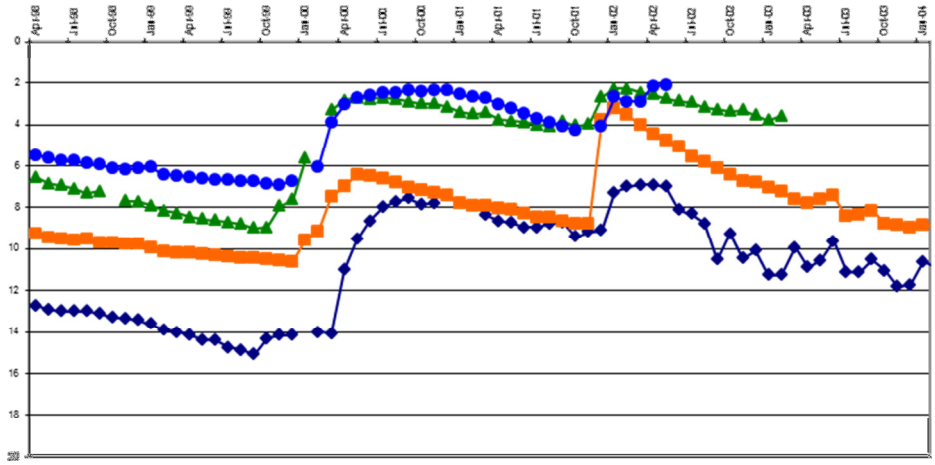
LIMPOPO REGION

QUARTERLY STATUS REPORT ON GROUNDWATER LEVEL TRENDS



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DIRECTORATE
WATER REGULATION AND USE

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SUMMARY

This report coincide with the end of the “dry” season and as can be expected was a general declining trend recorded for the past 6 months

The decline is mostly not significant with almost 60 % of groundwater levels currently higher than the corresponding time last year. Available long-term data indicates that the overall groundwater situation is in a healthy state.

An intense rainfall incident with high rainfall over a short period was experienced in January 2013 over most of the north-north eastern part of the Province which led to some dramatic responses in groundwater levels in that area.

The groundwater situation in any area is dependent on local conditions, and deviations from the general trend are always present. The effect of water use and abstraction practices on the groundwater level trend need to be monitored to enable sustainable use.

1. BACKGROUND

The quarterly report on groundwater status is compiled from the data collected at 188 of the 190 stations on the permanent reference monitoring network. The data from 2 stations monitored in the Crocodile west-Marico Water Management Area (A2 drainage) is not included in the quarterly report. MAP 1

Monitoring projects differ both in purpose and time frames and findings are reported at the conclusion of each project.

The number of stations, for both the network as well as projects, may vary from time to time due to loss of stations due to boreholes collapsing, invasion by tree roots, vandalism, flood damage and installation of pumping equipment by municipalities, other service providers or private individuals etc.

Groundwater level data for this report was collected during November 2013. All water level values used are that on the 1st of each month in question and taken at 12H00 in the case of electronic data. Where electronic data is not available the hand measurement taken during the site visit is used.

2. GROUNDWATER LEVELS

2.1 GROUNDWATER LEVEL TREND; AUGUST TO NOVEMBER 2013 (MAP 2)

August November 2013				
Total	190	Stations		
Less A2 drainage	188	Stations		
With data	164	Stations	87.2%	
Water level			**Average**	**%**
Down	139	Stations	-0.63	84.80%
Up	25	Stations	0.21	15.20%
Na change	0	Stations		
No Data	24	Stations		

Scattered heavy thunderstorms occurred in some areas in the A7 and A6 drainage areas during November while data collection was taking place. 25 stations could not yet be accessed due to very wet conditions in the field.

164 Of the stations visited (87.2%) have data for both dates.

As can be expected over the dry season, groundwater levels were declining and 84.8% (139 stations) indicate lower groundwater levels over the past 3 months with the average being 0.63m down. 15.2 % (25 stations) indicate slightly higher groundwater levels, average 0.21m higher.

2.2 GROUNDWATER LEVEL TREND; NOVEMBER 2012 TO NOVEMBER 2013 (MAP 3)

November 2012 to November 2013				
Total	190	Stations		
Less A2 drainage	188	Stations		
With data	163	Stations	86.7%	
Water level			**Average**	**%**
Down	66	Stations	-1.09	40.50%
Up	97	Stations	1.4m	59.50%
Na change	0	Stations		
No Data	25	Stations		

97 Stations (59.5%) indicate higher water levels than the corresponding time last year; the average rise is 1.4m.
Lower water levels were recorded at 66 (40.5%) of the stations. The average is 1.09m lower.
Groundwater levels are overall slightly higher than the same time last year.

3. RAINFALL

3.1. RAINFALL DISTRIBUTION; NOVEMBER 2012 TO NOVEMBER 2013 (MAP 4)

A large variation exist both spatially and in total rainfall recorded in the Province the past year. The eastern half of Limpopo received better rainfall than the western half with highest rainfall occurred as usual over the mountainous areas of Tzaneen and Thoyandou. The total rainfall recorded was mostly below normal.

3.2. AVERAGE MONTHLY RAINFALL; NOVEMBER 2012 TO NOVEMBER 2013 (GRAPH 1)

Most of the rainfall was recorded in the first half of the rainy season with the highest being received in January 2013, especially along the northern and north eastern parts of the Province. The late season was general characterized by low rainfall.

4. GROUNDWATER LEVEL RESPONSE TIO RAINFALL

The response in groundwater levels to rainfall is dependent of a large number of factors of which the intensity of a rainfall event is one of the major factors. A high rainfall season of low intensity incidents spread over the whole season may, despite a high total, not have any significant impact on groundwater levels. Only one high intensity event on the other hand, may have a large impact.

4.1. GROUNDWATER LEVEL RESPONSE AT STATION A7 MOPANE, B7 THE WILLOWS & B7 WOLKBERG (GRAPHS 2 & 3)

Graph 2 illustrates the dramatic response in groundwater level after a high rainfall incident in January 2013 in the area. The rainfall was recorded at Waterpoort, Venetia mine and Pontdrift to the South, West and North West of Mopane respectively. Groundwater levels in the northern and north eastern part of the Province responded in varying degrees to this event.

To the south east where even higher total rainfall was recorded, but spread over the season, responses were less noticeable. Graph 3 illustrates the relative small responses at B7 The Willows and B7 Wolkberg where a high total rainfall was recorded over the whole rainy season.

5. SOME TYPICAL GROUNDWATER LEVEL TRENDS OVER THE MEDIUM TO LONG-TERM

Despite some differences in groundwater level behavior due to various factors such as local rainfall, abstraction patterns, water use etc. the underlying medium to long-term trends can be discerned and correlated with each other. The correspondence in current trends can be used to extrapolate long-term trends to areas with less data.

