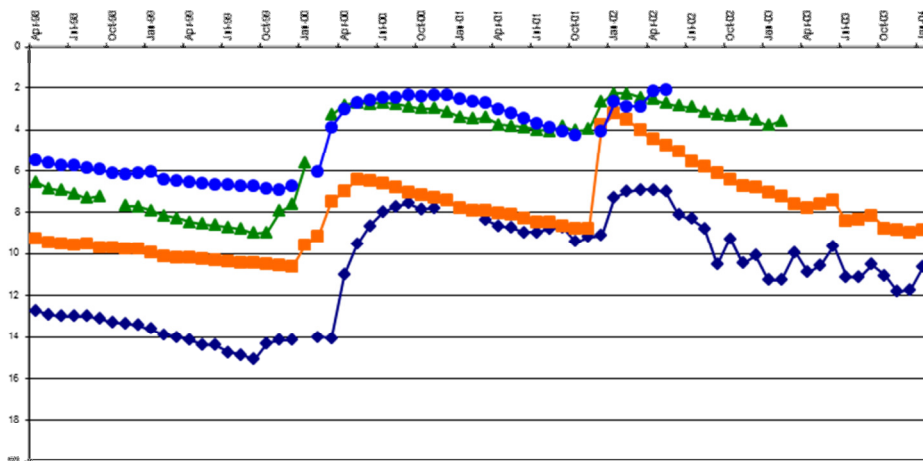


LIMPOPO REGION

QUARTERLY STATUS REPORT ON GROUNDWATER LEVEL TRENDS



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**DIRECTORATE
WATER REGULATION AND USE
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SUMMARY

The current wet season has reached midpoint and 68.5% of groundwater levels monitored indicates some rise since the start of the season. The groundwater level at 53.3% of stations monitored is currently lower than the corresponding time last year.

Despite a general slow declining trend evident at a large number of stations for some years indications are that the overall condition of the aquifers is good and well above levels of concern.

Late season rainfall during March was very intense in some areas and groundwater levels in these areas are expected to respond favourably by the end of the season.

Sound resource management is necessary to ensure that the current favourable condition of the resource is maintained as much as possible to enable the sustainable use over the long-term.

1. BACKGROUND

The permanent groundwater level monitoring network in Limpopo currently consists of 188 monitoring stations. Water level data is collected and analysed quarterly to compile this report. 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.

Loss of the use of stations sometimes occur for various reasons of which installation of pumping equipment by municipalities or other service providers is the major cause.

All stations are not always accessible, mostly due to extreme wet conditions in the rainy season, which result in data not available for both dates.

Groundwater level data for this report was collected during February 2014. 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. RAINFALL

2.1. RAINFALL RECORDED; NOVEMBER 2013 TO FEBRUARY 2014 (MAP 4)

Available rainfall data for November 2013 to end of February 2014 were used for compilation of map 4. The highest rainfall recorded for the first half of the rainy season was, as is normally the case, mostly long the escarpment. The upper or recharge areas of the A9 and B8 drainages received the highest rainfall up to this stage. Heavy rains occurred in various parts of the Province during March 2014 resulting in serious flooding in some areas. Groundwater levels in these areas would probably indicate a very positive response after the end of the wet season.

3. GROUNDWATER LEVELS

3.1 GROUNDWATER LEVEL RESPONSE; NOVEMBER 2013 TO FEBRUARY 2014

November 2013 to February 2014

Total	188	Stations

With data	162	Stations	86.2%
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Water level			Average(m)	%
Down	49	Stations	-0.67	30.25%
Up	111	Stations	1.42	68.52%
Na change	2	Stations		1.23%
No Data	26	Stations		16.05%

The data in table above represent that since the start to midway of the current wet season. Higher groundwater levels were recorded at 111 (68.5%) of the stations with data for the period indicating possible early season recharge.

The distribution of stations with higher or lower groundwater levels is shown on MAP 2.

