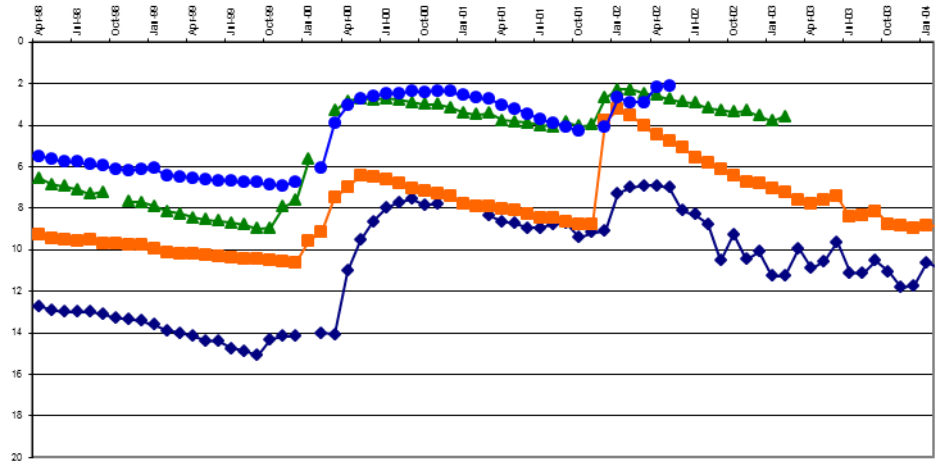
LIMPOPO REGION

QUARTERLY STATUS REPORT ON GROUNDWATER LEVEL TRENDS



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DIRECTORATE
WATER REGULATION AND USE

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SUMMARY

Current groundwater levels represent that at the end of the hydrological year and also the end of the dry part. Recharge during the first halve of the season varied over the province and despite normal decline over the dry latter part the majority of stations (64%) have higher water levels than at the corresponding time last year. Considering the correlation of short to medium term trends with that of stations with available long-term data, indicating a healthy resource the status of the resource is considered to be generally healthy over most of the Province. Some small local areas of concern do occur and are mostly due to large scale localised abstraction. The northern part of the B8 drainage, Molototsi, Klein and Middel Letaba River area, is however a relative large area of concern with groundwater levels continuously declining for some years now.

Sustainable use of a groundwater resource depends on professional resource development, monitoring and resource management.

1. BACKGROUND

This report focus on groundwater level trends in the Limpopo Province and serves to report on the current status of the resource.

Monitoring stations are equipped with electronic data loggers. Data is collected on a quarterly basis, processed and analysed to evaluate the current status of groundwater in the Province which in this case represent the end of the past hydrological year. Comparison is drawn between the situation at the start and end of the past dry season; 1 April to 1 October 2014. Comparison is also made with the current groundwater level status compared to the corresponding time the previous year.

The distribution of the monitoring network is illustrated by MAP 1.

A number of specific monitoring stations on different projects are monitored and the results are reported at the conclusion of each project.

For various reasons all stations are not always accessible, which result in data not available. The main reason for current data gaps is however the lack of replacement instruments for old or defect instruments during the previous two data collection events as well as monitoring boreholes being equipped with pumps or tested by contractors appointed by municipalities.

Electronic groundwater level data for this report was collected during October and November 2014.

2. GROUNDWATER LEVELS

2..1. DIFFERENCE IN GROUNDWATER LEVELS; APRIL TO OCTOBER 2014.

April - October 2014

Total	188	Stations

With data	142	Stations	75.5%

Water level			**Average(m**	**%**
Down	116	Stations	1.5	81.69%
Up	26	Stations	0.63	18.31%
Na change	0	Stations		0.00%
No Data	46	Stations		100.00%

The data represent the 2nd half of the hydrological year which is the dry season. Normal decline in groundwater levels over the dry season is the general trend with 116 (81.69%) of 142 stations with continuous data available indicating a decline. The average decline is 1.5m for the 116 stations. This figure is however skewed by some water levels being affected by pumping and some returning to “normal” from extreme highs at the end of the wet season.
The distribution of stations with higher or lower groundwater levels from April to October is shown on MAP 2.

2..2. DIFFERENCE IN GROUNDWATER LEVELS; OCTOBER 2013 TO OCTOBER 2014

October 2013 - October 2014

Total	188	Stations

With data	132	Stations	70.2%

Water level			**Average(m**	**%**
Down	47	Stations	0.95	35.61%
Up	85	Stations	1.34	64.39%
Na change	0	Stations		0.00%
No Data	56	Stations		100.00%

64% of available groundwater levels are currently higher than at the end of the previous hydrological year. Lower groundwater levels are present at 35.6% of the stations but is generally not by much. Declining water levels may be part of a normal trend or response and not necessarily always a reason for concern.
The distribution of stations with higher or lower groundwater levels from June 2013 to June 2014 is shown on MAP 3.

3. THE IMPORTANCE OF LONG-TERM MONITORING DATA

It is vital to continuously monitor groundwater level trends as indication of a worsening or improving situation but concentrating only on what is currently happening may lead to incorrect conclusions. Despite the fact that rising water levels indicate an improvement it does not necessarily mean that all is well. The same can be said for declining water levels whereas a decline may not always be any reason for concern. To evaluate the importance to attach to a current trend a long-term perspective is needed. The status of the resource can only be assessed by comparison of short-term trends to that in the long-term.

4. SHORT TO LONG-TERM GROUNDWATER LEVEL TRENDS; SOME EXAMPLES

Distribution of stations used in the examples is illustrated on MAP 4.

4..1. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A4 DRAINAGE OVER THE PAST YEAR

GRAPH 1 illustrates the groundwater level trends in the headwater area of the Mokolo River drainage over the past hydrological year. The current water levels are higher than the same time the previous year and are clearly due to good recharge in the second quarter of the hydrological year followed by a natural decline over the dry season

4..2. GROUNDWATER LEVEL TREND AT STATION A4 ALMA OVER 5 YEARS

The water level at one of the stations, A4 Alma, illustrated in the previous graph show a marked rise over the past year. A longer term over 5 years is depicted on GRAPH 2 which brings the importance of the rise over a short tem into perspective. The graph indicates that the rise represent a water level recovering after a steady decline over two years. Current water levels compare well with that at the start of monitoring at this site with water levels indicating normal seasonal highs and lows. Groundwater status in this area is considered to be healthy.

4..3. GROUNDWATER LEVEL TREND AT STATION A6 SEKHUNG OVER THE PAST YEAR

The groundwater level is also higher than the previous year but recharge was delayed with rising of the water level starting late in the season and continuing well into the dry season. Dry season decline only started in August with a slight decline by the end of the season. GRAPH 3

4..4. GROUNDWATER LEVEL TREND AT STATION A6 SEKHUNG OVER 7 YEARS

Water level at this station indicates normal seasonal fluctuations with an underlying slight declining trend over the first 5 years GRAPH 4. The higher water level over the past year is a continuing of a rise that started the previous year already indicating good recharge the past 2 years. Current water level is very high compared to the first 5 years representing a healthy status of the resource quantity.

4..5. GROUNDWATER LEVEL TREND AT STATION B7 NAMAKGALE OVER THE PAST 4 YEARS

The trend displayed by GRAPH 5 indicates dry season decline after April with the water level slightly higher at the end of the dry season than the corresponding time last year. The 4 year trend shows that it is normal seasonal fluctuation with the current water level within the norm for this time of the year and stable conditions prevailing. The underlying linear trend over 4 years is a slightly rising one.

4..6. GROUNDWATER LEVEL TREND AT STATION B8 SEKGOPO OVER THE PAST YEAR

The groundwater level trend at station B8 Sekgopo over the past year differs with those discussed above. A decline is indicated over the whole period despite some stabilizing due to recharge from December to May. The decline is only 40 cm and depending on the status of the resource at the start of the period may not be significant while the opposite is true if the resource were already stressed GRAPH 6.

4..7. GROUNDWATER LEVEL TREND A STATION B8 SEKGOPO OVER TEN YEARS

The 10 year trend at station B8 Sekgopo places the short-term decline in clear perspective GRAPH 7. The graph leaves no doubt that groundwater level in the area is seriously declining over the long-term. Some minor seasonal recharge can be noted but the loss I more than the gain in time. The short term decline of 0.4m added to an already continuous decline is considered to be significant. The status of the resource in the area is steadily deteriorating and closer monitoring to identify the reason and the extent of the area affected is warranted.

4..8. LONG-TERM GROUNDWATER LEVEL TREND AT STATION A7 WATERLAND SINCE 1975

The long-term groundwater level trend over a 39 year period since 1975 at station A7 Water land is illustrated by GRAPH 8.The effect of a drought period after 1980 that lasted to 1995 can be seen clearly. The situation improved greatly from 1996 to 2000 which is marked by another good recharge event. Since then groundwater levels indicate fairly stable conditions with seasonal fluctuations representing a healthy status of the resource.