5.1. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A4 DRAINAGE (GRAPH 4)

All of these monitoring stations are in areas of very low impact on groundwater due to the fact that land use is limited to game and to a lesser degree cattle farming.
The trends display fairly stable conditions varying from slightly declining to stable to slightly rising over a period of 5 years, the period with data available for this drainage. Seasonal recharge also varies and was mostly not significant during this period. The general trend is however very similar.

5.2. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A5 DRAINAGE (GRAPH 5)

Except for the Visgat and Setateng areas where some abstraction for irrigation as well as community supply occurs, are all stations located in low impact areas. The trends are similar to that of the A4 drainage as discussed above but the slightly steeper slope of decline at Setateng and initially at Visgat can be noted.

5.3. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A7 DRAINAGE (GRAPH 6)

Long-term data is available for numerous stations in this drainage. From the graph is can be seen that current groundwater levels indicate a healthy state of affairs. Comparison with the trend since 2008 with those of the two drainages discussed above indicates a very good correlation for the period. This correlation may indicate that that the same can be said for those areas lacking long-term data, indicating a healthy current status.

The trends presented above are considered to be representative of the general condition over the Province for areas of low to moderate impact on groundwater. Local deviations will always be present due to local abstraction patterns and volumes.

6. IMPORTANCE OF GROUNDWATER MANAGEMENT

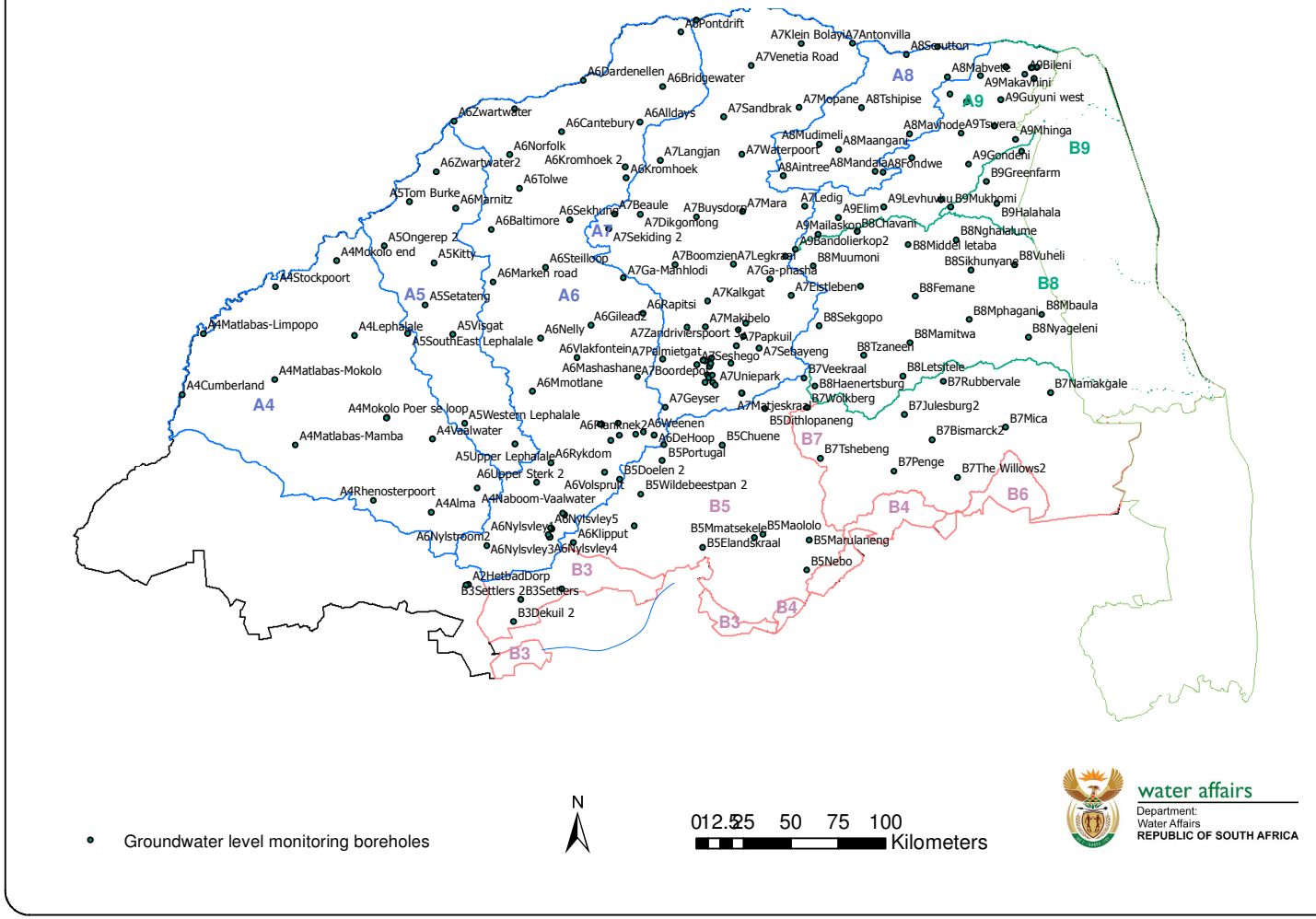
The impact of abstraction from a nearby borehole that is easy to note, especially if direct pumping effects are present in the trend. If groundwater levels are not monitored even such clear indications of possible over abstraction will be missed. The combined impact of abstraction in an area where direct pumping effects are not present is not always so easy to note, especially in the short-term.

6.1. GROUNDWATER LEVEL TREND AT STATION A4 ALMA (GRAPH 7)

The relative stable groundwater conditions in the A4 drainage was discussed above in Point 5.1. An exception can be found in the Alma area. The trend differs completely from that at other stations in the drainage and display a sharp decline despite obvious seasonal recharge. No direct pumping effects could be discerned and the scale of irrigation activities is not clear from the ground. Google earth images of the area indicate numerous irrigation circles spread out all around the monitoring area and no indication of a possible surface water source for the irrigation. This leaves the assumption that groundwater is used and supply the reason for the declining level.