3.2 GROUNDWATER LEVEL RESPONSE; FEBRUARY 2013 TO FEBRUARY 2014

February 2013 to February 2014

Total	188	Stations

With data	169	Stations	89.9%
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Water level			Average(m)	%
Down	90	Stations	-1.47	53.25%
Up	78	Stations	1.14	46.15%
Na change	1	Stations		0.59%
No Data	19	Stations		11.24%

Groundwater levels are lower at 90 (53.25%) of the stations with data available since the corresponding time last year. A slow but constant decline in groundwater levels regarded as a normal trend has been noted for some years now. Long-term data indicate that the current status is generally still healthy. The distribution of stations with higher or lower groundwater levels is shown on MAP 3.

4. GROUNDWATER LEVEL TRENDS IN THE A4 DRAINAGE

Spatially, groundwater level trends may differ due to a number of reasons. The groundwater level trends of a few stations in the A4 drainage were selected as illustration of one such case. Groundwater flow, as with surface water, drains from the higher lying upper reaches, or recharge area, towards the lower discharge area. Normally, especially if mountainous, recharge areas receive higher rainfall than the lower lying areas. The effect of recharge and subsequent outflow, or discharge, on groundwater levels is more pronounced than in the lower area depending for most of the recharge on outflow from the higher parts.

4.1. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE RECHARGE AREA OF THE A4 DRAINAGE (MAP 5) (GRAPH 1)

The groundwater level trends depicted by graph 1 clearly illustrate the sudden rises due to seasonal recharge followed by outflow again. The trend for A4Matlabas Mamba situated further downstream is much more subdued than that at A4Alma and A4Rhenosterpoort and clear indication of recent recharge exists at the latter two stations while hardly noticeable at A4Matlabas Mamba yet.

4.2. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE DISCHARGE AREA OF THE A4 DRAINAGE (MAP 5) (GRAPH 2)

In contrast to the trends as discussed above, recharge and discharge events in this area are indicated by slow very subdued rises or declines over a period of time. The area is a low impacted groundwater area and groundwater levels indicate stable conditions.

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

(Locations of stations used in the graphs are shown on MAP 6)

5.1. GROUND WATER LEVEL TRENDS AT SOME STATIONS IN THE A5 DRAINAGE (GRAPH 3)

Groundwater levels indicate some seasonal fluctuations with a slow decline over some years present at all. The decline at A5Setateng is more pronounced and may be affected by abstraction in the area although no direct pumping effect is displayed.

5.2. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A6 DRAINAGE (GRAPH 4)

Stations selected are located in the middle (Storage) and lower (Discharge) areas of the catchment and is regarded as a good reflection of the general trend over the past few years. Stable conditions with normal seasonal fluctuations are displayed but an underlying slight decline since 2009 is present. The sudden rise in January 2013 is only present in this drainage at stations located near the Limpopo when the river was in flood and the area received high rainfall incidents.

5.3. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A7 DRAINAGE (GRAPH 5)

The displayed trends are very similar to that of graph 4. Despite the fact that A7Roodewal and A7Mara both are located along the Sand River while A7Sekiding 2 is in the Blouberg area, there is still corresponding trends. A7Mara represent the alluvial aquifer next to the river and the sudden rise in water level during river flow is clear.

5.4. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A8 DRAINAGE (GRAPH 6)

The stations presented in graph 6 are located in the recharge area of the catchment. A seasonal fluctuation of recharge and outflow is clearly displayed with conditions quite stable. Early season recharge is evident at all three stations for the current wet season.

5.5. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A9 DRAINAGE (GRAPH 7)

Groundwater levels in the A9 drainage had a more marked declining trend than elsewhere over the past few years and some concern were raised, especially in the Tswera area. It can be seen on the graphs that a steady decline with little to now seasonal recharge is displayed from 2007 to 2013. The area experience flooding in January 2013 and groundwater levels recovered well. Only at A9Tshirunzini the recovery was not complete.