Good correlation exists with the trends at the majority of monitoring stations for the past 6 to 10 years which may suggest that the status in those areas is healthy as well.

5. AREA OF CONCERN

The long-term decline in groundwater level in the Sekgopo area as mentioned in point 4.7 demanded a close look at all long-term declining levels not known to be related to direct abstraction impact. 7 Stations, including Sekgopo were identified. The magnitude in decline varies but the trends are similar over some years. The distribution of these stations was found to be all in one area, the northern part of the B8

drainage. The area is considered an area of concern and is marked as such on MAP 5. Investigation into the situation and implementing of sound groundwater management in this area is essential.

6. IMPORTANCE OF GROUNDWATER MANAGEMENT

Groundwater is probably one of our most valuable resources providing in the daily water needs of a vast number of people with the potential of improving the living conditions of many more. Exploitation of any resource has to be well managed to ensure sustainability. Unfortunately groundwater management is mostly not well understood or just ignored. Monitoring of groundwater levels is one of the most important tools in groundwater management with regard to quantity. It is easy to implement and costs involved is relatively low but the information gathered is of great importance.

GRAPH 9 illustrates the long-term groundwater level trend at station B5 Klipput since 1984. The decline until 1995, subsequent recovery in 1996 as well as 2000 can be seen as in the previous graph 8. The aquifer is however seriously impacted by irrigation abstraction and any gain is soon wiped out again. Since 2001 no important recharge event occurred and the resource is being mined constantly resulting in the water level declining steadily to its lowest level in 30 years. The aquifer is without doubt under stress and if no major recharge occurs serious problems will be experienced by the users in the area who are probably not aware of the situation due to the lack of resource management.

A concentrated monitoring network is planned for the area.

7. LOSS OF MONITORING STATIONS

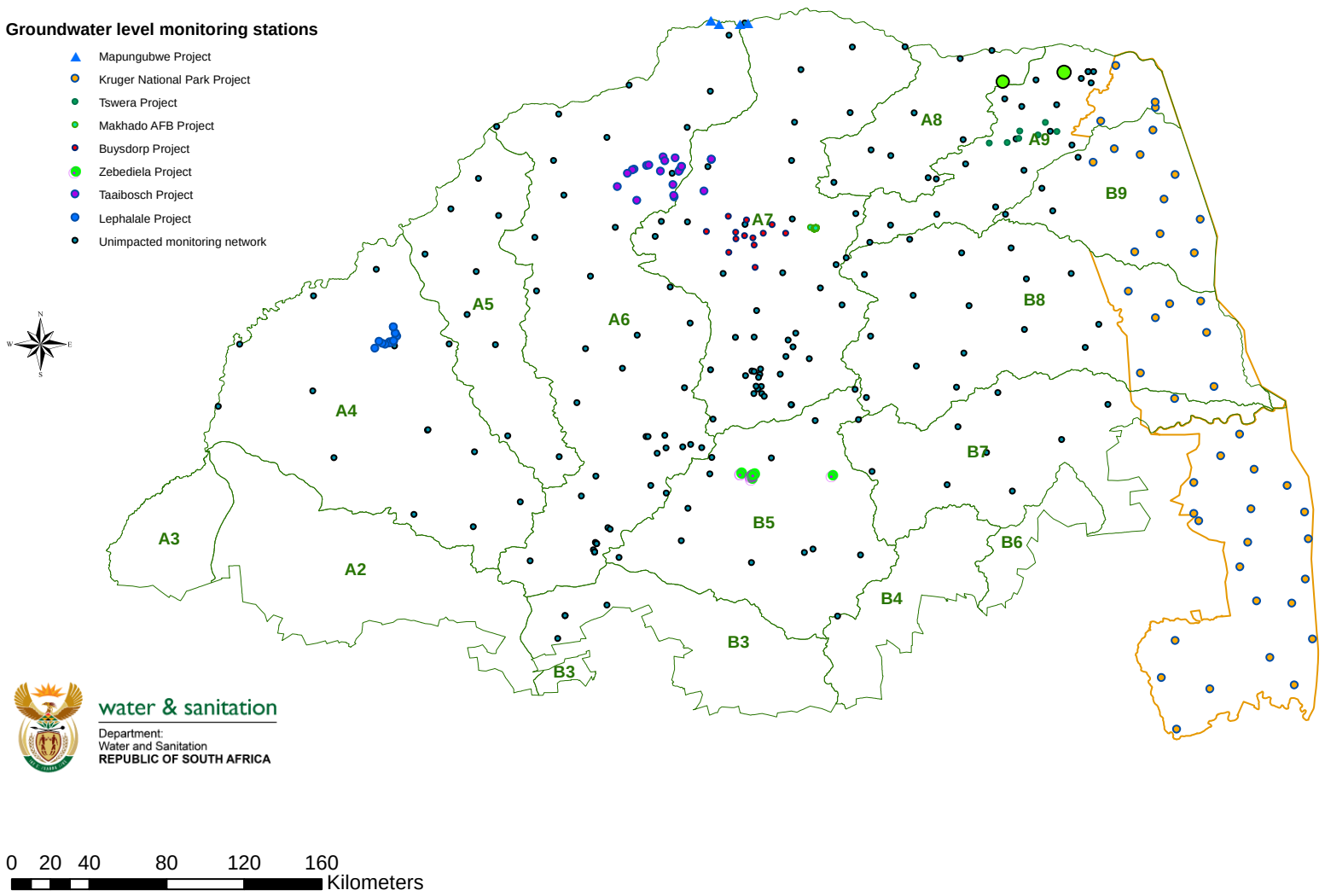
The importance of continuous monitoring over the long-term cannot be denied. Long-term data is crucial to evaluate the status of groundwater resources. To achieve this it is of vital importance that groundwater monitoring stations are maintained to actively monitor groundwater levels continuously for many years. Unfortunately, despite attempts to safeguard the Department`s monitoring stations by the use of specialised locking lids as well as concrete constructions around the boreholes, monitoring stations are lost on a regular basis. Although the steps taken has virtually eliminated plain vandalism the installation of pumping equipment or just pump testing of monitoring borehole by contractors, usually appointed by municipalities or other such service provider, continues.

This normally result in long negotiations, sometimes unsuccessful, to get the use of the borehole back. A new replacement borehole then needs to be drilled at huge costs and not within the area of influence of the existing monitoring borehole now being pumped. Even is the original borehole can be monitored again the continuity of the data string is broken, sometimes for more than 2 years while negotiations are going on. If a new borehole has to be drilled monitoring has to start from scratch again to build up long-term data.

The costs involving each such case are enormous but the cost of lost data is immeasurable.

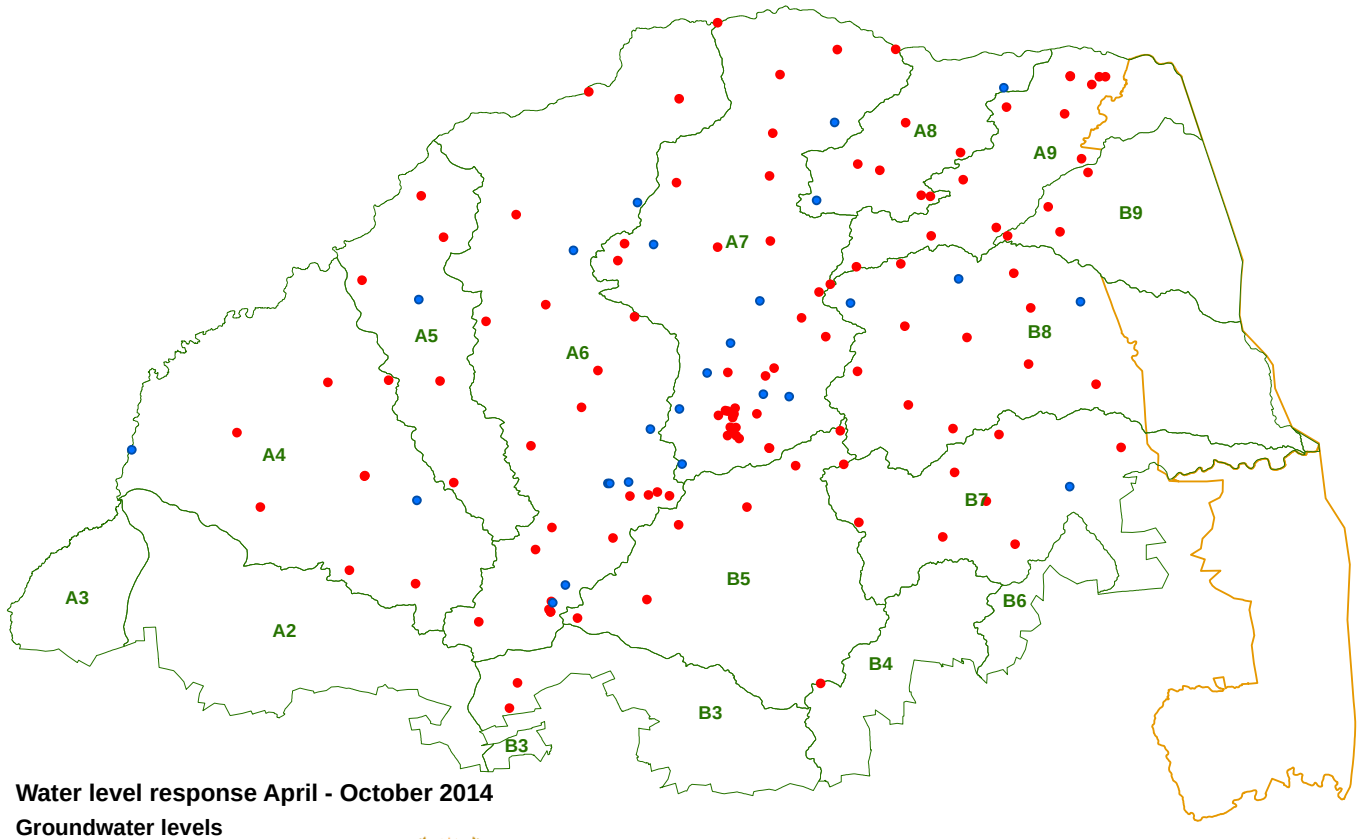
Some examples of such stations is included as PHOTGRAPHS 1 TO 5. At station B8 Mbaula where negotiations have dragged for almost 2 years now more than 22 000 data values have been lost so far from discontinued monitoring.

