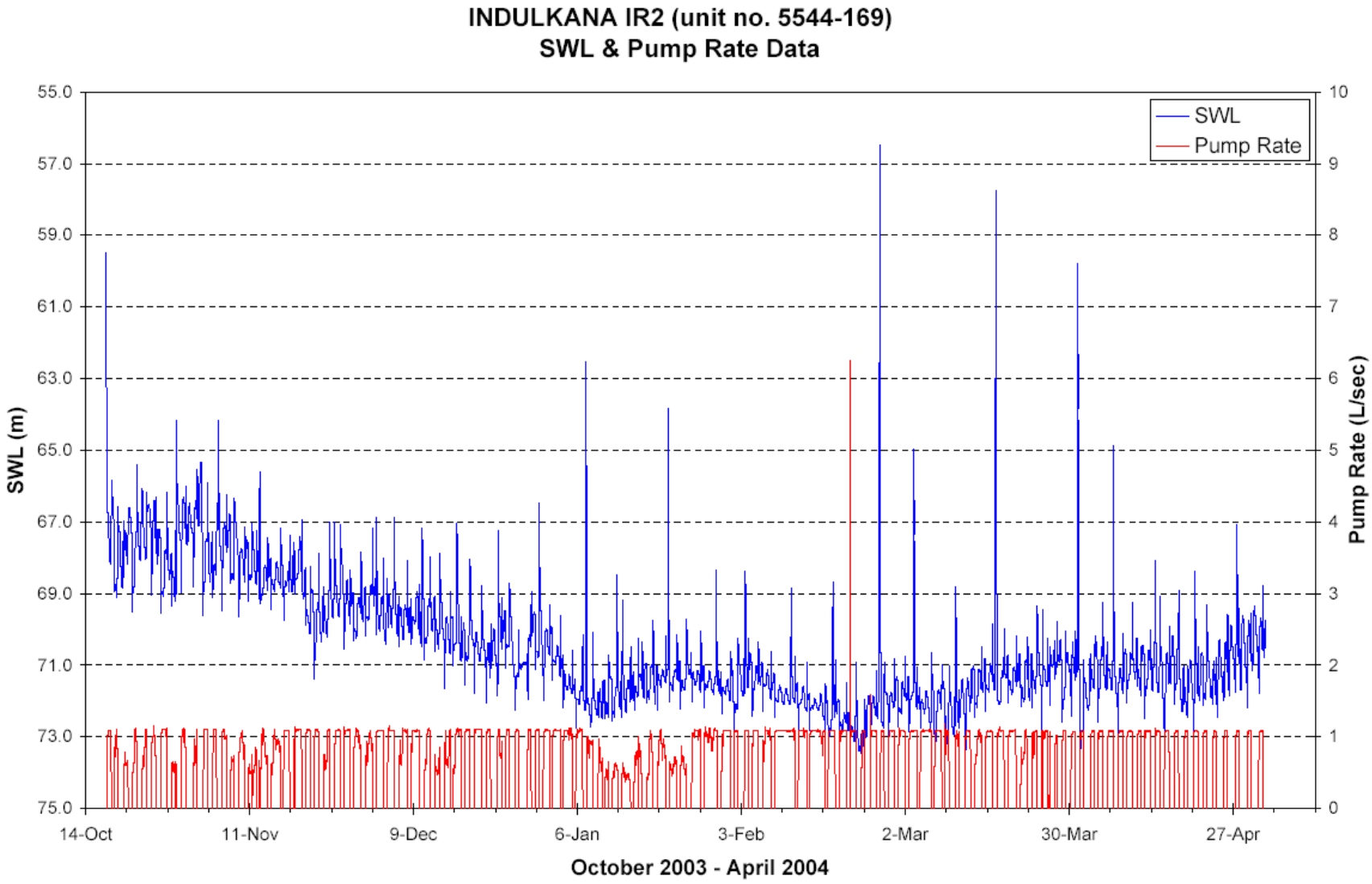

INDULKANA IMB19A (unit no. 5544-132)
SWL & Pump Rate Data
SWL
Pump Rate
Water level sensor failure
SWL (m)
Pump Rate (L/sec)
20.0
30.0
40.0
50.0
60.0
70.0
80.0
3
2.5
2
1.5
1
0.5
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

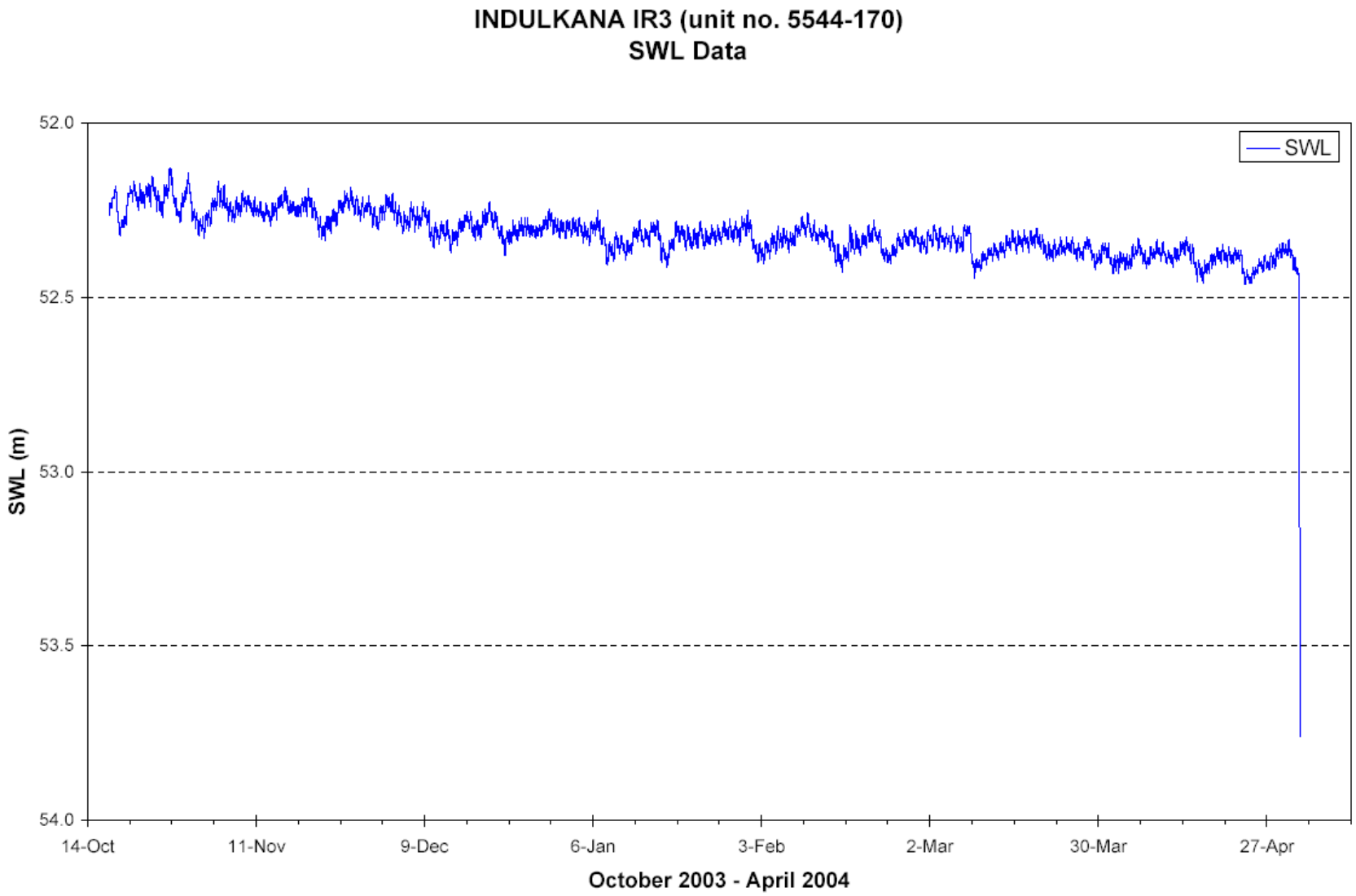

INDULKANA IMB25 (unit no. 5544-157)
SWL & Pump Rate Data
SWL
Pump Rate
Battery failure
SWL (m)
Pump Rate (L/sec)
5.0
10.0
15.0
20.0
25.0
30.0
35.0
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


INDULKANA IMB26 (unit no. 5544-158)
SWL Data (manually recorded)
SWL
SWL (m)
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
1-Jan-98
1-Jan-99
1-Jan-00
1-Jan-01
1-Jan-02
1-Jan-03
1-Jan-04
1-Jan-05


INDULKANA IMB27 (unit no. 5544-159)
SWL Data
SWL
SWL (m)
9.0
9.2
9.4
9.6
9.8
10.0
10.2
10.4
10.6
10.8
11.0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


INDULKANA IR1 (unit no. 5544-172)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
40.0
50.0
60.0
70.0
80.0
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


INDULKANA IR2 (unit no. 5544-169)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
55.0
57.0
59.0
61.0
63.0
65.0
67.0
69.0
71.0
73.0
75.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


INDULKANA IR3 (unit no. 5544-170)
SWL Data
SWL
SWL (m)
52.0
52.5
53.0
53.5
54.0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

MIMILI

Water extraction from the Mimili bores have been more than trebled this monitoring period (October 2003 to April 2004) compared to that of the previous monitoring period (April to October 2003).

During this period 84.2 mm of rain fell with a maximum intensity of 9.2 mm/hr recorded in mid February.

M1

Extraction from this bore was approximately 1663 kL (27%) more than that for the previous monitoring period. Non-pumping SWLs remained constant throughout the monitoring period. Spikes in the water level data, which occur when the pump is turned off, are still present in the data. These spikes are caused by a faulty non-return valve on the water extraction pump and first appeared during the previous monitoring period. The non-return value should be inspected and replaced during the next visit to the site.

M3

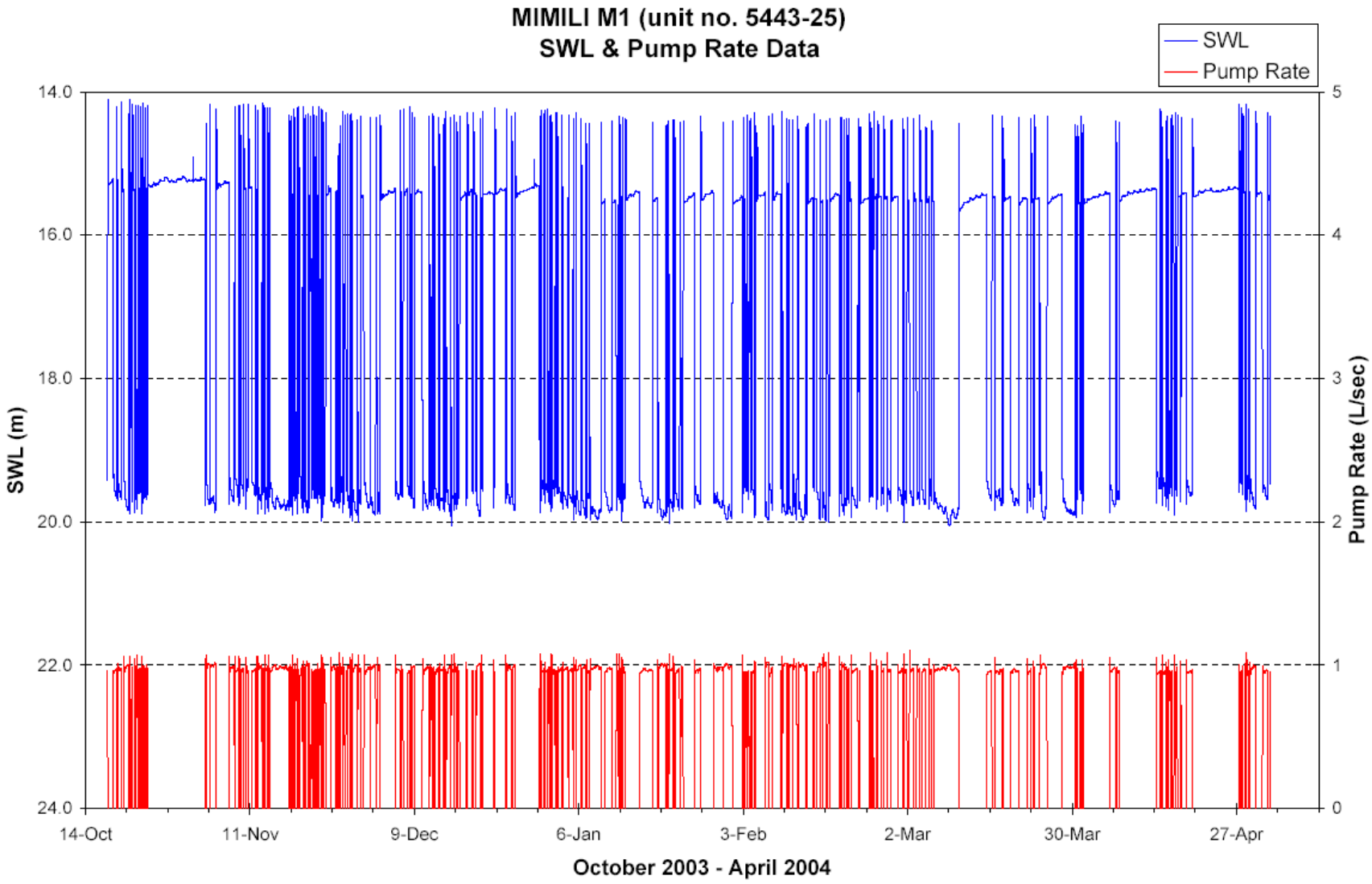
Extraction from this bore was far greater than that extracted in the previous monitoring period, in fact extraction this period (14 312 kL) was the highest volume taken from this bore in its entire history. Non-pumping water levels are stable, however pumping water levels have recorded a 0.5-1 m drop during the monitoring period. It should be noted that for a period in early February 2004 non-pumping water levels did not fully recover. This may have been due to the intensity of the pumping, during this period, where the bore was not allowed sufficient time to recover before the next pumping event.

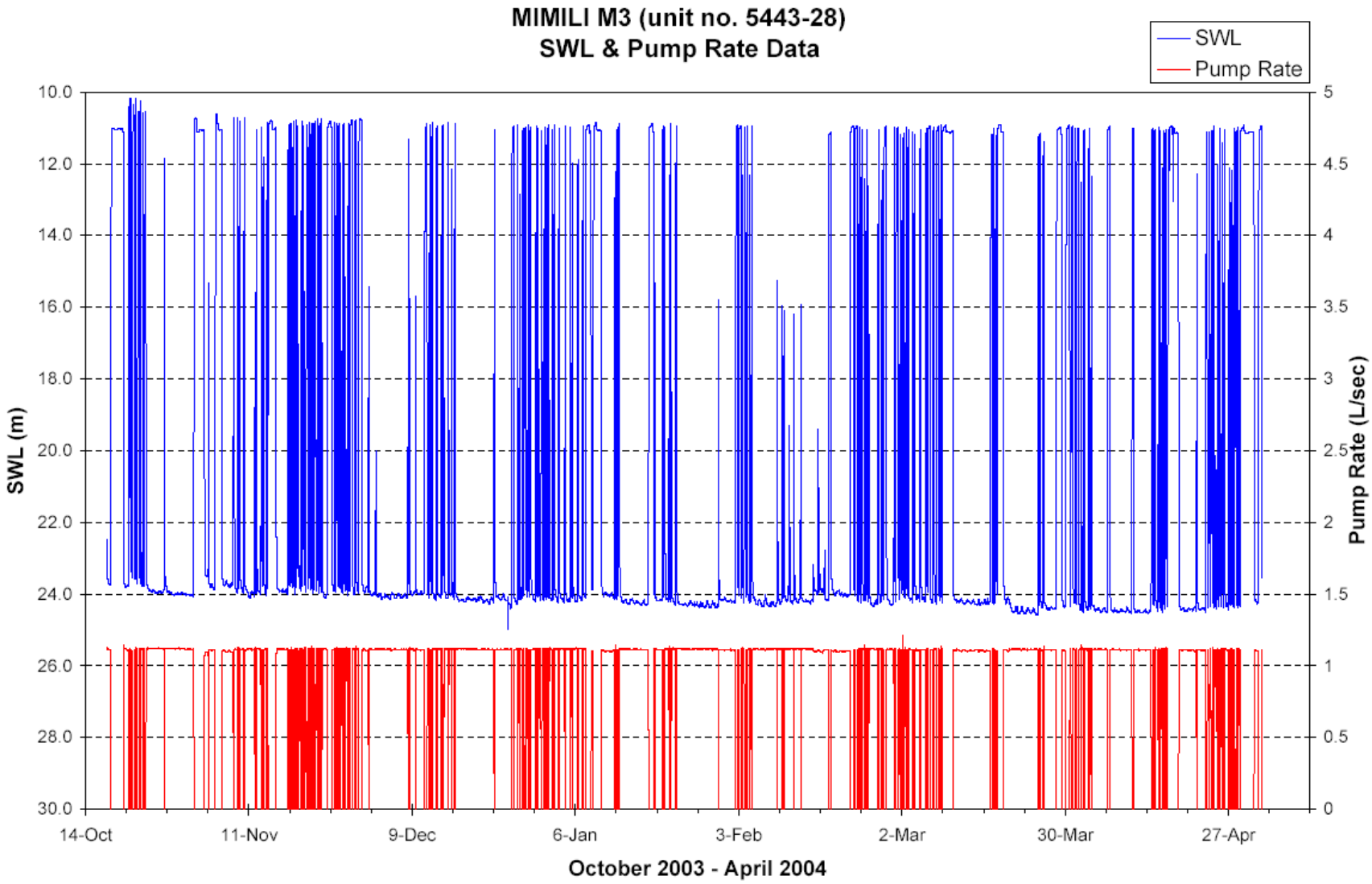
M4

Water was not extracted from this bore for this period. The logger displayed constant water level readings for the period October to March unlike the fluctuations evident from March onwards and in the previous monitoring period. A blockage may have occurred in the water level probe, but it appears to have cleared in early March. The SWLs vary slightly but systematically, and hence are most likely seasonal.

Prognosis:

It has been stated in previous reports that SWLs for both M1 and M3 were being maintained with no evident danger of either bore drying up, now or in the near future. Sustainability has much the same prognosis, for this period, despite trebling the extraction volume. Extraction volumes are the largest ever experienced in this community.


MIMILI M1 (unit no. 5443-25)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
14.0
16.0
18.0
20.0
22.0
24.0
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


MIMILI M3 (unit no. 5443-28)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
5
4.5
4
3.5
3
2.5
2
1.5
1
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0
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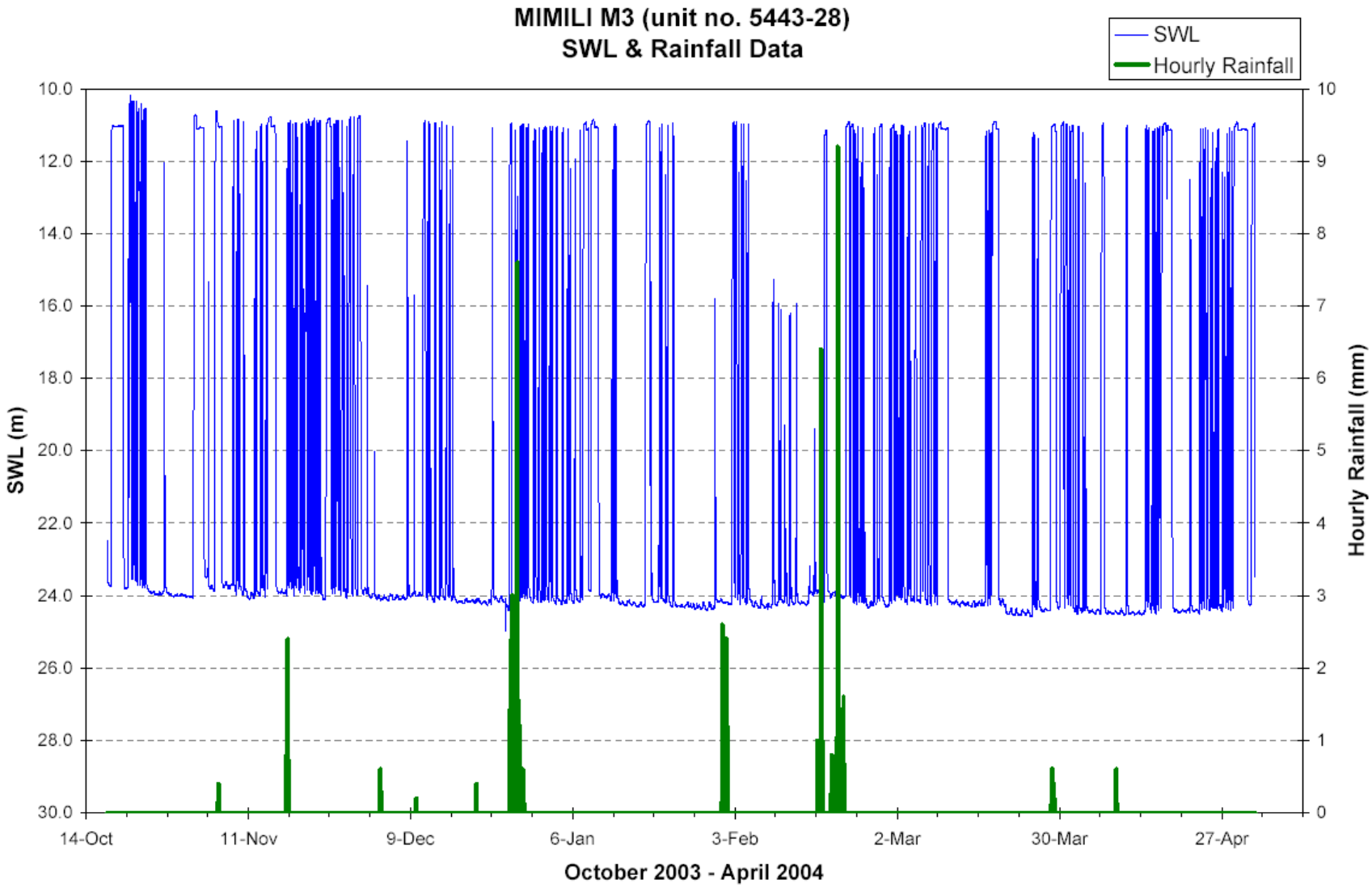
October 2003 - April 2004


MIMILI M3 (unit no. 5443-28)
SWL & Rainfall Data
SWL
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
10
9
8
7
6
5
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14-Oct
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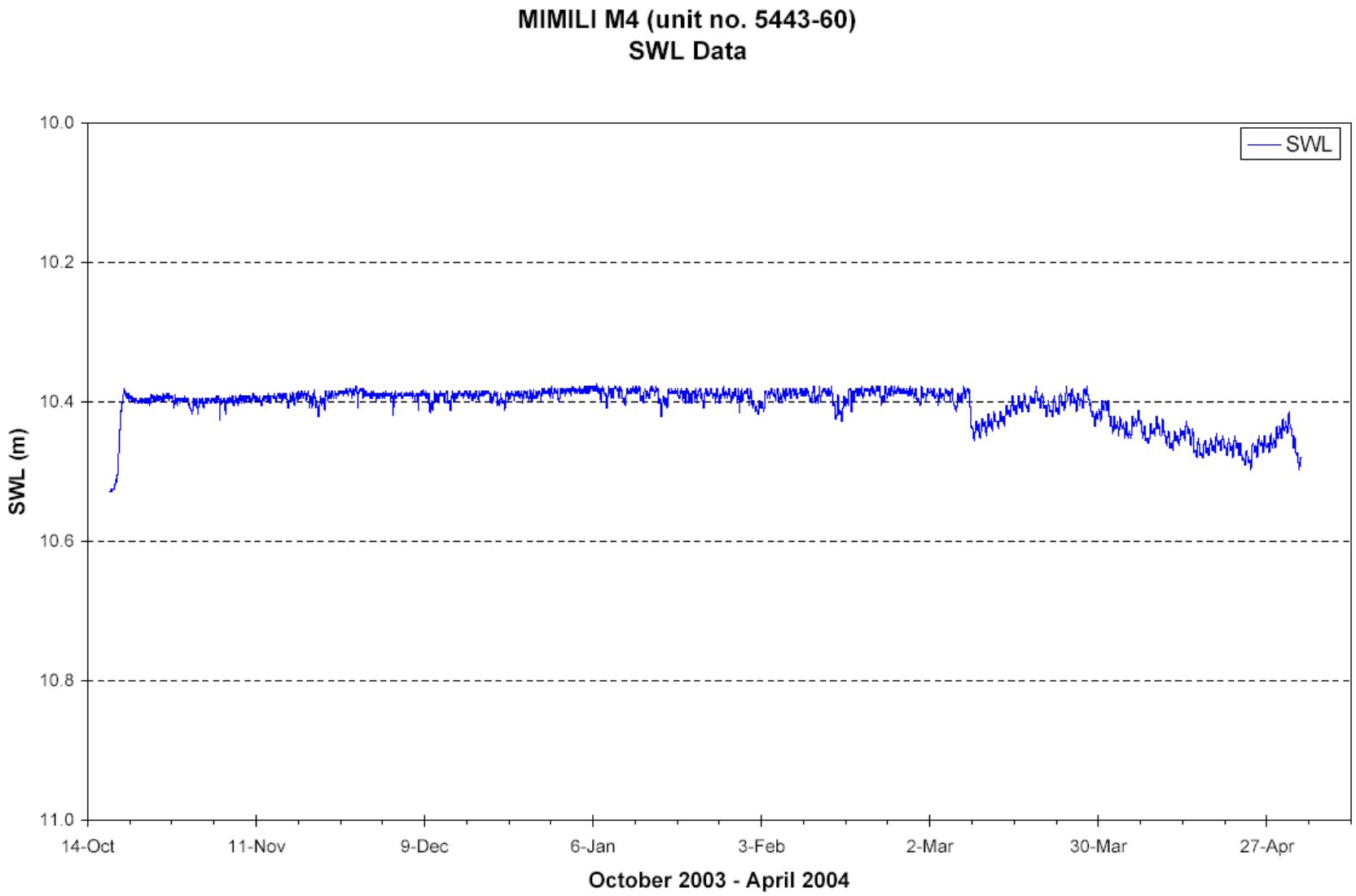
30-Mar
27-Apr
October 2003 - April 2004


MIMILI M4 (unit no. 5443-60)
SWL Data
SWL
SWL (m)
10.0
10.2
10.4
10.6
10.8
11.0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

FREGON

Overall, water production has doubled during this period (October 2003 to April 2004) compared to that of the previous monitoring period (April to October 2003). Sourcing of the water has again changed with a significant increase in extraction and the greatest contributor to the community in bore FRG7. Extraction for this period was the highest recorded at Fregon community.

During this period, 123.8 mm of rain fell with a maximum intensity of 7.4 mm/hr recorded at the end December 2003.

FRG1

Extraction from this bore was intense for the first 2 months of the monitoring period. Approximately 78% of water extracted from this bore for this monitoring period was extracted in these first two months. As a result, the SWLs dropped slightly (0.1 m) during the first 2 months but appear to have recovered slightly (0.2 m) and stabilised towards the end of the monitoring period.

FRG7

Water extraction from this bore has had a marked increase this monitoring period with approximately 50% (25 206 kL) of the entire communities water being sourced from this bore. Intermittent pumping occurred at the start and end of the monitoring period, however most of the water was sourced from a continuous pumping even in the middle of the period that spanned 3 months. Water levels during this period of continuous pumping dropped by 1.2 m however they did start to stabilise in the last month of this pumping period. Non-pumping water levels have dropped 0.6 m, but were starting to recover by the end of the monitoring period. It should be noted that for a period in April 2004 non-pumping water levels did not fully recover which may have been due to the intensity of the pumping regime during this period where the bore was not allowed sufficient time to recover before the next pumping event.

FRG14

For the first half of the monitoring period the bore was pumped once. Despite this, non-pumping water levels declined by 0.2 m, which could be a result of natural drainage. Recovery from a continuous pumping period in February 2004 was gradual, with the rate of recovery dependant on the pumping intensity. A decline in water levels, in mid to late April 2004, is a result of periods of continuous pumping.