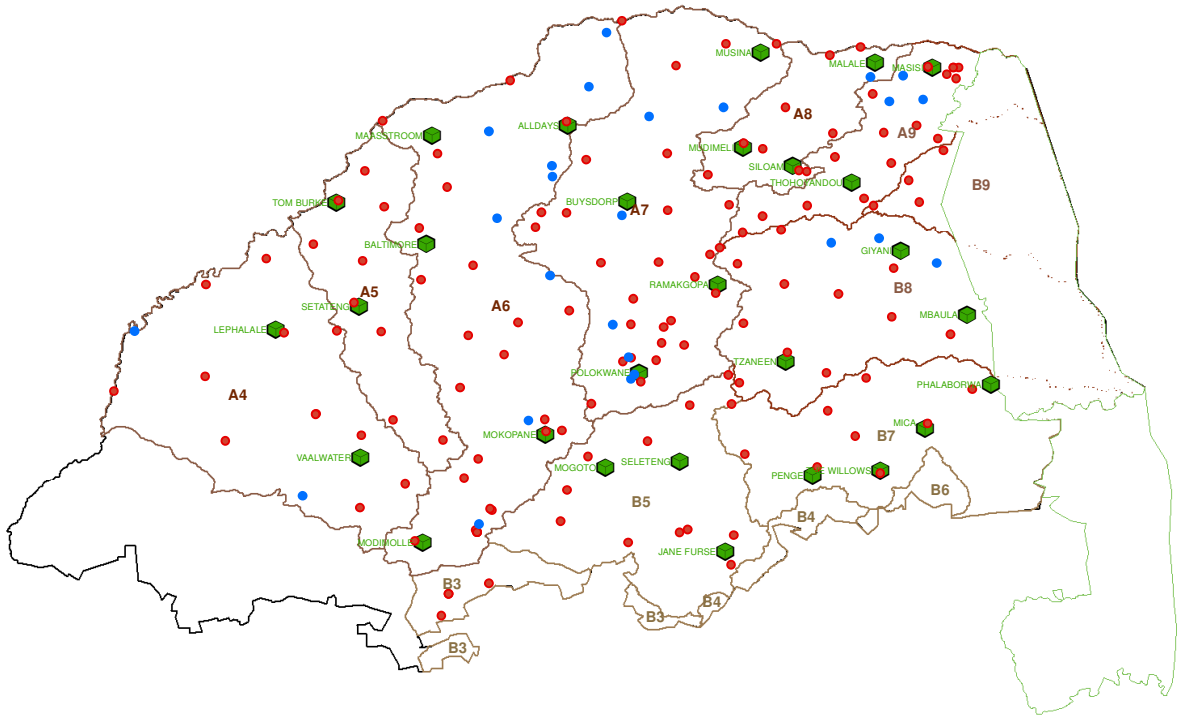
The need for groundwater management is again stressed by this situation.

DISTRIBUTION OF GROUNDWATER LEVEL MONITORING NETWORK: LIMPOPO PROVINCE



MAP 1

Distribution of lower and higher groundwater levels
from August to November 2013



Water level trend; August to November 2013

August to November 2013

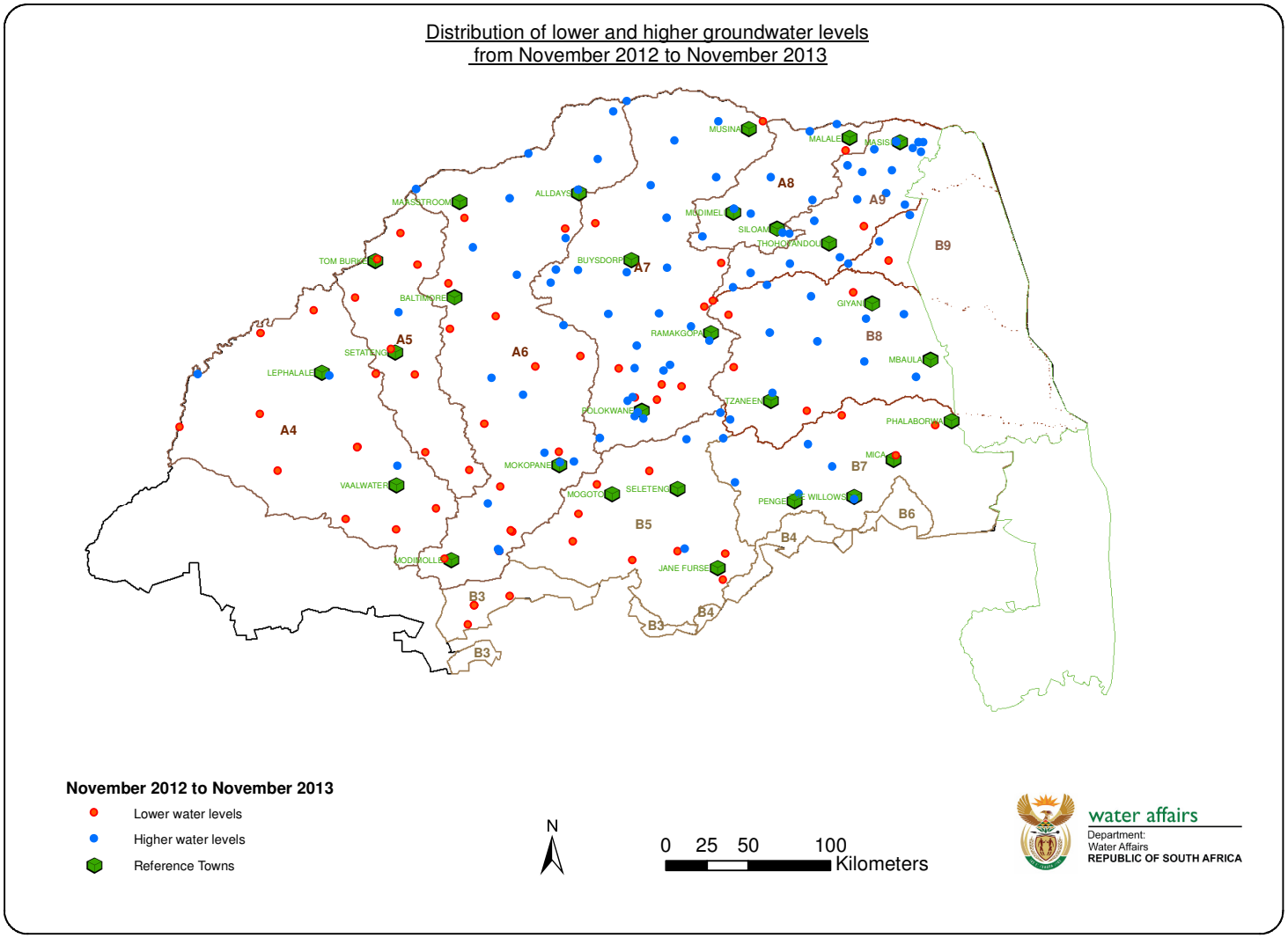
- Lower water levels
- Higher water levels
- Reference Towns