DISTRIBUTION OF GROUNDWATER LEVEL MONITORING STATIONS LIMPOPO PROVINCE



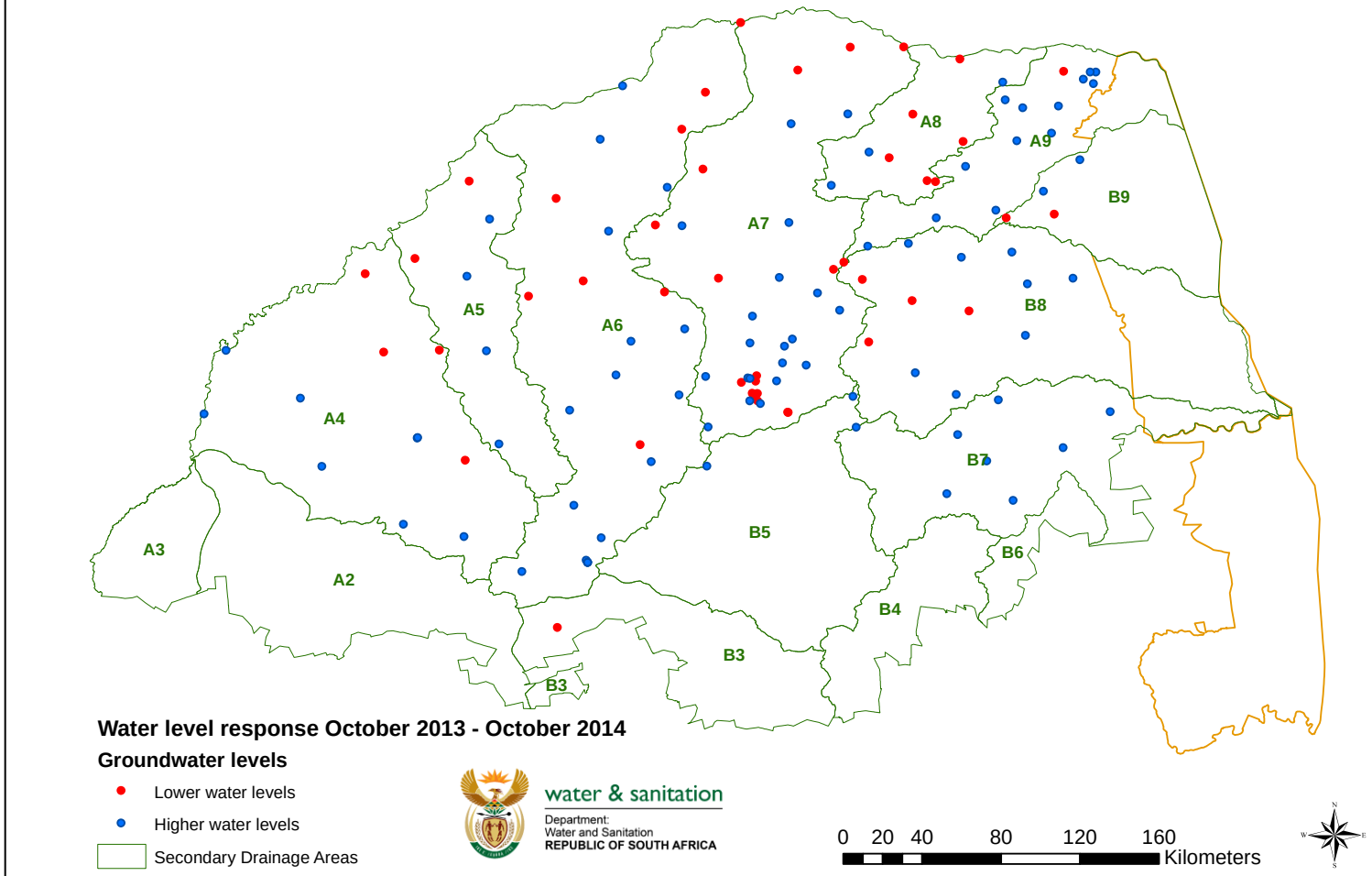
MAP 1

RESPONSE IN GROUNDWATER LEVELS OVER THE PAST DRY SEASON; 1 APRIL TO 1 OCTOBER 2014



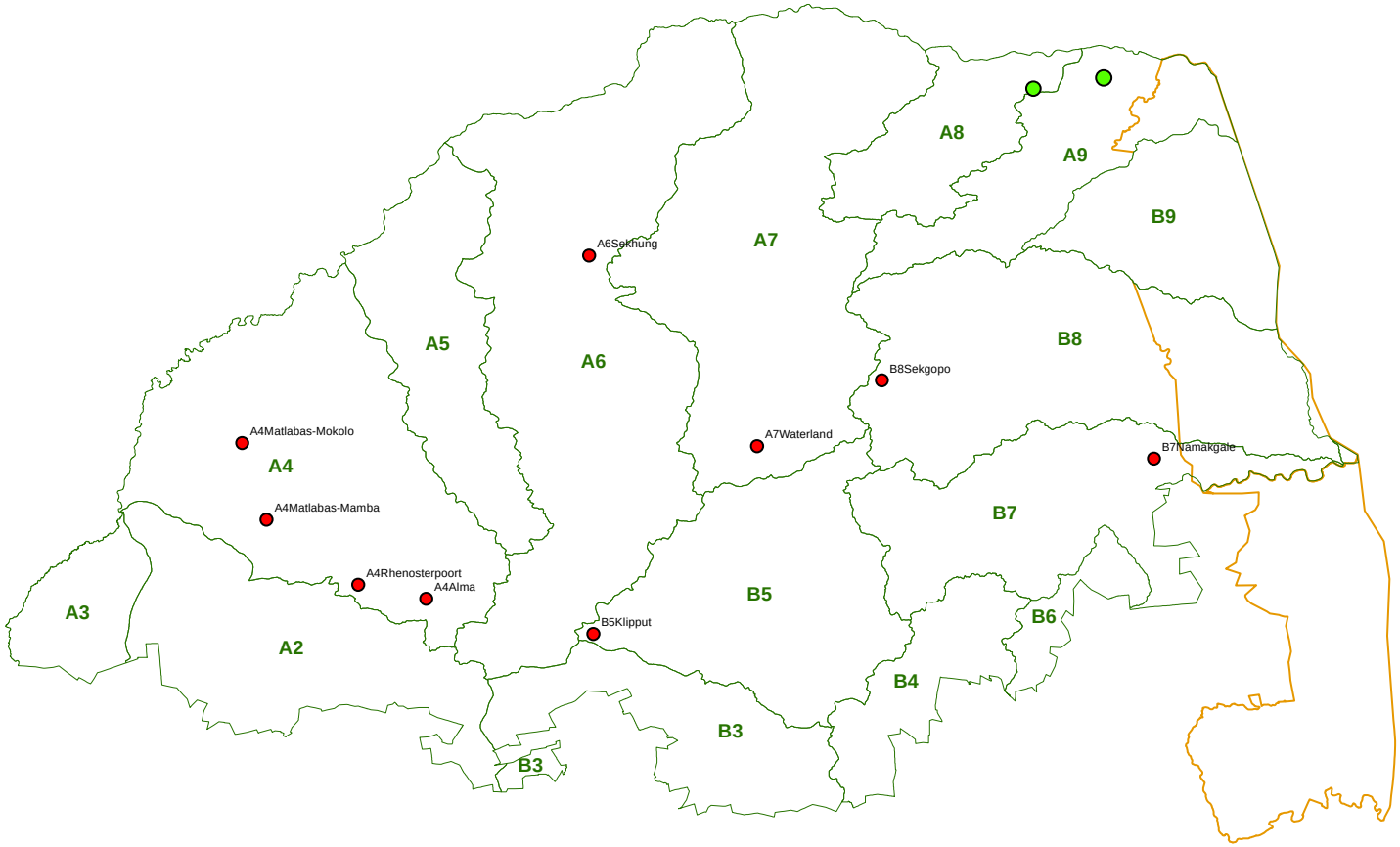
MAP 2

RESPONSE IN GROUNDWATER LEVELS OVER THE PAST HYDROLOGICAL YEAR;