FRGE4

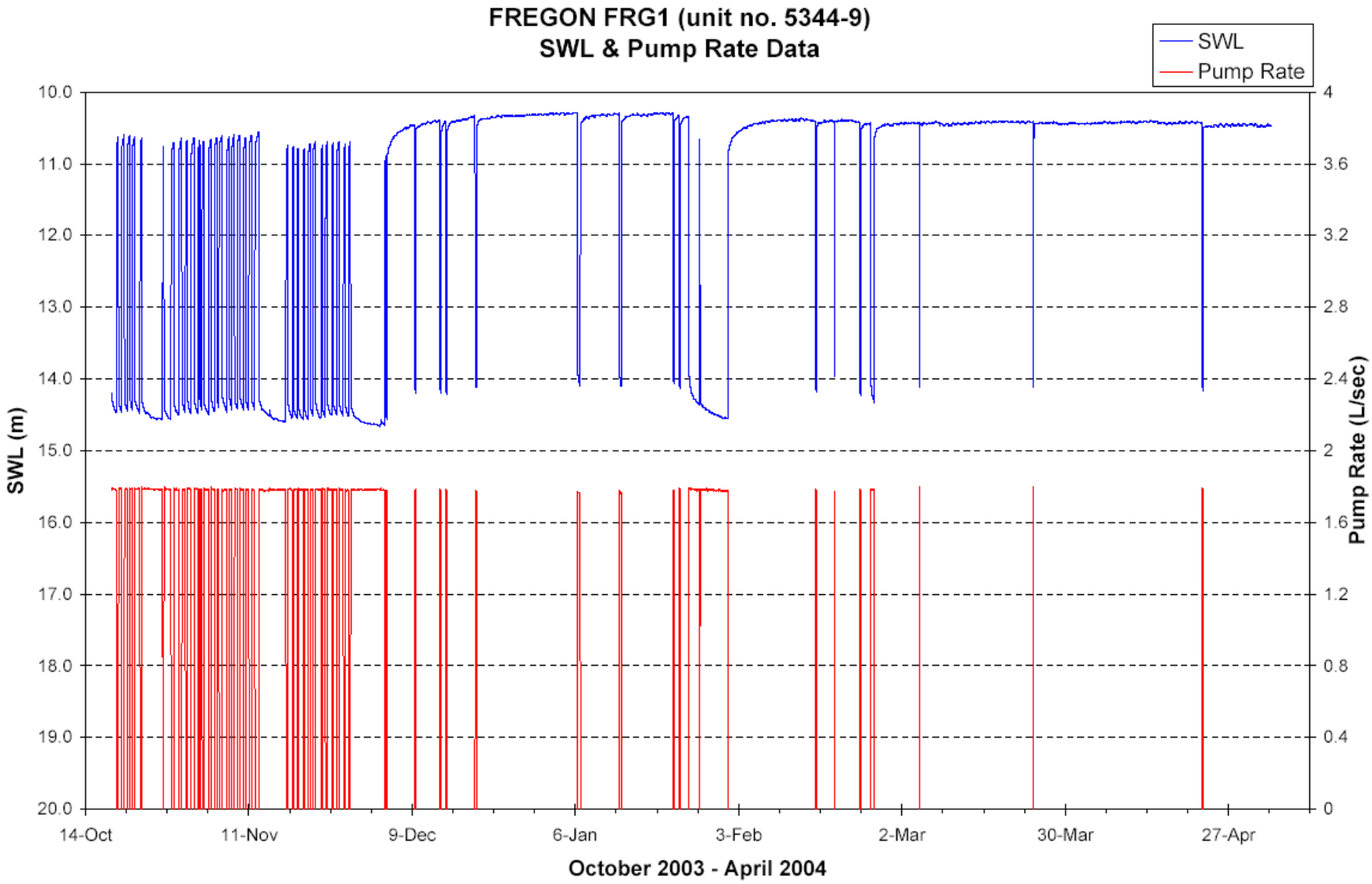
Not enough data was recorded to comment on the stability of water levels in this bore due to a data logger failure that occurred in mid-November 2003.

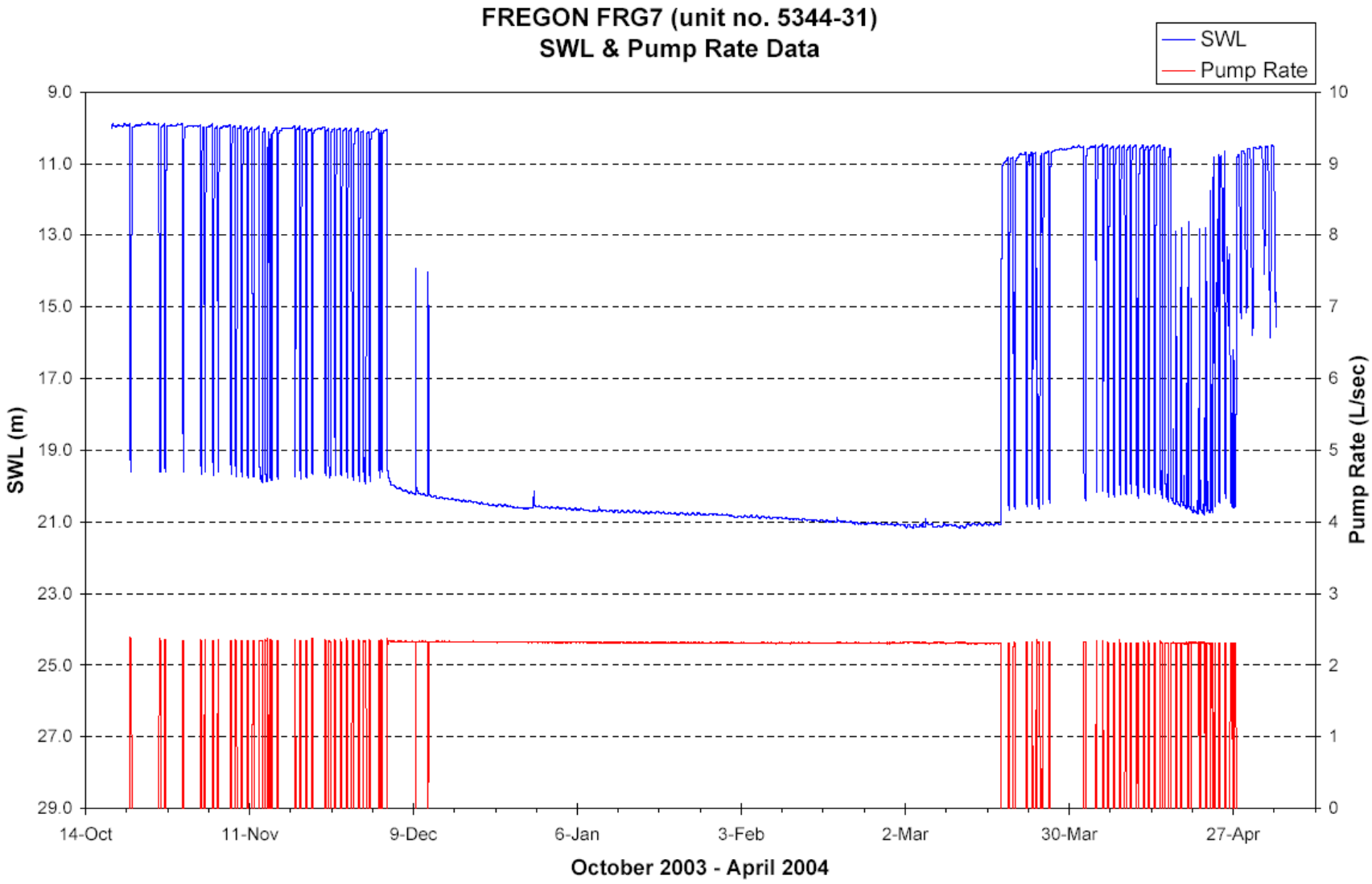
FRG64

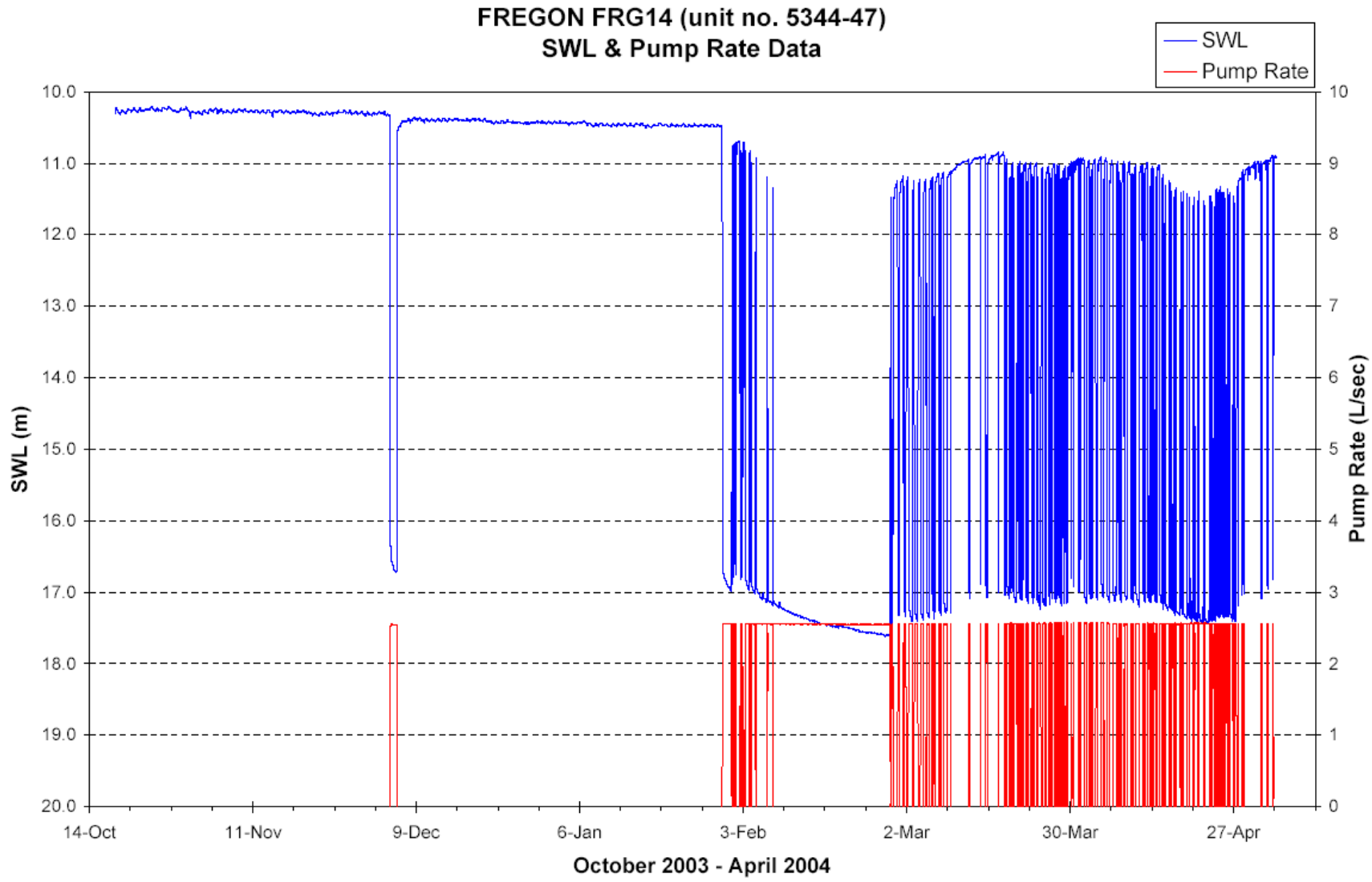
Water was not extracted from this bore for this period. Water levels are steady.

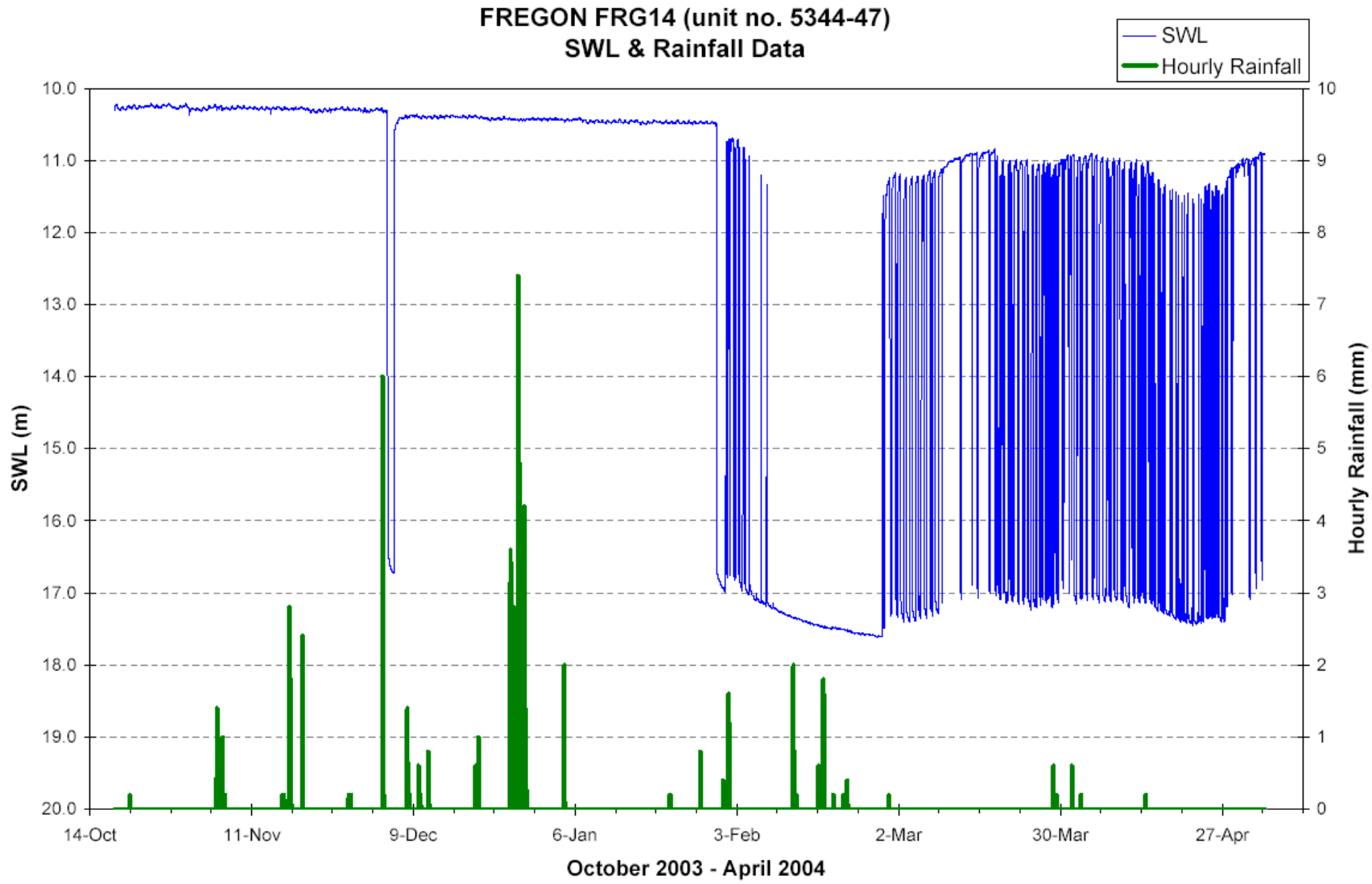
Prognosis:

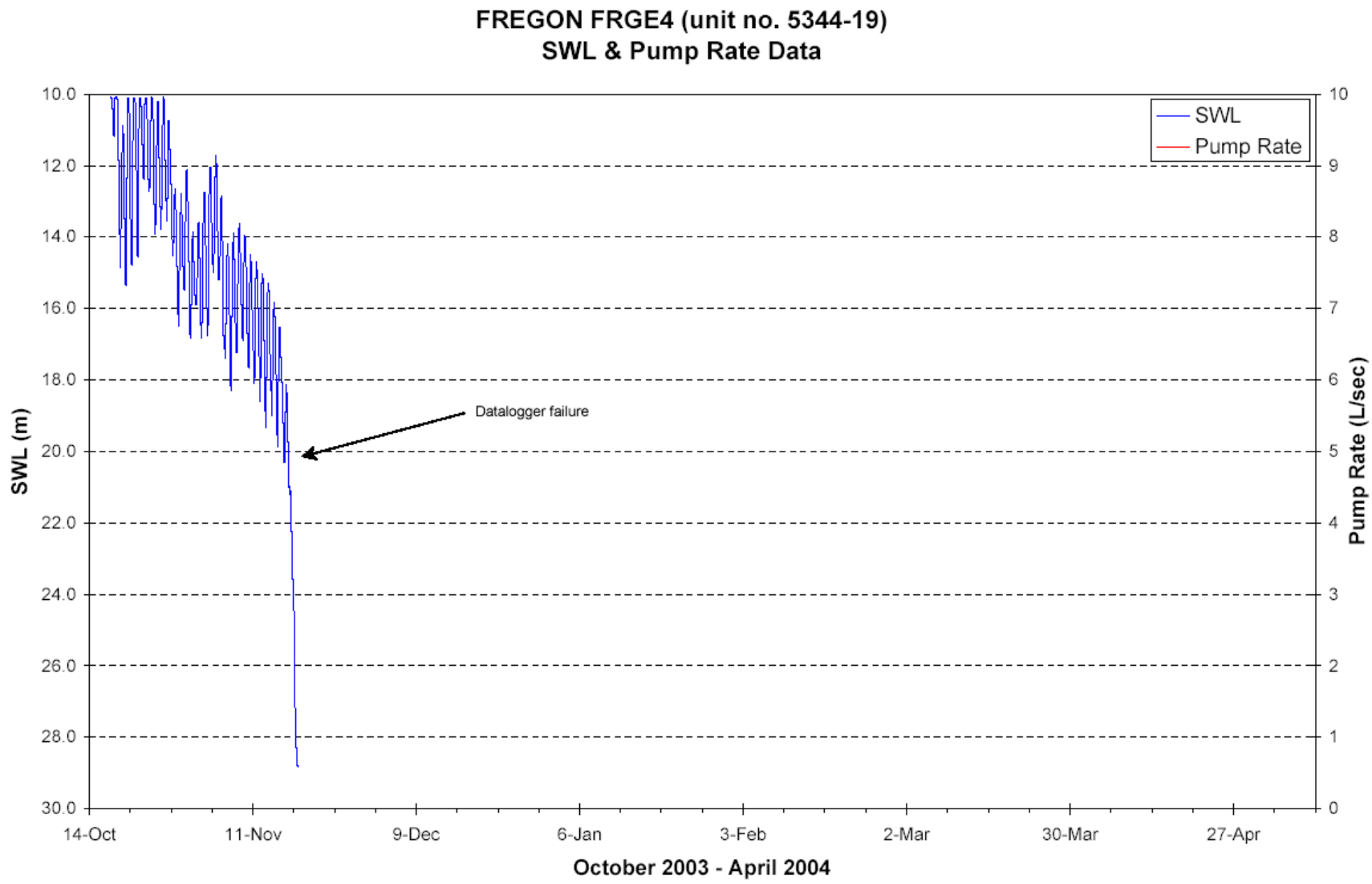
Water levels appear to be stable for FRG1, under the current pumping intensity. Water levels for bore FRG7 also appears to be stable despite the great increase in water taken from this bore. Water levels in FRG14 are susceptible to lengthy periods of continuous pumping. Pumping from this bore needs to be managed so that water levels have sufficient time to recover. Water levels suggest the bore is close to exhaustion with fluctuations and gradual recovery in non-pumping water levels and the fact that pumping water levels are within 0.5 m of the screen.

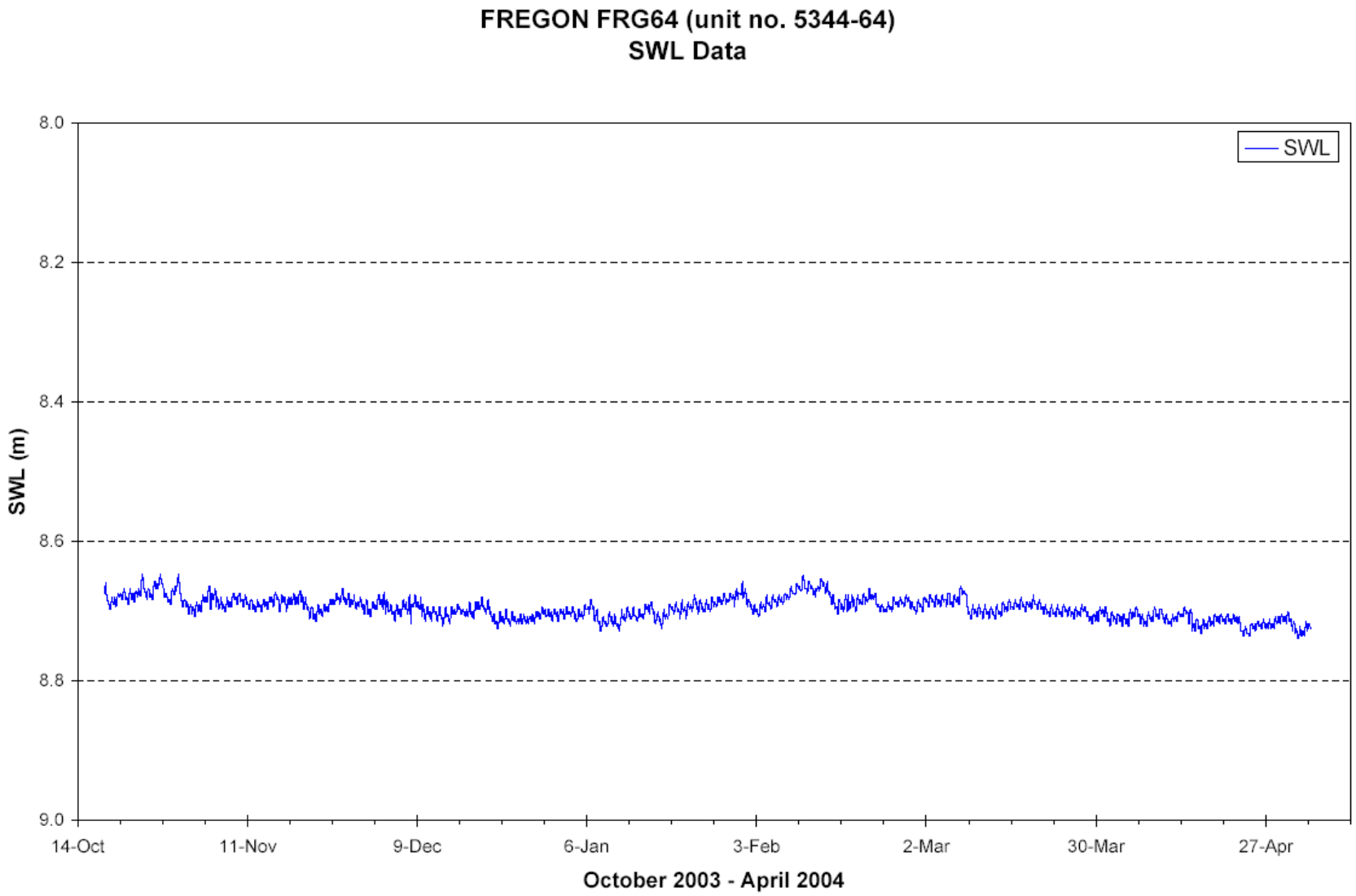

FREGON FRG1 (unit no. 5344-9)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
4
3.6
3.2
2.8
2.4
2
1.6
1.2
0.8
0.4
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


FREGON FRG7 (unit no. 5344-31)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
9.0
11.0
13.0
15.0
17.0
19.0
21.0
23.0
25.0
27.0
29.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


FREGON FRG14 (unit no. 5344-47)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


FREGON FRG14 (unit no. 5344-47)
SWL & Rainfall Data
SWL
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


FREGON FRGE4 (unit no. 5344-19)
SWL & Pump Rate Data
SWL
Pump Rate
Datalogger failure
SWL (m)
Pump Rate (L/sec)
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


FREGON FRG64 (unit no. 5344-64)
SWL Data
SWL
SWL (m)
8.0
8.2
8.4
8.6
8.8
9.0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

KENMORE PARK

Water production for the community this monitoring period (October 2003 to April 2004) remained similar to that of the previous monitoring period (April to October 2003). Production increased for KP6 and KP7 but decreased for KP98.

During this period, 225.2 mm of rain fell with a maximum intensity of 15.4 mm/hr.

KP6

This bore was the biggest supplier of water to this community. The reason for an 8.25 m shift in the water level data that occurred on 29th December 2003 is unclear. It may well be an effect caused by lowering of the data logger however movement of the data logger for any reason was not recorded and no site visit by DWLBC was conducted at that time of the year. For this reason the data for this period should not be used in absolute terms. It should also be noted that water level readings appear noisy after this shift.

In relative terms, the SWLs were highly variable over the period. Recovery of the bore was immediate during periods of non-pumping. Towards the end of the monitoring period, the bore was not pumped for 2 months and as a result water levels recovered ~1.0 m. Data this period (similar to last period) suggests that KP6 might be highly sensitive to slight variations in pumping rate. While rates of recovery have been fast, sufficient time has not been given to aid in a full recovery of the bore explaining why there is such variability in water levels.

KP7

The SWL time series data is very unusual. According to the data file the bore was not pumped for 4 months (mid-November 2003 to late-March 2004) however during this period water levels fluctuated quite significantly and spikes appear in the profile which you might expect if the bore was being pumped at these times. A comparison between flow meter water volume recorded at the time of download and the accumulative flow recorded in the data file was made to establish whether the data file flow rate profile had missing data. These values were within 130 kL of each other, with the larger being the calculated volume from the hourly pump rates, therefore it is unlikely that there is missing data. Interference from neighbouring bore KP6 was ruled out since there was no correlation with pumping and the spikes found in the water level data in KP7. Therefore, it is not clear as to the origin of these spikes and creates doubt in the confidence of water level data for this bore during this period.

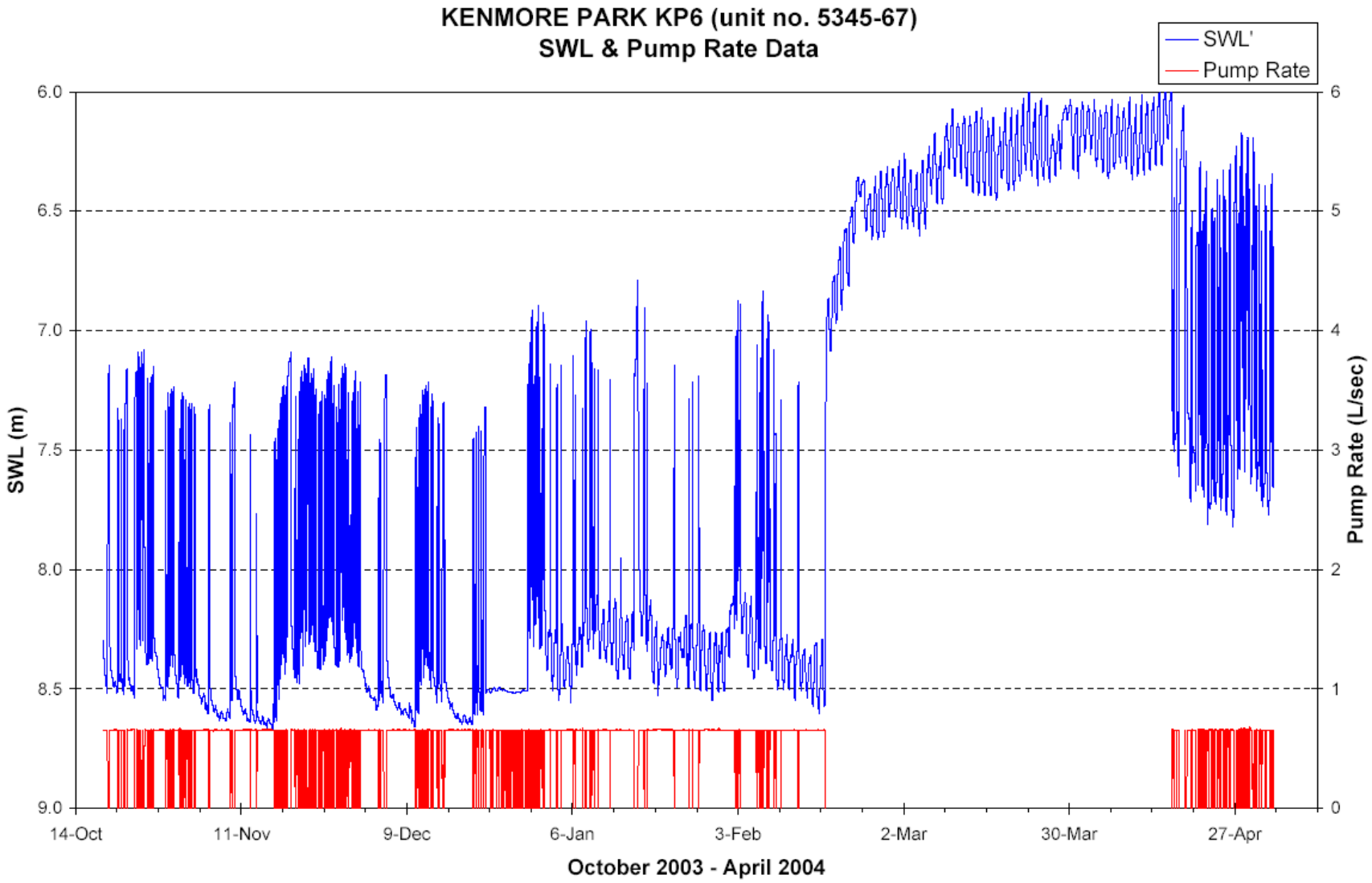
SWLs do show evidence of a recharge event that occurred in late December 2003.