N

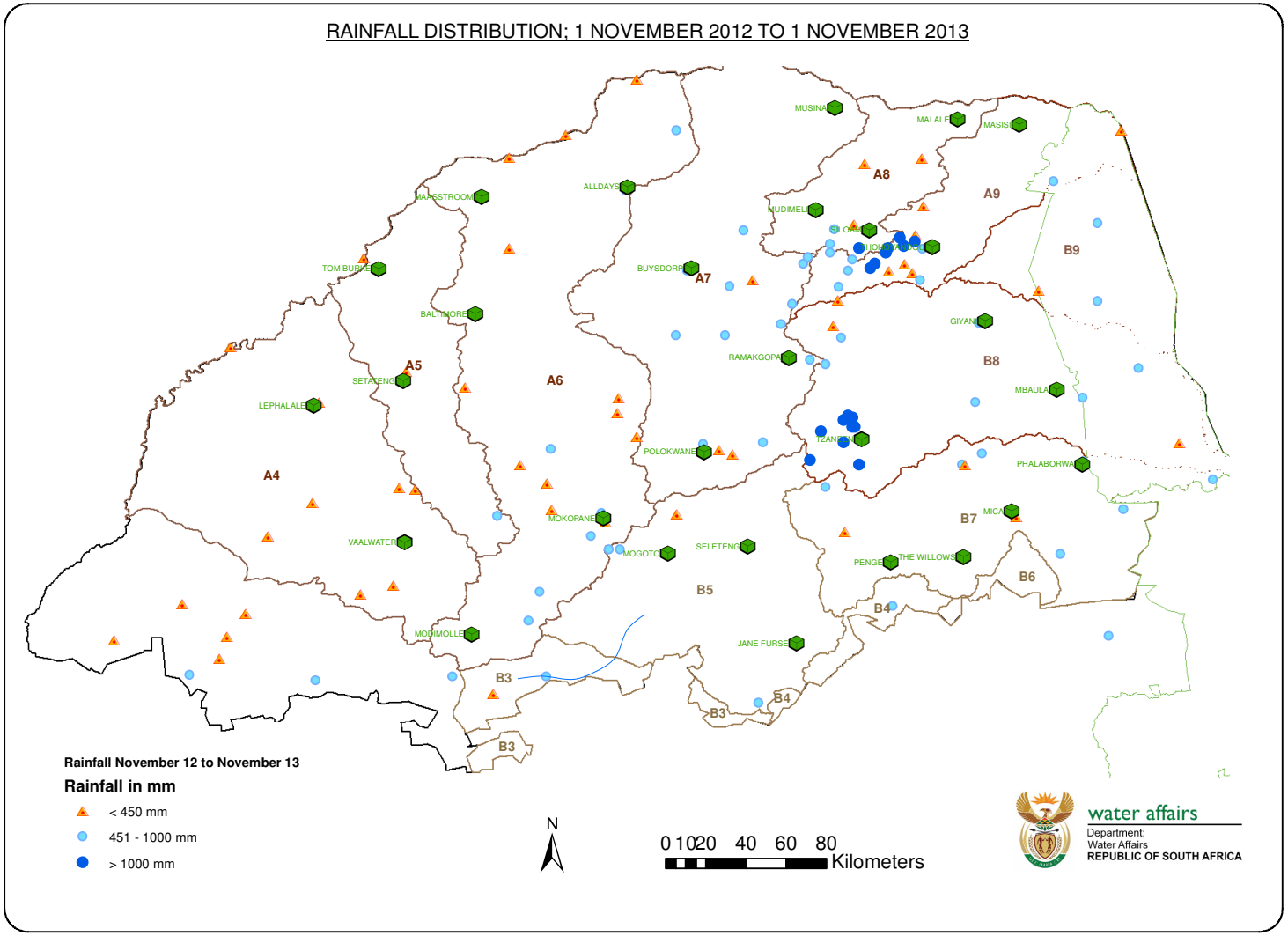
0 12.25 50 75 100 Kilometers

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

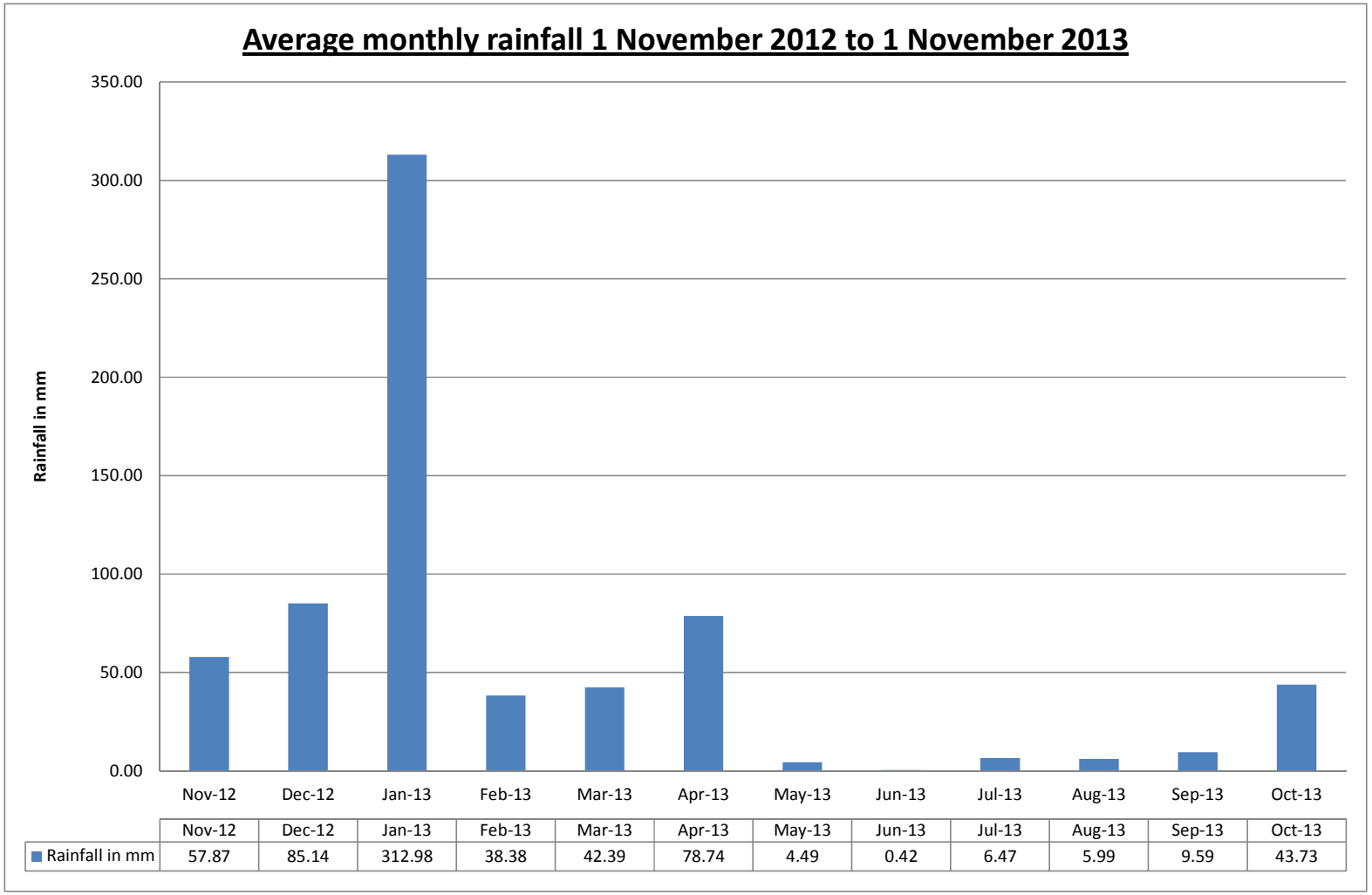
MAP 2


Distribution of lower and higher groundwater levels
from November 2012 to November 2013
MUSINA
MALALE
MASISI
ALLDAYS
MARKSTROOM
MODIMEL
SILOAM
THOHOYANDOU
TOM BURKE
BUYSDORP
BALTIMORE
GIYANI
RAMAKGOPA
SETATENG
LEPHALALE
MBAULA
TZANEEN
POLOKWANE
PHALABORWA
MICA
MOKOPANE
VAALWATER
MOGOTO
SELETENG
PENGE
THE WILLOWS
MODIMOLLE
JANE FURSE
A4
A5
A6
A7
A8
A9
B3
B4
B5
B6
B7
B8
B9
November 2012 to November 2013
Lower water levels
Higher water levels
Reference Towns
N
0 25 50 100
Kilometers
water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