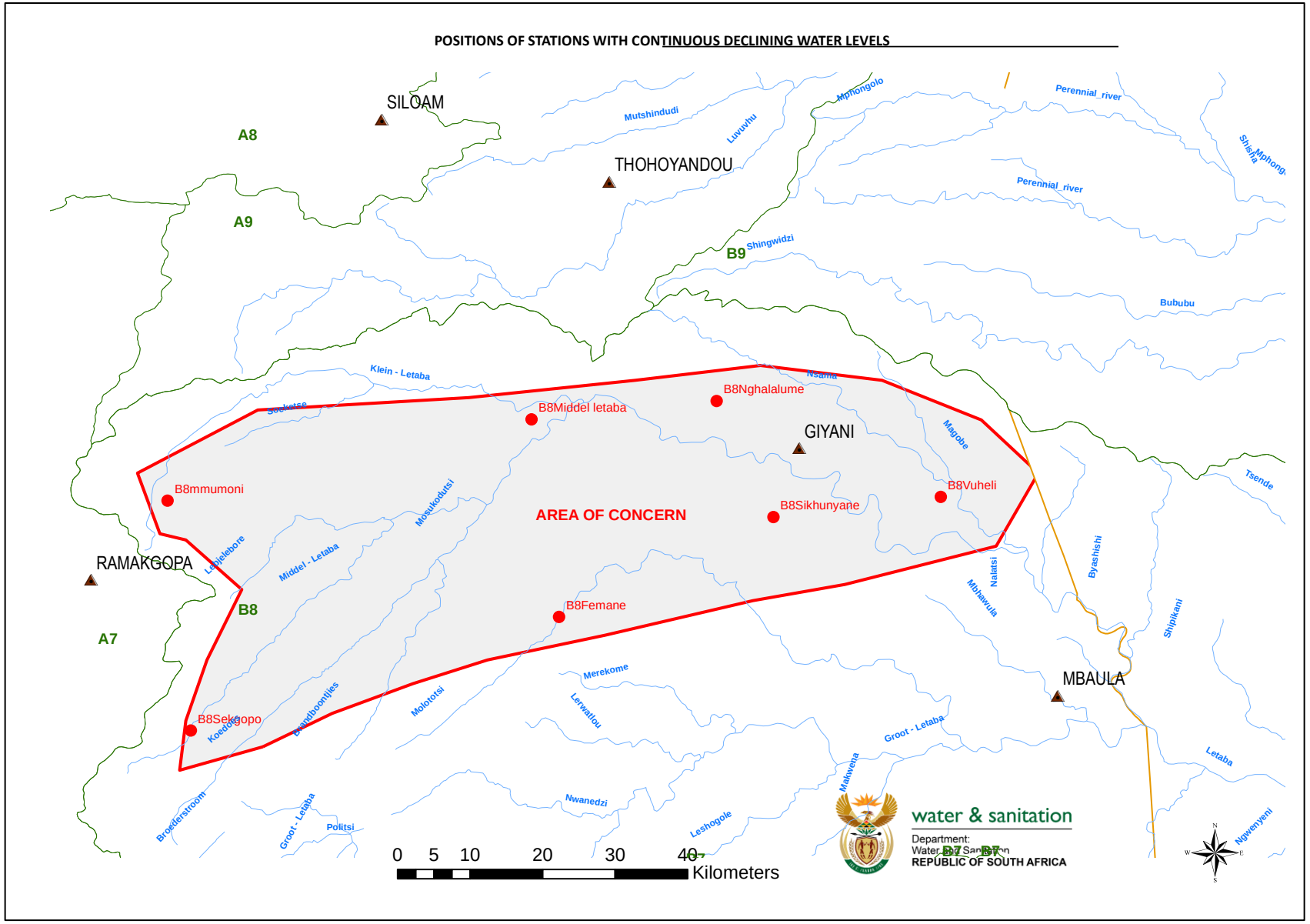


MAP 3

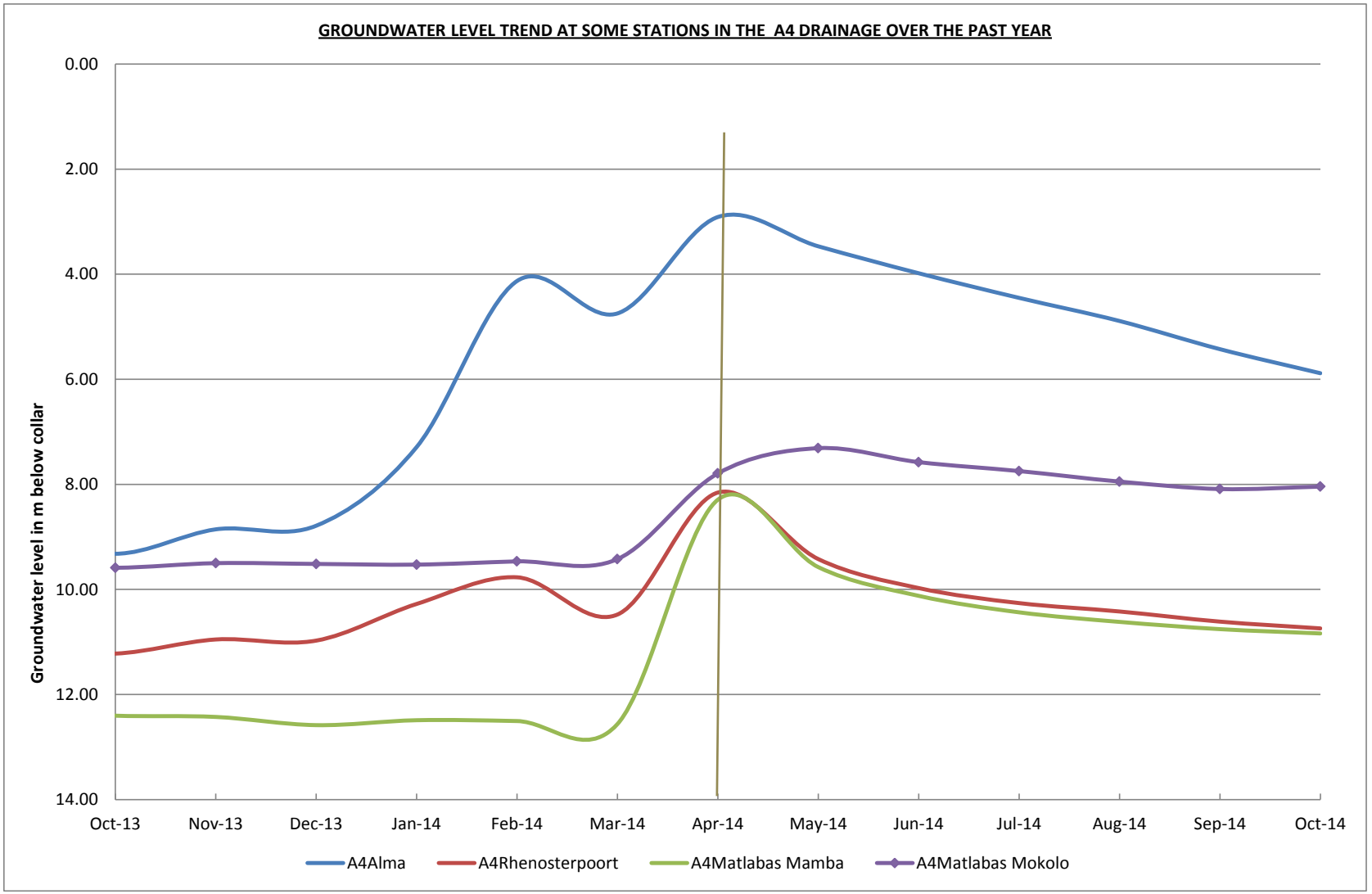
DISTRIBUTION OF GROUNDWATER LEVEL MONITORING STATIONS USED IN EXAMPLE GRAPHS



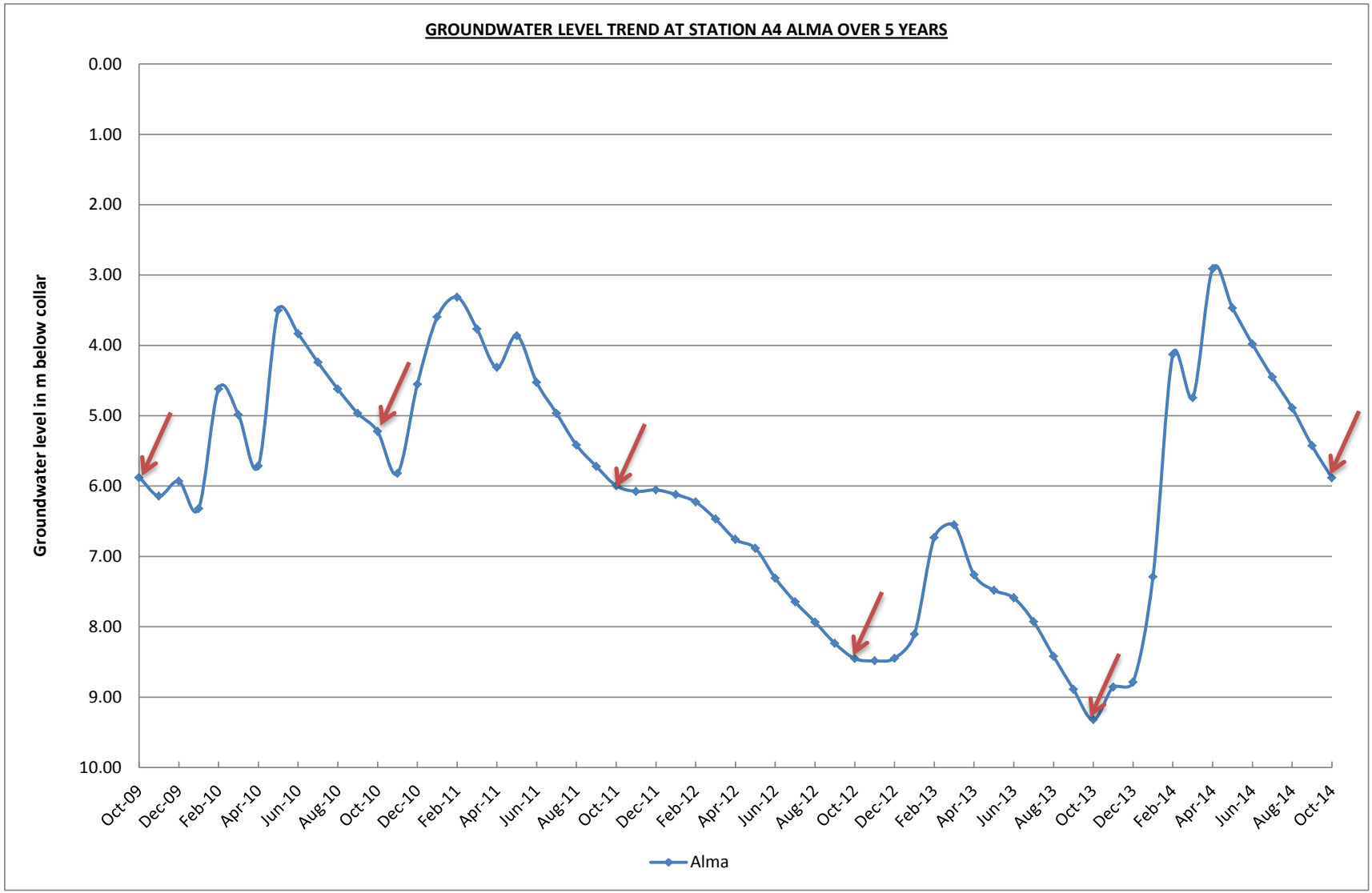
MAP 4


POSITIONS OF STATIONS WITH CONTINUOUS DECLINING WATER LEVELS
SILOAM
THOHOYANDOU
GIYANI
MBAULA
RAMAKGOPA
A8
A9
A7
B8
B9
B8Nghalalume
B8Middel letaba
B8mmumoni
B8Vuheli
B8Sikhunyane
B8Femane
B8Sekgopo
AREA OF CONCERN
Mutshindudi
Luvuvhu
Mphongolo
Perennial river
Shingwidzi
Bububu
Klein - Letaba
Mogalakwena
Magoebe
Tsende
Mosukoduts