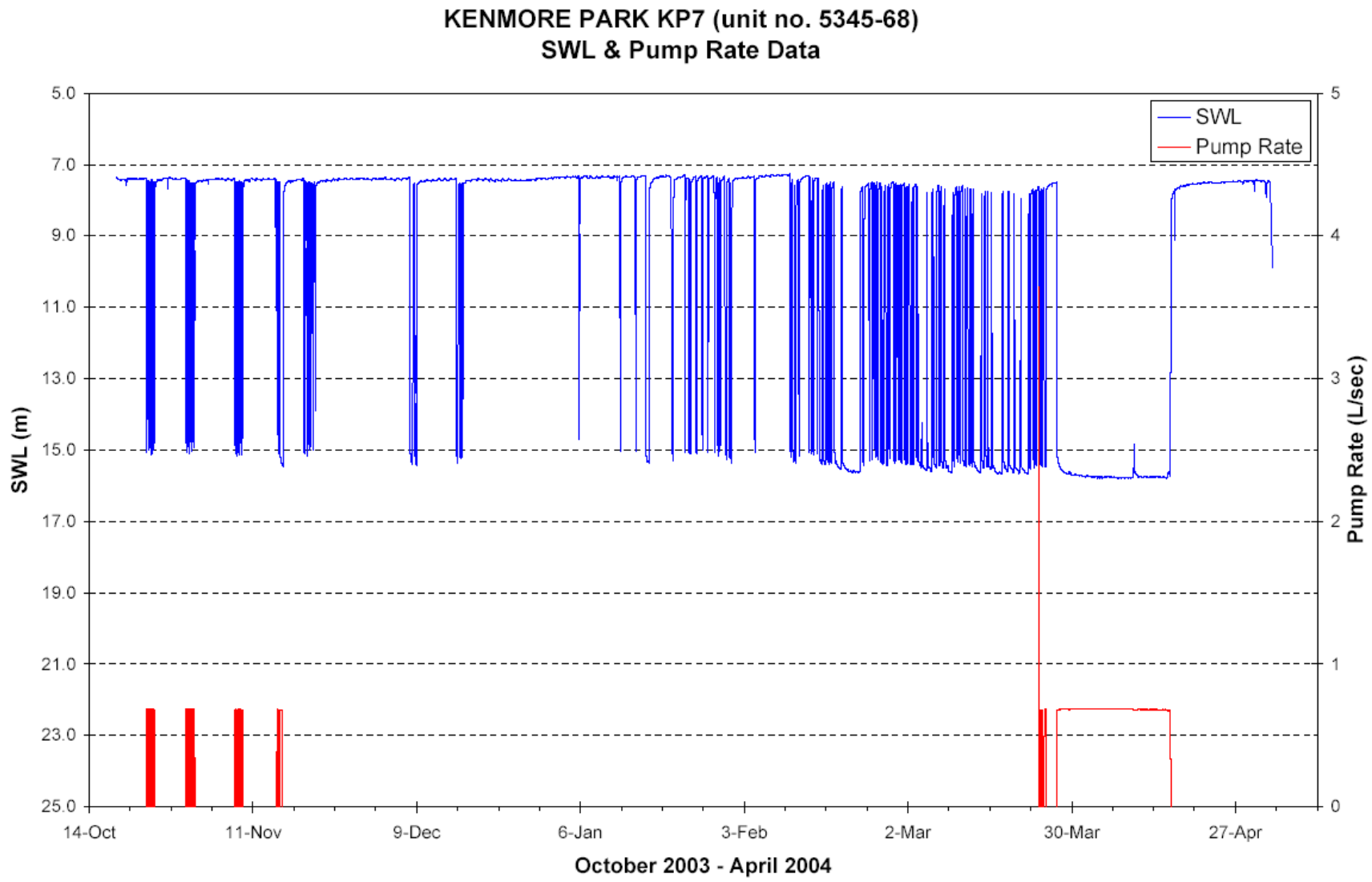
KP98

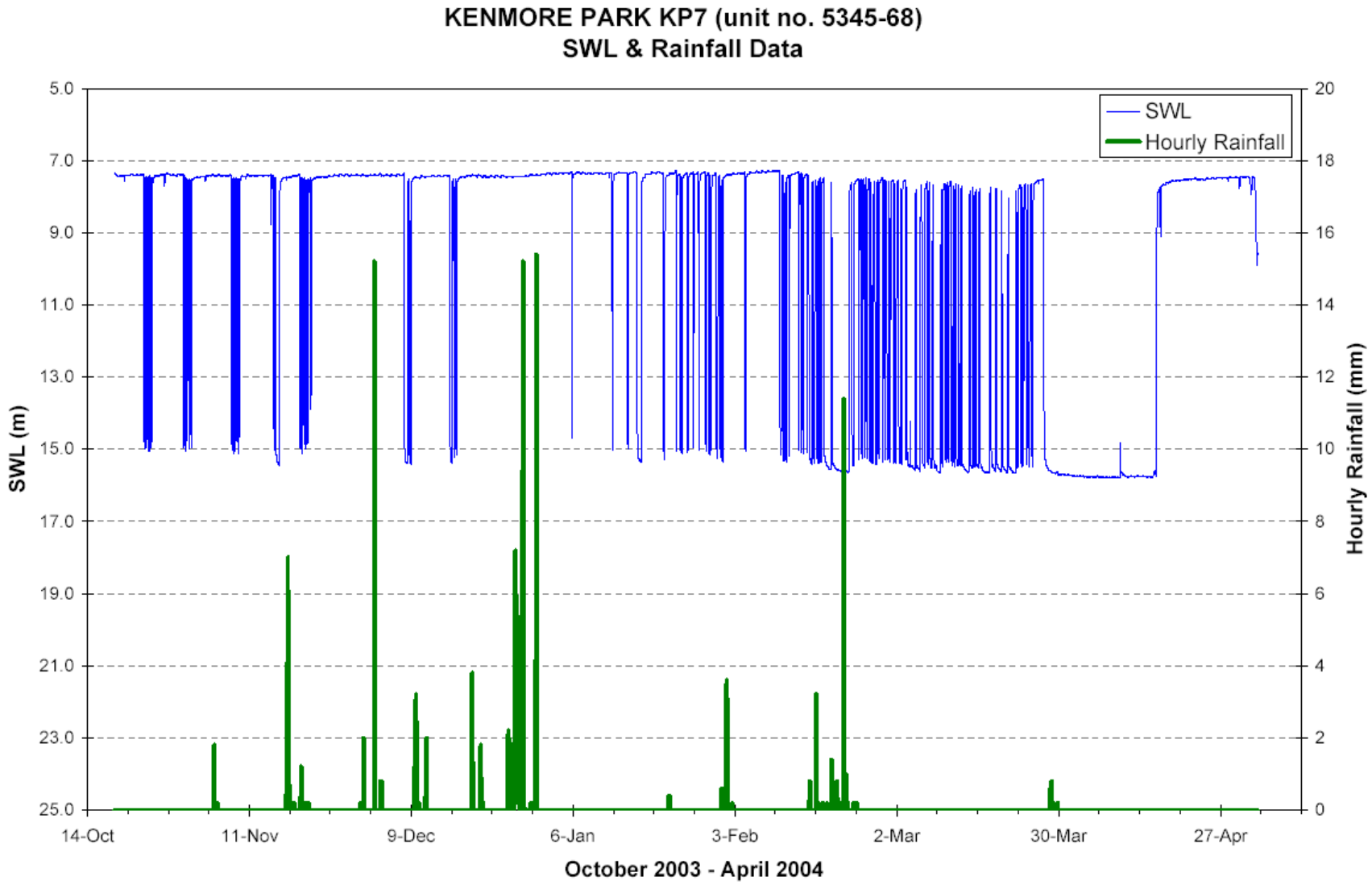
Not enough data was recorded to comment on the stability of water levels in this bore due to a data logger failure that occurred in early December 2003.

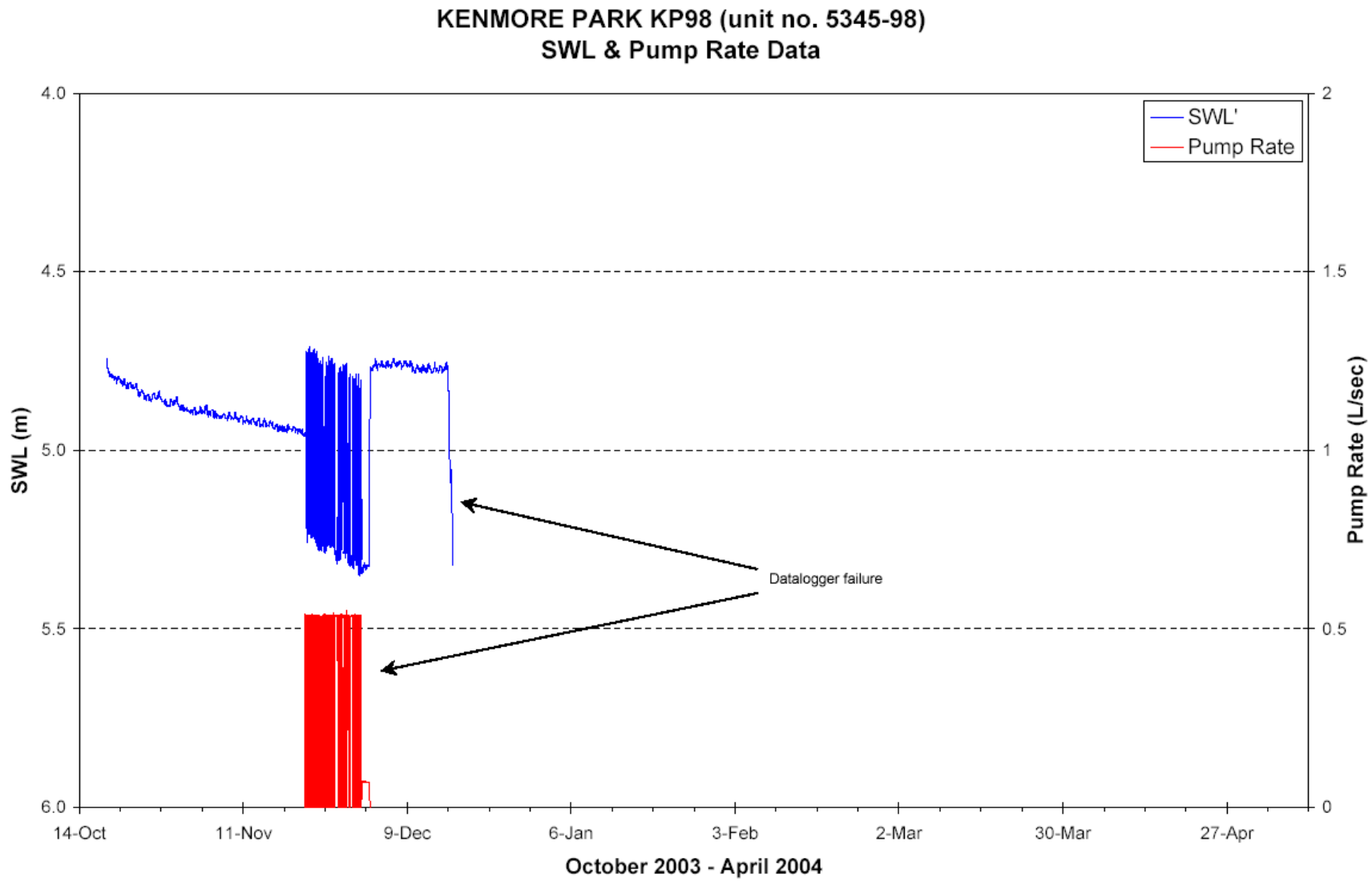
Prognosis:

Overall, water extraction volumes are sustainable. There is however, concern over the quality of data from this community with some unknown phenomena (such as spikes and steps) occurring in the data for both KP6 and KP7.


KENMORE PARK KP6 (unit no. 5345-67)
SWL & Pump Rate Data
SWL'
Pump Rate
SWL (m)
Pump Rate (L/sec)
6.0
6.5
7.0
7.5
8.0
8.5
9.0
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


KENMORE PARK KP7 (unit no. 5345-68)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
5.0
7.0
9.0
11.0
13.0
15.0
17.0
19.0
21.0
23.0
25.0
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


KENMORE PARK KP7 (unit no. 5345-68)
SWL & Rainfall Data
SWL
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
5.0
7.0
9.0
11.0
13.0
15.0
17.0
19.0
21.0
23.0
25.0
20
18
16
14
12
10
8
6
4
2
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


KENMORE PARK KP98 (unit no. 5345-98)
SWL & Pump Rate Data
SWL'
Pump Rate
SWL (m)
Pump Rate (L/sec)
4.0
4.5
5.0
5.5
6.0
2
1.5
1
0.5
0
Datalogger failure
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

PUKATJA (Ernabella)

Water production for the community increased this monitoring period (October 2003 to April 2004) by 45% from that of the previous monitoring period (April to October 2003). Water production for E97B increased 6-fold to that extracted last period.

During this period 264.8 mm of rain fell with a maximum intensity of 13 mm/hr, recorded at the end of March.

E12

This monitoring period water extraction has almost doubled from that of the previous period. Slight variations in the pumping rate results in obvious shifts in water level. Two recharge events, the first in late December 2003 and the second in late February 2004, have a significant and immediate effect on the water level. Data logger stopped on 6th April 2004 due to a battery failure.

E42

For the majority of the time this bore was pumped on a continuous basis. During these periods of continuous pumping water levels fell by approximately 0.07 m per month. Recovery during non-pumping periods was gradual and there is evidence of recharge in December 2003 and February 2004. Spikes in the water level have continued to appear this monitoring period. It is still not clear as to what the cause of these repeated 0.5 m drops in water level are during pumping. The most likely cause is interference from a neighbouring bore i.e. E12. However, on investigation there is no correlation between these 0.5 m drops in water level experienced in E42 and the pumping regime of E12.

E44

SWLs were steady over the monitoring period. The bore loss component of drawdown is small due to the low pumping rate. Two recharge events (as per E12) have affected water levels in this bore.

E45

SWLs are steady until a continuous pumping regime was introduced in February 2004, which resulted in a slight (0.02 m) drop in water levels. Two recharge events (as per E12 and E44) have affected water levels in this bore.

E97B

Despite a substantial increase in extraction volume from this bore, water levels remain steady and therefore an extraction volume of this quantity appears to be sustainable. The late December 2003 recharge event is the only recharge event that has affected water levels in this bore. Noise appears in the water level readings towards the end of the monitoring period when the bore was not pumped.

E97G

This is a stand-alone data logger in a non-pumped bore. Water levels dropped by 2 m in the first 2 months of the monitoring period. By the start of February 2004 the bore had fully recovered, then declined at a much slower rate of 0.40 m over 3 months. There is a high correlation between E97G water levels and the pumping regime of bore E97L (approximately 1350 m away), however further investigation is required for conclusive evidence.

E97K

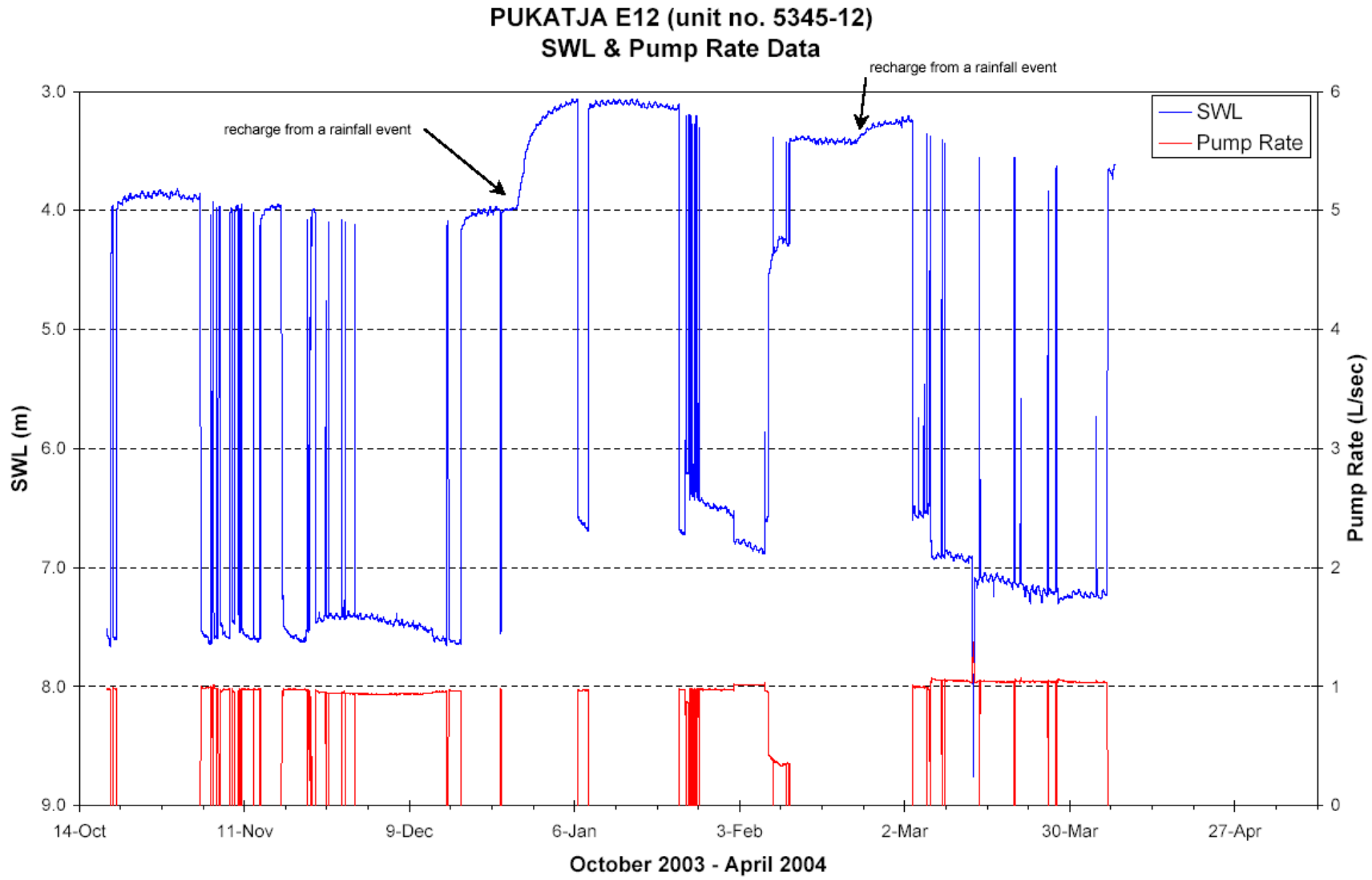
This is a stand-alone data logger in a non-pumped bore. The reason for a 1.7 m step in data that occurred towards the end of 2003 is unclear. It is not an immediate step but rather occurred over several days of monitoring. It is likely that the cause of such an increase is due to a combined effect of recharge to the groundwater through a recent rainfall event and surface water runoff ponding near the bore and entering the top of the bore. Despite this, there is a definite decline in water levels, which are attributed to natural drainage.

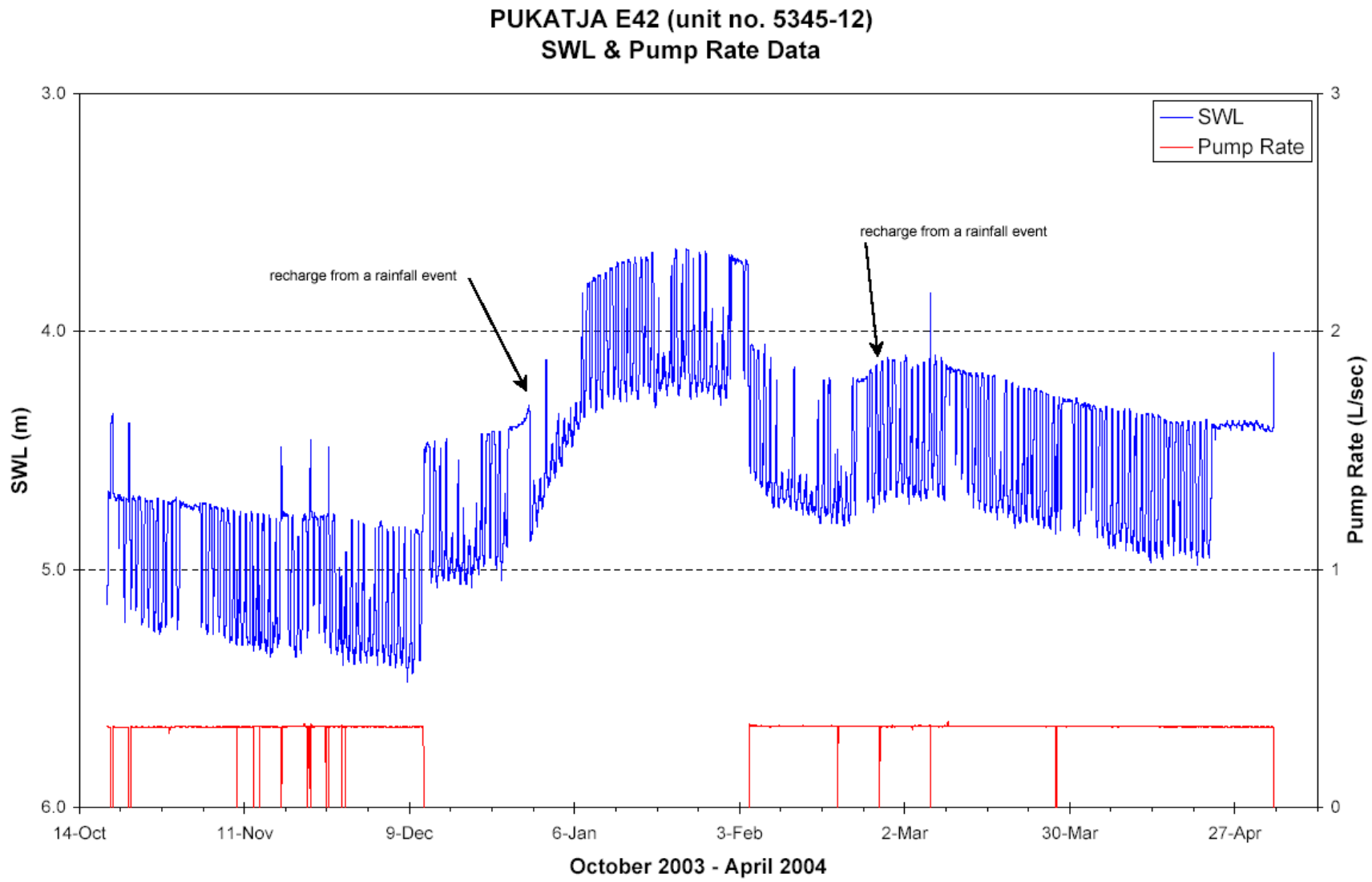
E97L

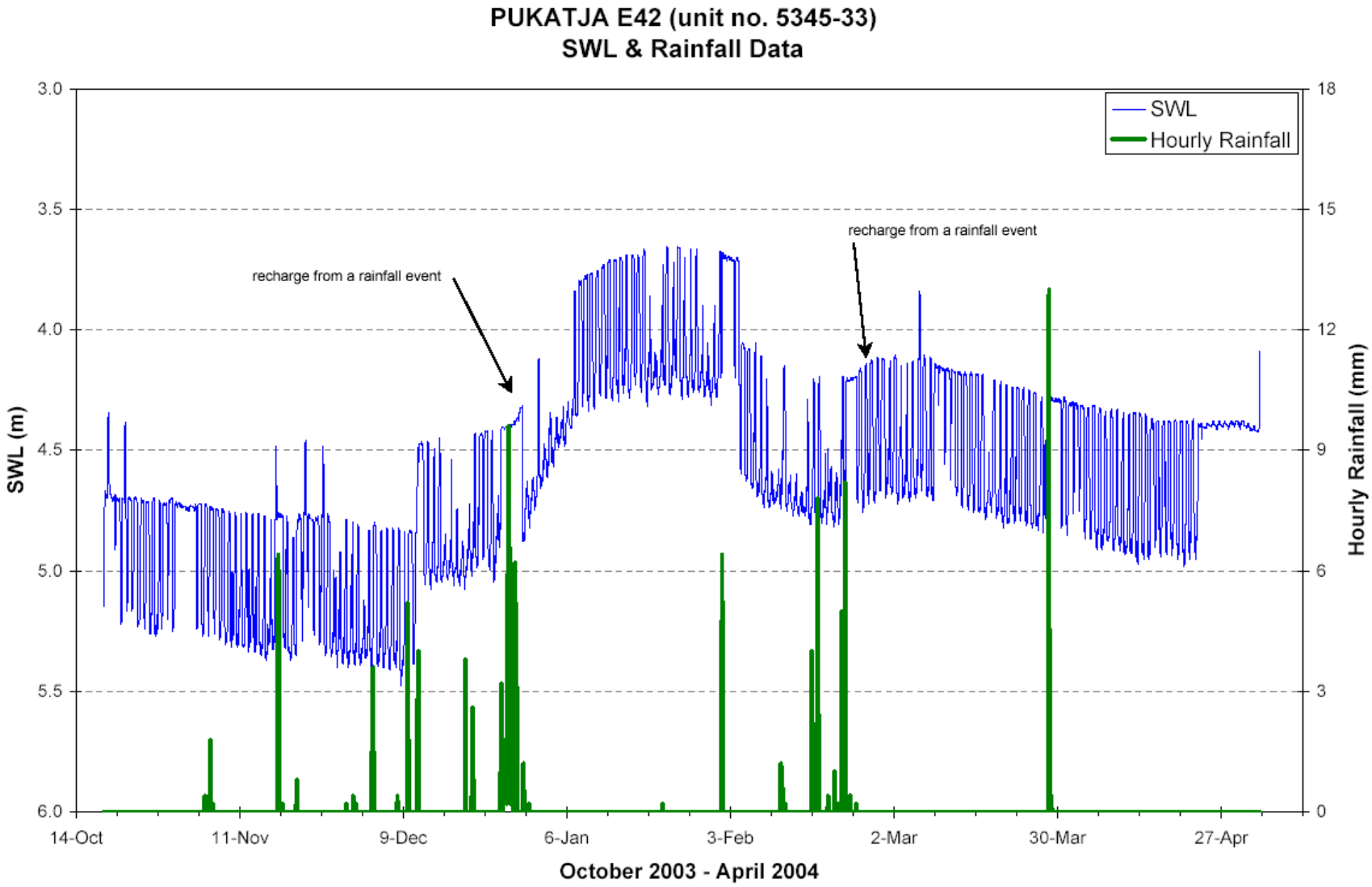
Water extraction was reduced (24%) this monitoring period compared to that of the previous monitoring period. Both non-pumping and pumping water levels have declined. Non-pumping levels have dropped by 40 cm while levels under pumping conditions have dropped by 1 m over the monitoring period. This bore is also in the vicinity of bore E97B (approximately 800 m away) and so interference from this bore is the likely cause of the decline in water levels. The first rainfall event felt by most bores in the community during this monitoring period is evident in the water level data, although recharge is gradual in this bore.

Prognosis:

All bores show much the same picture of steady or slight decline in water levels as a result of the intense extraction of water from the community bores. The aquifer and subsequently the bores in the community, observe immediate recharge from rainfall events with most bores displaying evidence of recharge from at least one event. Declines are only small and with significant recharge events supplying the bores, extraction rates are believed to be sustainable.