5.6. B3 DRAINAGE; EXAMPLES OF IMPACTED AND NON IMPACTED AQUIFERS

5.6.1. B3 DRAINAGE; EXAMPLE OF AQUIFER NOT IMPACTED BY ABSTRACTION (GRAPH 8)

Both stations used are new monitoring stations with data strings starting in 2011. Hardly any fluctuation is displayed but a steady slow decline is evident since 2011. The water level at B3settlers 2 indicates a possible effect from abstraction but not to a great extent.

5.6.2. B3 DRAINAGE; EXAMPLE OF AQUIFER HEAVILY IMPACTED BY ABSTRACTION (GRAPH 9)

The effect of abstraction from 2002 to 2008 is clearly illustrated by the graph 9 and the groundwater level at B3Tuinplaas declined by 50 meters. The reason for the recovery from 2008 to 2011 is not clear but the users possibly experienced problems due to the declined levels and stopped abstraction for a while. Since 2011 the levels are declining fast again in contrast with that indicated by the previous graph.

5.7. LONG-TERM GROUNDWATER LEVEL TRENDS OF TWO STATIONS IN THE B5 DRAINAGE (GRAPH 10)

This graph is included to give better perspective on the current state of groundwater levels versus historical. By 1995 the Province was experiencing great difficulties due to the declined ground water levels throughout the province. These levels were the result of a prolonged drought lasting some years and are considered a critical indicator level. The trends displayed indicate that the current groundwater levels are well above the critical level. Comparison of the latter part of the graphs from 2006 to current with the trends where no long-term data is available corresponds well with most, with the A9 drainage a clear exception. The correspondence over the past few years may indicate that the same is valid for historical conditions in the areas without long-term data indicating that the overall groundwater situation is generally healthy.

5.8. GROUNDWATER LEVEL TRENDS OF TWO STATIONS IN THE B7 DRAINAGE (GRAPH 11)

The main trend at both stations is basically the same with peaks at B7Rubbervale being much more pronounced. Unfortunately there is a large data gap due to the borehole being taken over and a pump installed for some time.

5.9. B8 DRAINAGE; DIFFERENT WATER LEVEL TRENDS, KLEIN AND GROOT LETABA RIVER DRAINAGES

The Groot Letaba River with a number of minor tributaries drains the southern part of the B8 drainage from west to east. The northern part of the drainage is drained from west to north east and then south east to the confluence with the Groot Letaba at the Kruger National Park border by the Klein Letaba River and its tributaries.

5.9.1 GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE B8 DRAINAGE ASSOCIATED WITH THE KLEIN, MIDDEL LETABA AND KOEDOES RIVER DRAINAGES (GRAPH 12)

The groundwater level trends displayed in this part of the drainage are similar to that of the A9 drainage as discussed under 5.5 above. There is little seasonal fluctuation apparent since 2006 when monitoring started. The steady declining trend is however prominent.

5.9.2. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE B8 DRAINAGE ASSOCIATED WITH THE GROOT LETABA RIVER DRAINAGE (GRAPH 13)

Stations in the southern part of the B8 drainage drained by the Groot Letaba River system indicate the opposite trends than that of the Klein Letaba River system to the north. Seasonal fluctuation is prominent and the underlying trend is a slightly rising one.

5.10. GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE B9 DRAINAGE (GRAPH 14)

Despite clear seasonal fluctuation, trends indicate a steady but slow decline as well. Recharge in the previous wet season was considerable compared to the period between 2006 and 2013. Some early season recharge is notable for the current wet season and may be more positive by the end of the season.