Middel - Letaba
Lephalale
Byashishi
Nalatsi
Mbhawula
Shipikani
Merekome
Lerwatlou
Groot - Letaba
Molototsi
Makwena
Letaba
Ngwenyeni
Nwanedzi
Leshogole
Broederstroom
Politsi
Koedoespoort
0 5 10 20 30 40
Kilometers
water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

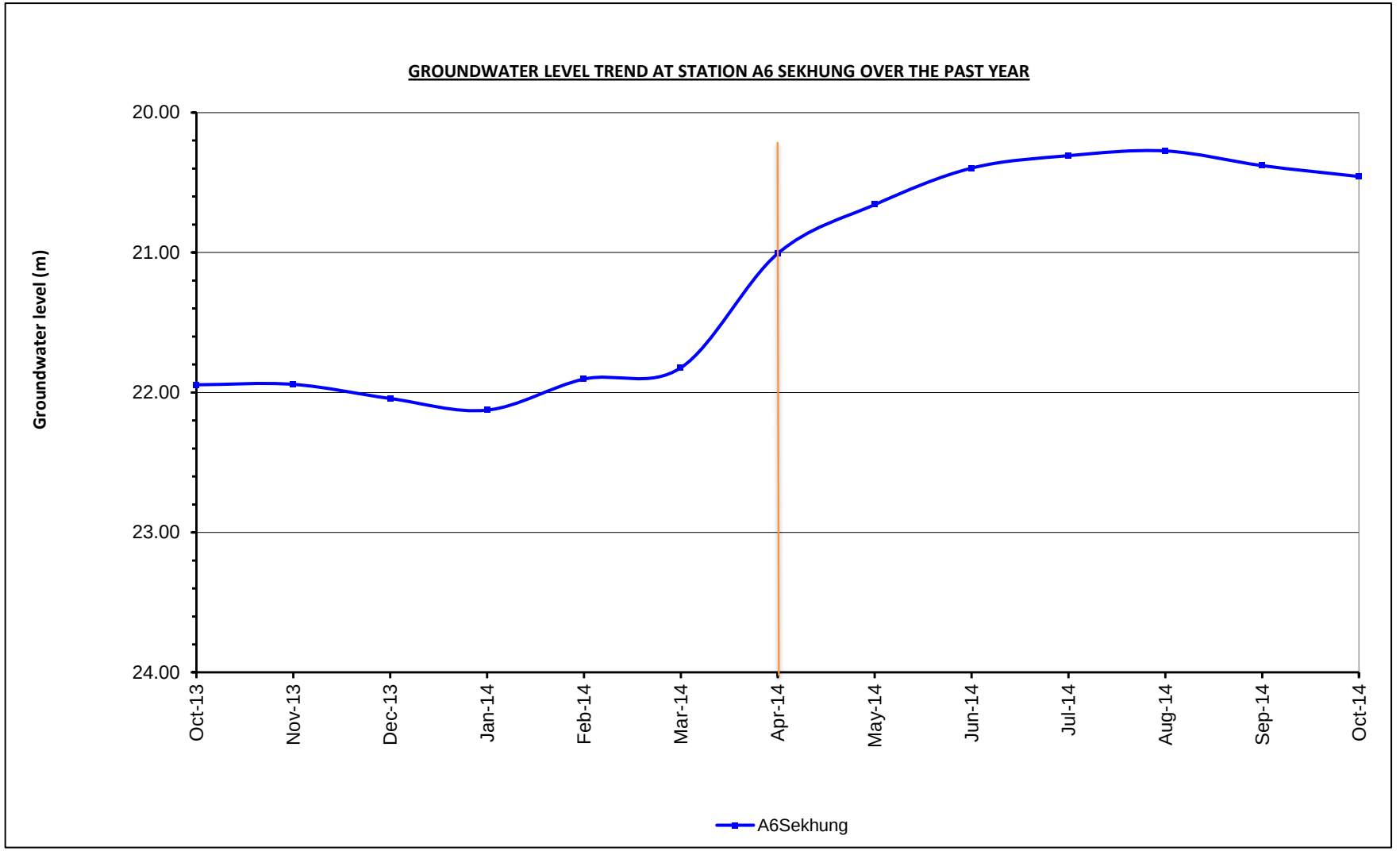
MAP 5


GROUNDWATER LEVEL TREND AT SOME STATIONS IN THE A4 DRAINAGE OVER THE PAST YEAR
Groundwater level in m below collar
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
A4Alma
A4Rhenosterpoort
A4Matlabas Mamba
A4Matlabas Mokolo