PUKATJA E12 (unit no. 5345-12)
SWL & Pump Rate Data
recharge from a rainfall event
recharge from a rainfall event
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
3.0
4.0
5.0
6.0
7.0
8.0
9.0
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E42 (unit no. 5345-12)
SWL & Pump Rate Data
SWL
Pump Rate
recharge from a rainfall event
recharge from a rainfall event
SWL (m)
Pump Rate (L/sec)
3.0
4.0
5.0
6.0
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E42 (unit no. 5345-33)
SWL & Rainfall Data
SWL
Hourly Rainfall
recharge from a rainfall event
recharge from a rainfall event
SWL (m)
Hourly Rainfall (mm)
3.0
3.5
4.0
4.5
5.0
5.5
6.0
18
15
12
9
6
3
0
14-Oct
11-Nov
9-Dec
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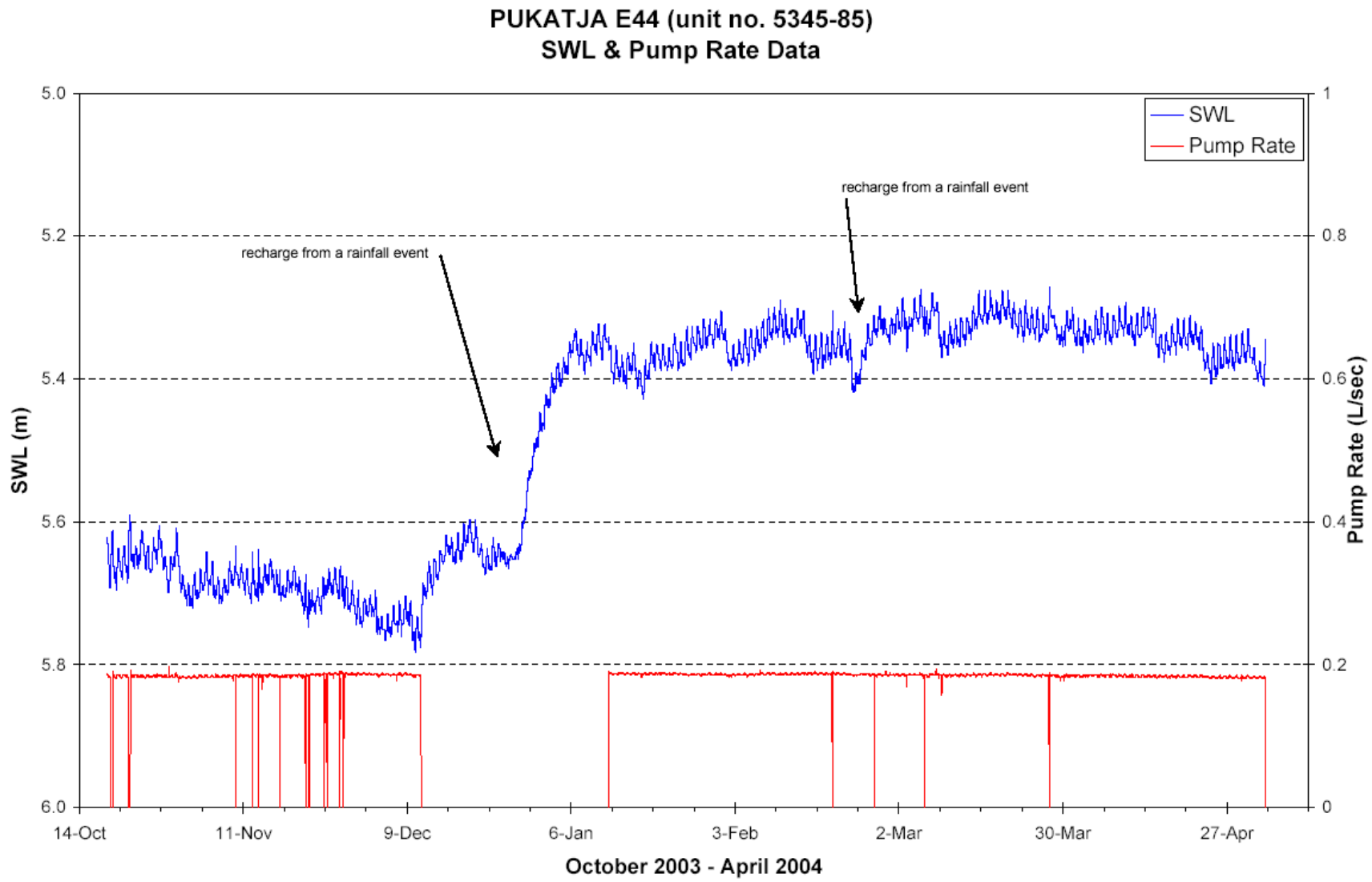
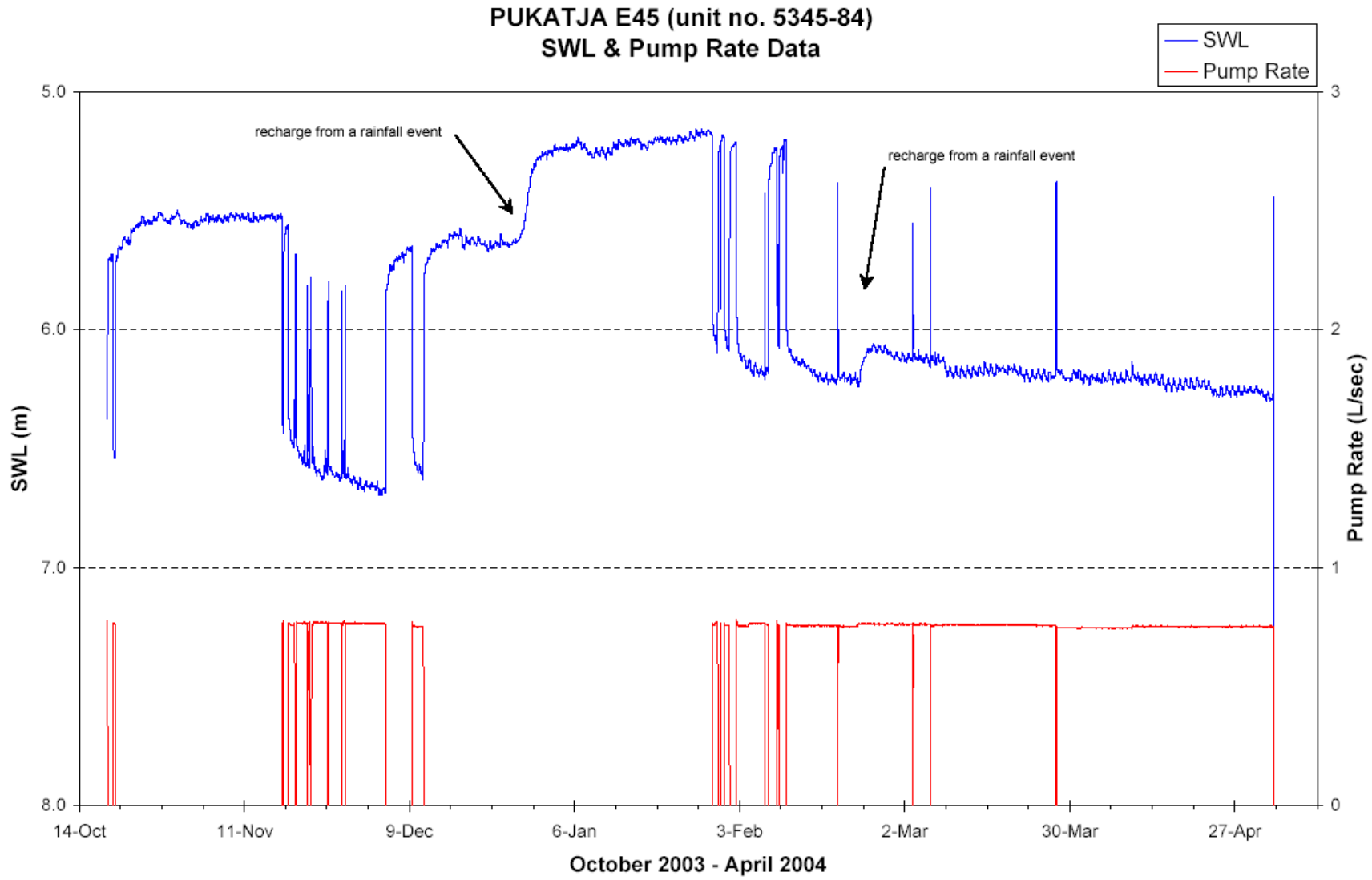
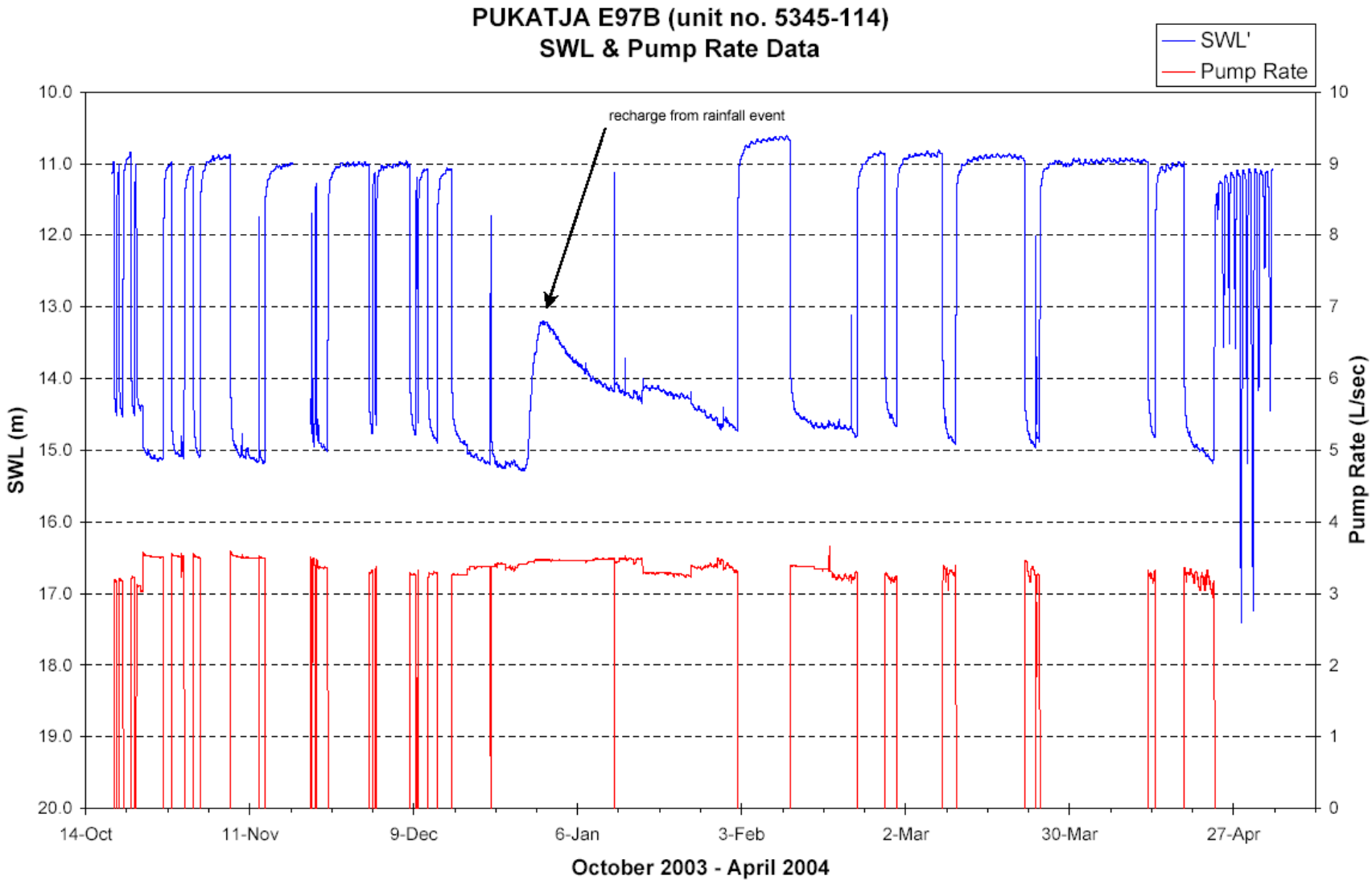
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E44 (unit no. 5345-85)
SWL & Pump Rate Data
SWL
Pump Rate
recharge from a rainfall event
recharge from a rainfall event
SWL (m)
Pump Rate (L/sec)
5.0
5.2
5.4
5.6
5.8
6.0
1
0.8
0.6
0.4
0.2
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E45 (unit no. 5345-84)
SWL & Pump Rate Data
SWL
Pump Rate
recharge from a rainfall event
recharge from a rainfall event
SWL (m)
Pump Rate (L/sec)
5.0
6.0
7.0
8.0
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E97B (unit no. 5345-114)
SWL & Pump Rate Data
SWL'
Pump Rate
recharge from rainfall event
SWL (m)
Pump Rate (L/sec)
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
10
9
8
7
6
5
4
3
2
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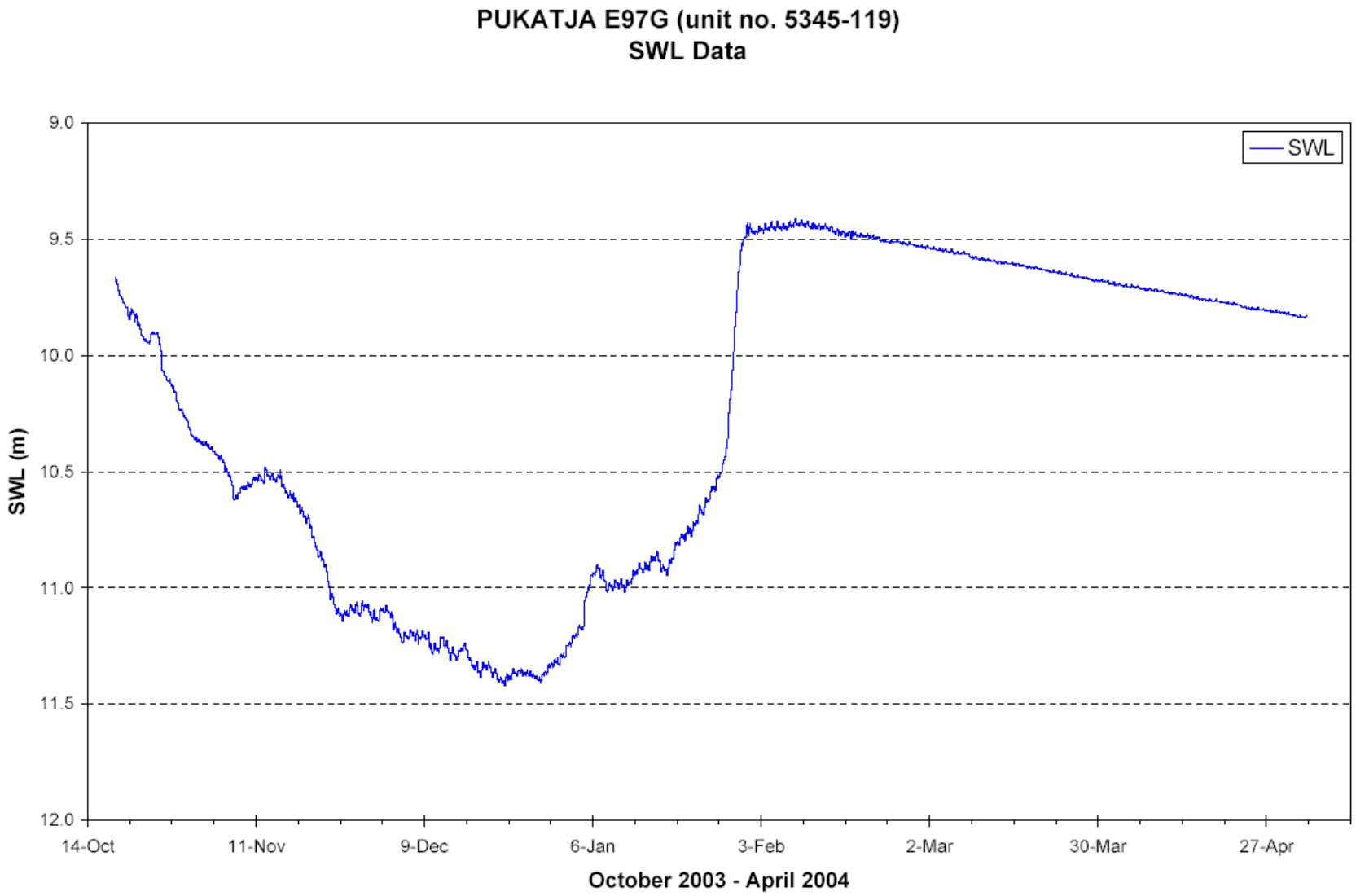
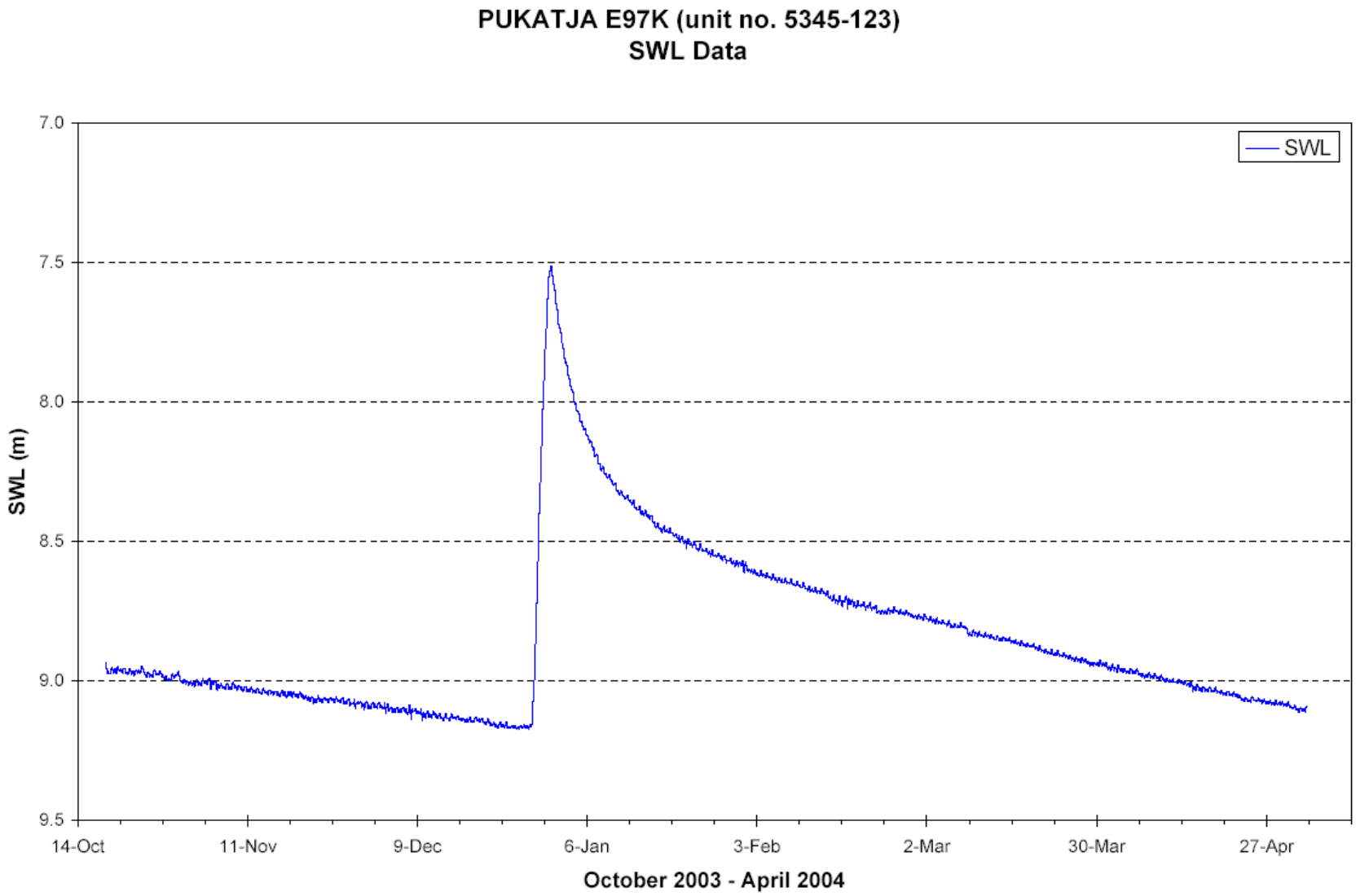
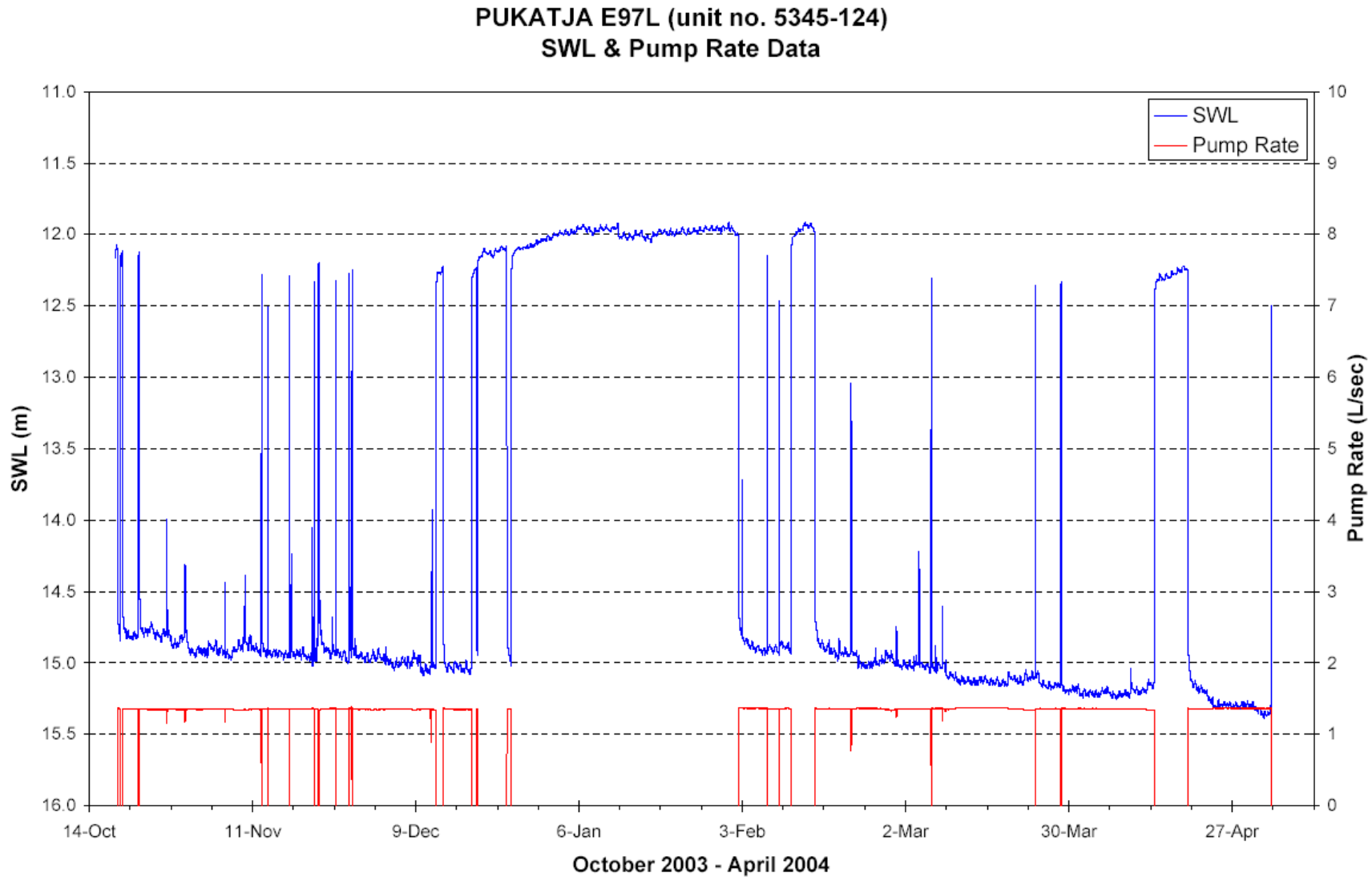
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E97G (unit no. 5345-119)
SWL Data
SWL
SWL (m)
9.0
9.5
10.0
10.5
11.0
11.5
12.0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E97K (unit no. 5345-123)
SWL Data
SWL
SWL (m)
7.0
7.5
8.0
8.5
9.0
9.5
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PUKATJA E97L (unit no. 5345-124)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

Water consumption rose this period (October 2003 to April 2004) by 36% of that consumed last monitoring period (April to October 2003). Bore A17 doubled its extraction volume during this monitoring period.

During this period, (October 2003 to Aril 2004) 246 mm of rain fell with a maximum intensity of 12.8 mm/hr, recorded in early January.

A17

Not enough data was recorded to comment on the stability of water levels in this bore due to a data logger failure that occurred in early December 2003. However up until this point SWLs were steady.

A26

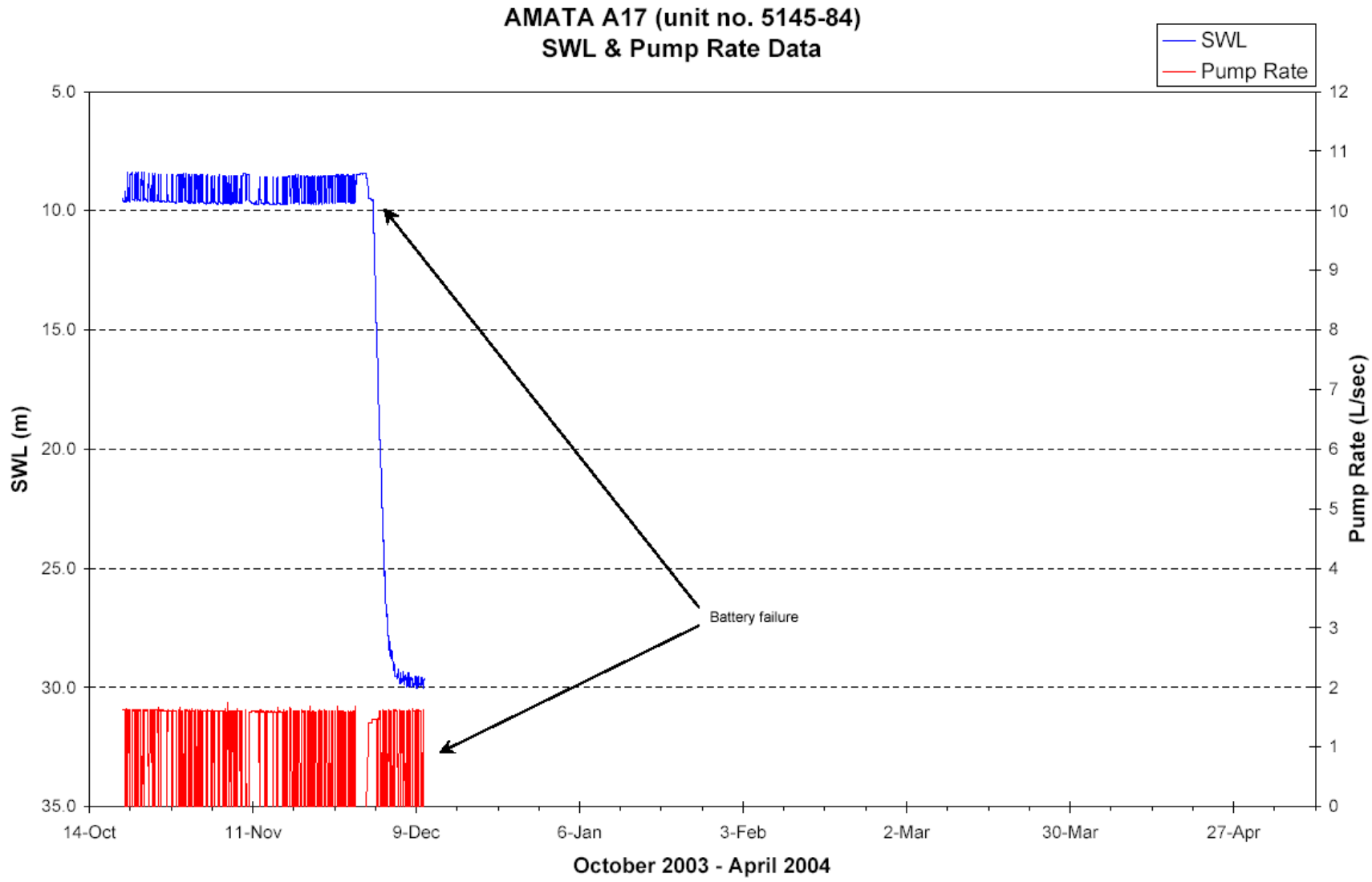
Like the previous monitoring period, this bore was used in a limited fashion with extraction for this period only 282 kL (0.9% of community supply). SWLs fluctuated slightly; dropping by 0.10 m in late December 2003, then rising by 0.15 m in early February 2004 followed by a further decline of 0.05 m by the end of the monitoring period. The rise in water level is the result of recharge from rainfall events while a decline is the result of natural drainage. SWLs at the start and end of the monitoring period effectively have not changed.