6. IMPORTANCE OF GROUNDWATER MANAGEMENT

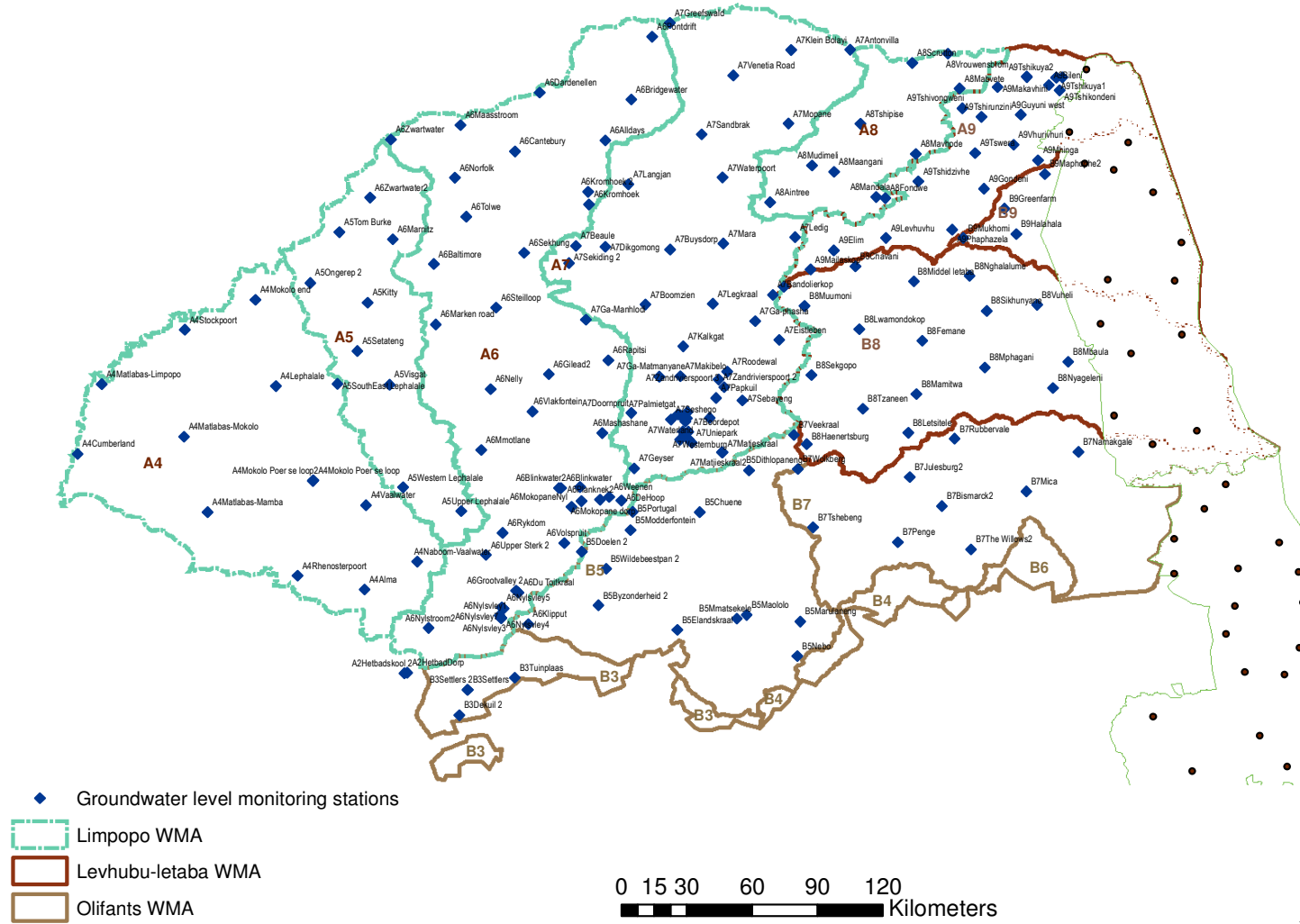
Graph 9 illustrating some trends in the B3 drainage serves as indication how important proper management of the resource is. Without management it is doomed to fail at some point which may result in a critical situation that could have been prevented.