MAP 3

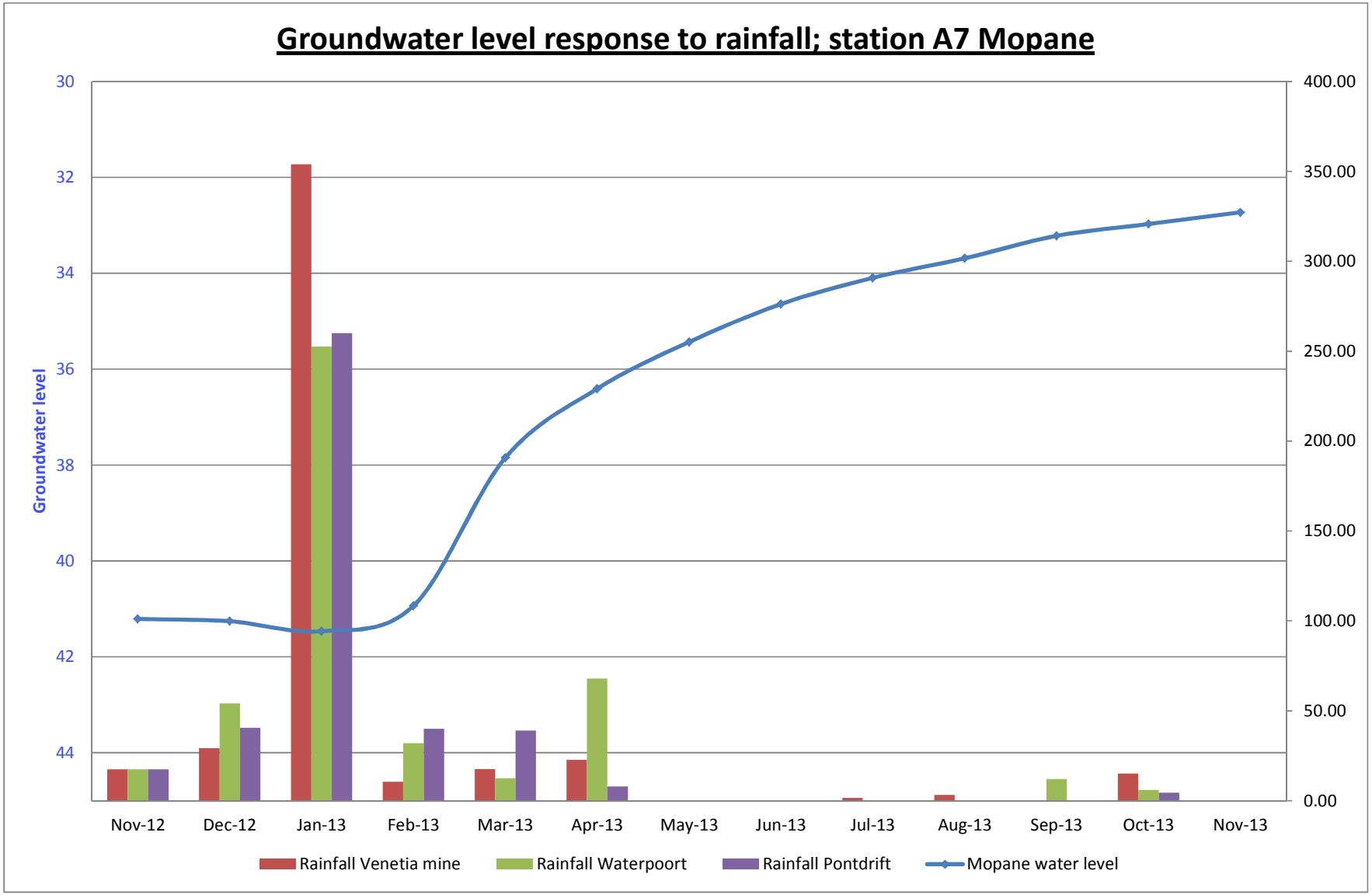

RAINFALL DISTRIBUTION; 1 NOVEMBER 2012 TO 1 NOVEMBER 2013
MUSINA
MALALE
MASISI
ALLDAYS
MARKSTROOM
MUDIMELI
TOM BURKE
BUYSDORP
BALTIMORE
GIYANI
RAMAKGOPA
SETATENG
LEPHALALE
POLOKWANE
MBAULA
PHALABORWA
MOKOPANE
VAALWATER
MOGOTO
SELETENG
PENGE
THE WILLOWS
MODIMOLLE
JANE FURSE
A4
A5
A6
A7
A8
A9
B3
B4
B5
B6
B7
B8
B9
Rainfall November 12 to November 13
Rainfall in mm
< 450 mm
451 - 1000 mm
> 1000 mm
N
0 10 20 40 60 80
Kilometers
water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