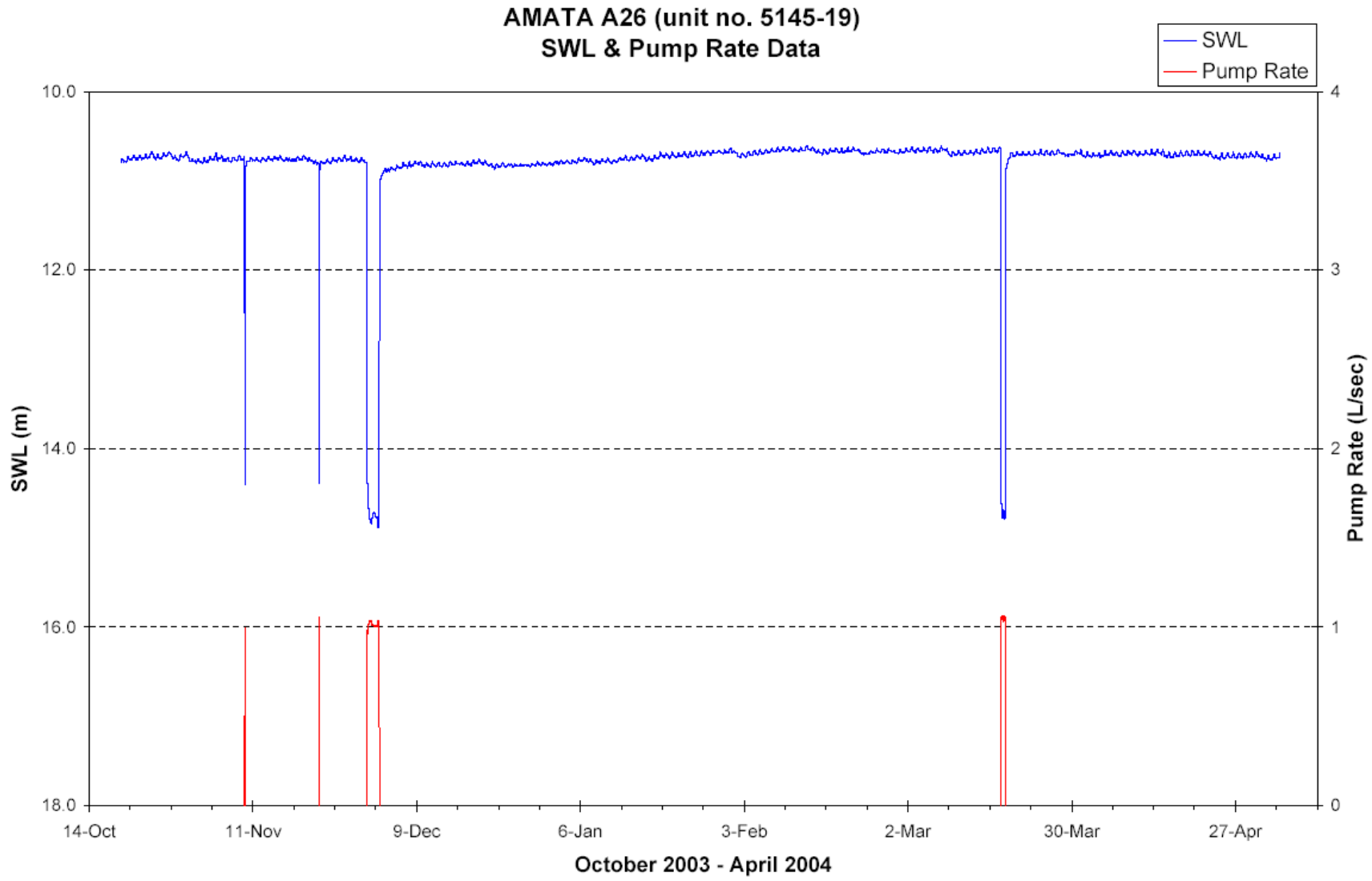
A109

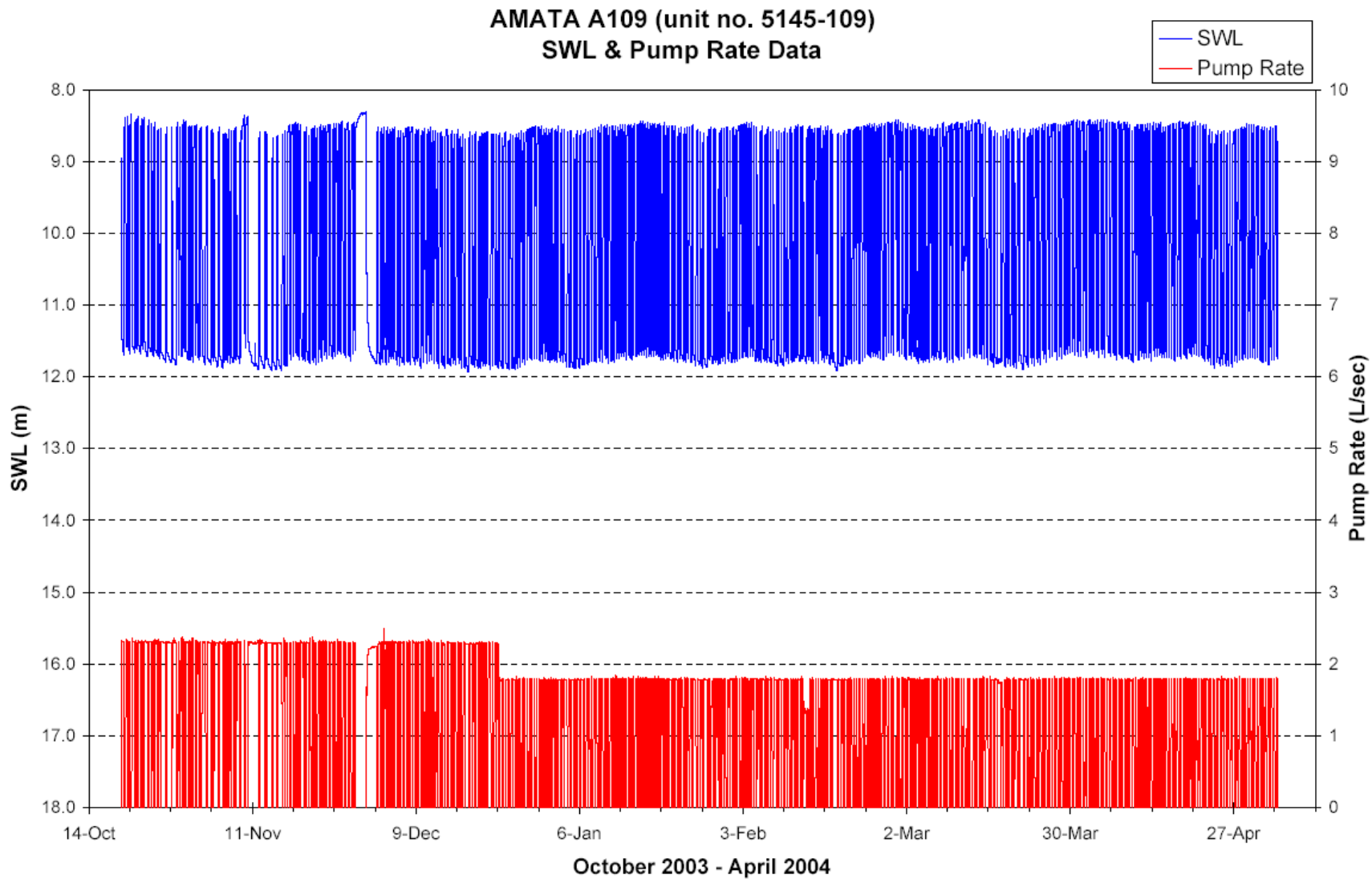
Although there were minor fluctuations in the water level data, water levels remained steady for the monitoring period. The fluctuations in water levels are most likely due to variations in pumping frequency and intensity. A drop in pumping rate was observed in December.

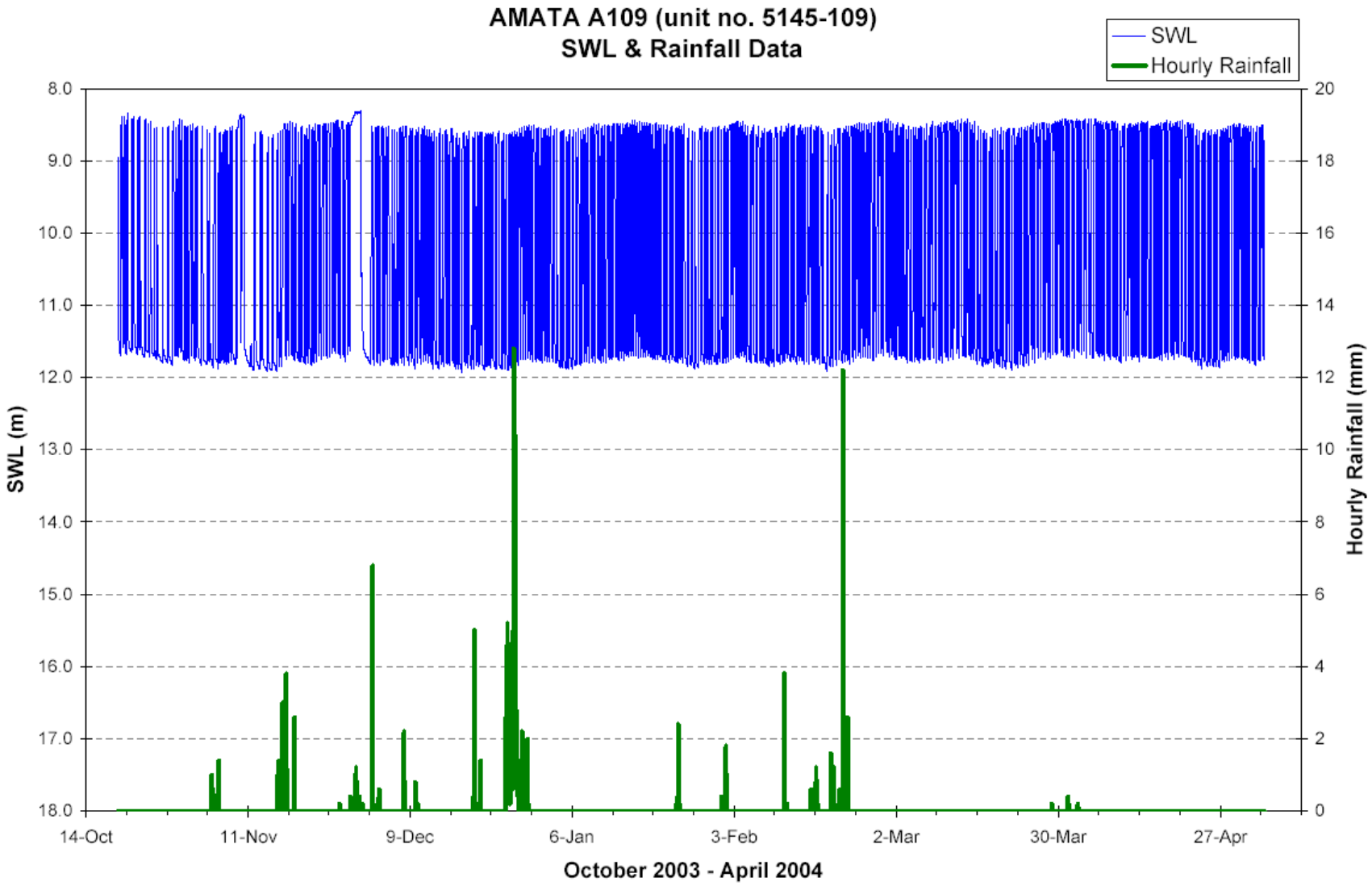
Prognosis:

No change from comments made in the previous interim report. The bores appear sustainable in the medium to long term, other than for droughts of over 10 years.


AMATA A17 (unit no. 5145-84)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
5.0
10.0
15.0
20.0
25.0
30.0
35.0
12
11
10
9
8
7
6
5
4
3
2
1
0
Battery failure
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


AMATA A26 (unit no. 5145-19)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
10.0
12.0
14.0
16.0
18.0
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


AMATA A109 (unit no. 5145-109)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


AMATA A109 (unit no. 5145-109)
SWL & Rainfall Data
SWL
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
20
18
16
14
12
10
8
6
4
2
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

KALKA

Kalka was one of the very few communities to experience a decrease, although slight (approximately 6%), in water usage this monitoring period (October 2003 to April 2004) compared with that of the last monitoring period (April to October 2003). Sourcing of water has changed with the introduction of bore KA137. Nearly all the water extracted by this community was extracted from this bore.

During this monitoring period, 352 mm of rain fell with a maximum intensity of 14 mm/hr recorded at the end of January.

KA1

Water is no longer extracted from this bore and it is equipped with a stand-alone data logger. SWLs rose by 0.5 m up until mid-December 2003 then remained steady for the rest of the monitoring period. It is unclear as to the cause of noisy data.

KA2

Water consumption was very small with an extraction volume of approximately 66 kL for the entire monitoring period. As a result, water levels have risen 0.10 m.

KA3

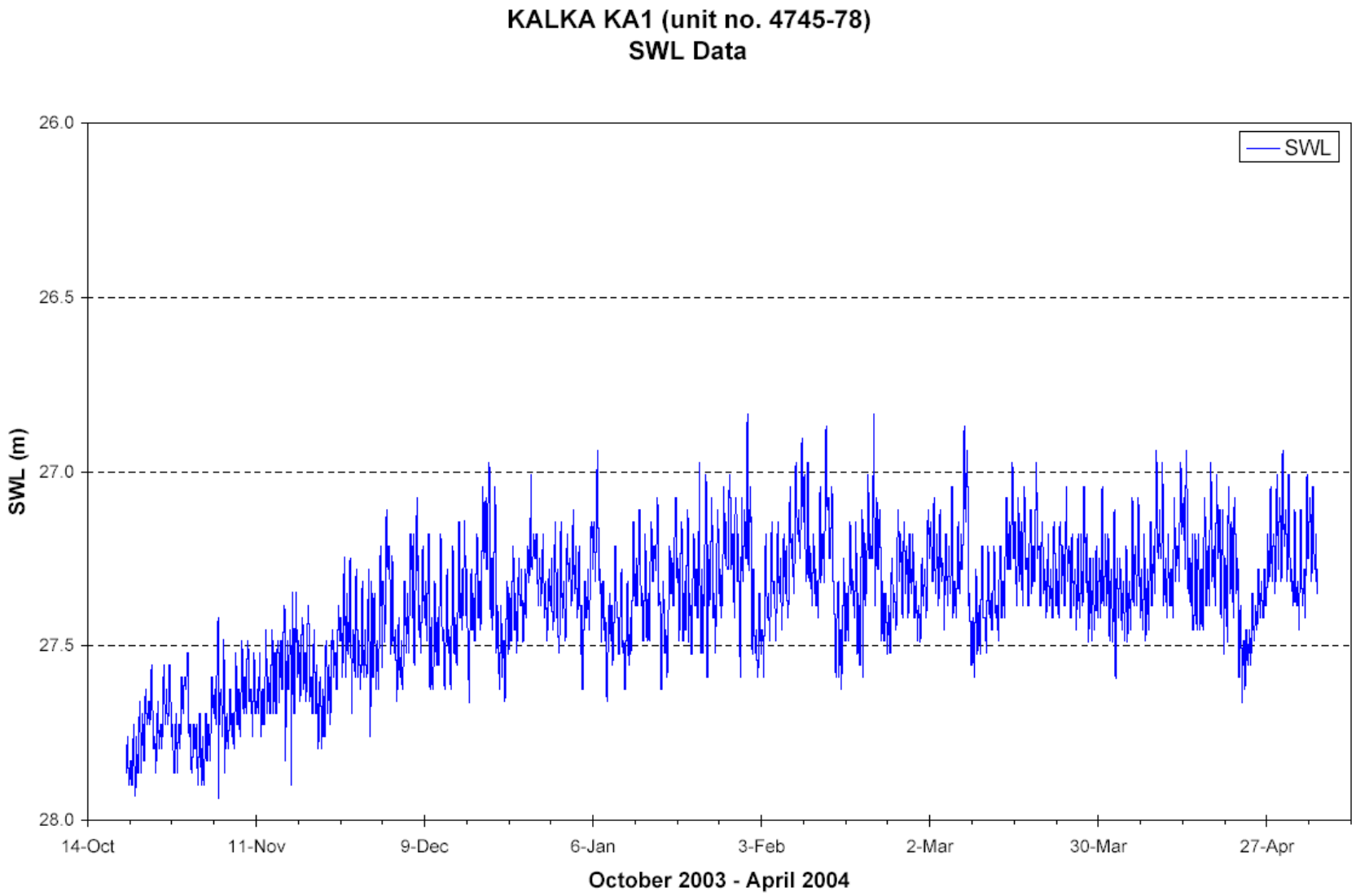
With bore KA137 now on-line bore KA3 has now been rested. Water extraction was approximately 260 kL this monitoring period and as a result, non-pumping water levels have risen almost 0.5 m. Water levels are still encroaching the top of the screen when the bore is pumped, which is a function of the pumping rate.

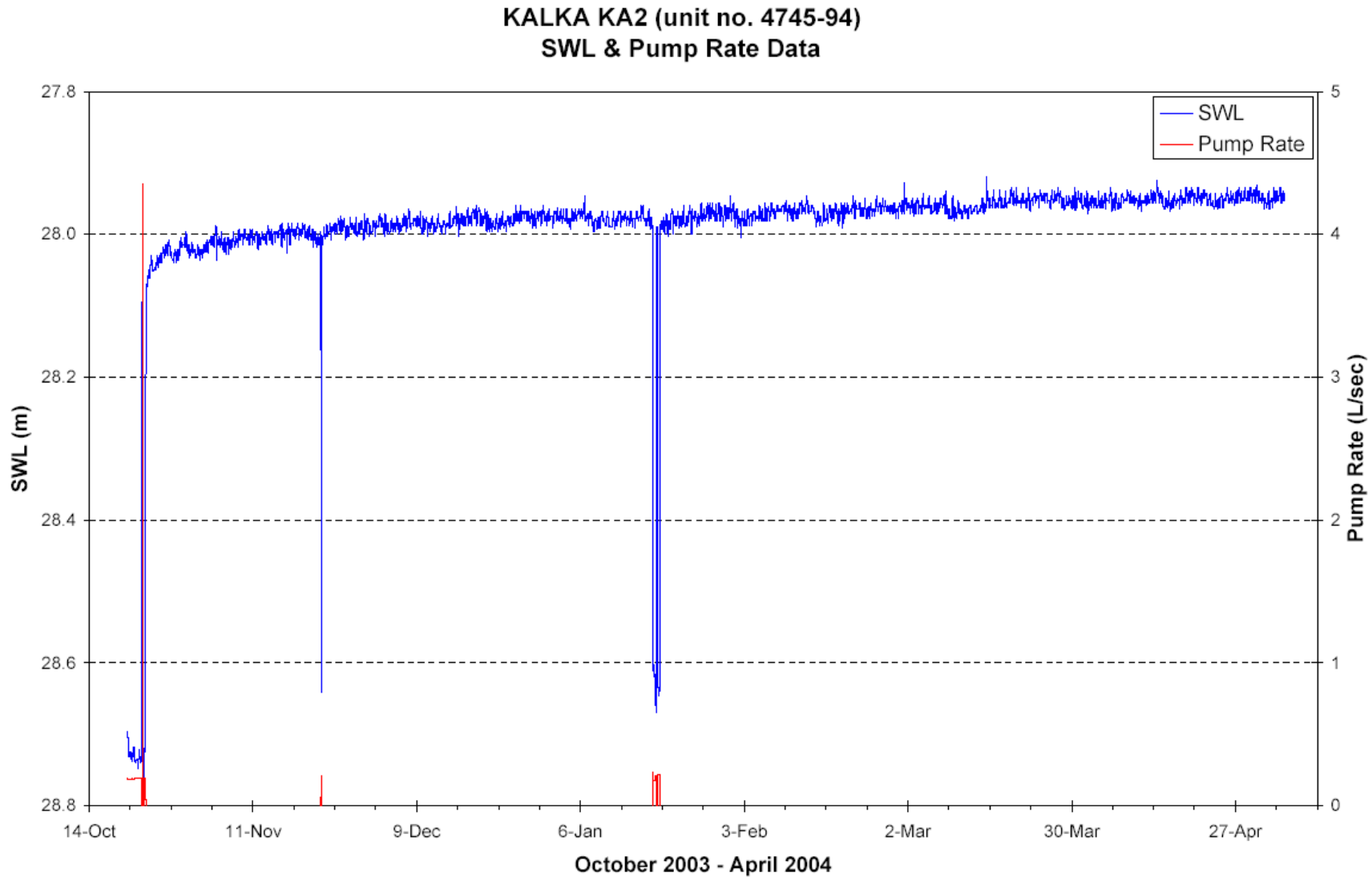
KA137

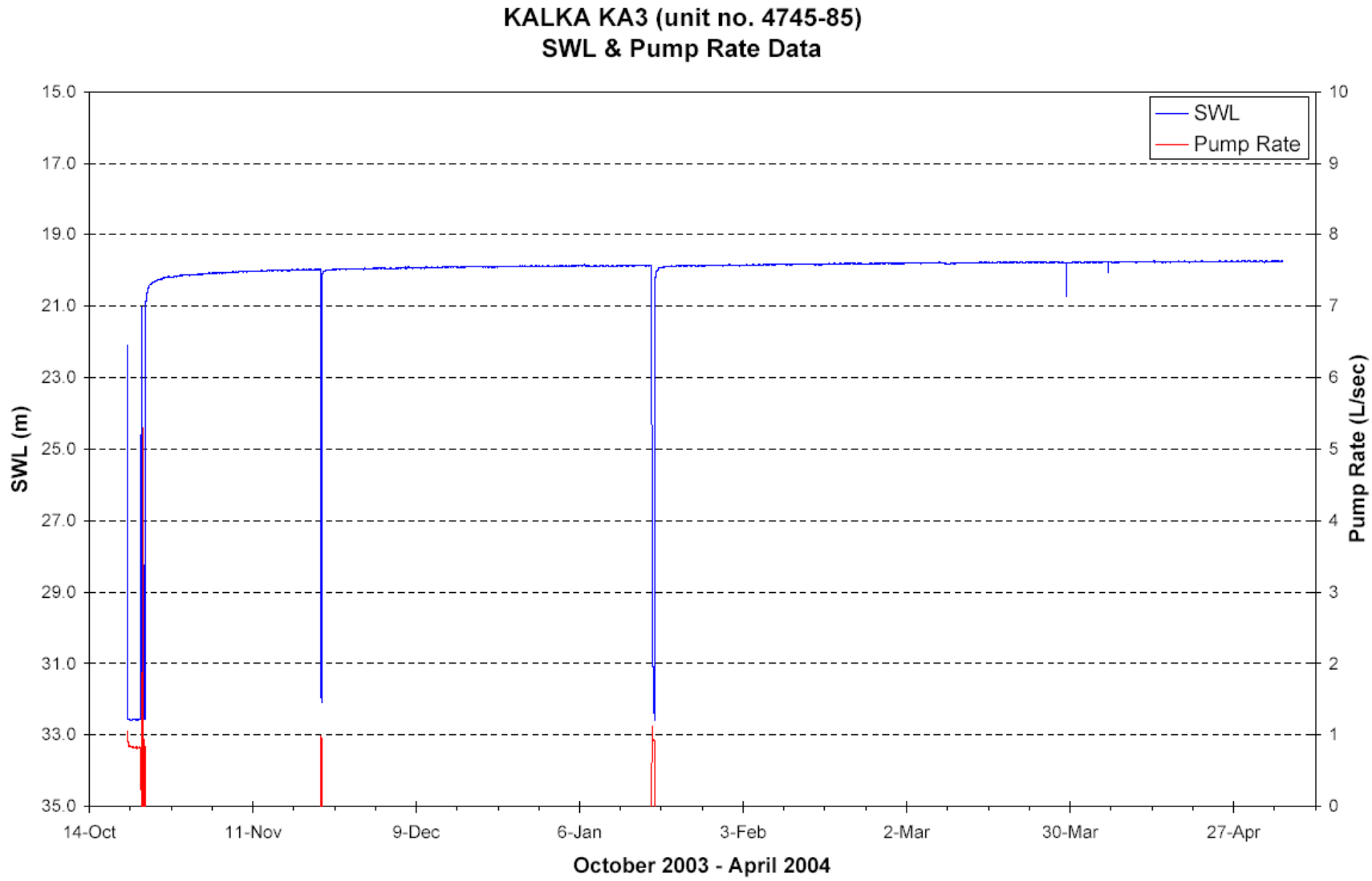
This bore is now equipped to extract water and this monitoring period was the prime contributor, extracting almost 97% of community water. Water levels declined by 0.20 m during the monitoring period. It should be noted that some pump data is missing in early November; water levels still fluctuate like they do under normal pumping conditions however there is no pump data to support these fluctuations.

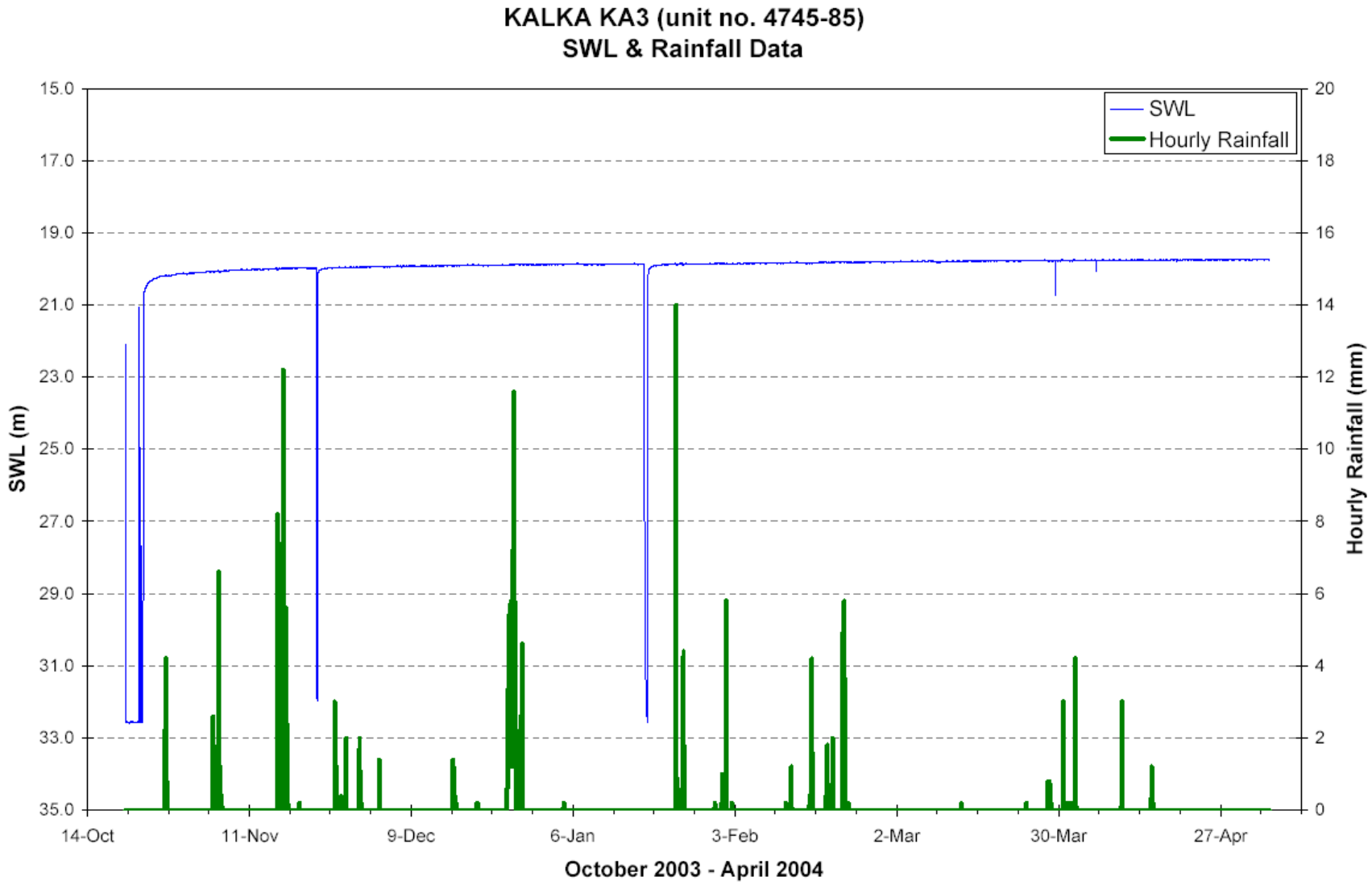
Prognosis:

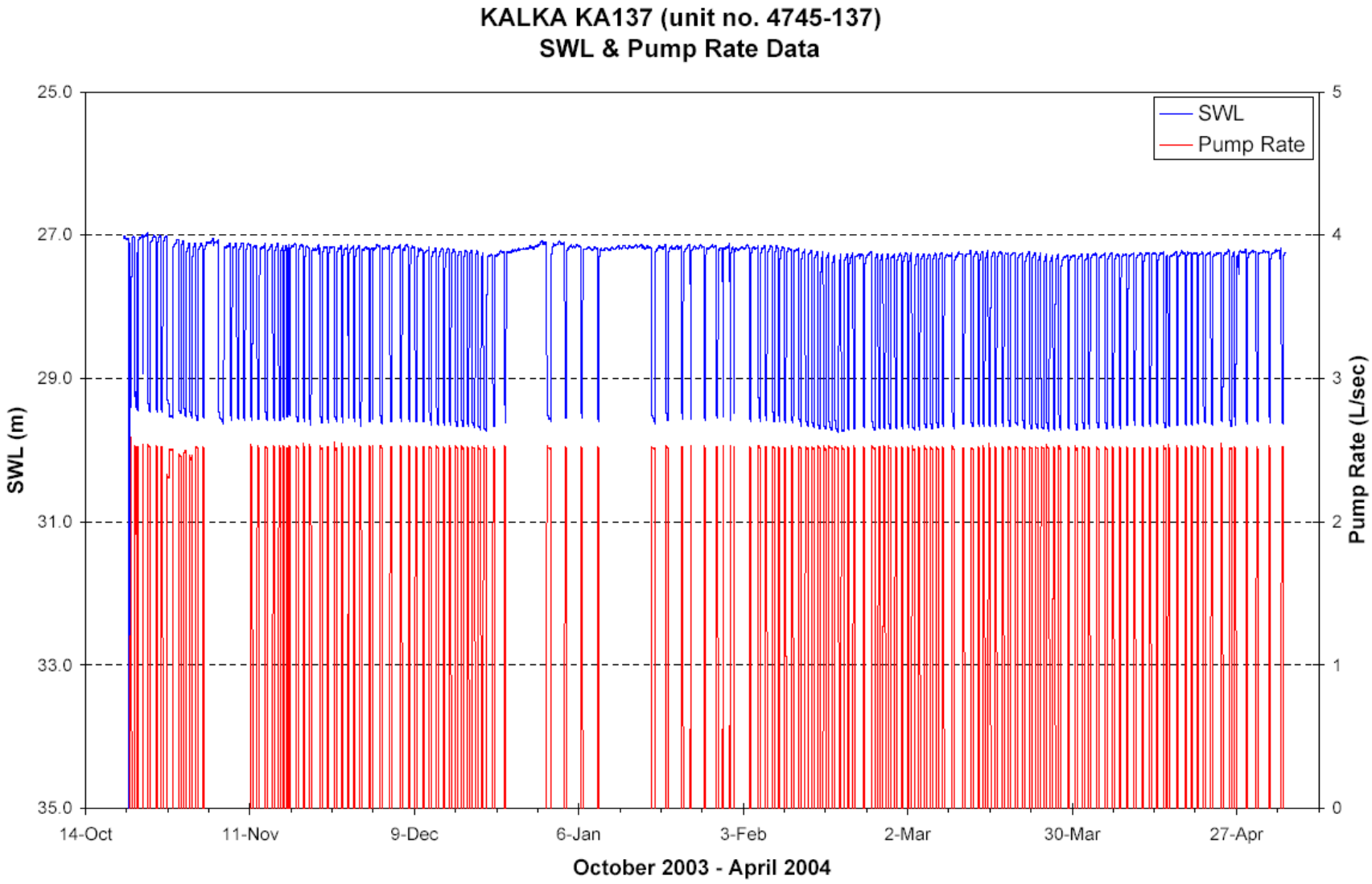
Early results for KA137 show that it is sustainable for at least the short to medium term at current extraction rates and volumes. Ongoing monitoring will assist in determining longer-term sustainability of the groundwater resource. KA3 is now being rested and the water level is recovering. On the odd occasion that the bore has been used this monitoring period, pumping water levels were still at a critical level. Further rest of this bore is required.