7. ACKNOWLEDGEMENT

info@weathersa.co.za<http://www.weathersa.co.za/>

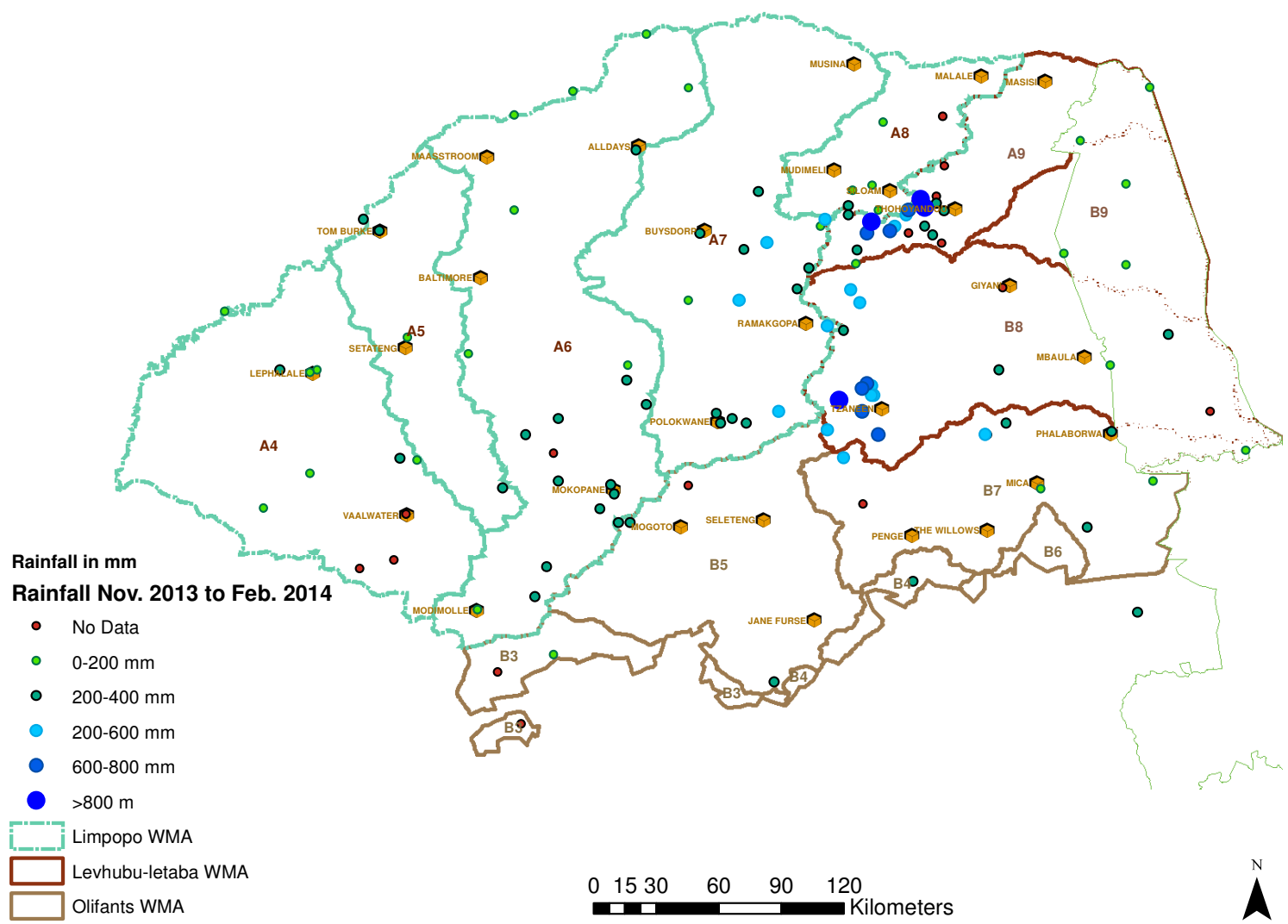
(Rainfall data for Limpopo Province)