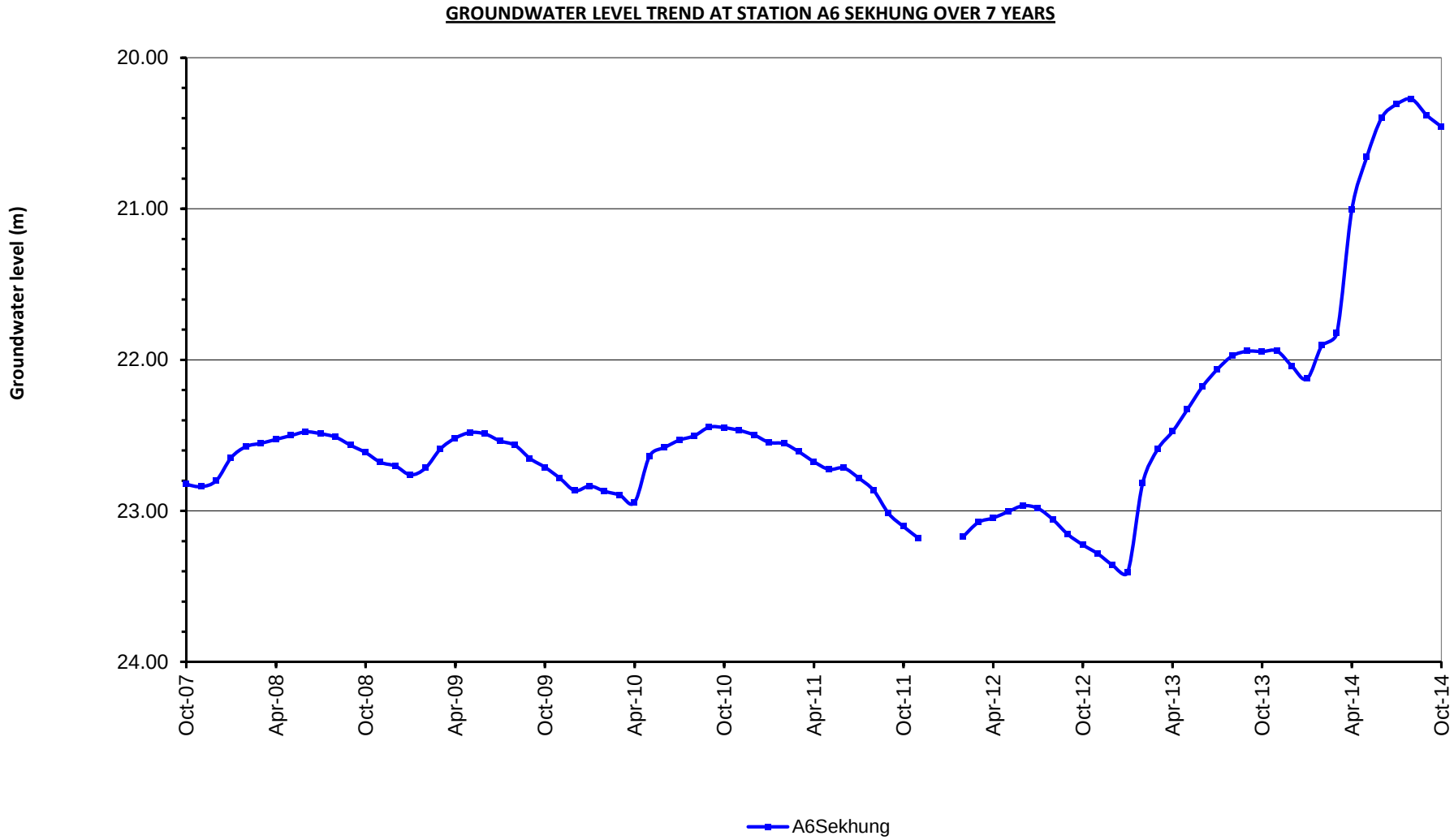
GRAPH 1


GROUNDWATER LEVEL TREND AT STATION A4 ALMA OVER 5 YEARS
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
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
Dec-13
Feb-14
Apr-14
Jun-14
Aug-14
Oct-14
Alma

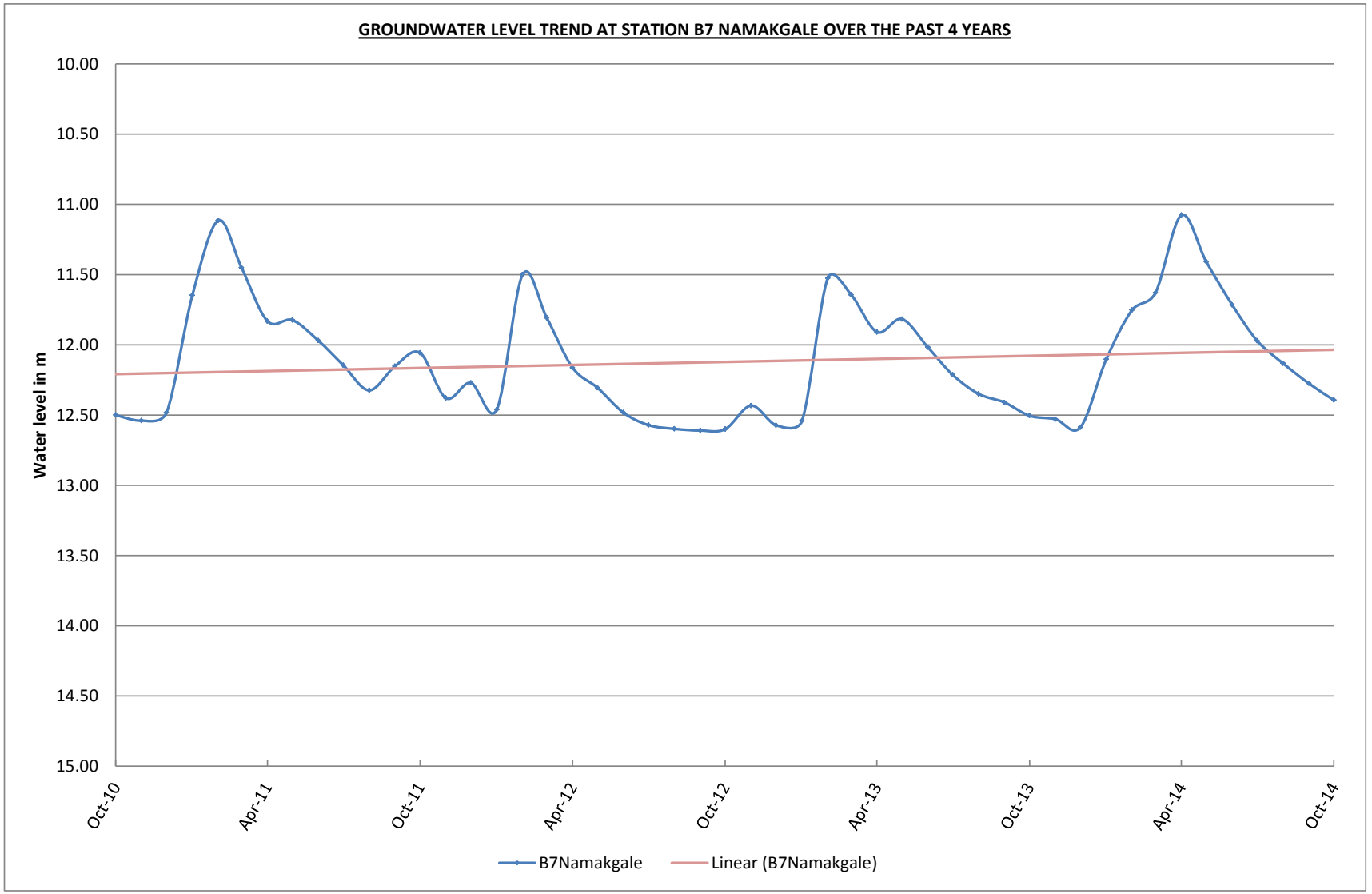
GRAPH 2


GROUNDWATER LEVEL TREND AT STATION A6 SEKHUNG OVER THE PAST YEAR
Groundwater level (m)
20.00
21.00
22.00
23.00
24.00
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
A6Sekhung