KALKA KA1 (unit no. 4745-78)
SWL Data
SWL
SWL (m)
26.0
26.5
27.0
27.5
28.0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


KALKA KA2 (unit no. 4745-94)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
27.8
28.0
28.2
28.4
28.6
28.8
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


KALKA KA3 (unit no. 4745-85)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
15.0
17.0
19.0
21.0
23.0
25.0
27.0
29.0
31.0
33.0
35.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


KALKA KA3 (unit no. 4745-85)
SWL & Rainfall Data
SWL
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
15.0
17.0
19.0
21.0
23.0
25.0
27.0
29.0
31.0
33.0
35.0
20
18
16
14
12
10
8
6
4
2
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


KALKA KA137 (unit no. 4745-137)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
25.0
27.0
29.0
31.0
33.0
35.0
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

PIPALYATJARA

Water extraction this monitoring period (October 2003 to April 2004) has been increased by 53% of that extracted in the previous monitoring period (April to October 2003). There are technical problems with the monitoring system at PIP95, as a result water level and pump rate data is limited and rainfall data is also limited and suspect.

PIP95

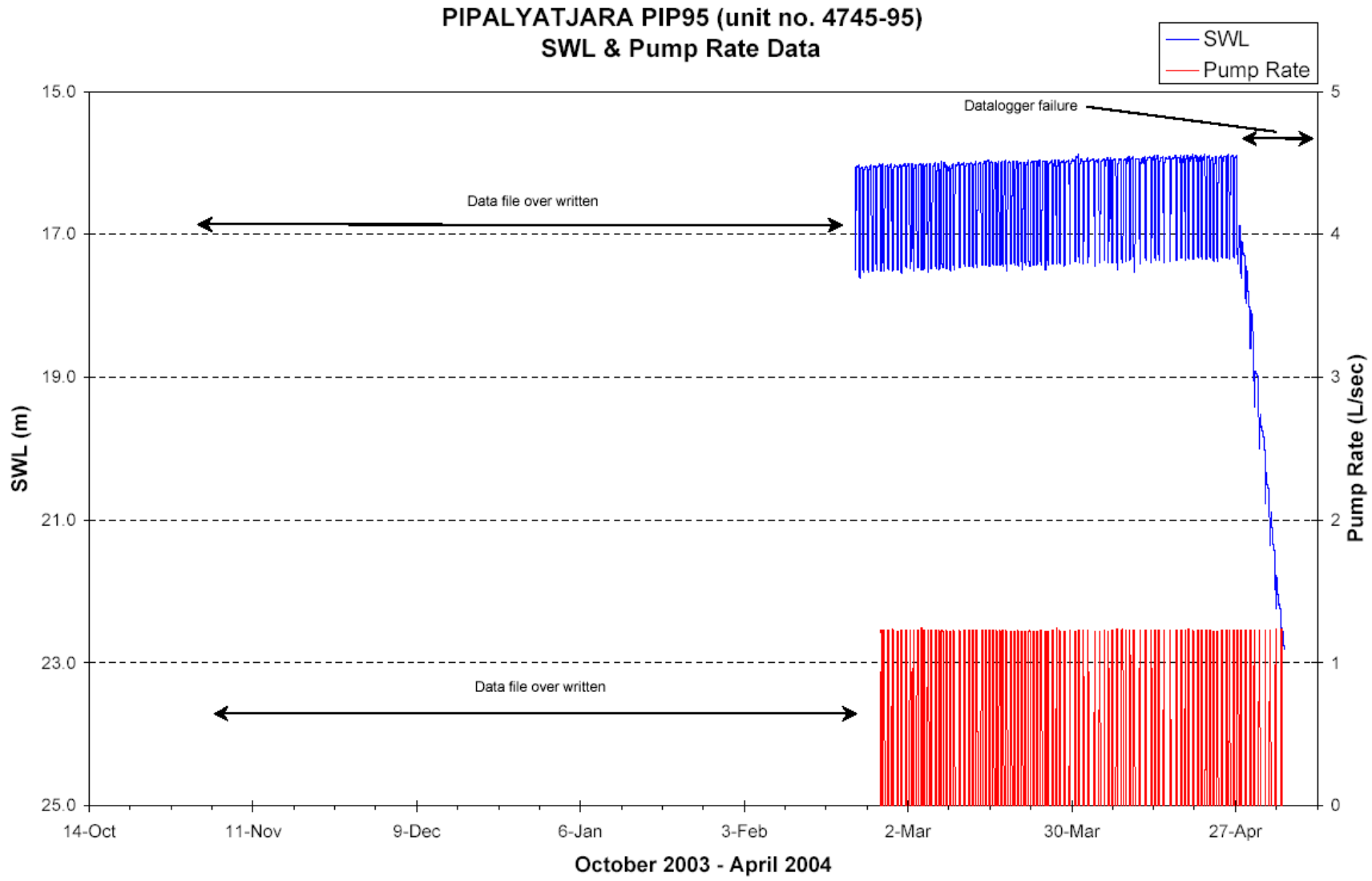
Technical problems which may stem from an electronic fault with the rainfall gauge have caused corruption of the data files. Water level and pump rate data is only available from 21st February 2004 to 26th April 2004 when the data logger failed. During this period, the water level in this bore recovered by 0.15 m despite regular pumping. There is some rainfall data for this period that was captured by the data loggers however the magnitude for rainfall events were suspect as they were an order of magnitude greater then expected.

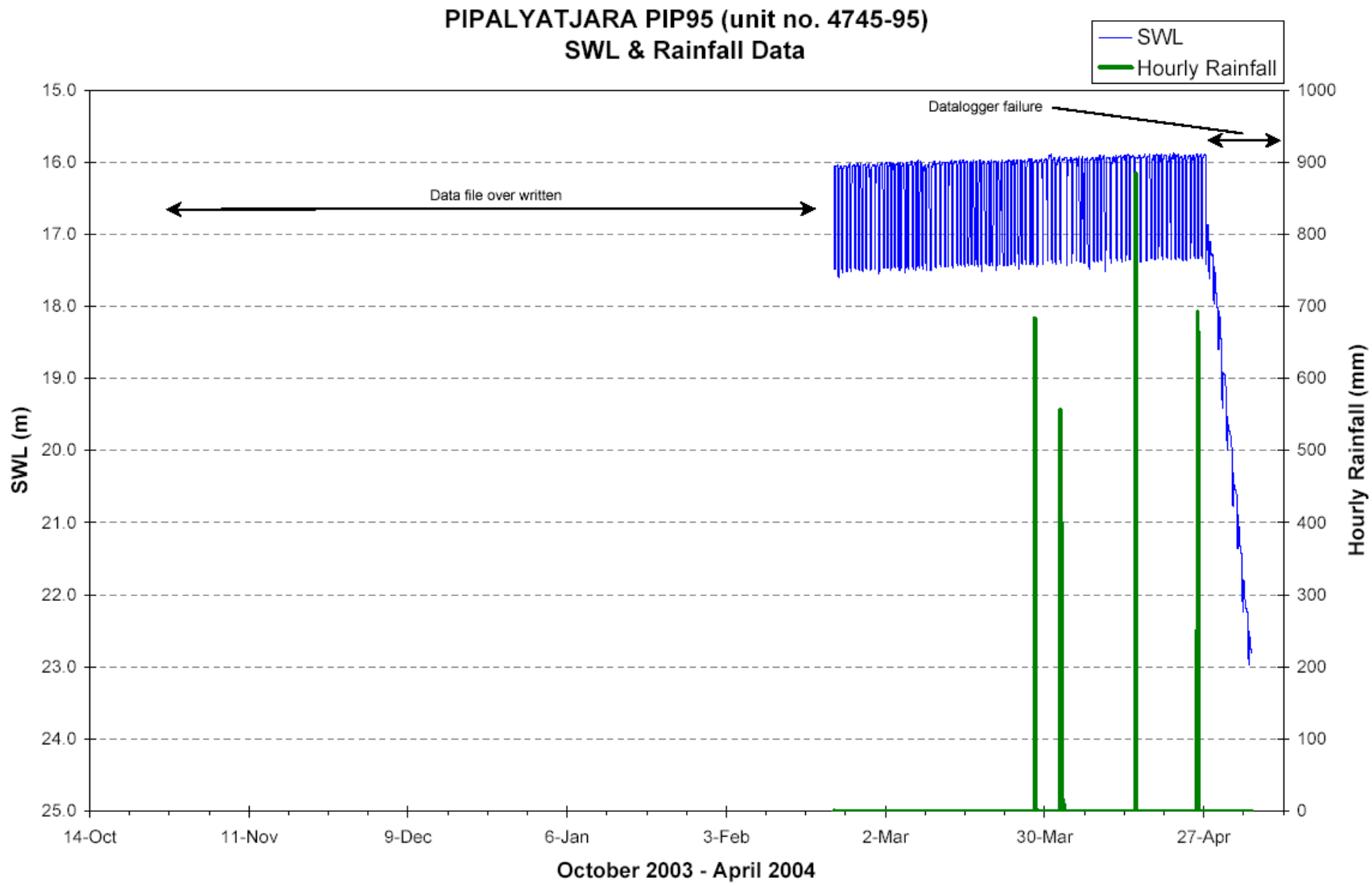
PIP96

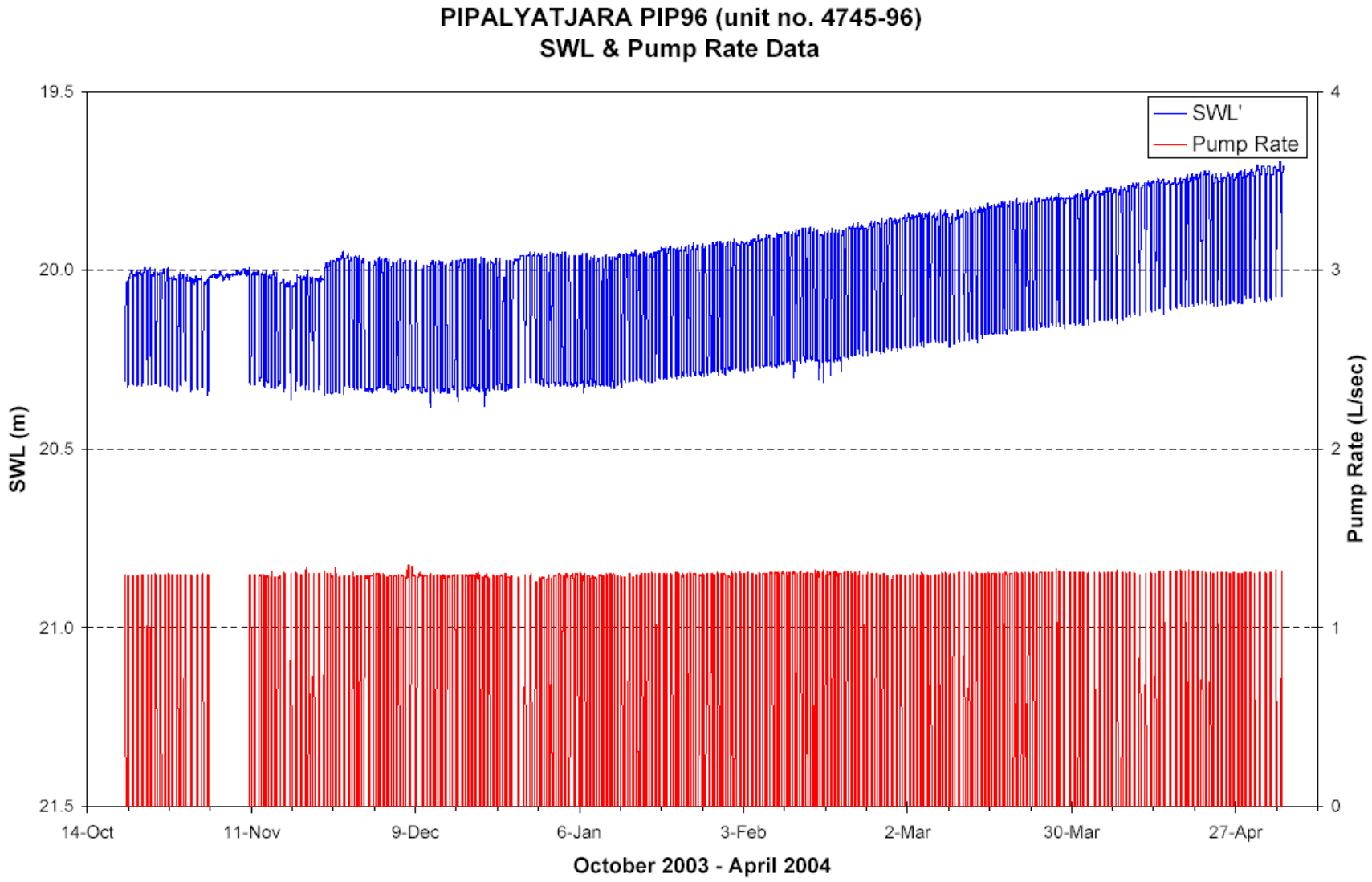
Production from this bore almost doubled this monitoring period compared with that of the last monitoring period. Water levels have risen by approximately 0.30 m over this monitoring period. It is not clear whether the rise is attributed to rainfall events as there is no data to verify this.

Prognosis

No change, bores are able to sustain current pumping regime.


PIPALYATJARA PIP95 (unit no. 4745-95)
SWL & Pump Rate Data
SWL
Pump Rate
Datalogger failure
Data file over written
Data file over written
SWL (m)
Pump Rate (L/sec)
15.0
17.0
19.0
21.0
23.0
25.0
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PIPALYATJARA PIP95 (unit no. 4745-95)
SWL & Rainfall Data
SWL
Hourly Rainfall
Datalogger failure
Data file over written
SWL (m)
Hourly Rainfall (mm)
15.0
16.0
17.0
18.0
19.0
20.0
21.0
22.0
23.0
24.0
25.0
1000
900
800
700
600
500
400
300
200
100
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


PIPALYATJARA PIP96 (unit no. 4745-96)
SWL & Pump Rate Data
SWL'
Pump Rate
SWL (m)
Pump Rate (L/sec)
19.5
20.0
20.5
21.0
21.5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

Water extraction for this community has doubled this monitoring period (October 2003 to April 2004) compared to that of the previous monitoring period (April to October 2003), however extraction this period is consistent with historical water extraction for this community. During this period, 28.2 mm of rain fell with a maximum intensity of 4.6 mm/hr recorded in early January.

Note: Three data sets were merged to produce water level and pump rate data that span the October 2003 to April 2004 monitoring period (24th October – 5th January, 18th February – 3rd April, 3rd April – 7th May).

N101

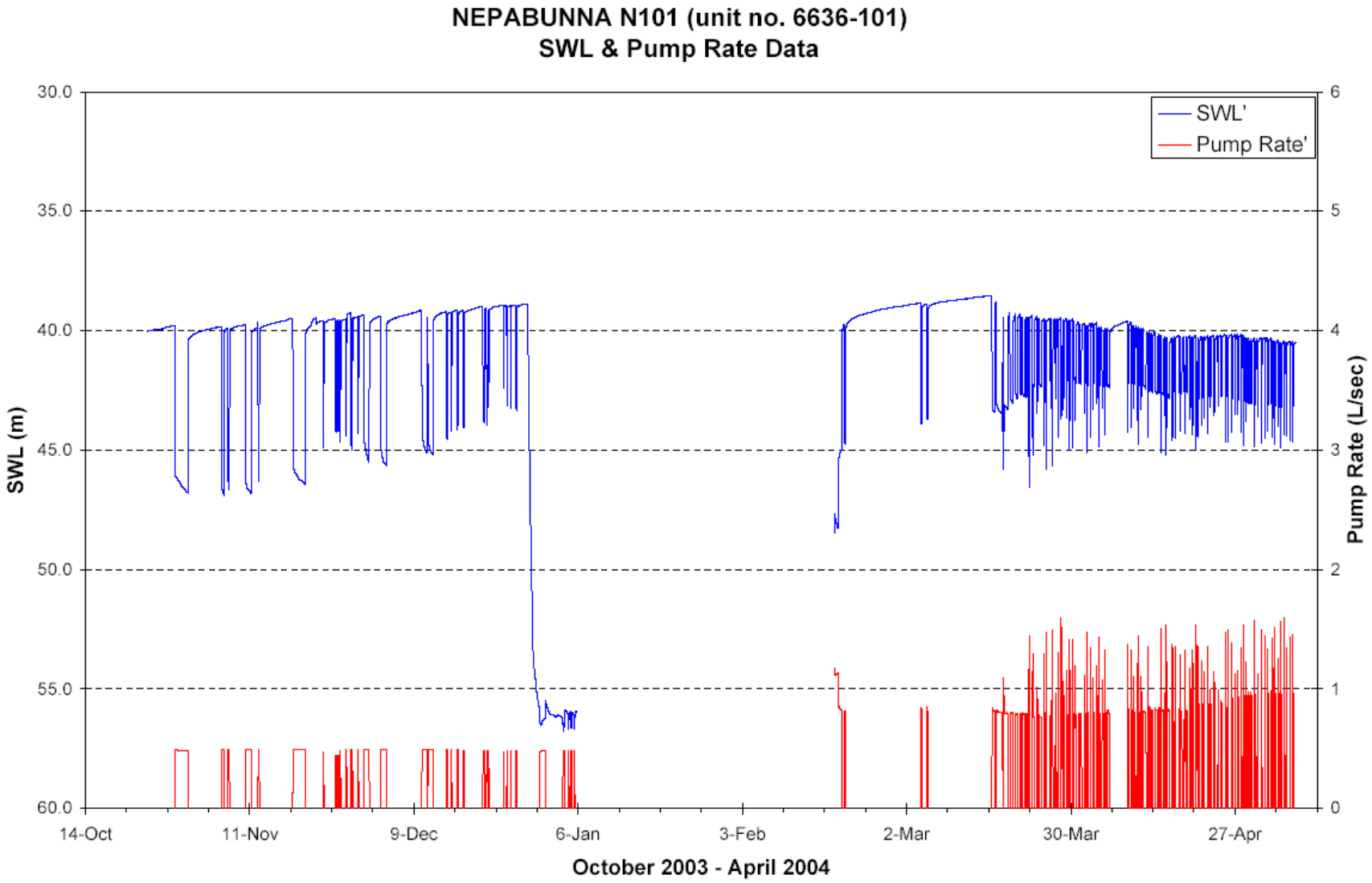
Extraction volume for this bore rose 3.5 times that extracted in the previous monitoring period. It is unclear as to the reason for missing data from 6th January to 17th February 2004 for this bore. Water levels rose approximately 1.3 m until mid-February 2004 when pumping intensity increased. Water levels then dropped 2 m by the end of the monitoring period.

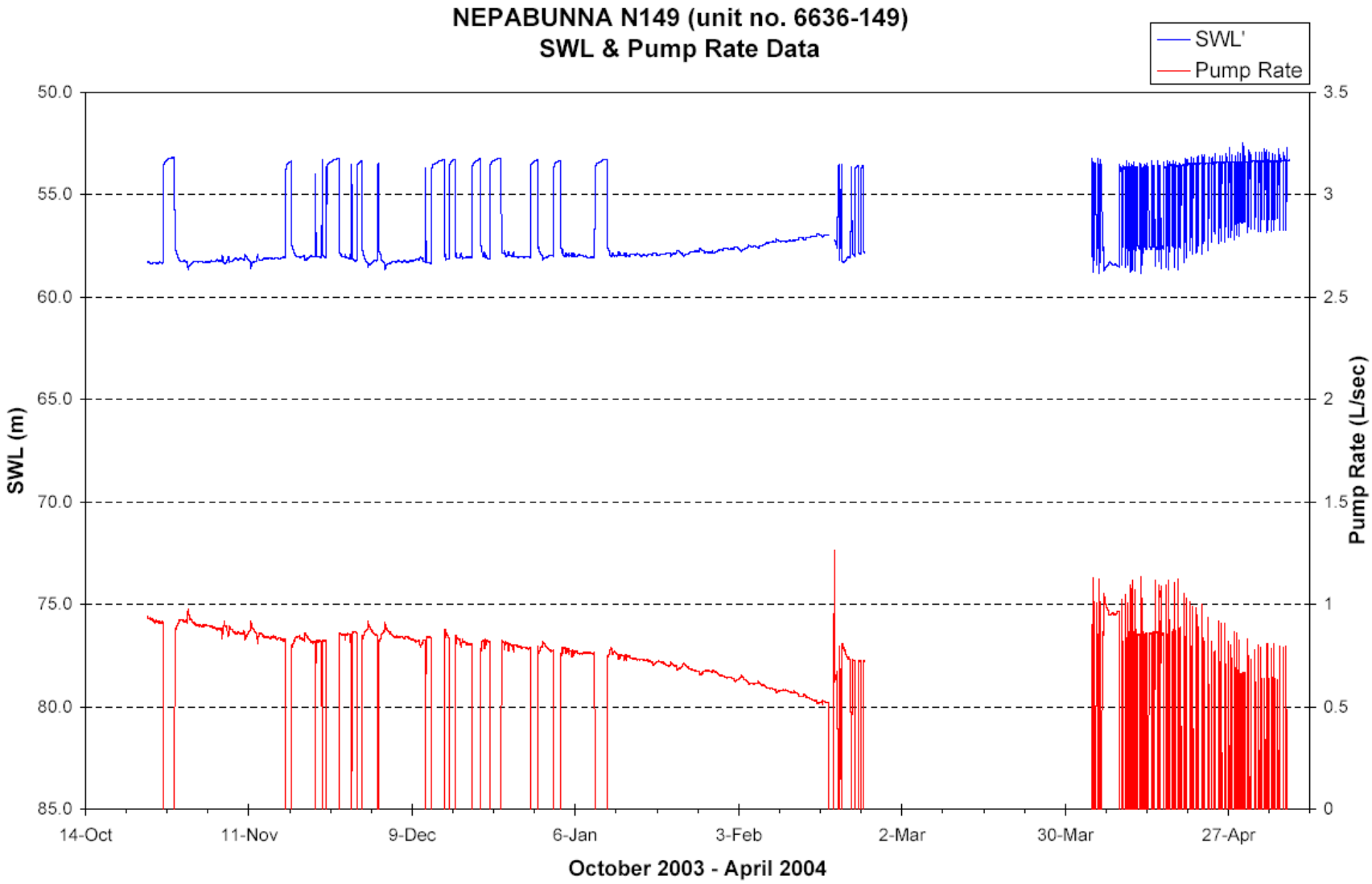
N149

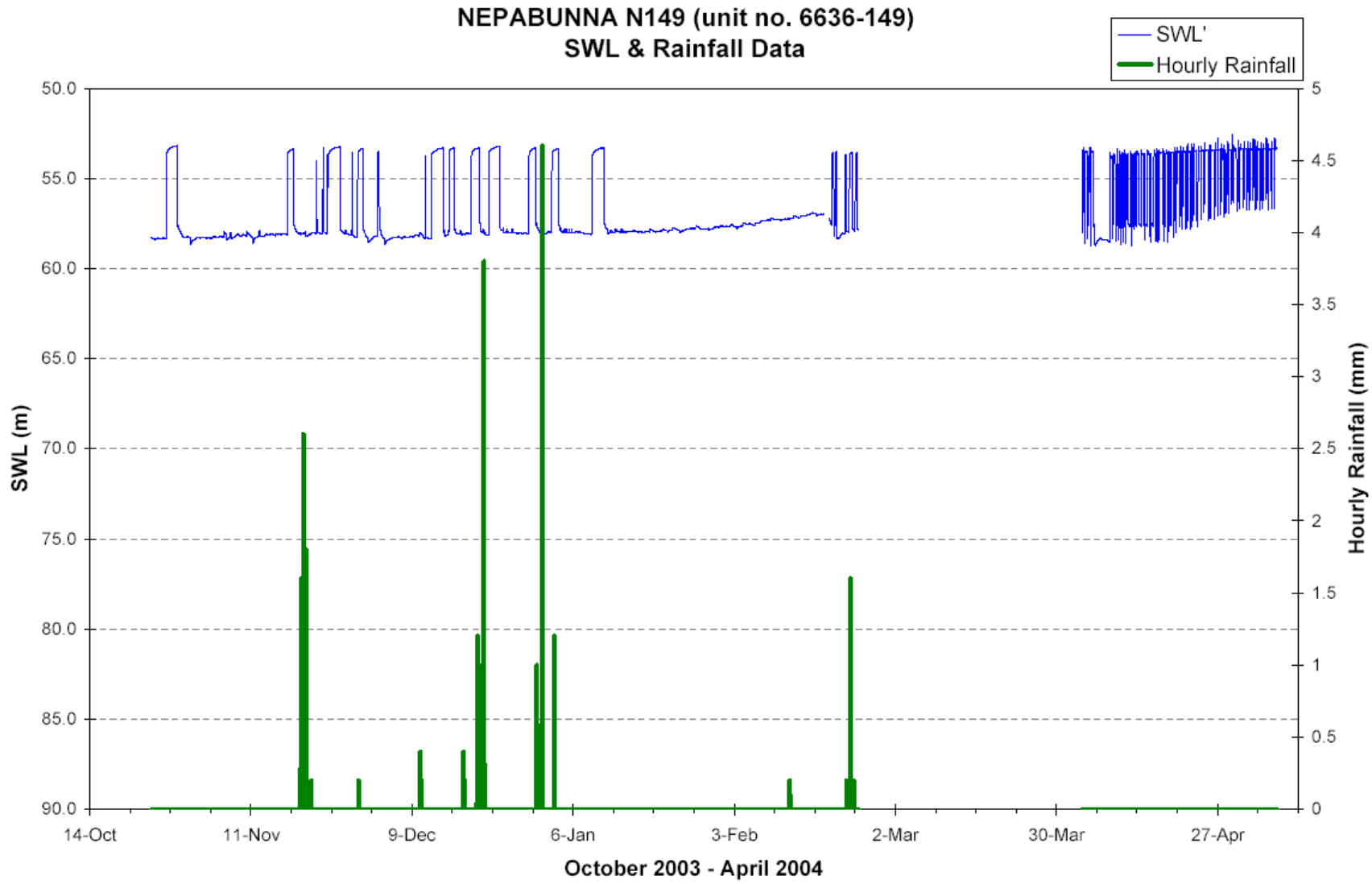
Water extracted for this bore almost doubled in this monitoring period in comparison to the previous monitoring period. Gaps in the data also appeared with missing data from 25th February to 2nd April 2004. Trends in water level and pump rate time series data were unusual. At various stages during the monitoring period, pump rates dropped when pumping intensified towards the end of the period. One would expect a decrease in flow rate such as this to be attributed to an exhaustion of the available drawdown, however the nature of the water level data does not support this assumption since water levels rose during these periods.

Prognosis

Although data is limited, extraction volumes are likely to be sustainable in the short to medium to long term.