**POSITIONS OF GROUNDWATER LEVEL MONITORING STATIONS
LIMPOPO NETWORK**



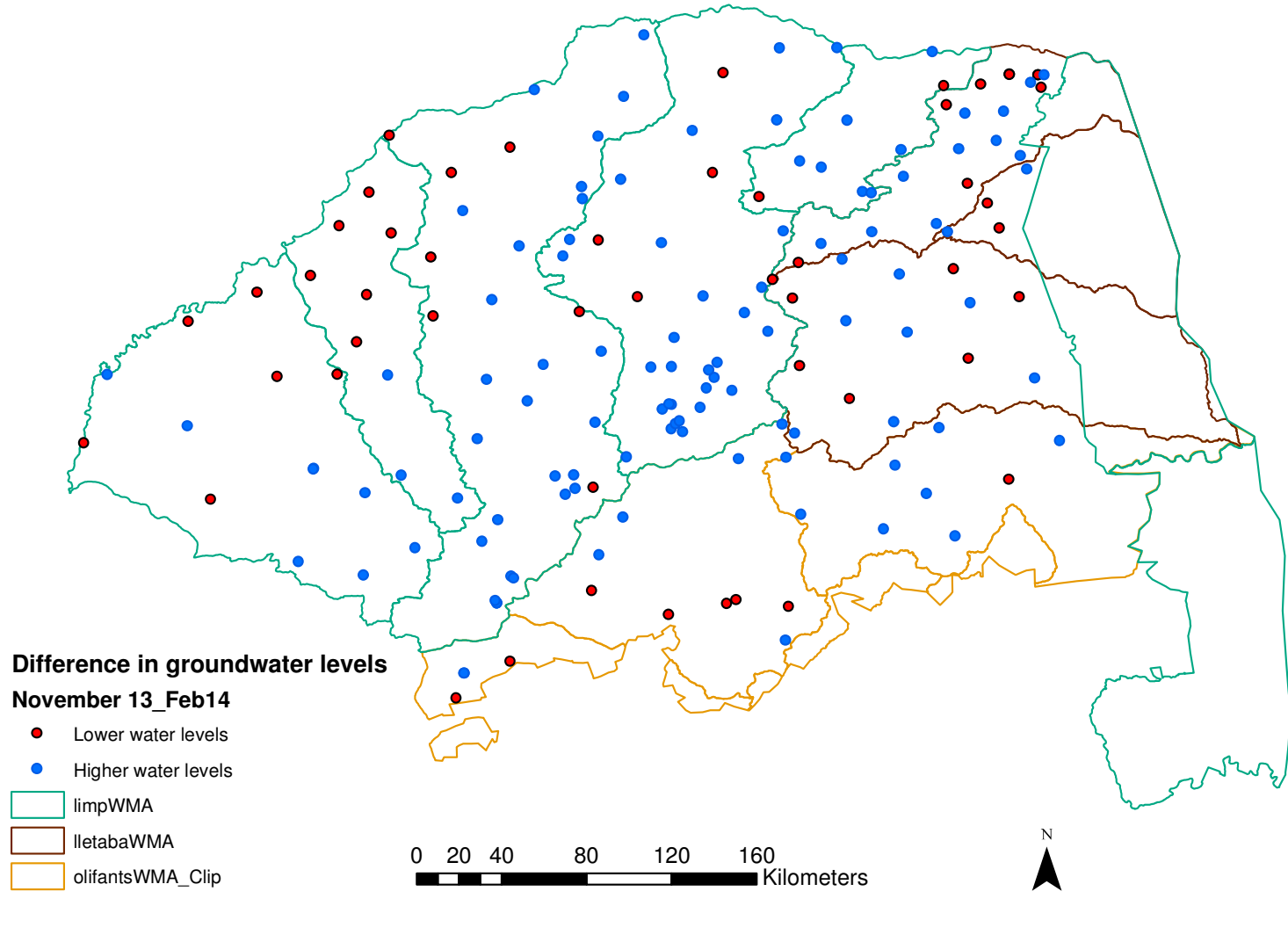
MAP 1