MAP 4

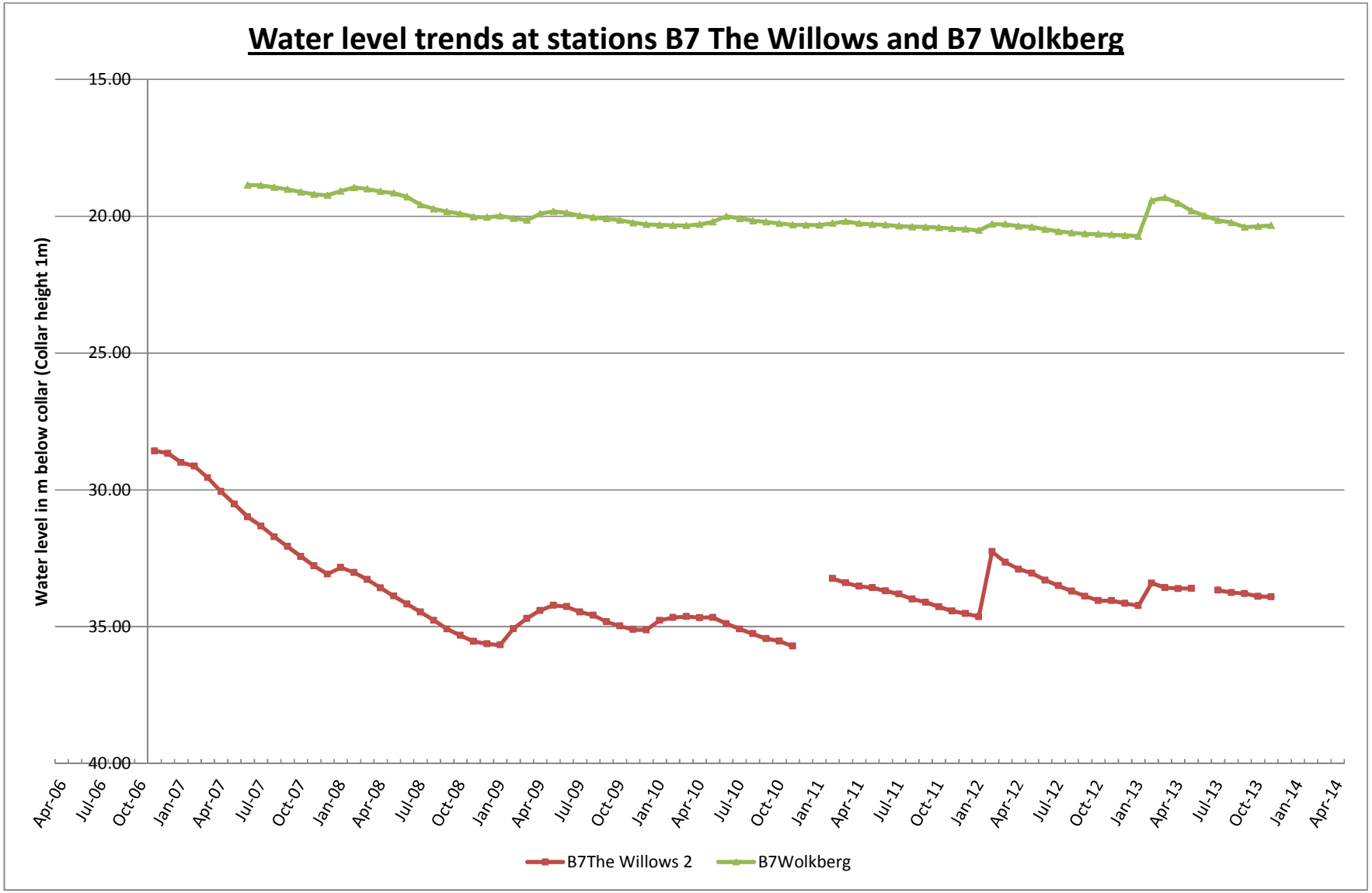


	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13
Rainfall in mm	57.87	85.14	312.98	38.38	42.39	78.74	4.49	0.42	6.47	5.99	9.59	43.73

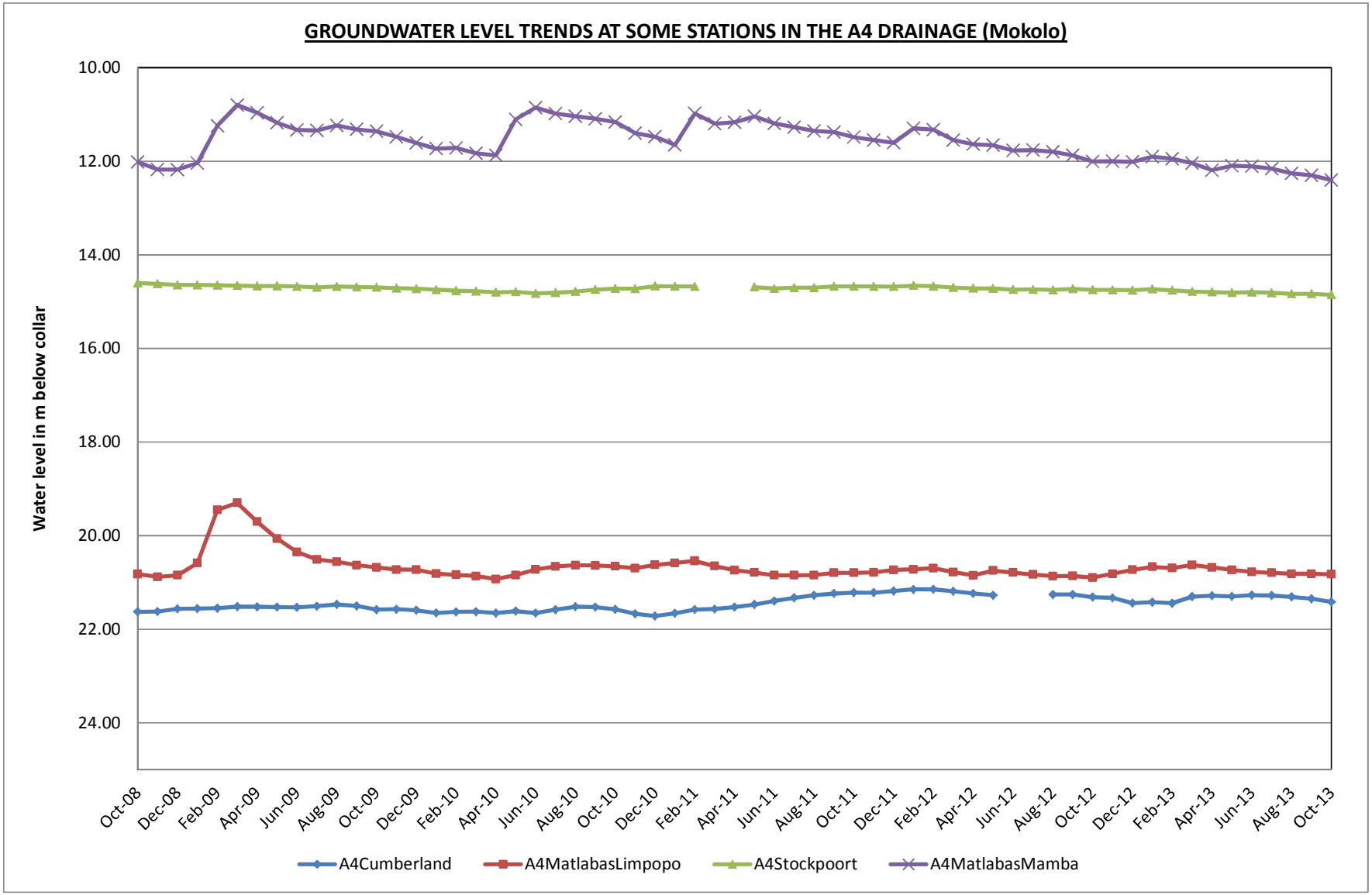
GRAPH 1


Groundwater level response to rainfall; station A7 Mopane
Groundwater level
30
32
34
36
38
40
42
44
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Nov-12
Dec-12
Jan-13
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Rainfall Venetia mine
Rainfall Waterpoort
Rainfall Pontdrift
Mopane water level