NEPABUNNA N101 (unit no. 6636-101)
SWL & Pump Rate Data
SWL'
Pump Rate'
SWL (m)
Pump Rate (L/sec)
30.0
35.0
40.0
45.0
50.0
55.0
60.0
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


NEPABUNNA N149 (unit no. 6636-149)
SWL & Pump Rate Data
SWL'
Pump Rate
SWL (m)
Pump Rate (L/sec)
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
3.5
3
2.5
2
1.5
1
0.5
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


NEPABUNNA N149 (unit no. 6636-149)
SWL & Rainfall Data
SWL'
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

Water extraction for this community has increased 18% this monitoring period (October 2003 to April 2004) to that extracted in the previous monitoring period (April to October 2003). No rain gauge is installed at this community location.

YT2

A minor amount of water (approximately 19 kL) was extracted from this bore this monitoring period. Water levels remained steady.

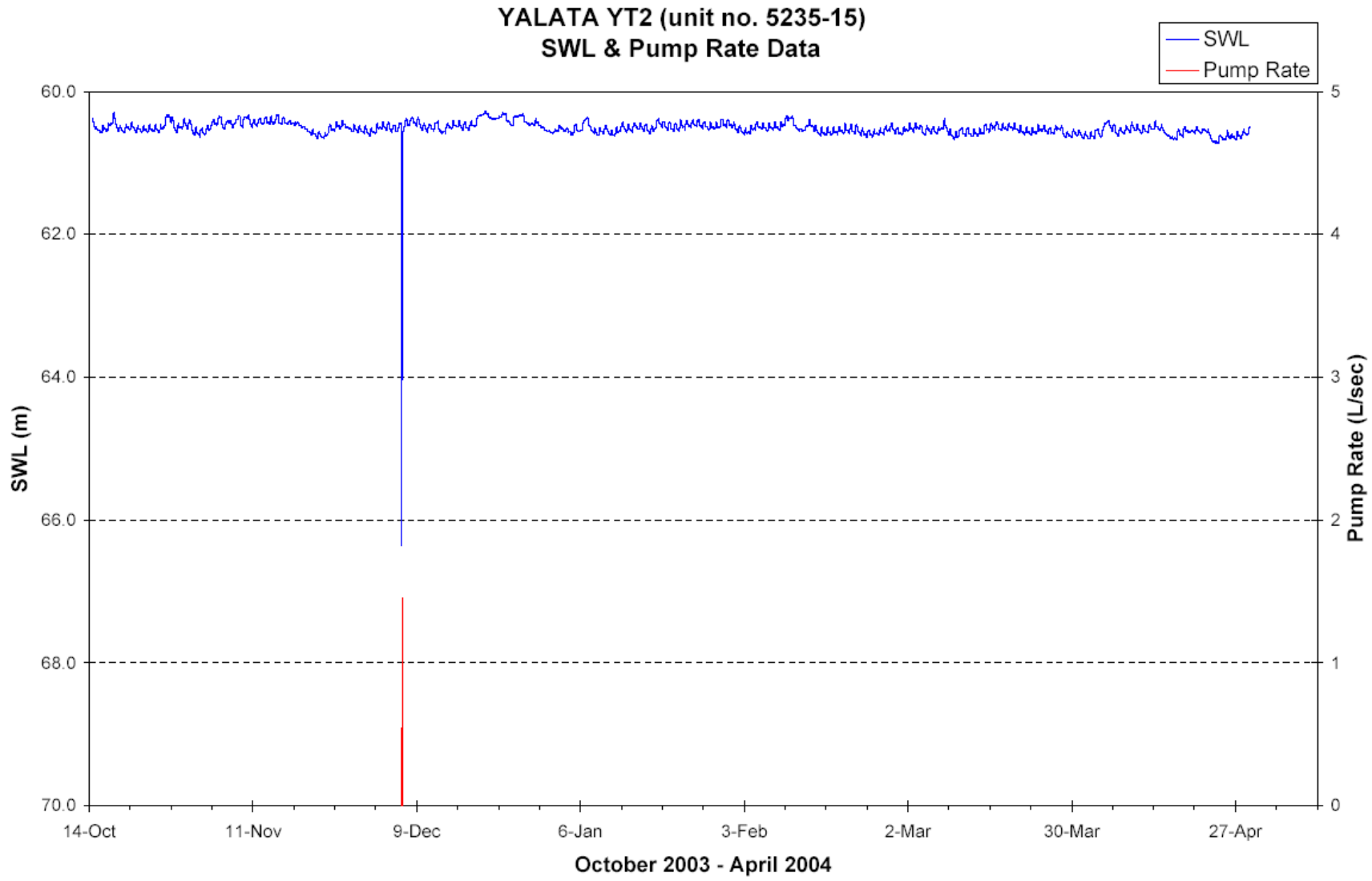
YT3

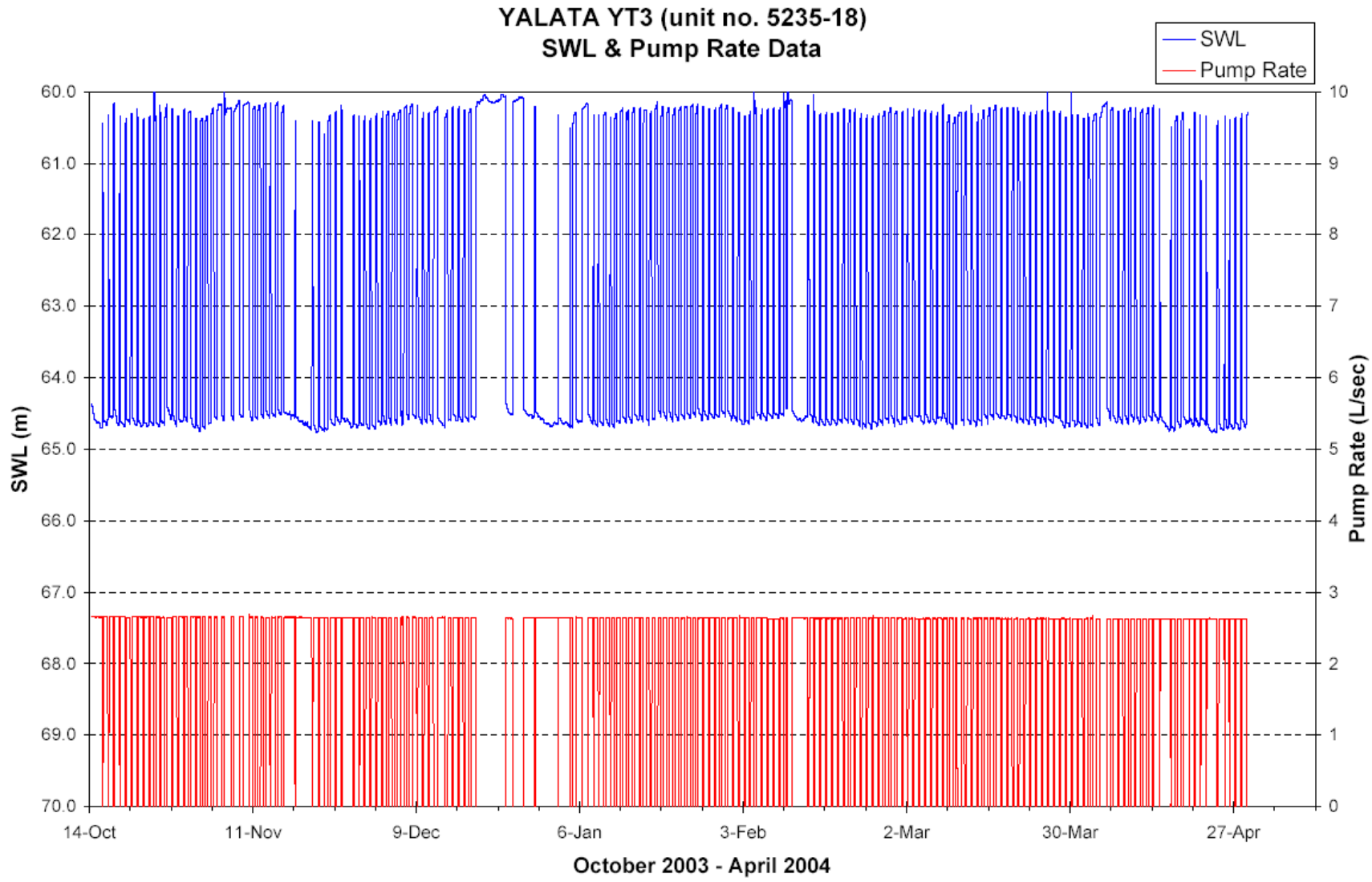
This bore was the major contributor to the community water volume. Water levels have remained steady.

Prognosis

No change, it seems likely that one aquifer links these bores and is probably continuous over the whole area, though its transmissivity varies considerably. There has been no sign of recharge over 4 years of monitoring. Recharge to the aquifer, appears not to be local and could be from as far away as the Ooldea Range or the Nullarbor Plain. The resource should be treated as non-sustainable until there is some evidence of recharge taking place. Forking can be expected within 70 years. Any change in the aquifer would be likely to bring forking closer.

The non-pumping SWL appears fairly constant for YT3. This pumping regime appears sustainable.


YALATA YT2 (unit no. 5235-15)
SWL & Pump Rate Data
SWL
Pump Rate
60.0
62.0
64.0
66.0
68.0
70.0
SWL (m)
5
4
3
2
1
0
Pump Rate (L/sec)
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


YALATA YT3 (unit no. 5235-18)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
60.0
61.0
62.0
63.0
64.0
65.0
66.0
67.0
68.0
69.0
70.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

OAK VALLEY

Figures recorded on water extraction for this community are incorrect. Investigation of the data file found that pump hours for this monitoring period (October 2003 to April 2004) are similar to that of the previous monitoring period (April to October 2003).

During this period, 196 mm of rain fell with a maximum intensity of 13.2 mm/hr recorded in mid February.

OV2

Water level readings are recorded manually every 6 months.

OV7

Water levels were steady and experienced a very slight increase (1-2 cm). Water level recovery was immediate. A baseline shift of -0.144 L/sec has also been applied to the pump rate data (denoted by *Pump Rate'*).

OV8

Water levels rose gradually, 0.10 m by the end of the monitoring period.

OV9

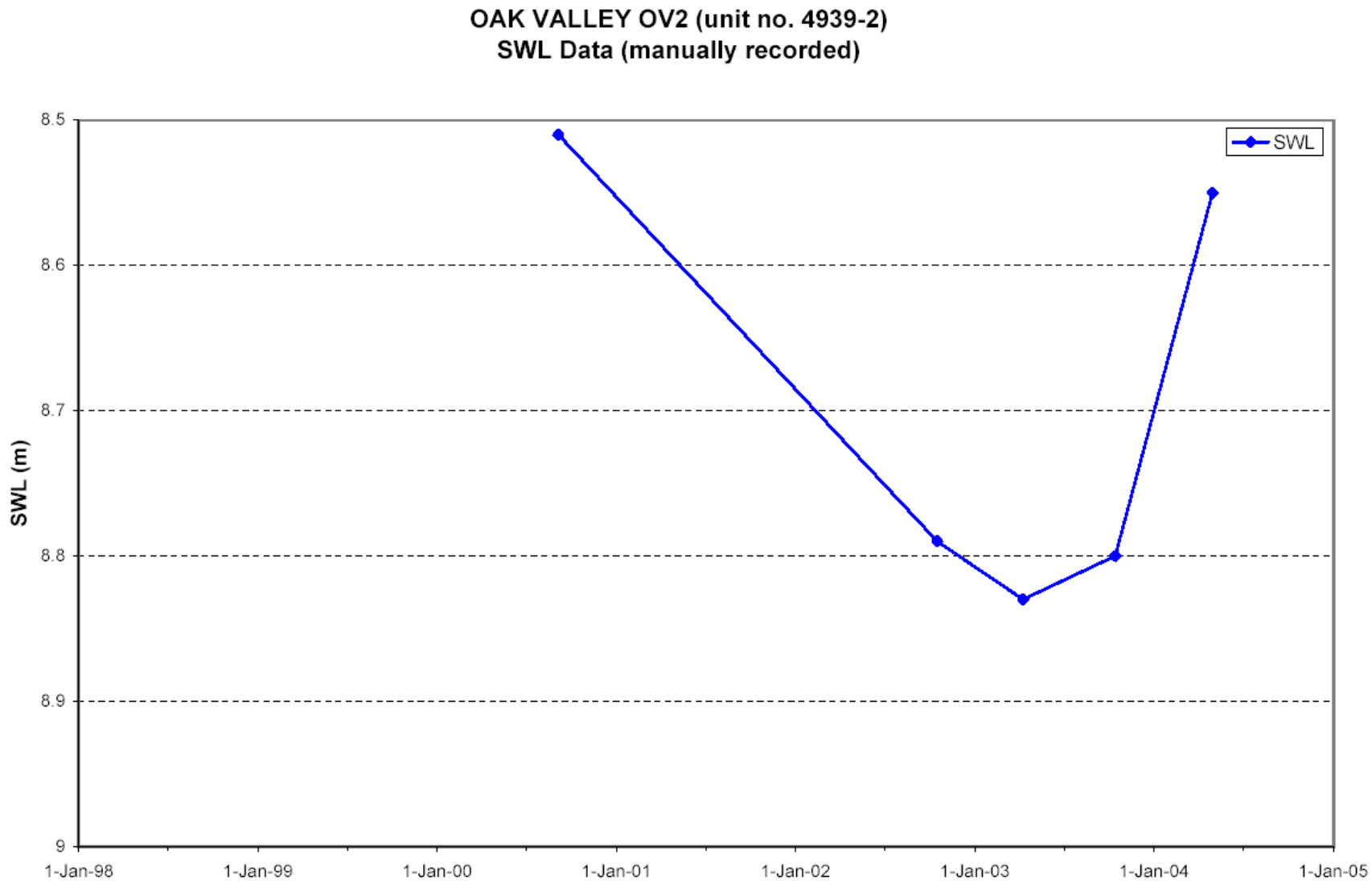
Water levels dropped gradually, 0.10 m by the end of the monitoring period. Fluctuations in pumping water levels indicate that the available drawdown has diminished. Bore construction records also support this as the bore is only 32 m in depth and water levels upon extraction are within 2-3 m of this bottom depth. Although the screen interval is unknown water levels are most likely to be encroaching the screen.

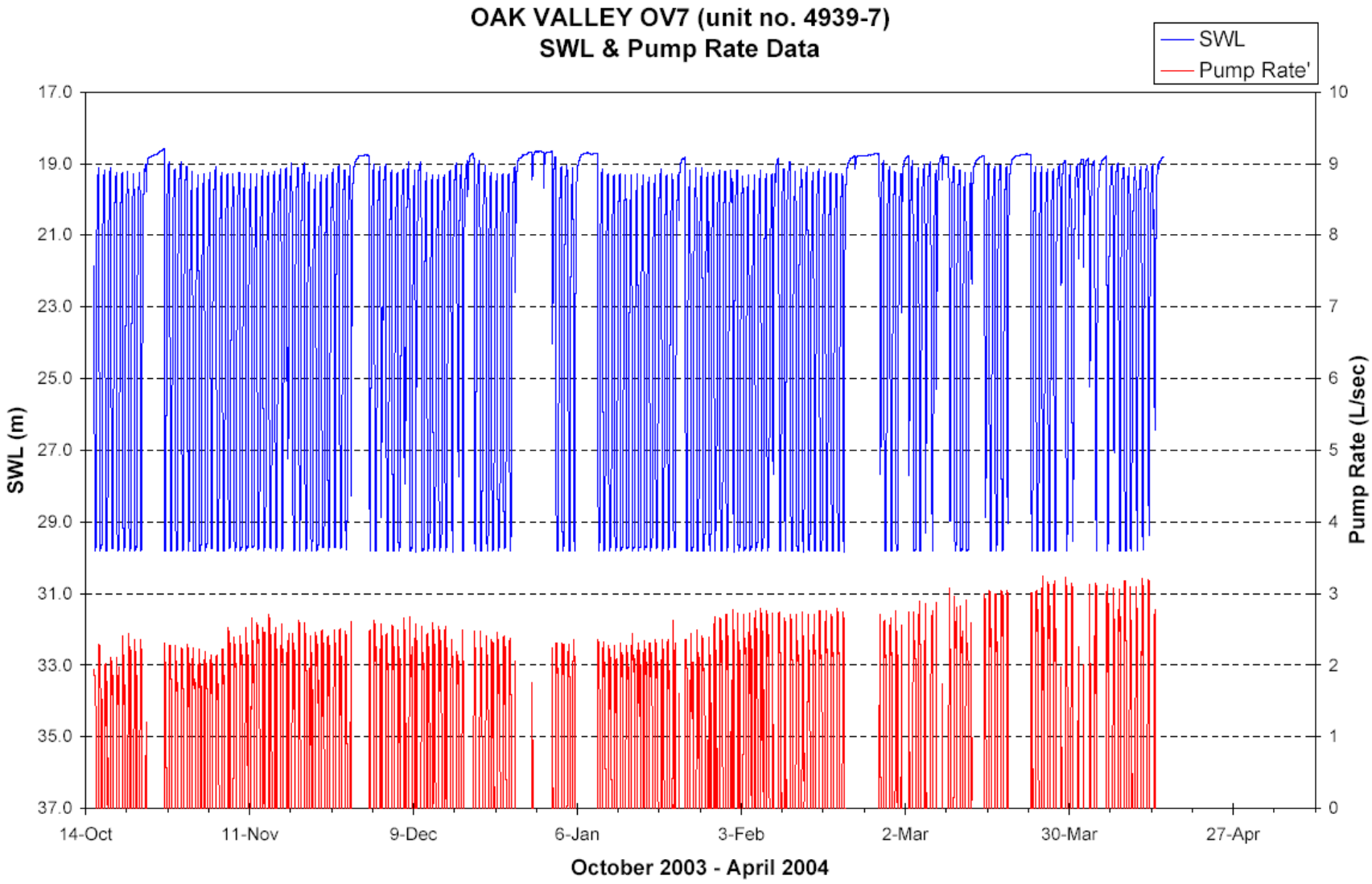
OV10

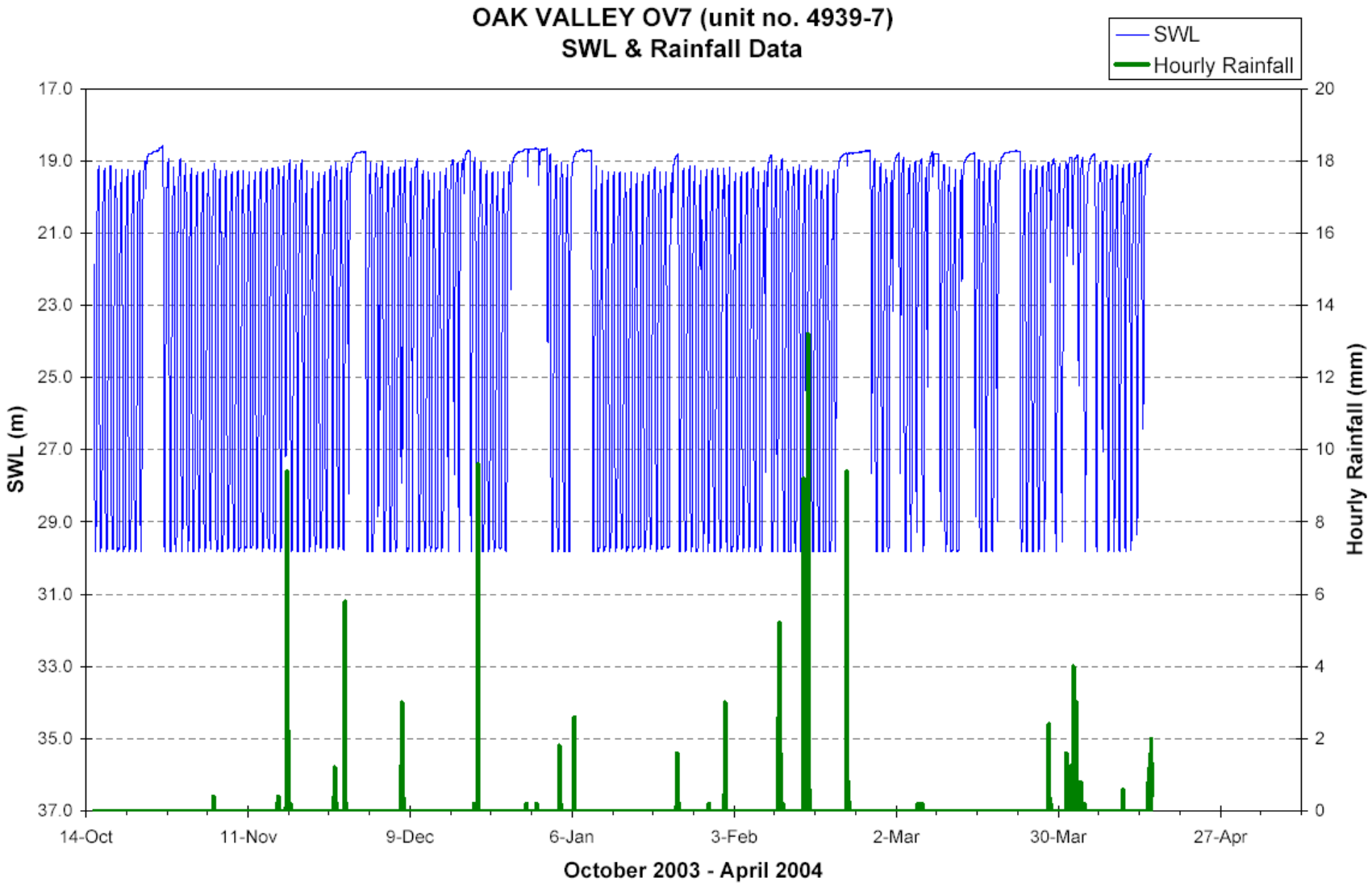
Water level readings are recorded manually every 6 months.

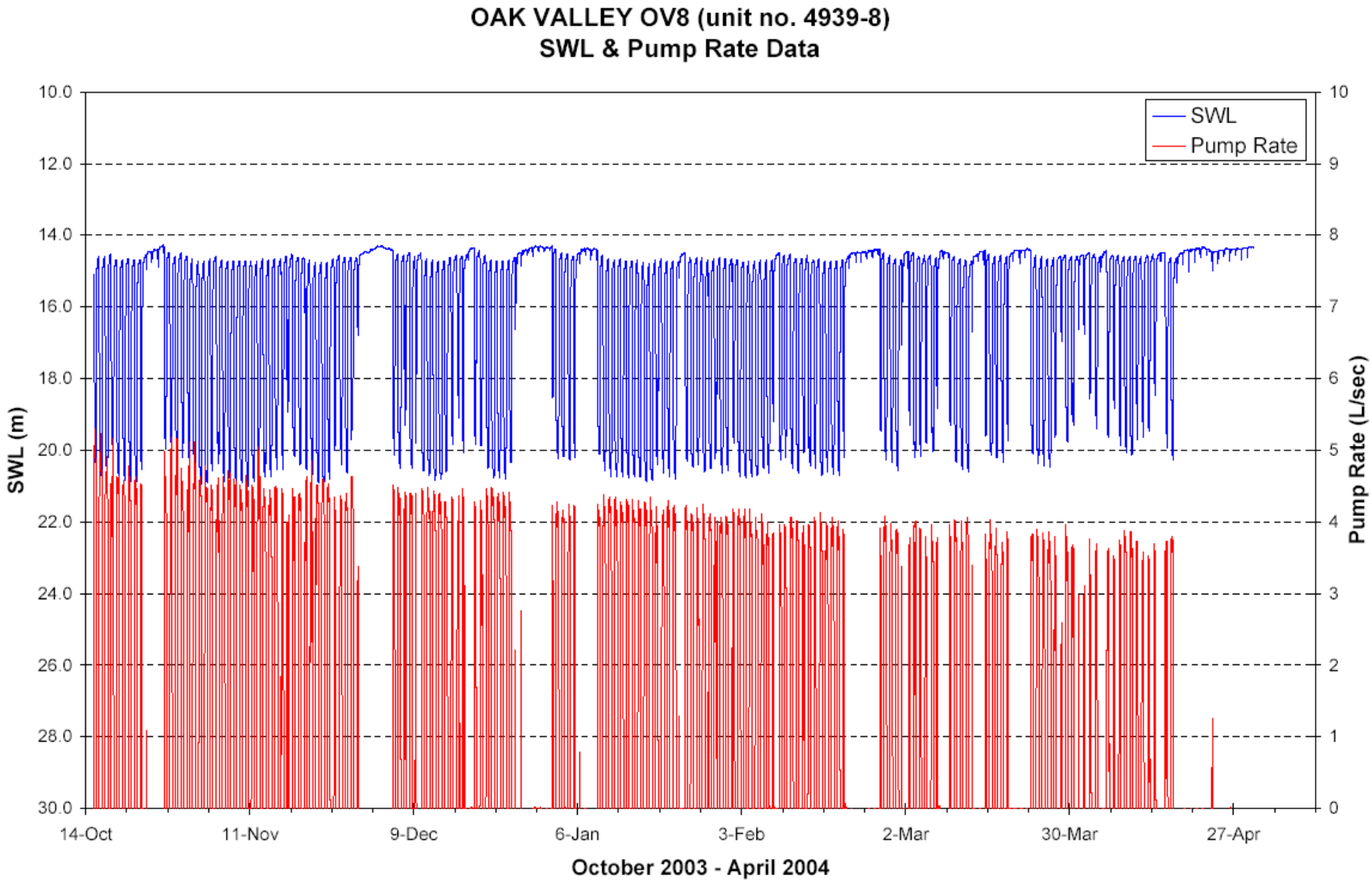
Prognosis

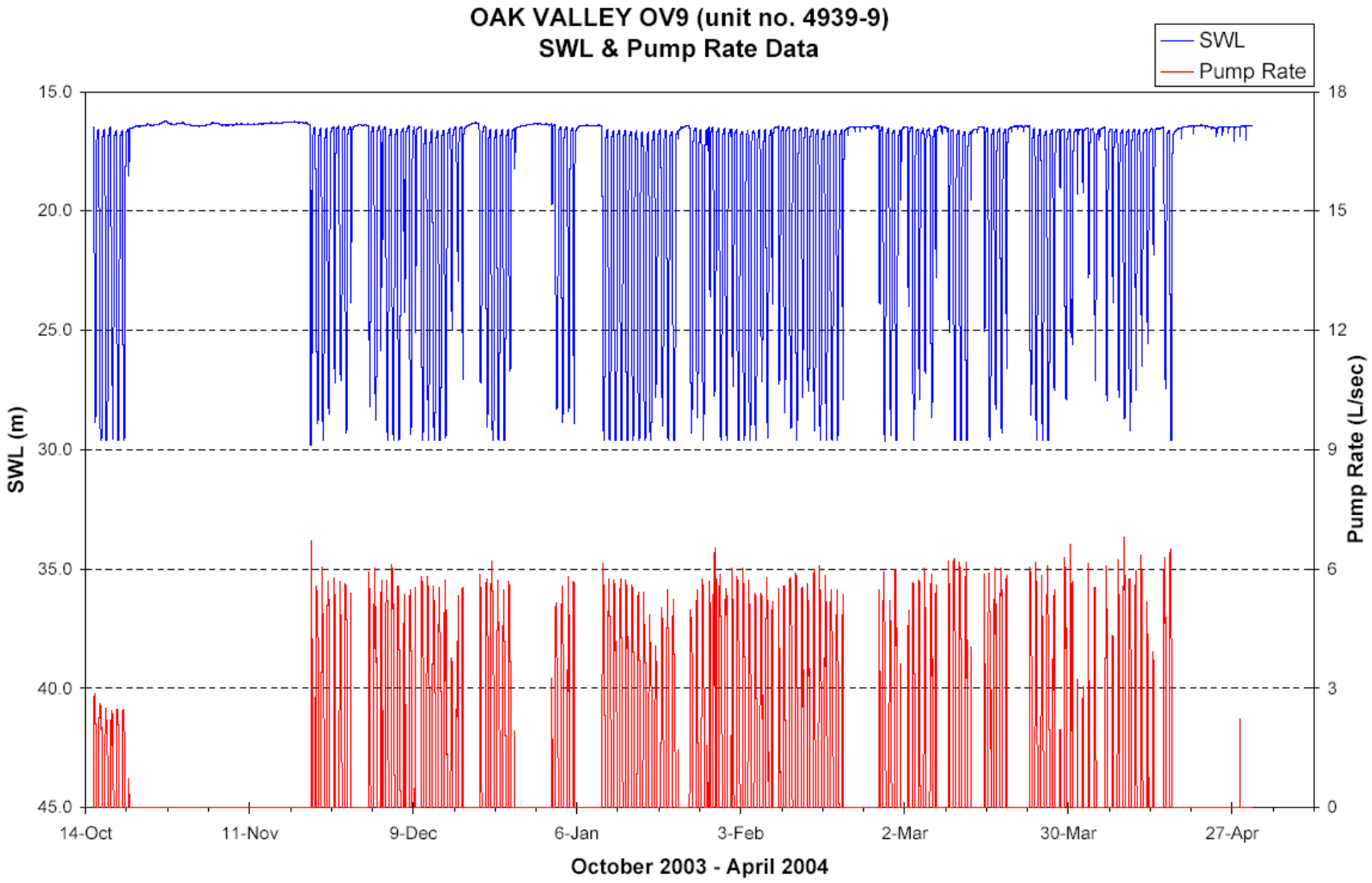
There is a slight to moderate recovery in water levels for this community. Water extraction volumes appear sustainable however the resource is still regarded as fragile.