Rainfall recorded; November 2013 to February 2014



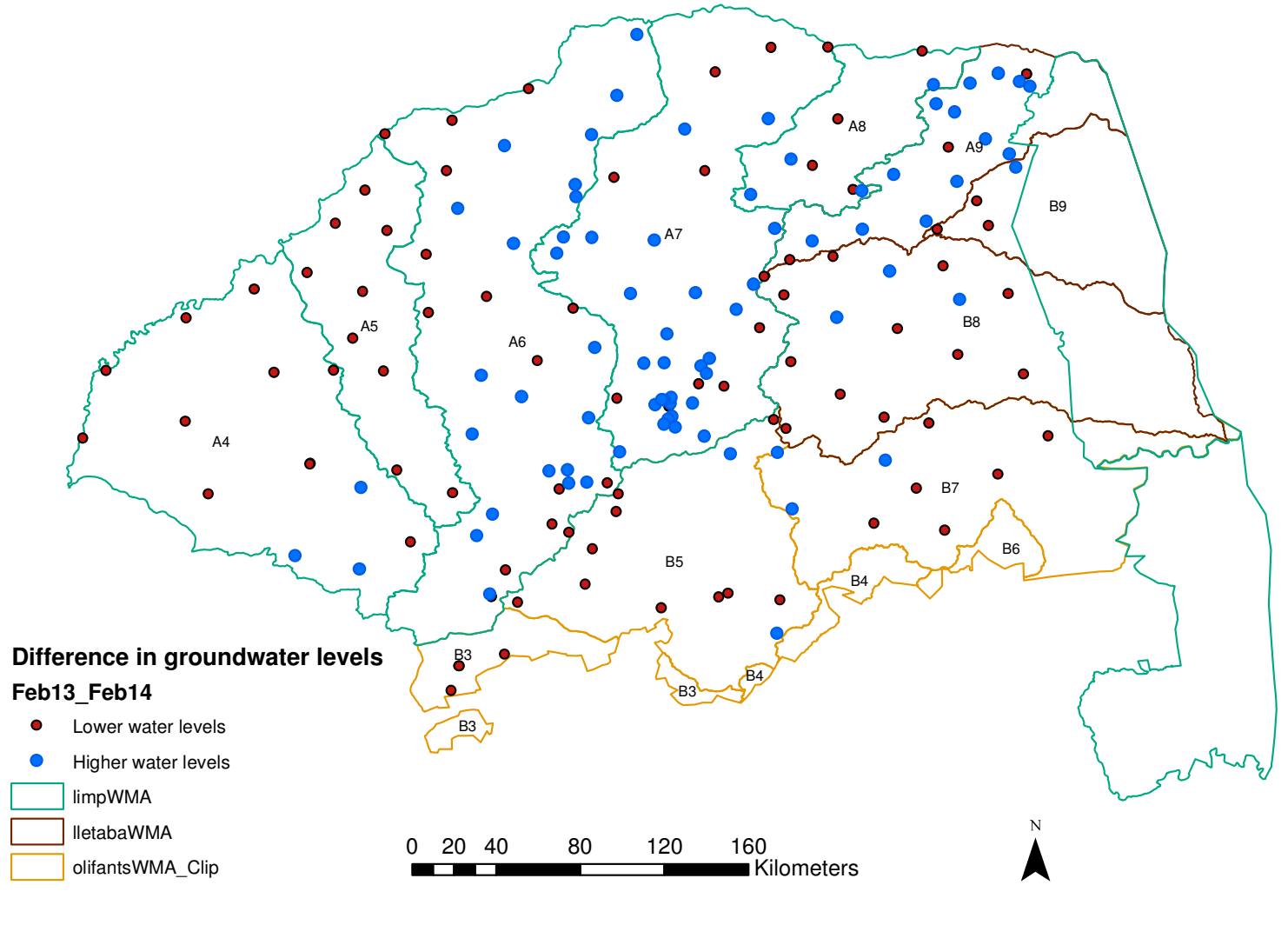
MAP 2

Groundwater level response; November 2013 