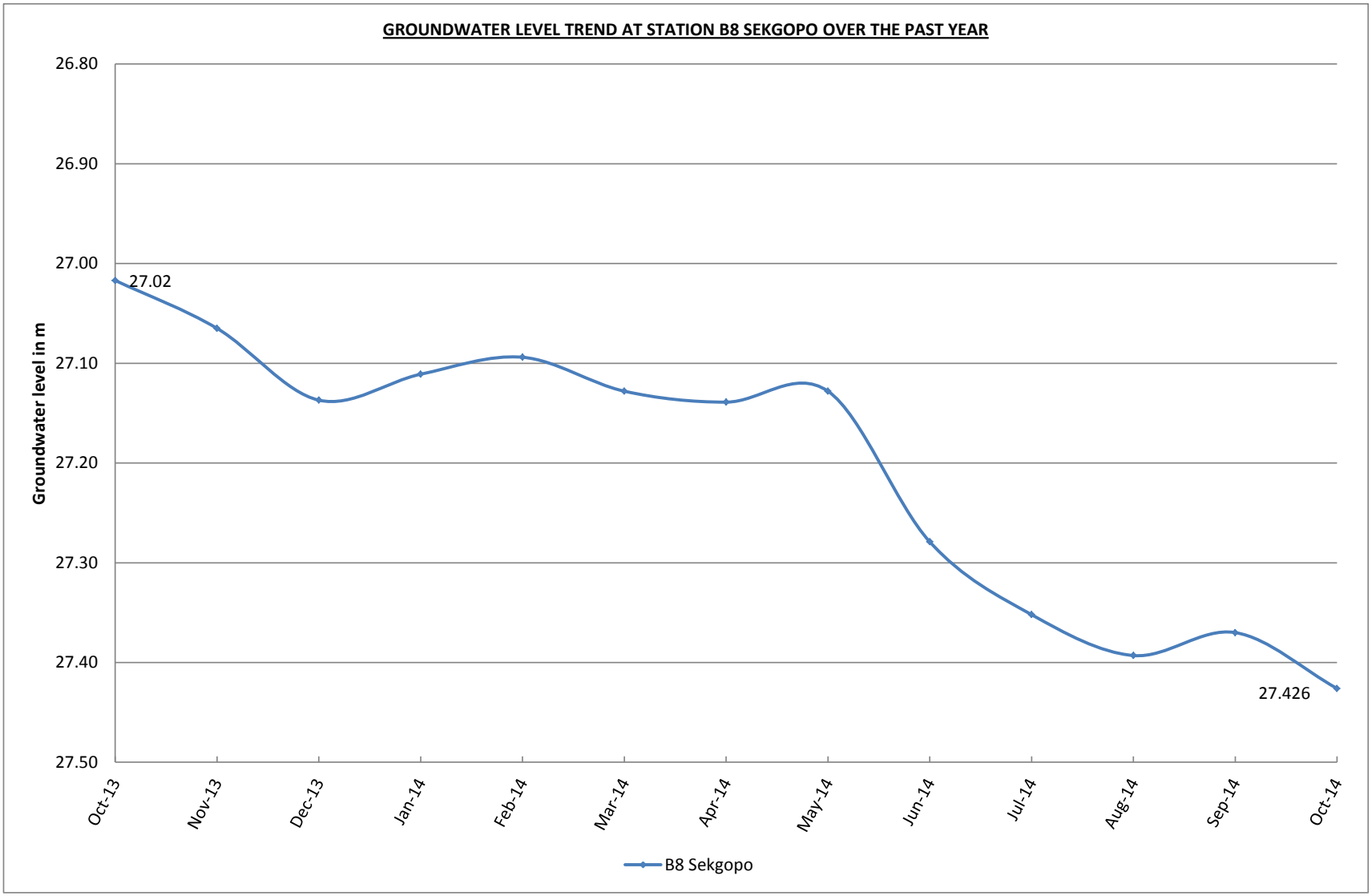
GRAPH 3


GROUNDWATER LEVEL TREND AT STATION A6 SEKHUNG OVER 7 YEARS
Groundwater level (m)
20.00
21.00
22.00
23.00
24.00
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
A6Sekhung

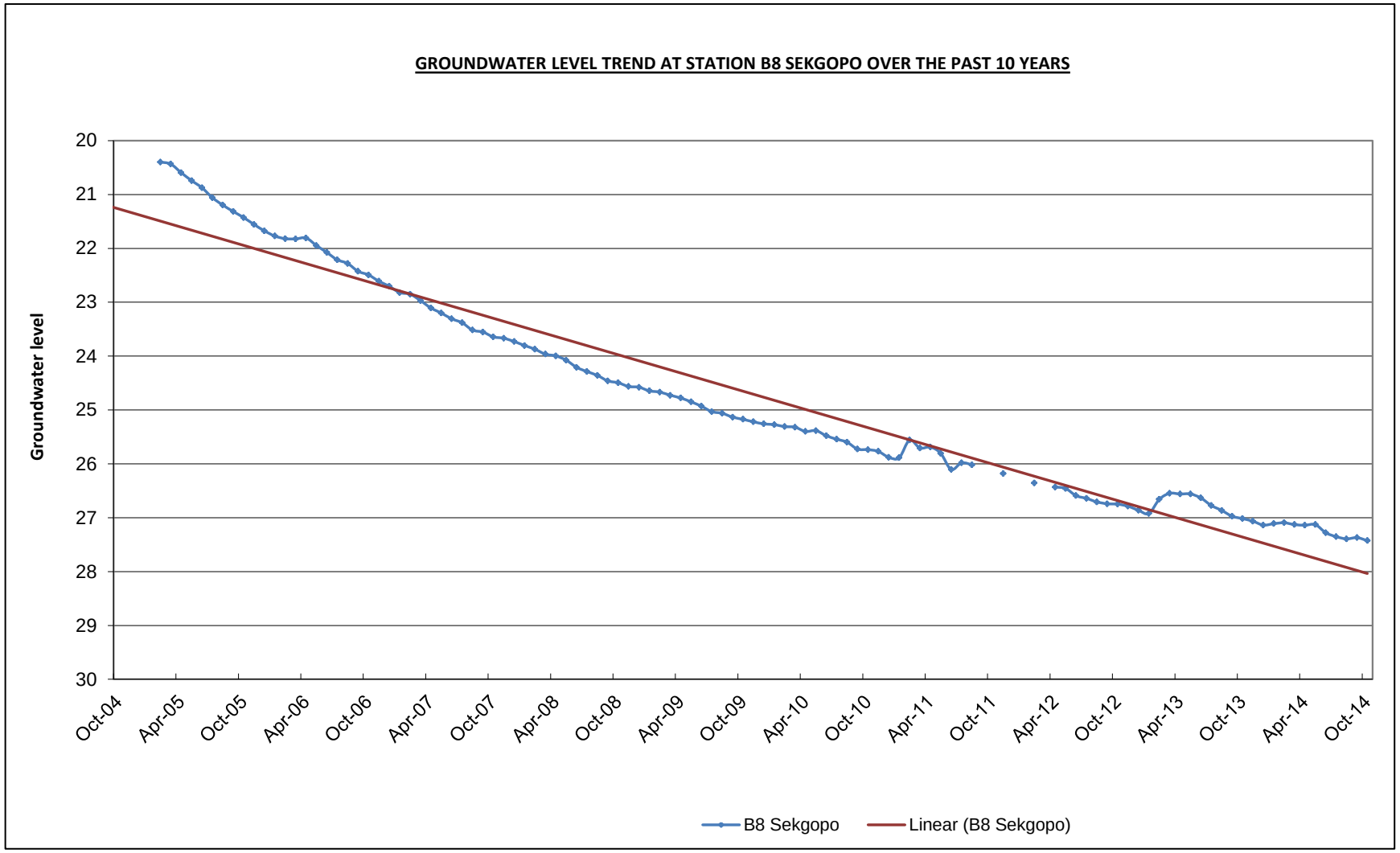
GRAPH 4


GROUNDWATER LEVEL TREND AT STATION B7 NAMAKGALE OVER THE PAST 4 YEARS
Water level in m
10.00
10.50
11.00
11.50
12.00
12.50
13.00
13.50
14.00
14.50
15.00
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
B7Namakgale
Linear (B7Namakgale)