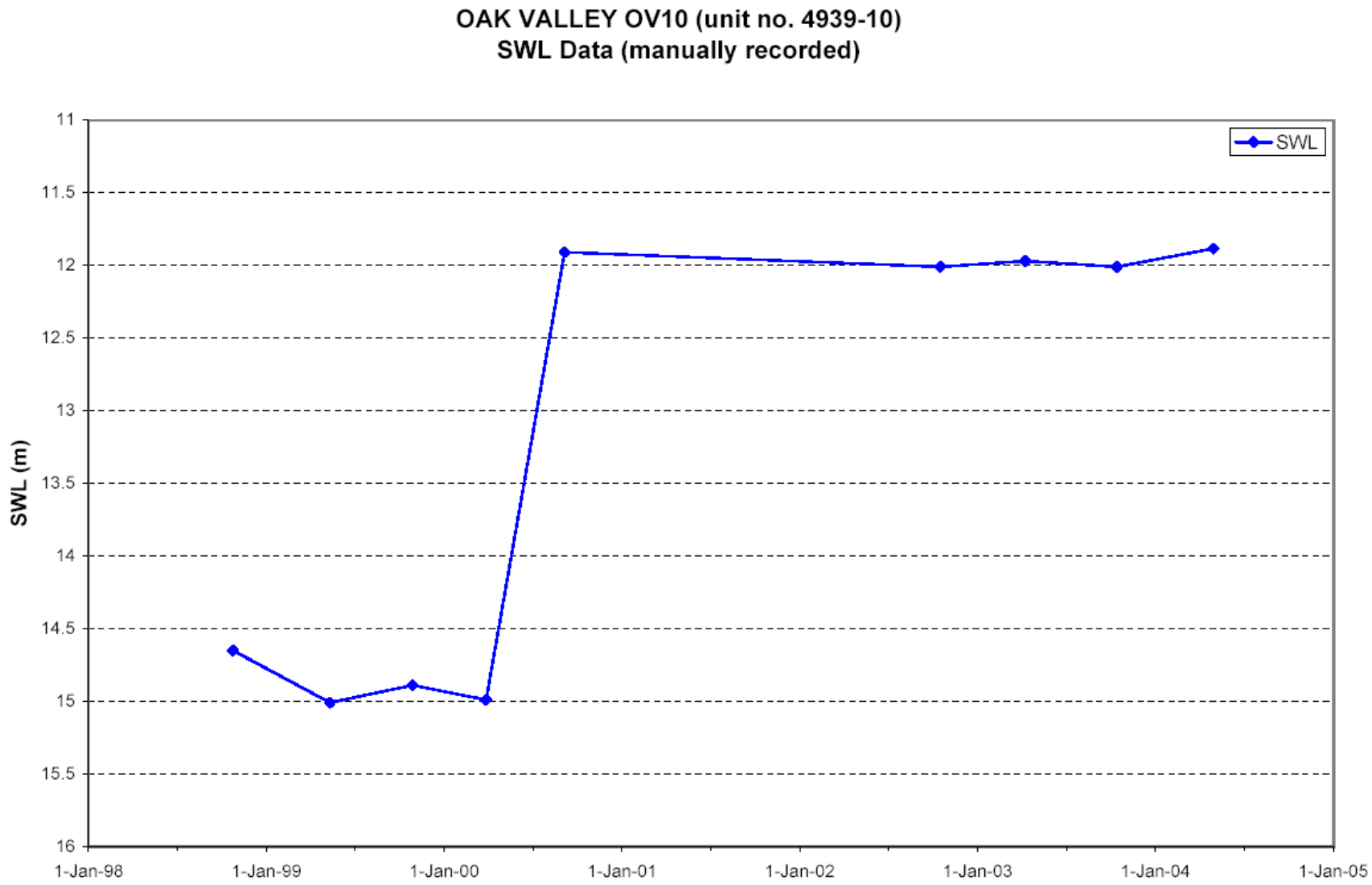

OAK VALLEY OV2 (unit no. 4939-2)
SWL Data (manually recorded)
SWL (m)
8.5
8.6
8.7
8.8
8.9
9
SWL
1-Jan-98
1-Jan-99
1-Jan-00
1-Jan-01
1-Jan-02
1-Jan-03
1-Jan-04
1-Jan-05


OAK VALLEY OV7 (unit no. 4939-7)
SWL & Pump Rate Data
SWL
Pump Rate'
SWL (m)
Pump Rate (L/sec)
17.0
19.0
21.0
23.0
25.0
27.0
29.0
31.0
33.0
35.0
37.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


OAK VALLEY OV7 (unit no. 4939-7)
SWL & Rainfall Data
SWL
Hourly Rainfall
SWL (m)
Hourly Rainfall (mm)
17.0
19.0
21.0
23.0
25.0
27.0
29.0
31.0
33.0
35.0
37.0
20
18
16
14
12
10
8
6
4
2
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


OAK VALLEY OV8 (unit no. 4939-8)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
10
9
8
7
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


OAK VALLEY OV9 (unit no. 4939-9)
SWL & Pump Rate Data
SWL
Pump Rate
SWL (m)
Pump Rate (L/sec)
15.0
20.0
25.0
30.0
35.0
40.0
45.0
18
15
12
9
6
3
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


OAK VALLEY OV10 (unit no. 4939-10)
SWL Data (manually recorded)
SWL (m)
11
11.5
12
12.5
13
13.5
14
14.5
15
15.5
16
1-Jan-98
1-Jan-99
1-Jan-00
1-Jan-01
1-Jan-02
1-Jan-03
1-Jan-04
1-Jan-05
SWL

UMUWA

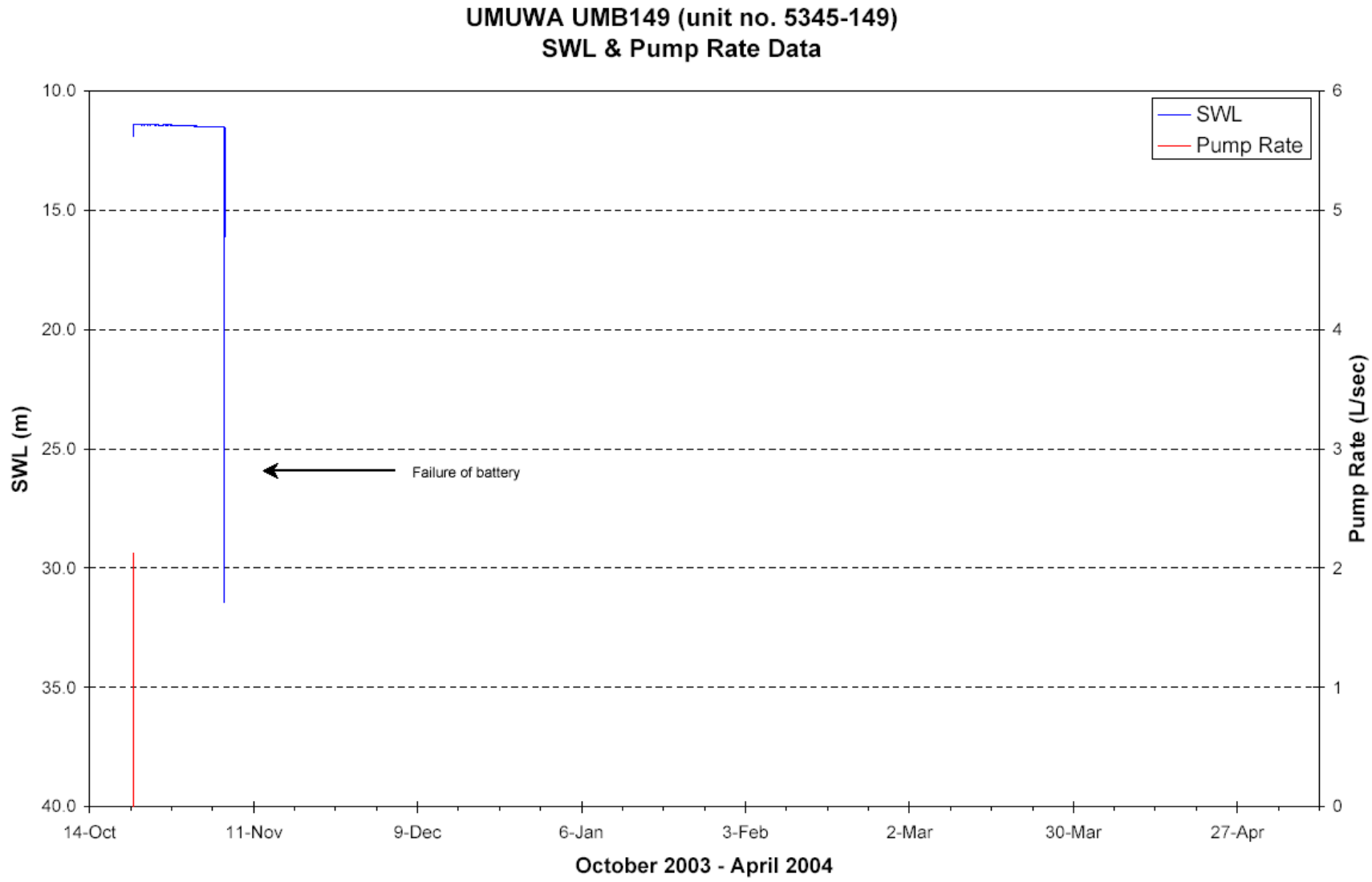
October 2003 to April 2004 was the first time groundwater had been extracted for supply to the Umuwa community. The community relies on just one bore (IMB149), which is a new installation. Water extraction for the period was recorded at 2271 kL. Only 3 weeks of water level, pump rate and rainfall data are available due to a battery failure.

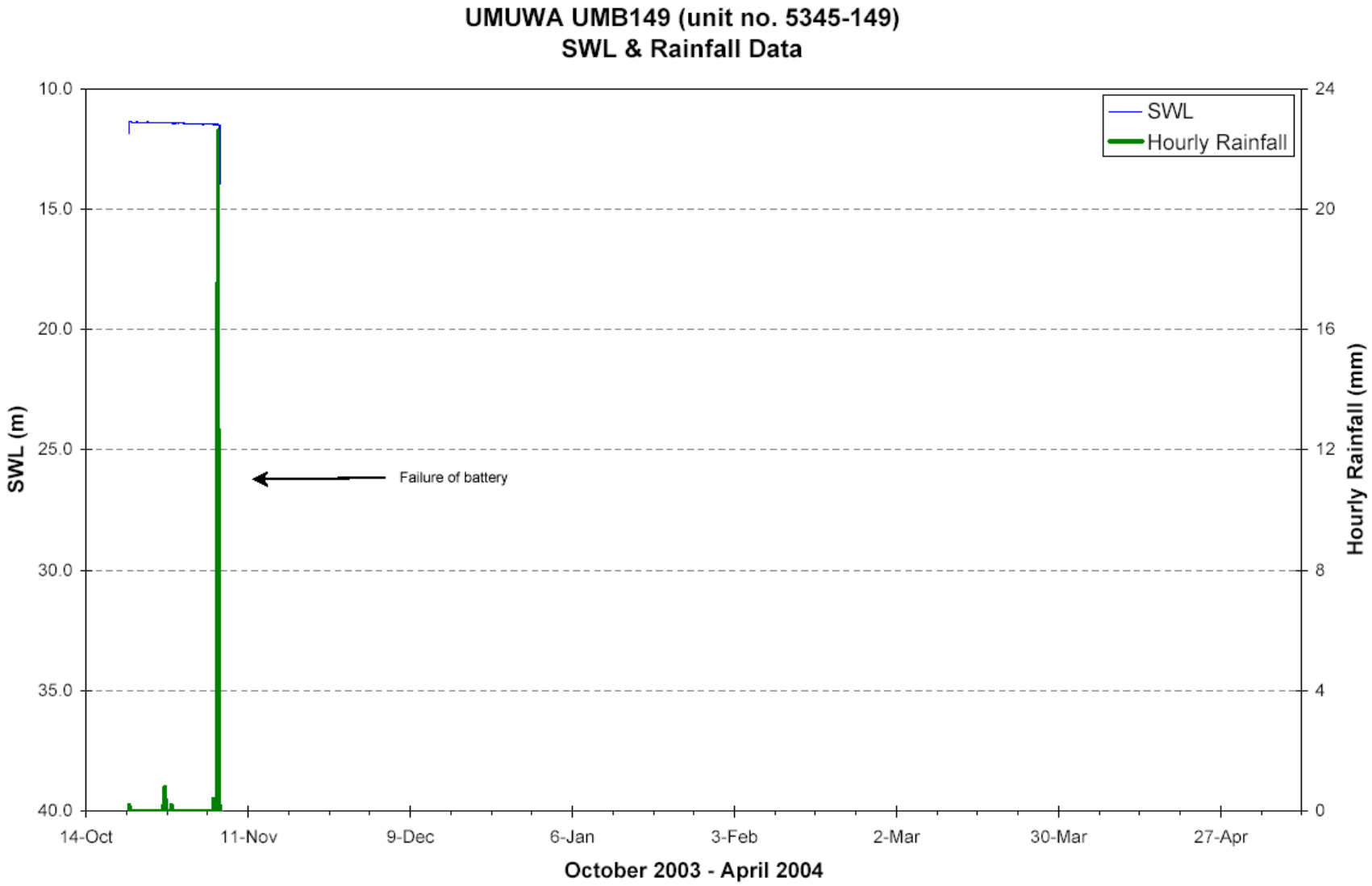
UMB149

This bore is a new installation for the community of Umuwa. Not enough data was recorded to comment on the stability of water levels in this bore due to a battery failure that occurred in early November 2003. Disconnection of the battery charger is thought to be the cause of the battery failure.

Prognosis:

There is not enough data to comment on the sustainability of the bore.


UMUWA UMB149 (unit no. 5345-149)
SWL & Pump Rate Data
SWL
Pump Rate
Failure of battery
SWL (m)
Pump Rate (L/sec)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
6
5
4
3
2
1
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004


UMUWA UMB149 (unit no. 5345-149)
SWL & Rainfall Data
SWL
Hourly Rainfall
Failure of battery
SWL (m)
Hourly Rainfall (mm)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
24
20
16
12
8
4
0
14-Oct
11-Nov
9-Dec
6-Jan
3-Feb
2-Mar
30-Mar
27-Apr
October 2003 - April 2004

APPENDIX A – Water Production Data

Table A1. Water production at Indulkana, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr – Nov 2001*	*Nov 2001 – Apr 2002*	*Apr – Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
IMB-19	5544-101	954.1	990.9	2 096.2	125.2	192.7	286	132.5	382.7	324.4	124.6	**322.2**
IMB-19A	5544-132	1 828.7	2 159.0	3 340.0	512.4	879.7	436.3	158.2	0.0	366.0	188.9	**508.1**
IMB-25	5544-157	6 039.0	3 367.0	1 347.0	1.5	0.1	0.0	0.0	0.0	0.0	0.0	**0.0**
IMB-26	5544-158	1 145.6	2 816.0	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	**0.0**
IMB-27	5544-159	1 528.7	787.8	111.3	0.2	0	0.0	0.0	0.0	0.0	0.0	**0.0**
IR-1	5544-172	–	–	5 565.6	0.0	12 433.0	7 835.3	18 704.0	23 268.0	12 786.0	6 191.5	**13 574.0**
IR-2	5544-169	–	–	4 863.1	4 970.6	5 246.8	2 910.3	4 566.7	2 888.9	5 544.6	4 855.1	**9 432.7**
IR-3	5544-170	–	–	–	–	–	–	–	–	–	–	**–**
IR-4	5544-171	–	–	–	–	–	–	–	–	–	–	**–**
Total		**11 496.1**	**10 120.7**	**17 324.0**	**5 610.2**[1]	**18 752.4**	**11 467.9**	**23 561.4**	**26 539.6**	**18 696.6**	**11 360.1**	**23 836.9**

[1] Total does not include production from IR-1, which had a faulty meter.

– No flowmeter installed.

Table A2. Water production at Mimili, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr – Nov 2001*	*Nov 2001 – Apr 2002*	*Apr – Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
M-1	5443-25	11 502.0	6 481.0	7 451.0	6 591.9	8 952.7	4 152.7	7 603.7	3 897.5	8 233.6	6 053.3	**7 716.2**
M-3	5443-28	8 126.0	3 319.0	6 390.0	6 304.0	6 556.0	6 281.0[1]	9 245.4	7 600.5	10 883.0	462.0	**14 312.0**
M-4	5443-60								*	–	–	–
Total		**19 628.0**	**9 800.0**	**13 841.0**	**12 895.9**	**15 508.7**	**10 433.7**[1]	**16 849.1**	**11 498.0**	**19 116.6**	**6 515.3**	**22 028.2**

[1] M-3 struck by lightening, losing possibly 3 months data.

* Bore constructed during this monitoring period.

‘ – ‘ No flowmeter installed.

Table A3. Water production at Fregon, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr – Nov 2001*	*Nov 2001 – Apr 2002*	*Apr - Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
FRG-1	5344-09	8 583.0	11 676.0	5 139.0	2 515.0	6 075.0	607.6	3 728.0	33.7	238.5	6 000.0	**6 724.0**
FRG-7	5344-31	14 178.0	4 845.9	8 600.9	4 237.5	15 250.0	5 011.9	12 562.0	1 578.3	851.7	1 526.7	**25 206.0**
FRG-14	5344-47	18 325.0	7 430.9	13 199.0	22 752.0	13 903.0	11 570.2	9 114.1	15 706.0	21 427.0	8 563.7	**12 254.0**
FRG-E4	5344-19	7 528.9	9 803.7	5 841.2	4.3	0.8	10 264.1	4 758.6	6 723.1	11 462.0	7 966.1	**7 316.2**
FRG-64	5344-64								*	–	–	–
Total		**48 616.9**	**33 756.5**	**32 780.1**	**29 508.8**	**35 228.8**	**27 453.8**	**30 162.7**	**24 041.1**	**33 979.2**	**24 056.5**	**51 500.2**

* Bore constructed during this monitoring period.

‘ – ‘ No flowmeter installed.

Table A4. Water production at Kenmore Park, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr – Nov 2001*	*Nov 2001 – Apr 2002*	*Apr – Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
KP-6	5345-67	10 529.0	4 767.0	6 405.0	1 773.0	7 458.0	5 114.9[2]	6 128.6[2]	5 351.9	7 951.7	5 415.1	**6 350.1**
KP-7	5345-68	978.1	798.6	584.6	3 413.0	1 246.6	1 334.0	1 156.0	521.7	590.2	773.8	**1 184.0**
KP-98[1]	5345-98	275.0	112.0	556.0	1 253.0	1 458.0	495.9	595.2	200.5	1 538.0	2 411.6	**1 030.6**
Total		**11 782.1**	**5 677.6**	**7 545.6**	**7 439.0**	**10 162.6**	**6 944.8**	**7 879.8**	**6 074.1**	**10 079.9**	**8 600.5**	**8 564.7**

[1] For the period Oct 1998 to Nov 2001, production for KP-98 was derived from the hours pumped and assuming a pump rate of 0.5L/s.

[2] KP-6 flow meter failed. Figures taken from hourly pump rate.

Table A5. Water production at Pukatja, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr - Nov 2001*	*Nov 2001 – Apr 2002*	*Apr – Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
E-1	5345-06	–	–	–	–	–	–	–	–	–	–	–
E-12	5345-12	18 280.0	16 193.0	4 801.9	16 802.3	10 746.0[1]	16 829.2	18 020.0	9 859.0	14 735.0	4 521.9	**8 326.8**
E-42	5345-33	638.4	1 563.2	2 395.0	2 726.7	1 839.9	3 362.2	1 000.2	0.0	3 846.0	5 341.1	**4 111.4**
E-44	5345-85	0.0	7.2	0.2	0.1	3.0	520.2	2 277.2	114.8	1 910.5	2 945.6	**2 616.4**
E-45	5345-84	9 802	8 205.0	9 346.3	10 579.0	6 294.0	8 385.0	11 385.0	7 321.0	6 517.0	6 723.0	**6 412.0**
E-97B	5345-114	–	19 310.0	6 899.6	1 913.9	30 126.0	8 399.1	17 493.0	2 358.4	7 100.2	4 435.5	**27 834.0**
E-97G	5345-119	–	–	–	–	–	–	–	–	–	–	–
E-97K	5345-123	–	–	–	–	–	–	–	–	–	–	–
E-97L	5345-124	–[2]	7 200.5	9 680.5	7 009.9	2 985.1	18 282.4	11 109.0	17 579.0	18 480.0	1 467.0	**16 386.0**
Total		**28 720.4**	**52 478.9**	**31 123.5**	**39 031.9**	**51 994.0**	**55 778.1**	**61 284.4**	**37 232.2**	**52 588.7**	**5 434.1**	**65 686.5**

[1] The production of E-12 was derived from the pumping hours, assuming a rate of 1.1 L/s.

' – ' No flowmeter installed.

Table A6. Water production at Amata, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr – Nov 2001*	*Nov 2001 – Apr 2002*	*Apr – Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
A-15	5145-55	16 300.0	12 853.0	14 251.0	0.0	2 097.0	2 036.0	–	–	–	–	–
A-17	5145-84	9 685.1	8 150.7	7 647.0	11 030.0	13 887.0	5 487.2	8 796.2[3]	6 594.6	9 104.3	7 480.0	**14 633.0**
A-26	5145-19	1 361.2	0.0	8 602.2	10 400.0	11 688.0	4 878.7	2 660.7	2 330.8	11 478.0	32.9	**281.5**
A-109	5145-109	–	–	–	–	–	2 197.0*	12 589.0	8 671.0	13 227.0	16 718.0	**17 981.0**
Total		**27 346.3**	**21 003.6[1]**	**30 500.0**	**21 430.0[2]**	**27 672.0**	**14 598.9**	**24 045.9**	**17 596.4**	**31 299.3**	**24 230.9**	**32 895.5**

[1] A-26 value is missing from total.

[2] A-15 value is missing from total.

[3] This output figure is taken from integration of hourly pump rates, as the accumulated flow figure was incorrect.

* Bore constructed during this monitoring period.

‘ – ‘ No flowmeter installed.

Table A7. Water production at Kalka, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr - Nov 2001*	*Nov 2001 – Apr 2002*	*Apr – Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
KA-1	4745-78	928.9	676.3	21.9	342.4	786.6	363.5	1 196.7	655.7	1 239.7	1 521.3	–
KA-2	4745-94	1 733.8	1 216.2	1 214.4	656.5	1 748.1	1 161.3	1 286.2	576.1	1 582.2	1 656.8	**65.6**
KA-3	4745-85	6 310.3	4 710.7	4 503.9	2 677.0	5 111.5	5 092.6	5 762.5	2 764.7	7 152.7	8 025.6	**260.3**
KA-137	4745-137						*	–	–	–	–	**10 158.8**
Total		**8 973.0**	**6 603.2**	**5 740.2**	**3 675.9**	**7 646.2**	**6 617.4**	**8 245.4**	**3 996.5**	**9 976.6**	**11 203.7**	**10 484.7**

* Bore constructed during this monitoring period.

‘ – ‘ No flowmeter installed.

Table A8. Water production at Pipalyatjara, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr – Oct 1999*	*Oct 1999 – Apr 2000*	*Apr – Oct 2000*	*Oct 2000 – Apr 2001*	*Apr – Nov 2001*	*Nov 2001 – Apr 2002*	*Apr – Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
PIP-95	4745-95	9 903.0	8 335.3	6 757.0	4 342.8	6 016.7	3 638.7[2]	4 944.7	4 068.1	7 734.1	3 846.1	**4 467.2**
PIP-96	4745-92	6 564.1	8 475.1	2 840.8	5 009.9	6 339.0	3 535.9	5 163.5	4 654.3	8 407.5	4 406.5	**8 131.3**
MD-13[1]	4745-96	–	–	–	–	–	–	–	–	–	–	–
Total		**16 467.1**	**16 810.4**	**9 597.8**	**9 352.7**	**12 355.7**	**7 174.6**	**10 108.2**	**8 722.4**	**16 141.6**	**8 252.6**	**12 598.6**

[1] There was no constant level of water production for MD 13 and no volume readings are available. The bore was pumped for 577.61 hrs in Apr – Oct 1999, 8.28 hrs in Oct 1999 – Apr 2000, 32.71 hrs in Apr – Oct 2000 and 333.68 hrs in Oct. 2000 – Apr. 2001.

[2] Figure has been determined from the hourly pump rate, rather than accumulated flow.

‘ – ‘ No flowmeter installed.

Table A9. Water production at Nepabunna, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr–Oct 1999*	*Oct 1999 – Apr 2000*	*Apr–Oct 2000*	*Oct 2000 – Apr 2001*	*Apr - Nov 2001*	*Nov 2001 – Apr 2002*	*Apr - Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
N-101	6636-101	–	–	6 126.3	5 937.8	3 558.2	8 527.5	5 393.4	3 100.7	0.0[2]	845.1	**2 972.3**
N-149	6636-149	–	–	6 846.7	6 682.2	8 447.1	2 103.5	4 621.5	6 535.8	0.0[2]	5 313.4	**9 665.0**
Total		**–**	**–**	**12 973.0**[1]	**12 620.0**	**12 005.3**	**10 631.0**	**10 014.9**	**9 636.5**	**0.0**[2]	**6 158.5**	**12 637.3**

[1] Monitoring equipment not installed until late November 1999.

[2] No production data for this monitoring period.

' – ' No flowmeter installed.

Table A10. Water production at Yalata, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr–Oct 1999*	*Oct 1999 – Apr 2000*	*Apr–Oct 2000*	*Oct 2000 – Apr 2001*	*Apr - Nov 2001*	*Nov 2001 – Apr 2002*	*Apr - Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
YT-2	5235-15	–	–	1 268.9	1 901.0	4 584.3	2 484.5	1 164.0[2]	147.8	521.1	0.6	**19.3**
YT-3	5235-18	–	–	16 041.0	27 026.0	23 985.0	36 465.0	28 992.0	30 157.0	33 523.0	26 081.0	**30 727.0**
Total		**–**	**–**	**17 309.9[1]**	**28 927.0**	**28 569.3**	**38 949.5**	**30 156.0**	**30 304.8**	**34 044.1**	**26 081.6**	**30 746.3**

[1] Accumulated flow measured from the period 30 Nov 1999 – 28 Mar 2000.

[2] Value is estimated from pump rate as was not recorded from flow meter at time of download.

‘ – ‘ No flowmeter installed.

Table A11. Water production at Oak Valley, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr–Oct 1999*	*Oct 1999 – Apr 2000*	*Apr–Oct 2000*	*Oct 2000 – Apr 2001*	*Apr - Nov 2001*	*Nov 2001 – Apr 2002*	*Apr - Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
OV-2	4939-2	***U/K	***U/K	***U/K	***U/K	***U/K	1 440.1	1 699.0	2 012.4	0.0	2 465.2	**248.8**[2]
OV-7	4939-7	–	–	–	–	–	1 258.3	1 466.0	1 724.2	0.0	2 146.5	**230.8**[2]
OV-8	4939-8	–	–	–	–	–	1 659.5	1 953.0	2 307.9	2 570.1	2 908.6	**259.6**[2]
OV-9	4939-9	–	–	–	–	–	128.2	429.0[1]	690.8	913.0	1 193.9	**380.0**[2]
OV-10	4939-10	***U/K	***U/K	***U/K	***U/K	***U/K	1 359.4	1 583.0	1 872.0	0.0	2 312.7	**236.0**[2]
Total							**5 845.5**	**7 130.0**	**8 607.3**	**3 483.1**	**11 027.0**	**1 355.2**[2]

*** Community was not part of the department's monitoring program therefore accumulated flows are unknown.

[1] Value is estimated from pump rate as was not recorded from flow meter at time of download.

[2] Flow meter reset, water extraction volumes recorded are not representative of true production. Water production calculated (hours pumped) to be > previous period.

' – ' No flowmeter installed.

Table A12. Water production at Umuwa, 1998–2004

Bore	Unit Number	Production (kL)										
		Oct 1998 – Apr 1999	*Apr–Oct 1999*	*Oct 1999 – Apr 2000*	*Apr–Oct 2000*	*Oct 2000 – Apr 2001*	*Apr - Nov 2001*	*Nov 2001 – Apr 2002*	*Apr - Oct 2002*	*Oct 2002 – Apr 2003*	*Apr – Oct 2003*	***Oct 2003 – Apr 2004***
UMB-149	5345-149						*	–	–	–	–	**2 271.4**
Total								–	–	–	–	**2 271.4**

* Bore constructed during this monitoring period.

‘ – ‘ No flowmeter installed.