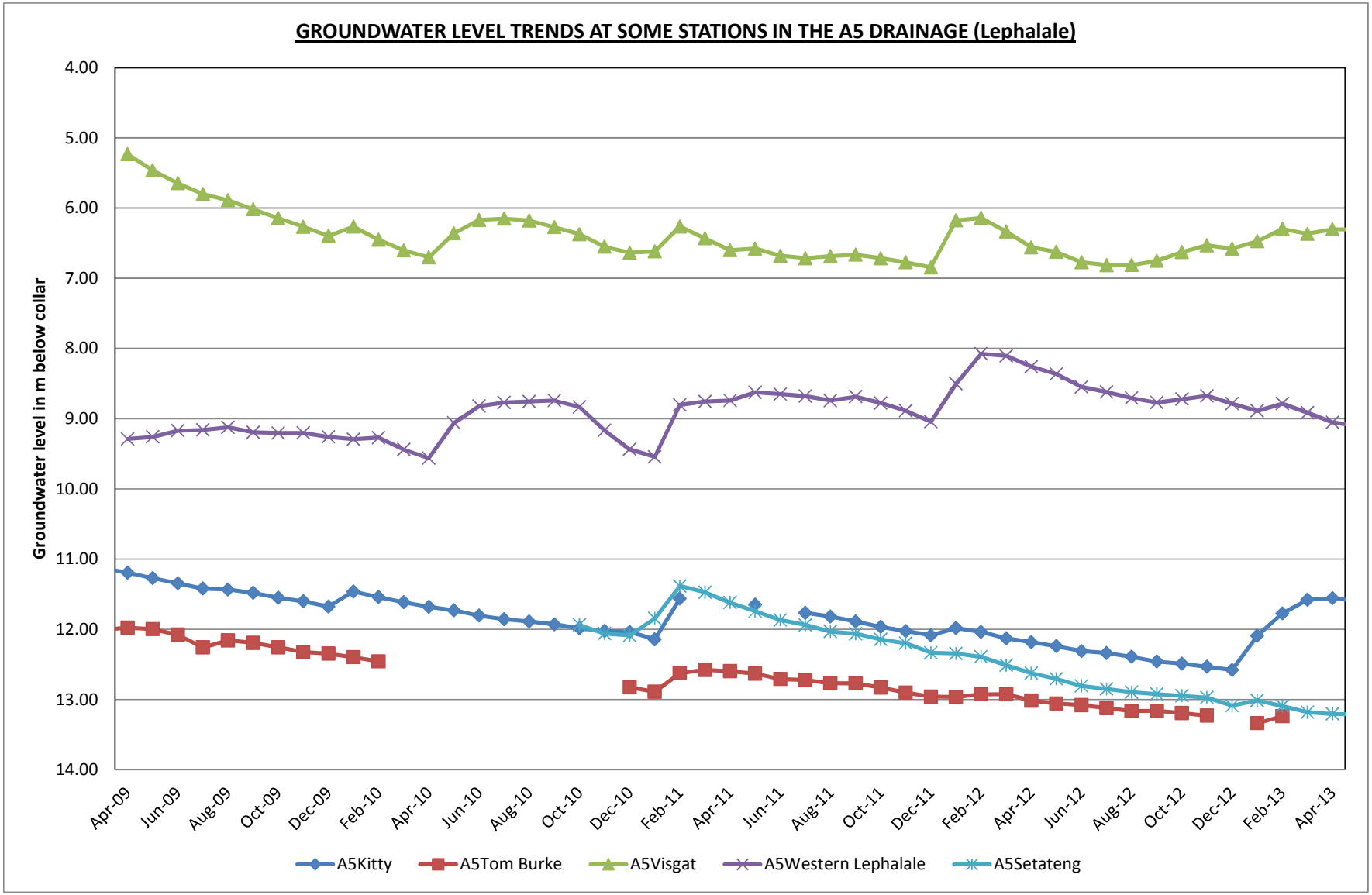
GRAPH 2


Water level trends at stations B7 The Willows and B7 Wolkberg
Water level in m below collar (Collar height 1m)
15.00
20.00
25.00
30.00
35.00
40.00
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
B7The Willows 2
B7Wolkberg