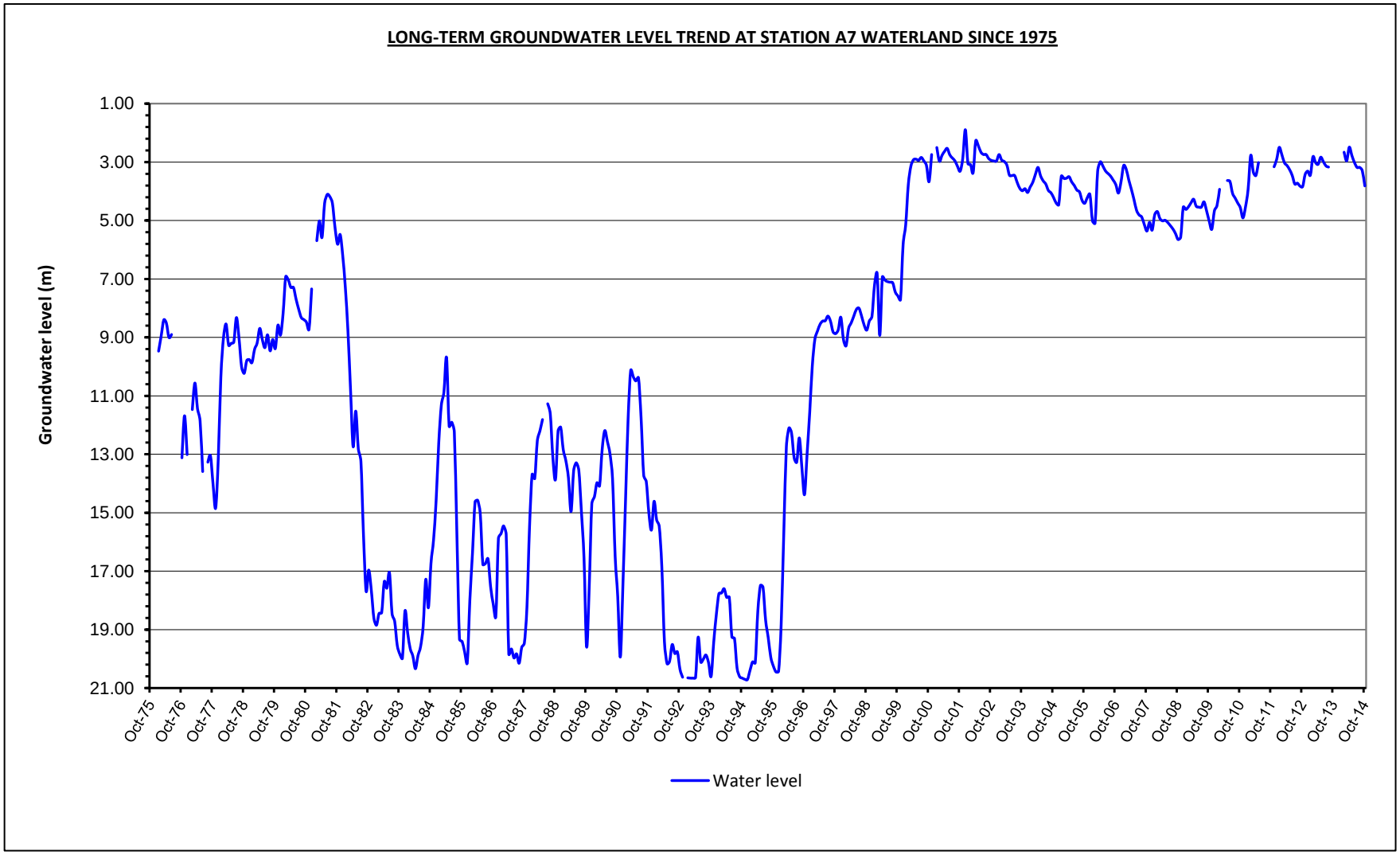
GRAPH 5


GROUNDWATER LEVEL TREND AT STATION B8 SEKGOPO OVER THE PAST YEAR
Groundwater level in m
26.80
26.90
27.00
27.10
27.20
27.30
27.40
27.50
27.02
27.426
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
B8 Sekgopo

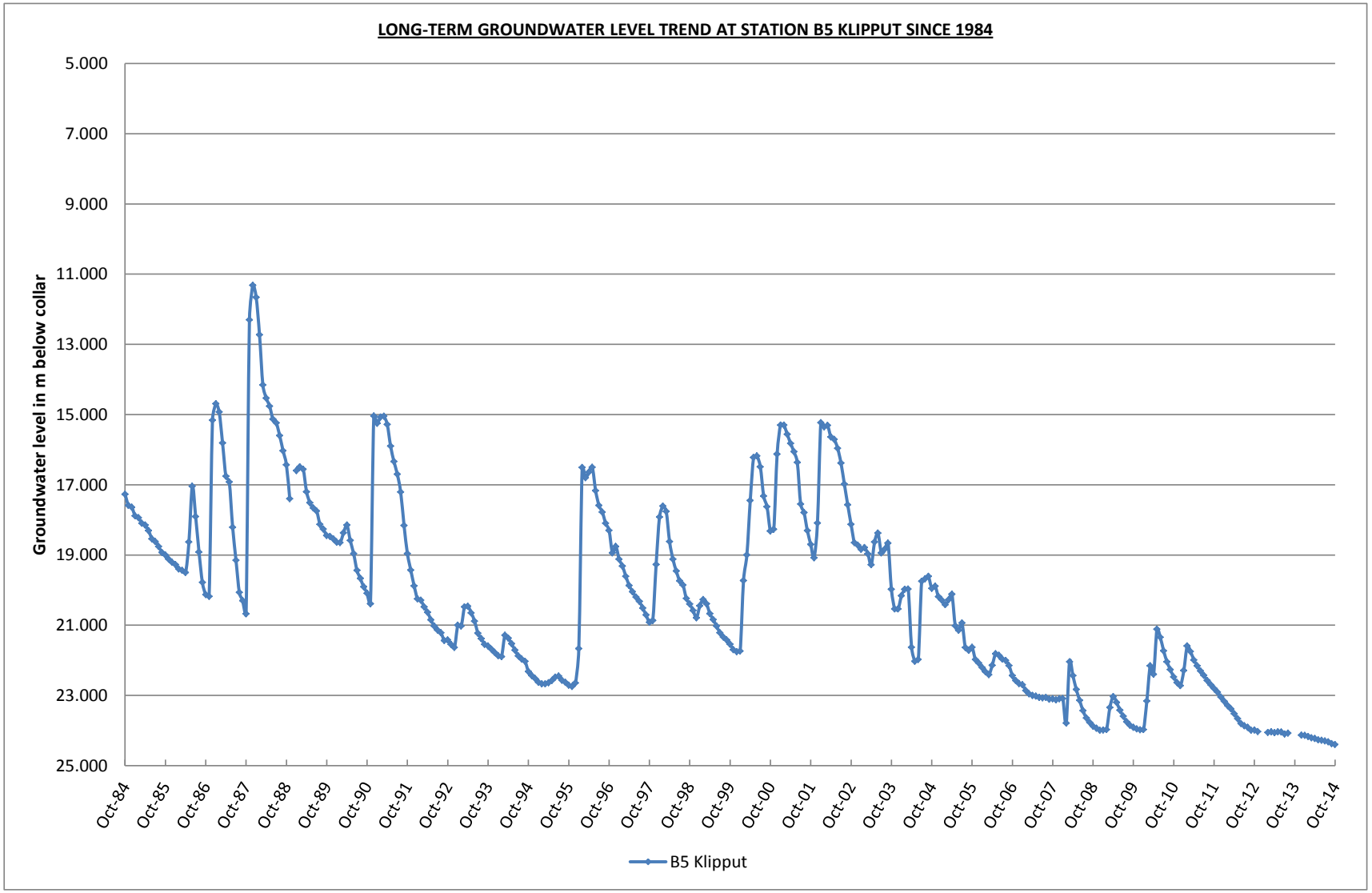
GRAPH 6


GROUNDWATER LEVEL TREND AT STATION B8 SEKGOPO OVER THE PAST 10 YEARS
Groundwater level
20
21
22
23
24
25
26
27
28
29
30
Oct-04
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
B8 Sekgopo
Linear (B8 Sekgopo)

GRAPH 7


LONG-TERM GROUNDWATER LEVEL TREND AT STATION A7 WATERLAND SINCE 1975
Groundwater level (m)
1.00
3.00
5.00
7.00
9.00
11.00
13.00
15.00
17.00
19.00
21.00
Oct-75
Oct-76
Oct-77
Oct-78
Oct-79
Oct-80
Oct-81
Oct-82
Oct-83
Oct-84
Oct-85
Oct-86
Oct-87
Oct-88
Oct-89
Oct-90
Oct-91
Oct-92
Oct-93
Oct-94
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Water level

GRAPH 8


LONG-TERM GROUNDWATER LEVEL TREND AT STATION B5 KLIPPUT SINCE 1984
Groundwater level in m below collar
5.000
7.000
9.000
11.000
13.000
15.000
17.000
19.000
21.000
23.000
25.000
Oct-84
Oct-85
Oct-86
Oct-87
Oct-88
Oct-89
Oct-90
Oct-91
Oct-92
Oct-93
Oct-94
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
B5 Klipput

GRAPH 9

PHOTOGRAPH 1; B8 MBAULA

PHOTOGRAPH 2; B7 BISMARCK

PHOTOGRAPH 3; A9 ELIM

PHOTOGRAPH 4; B 8 NWAMITWA

PHOTOGRAPH 5; B5 DITHLOPANENG