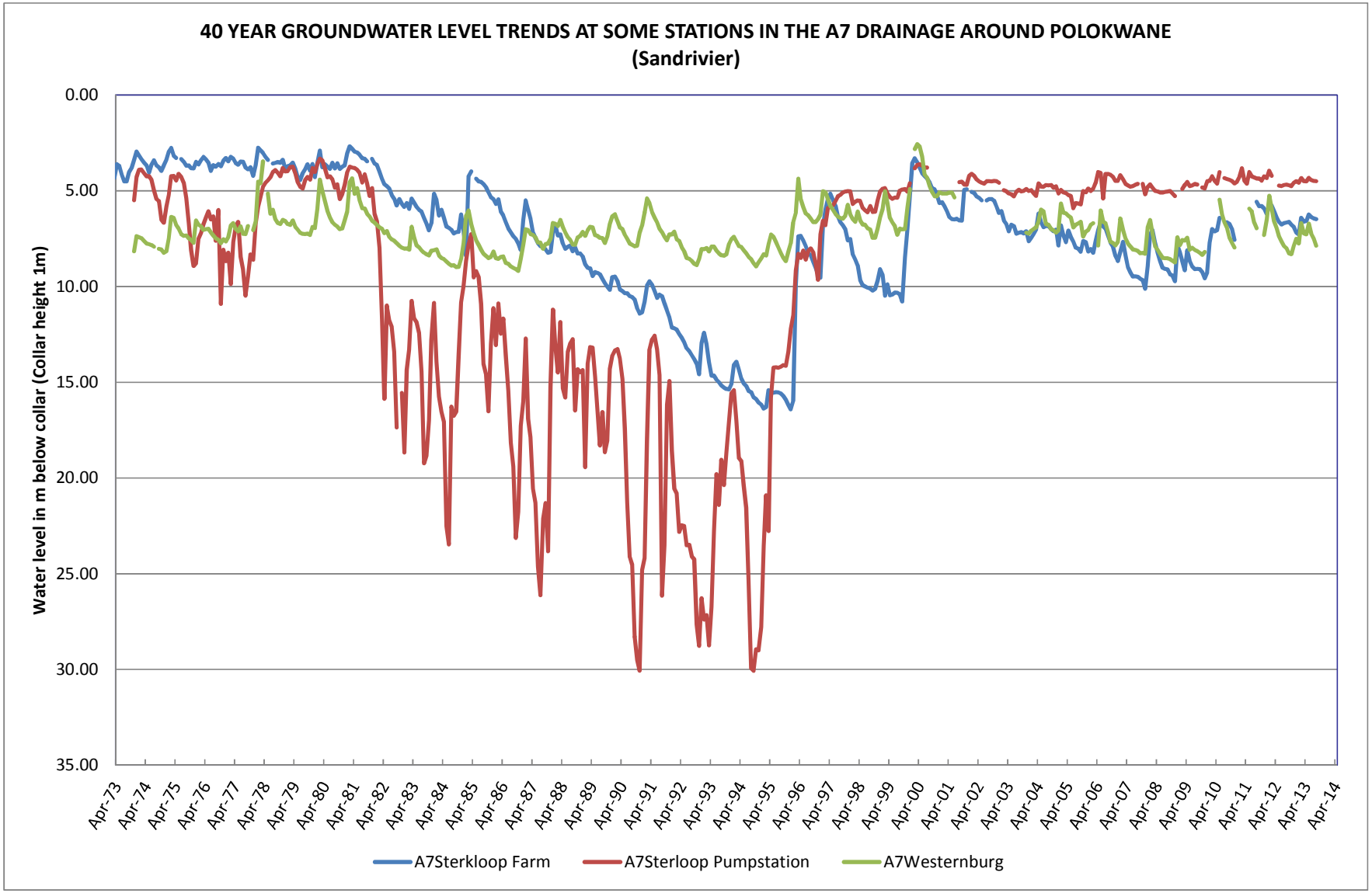
GRAPH 3


GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A4 DRAINAGE (Mokolo)
Water level in m below collar
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10
Aug-10
Oct-10
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Apr-13
Jun-13
Aug-13
Oct-13
A4Cumberland
A4MatlabasLimpopo
A4Stockpoort
A4MatlabasMamba

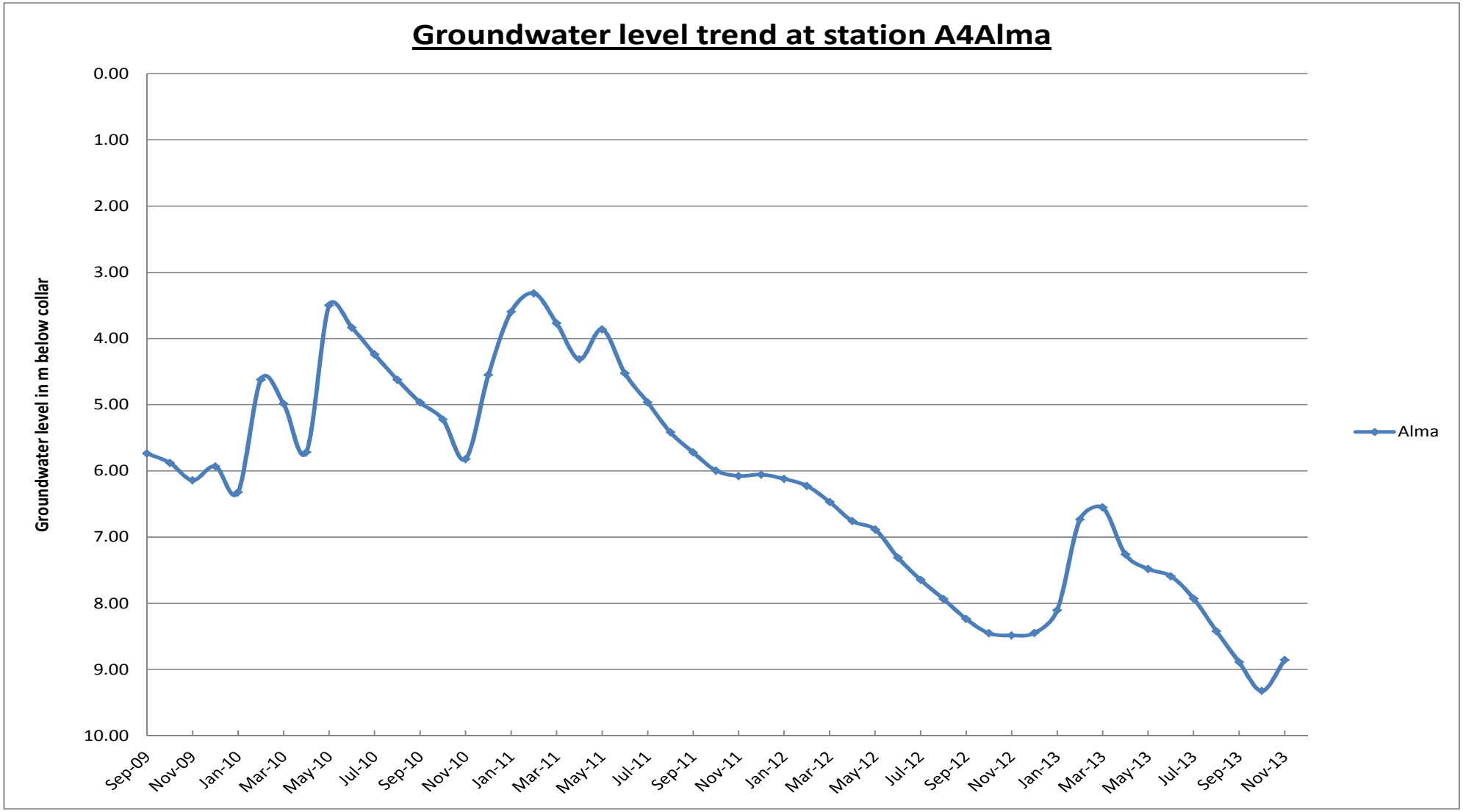
GRAPH 4


GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A5 DRAINAGE (Lephalale)
Groundwater level in m below collar
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10
Aug-10
Oct-10
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Apr-13
A5Kitty
A5Tom Burke
A5Visgat
A5Western Lephalale
A5Setateng

GRAPH 5


40 YEAR GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A7 DRAINAGE AROUND POLOKWANE
(Sandrivier)
Water level in m below collar (Collar height 1m)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
Apr-73
Apr-74
Apr-75
Apr-76
Apr-77
Apr-78
Apr-79
Apr-80
Apr-81
Apr-82
Apr-83
Apr-84
Apr-85
Apr-86
Apr-87
Apr-88
Apr-89
Apr-90
Apr-91
Apr-92
Apr-93
Apr-94
Apr-95
Apr-96
Apr-97
Apr-98
Apr-99
Apr-00
Apr-01
Apr-02
Apr-03
Apr-04
Apr-05
Apr-06
Apr-07
Apr-08
Apr-09
Apr-10
Apr-11
Apr-12
Apr-13
Apr-14
A7Sterkloop Farm
A7Sterloop Pumpstation
A7Westernburg

GRAPH 6


Groundwater level trend at station A4Alma
Groundwater level in m below collar
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Mar-13
May-13
Jul-13
Sep-13
Nov-13
Alma

GRAPH 7