to February 2014



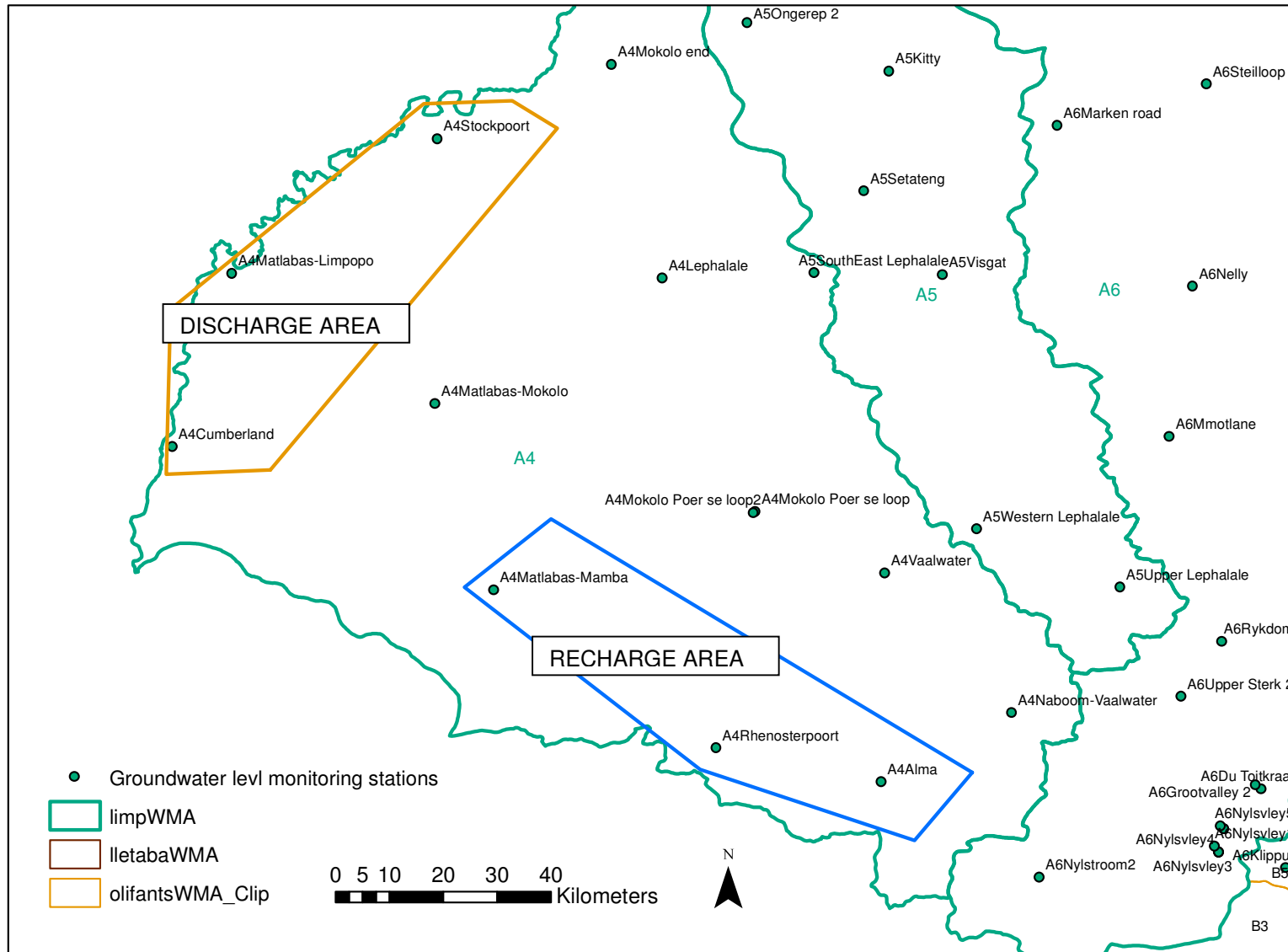
MAP 3

Groundwater level response; February 2013 to February 2014



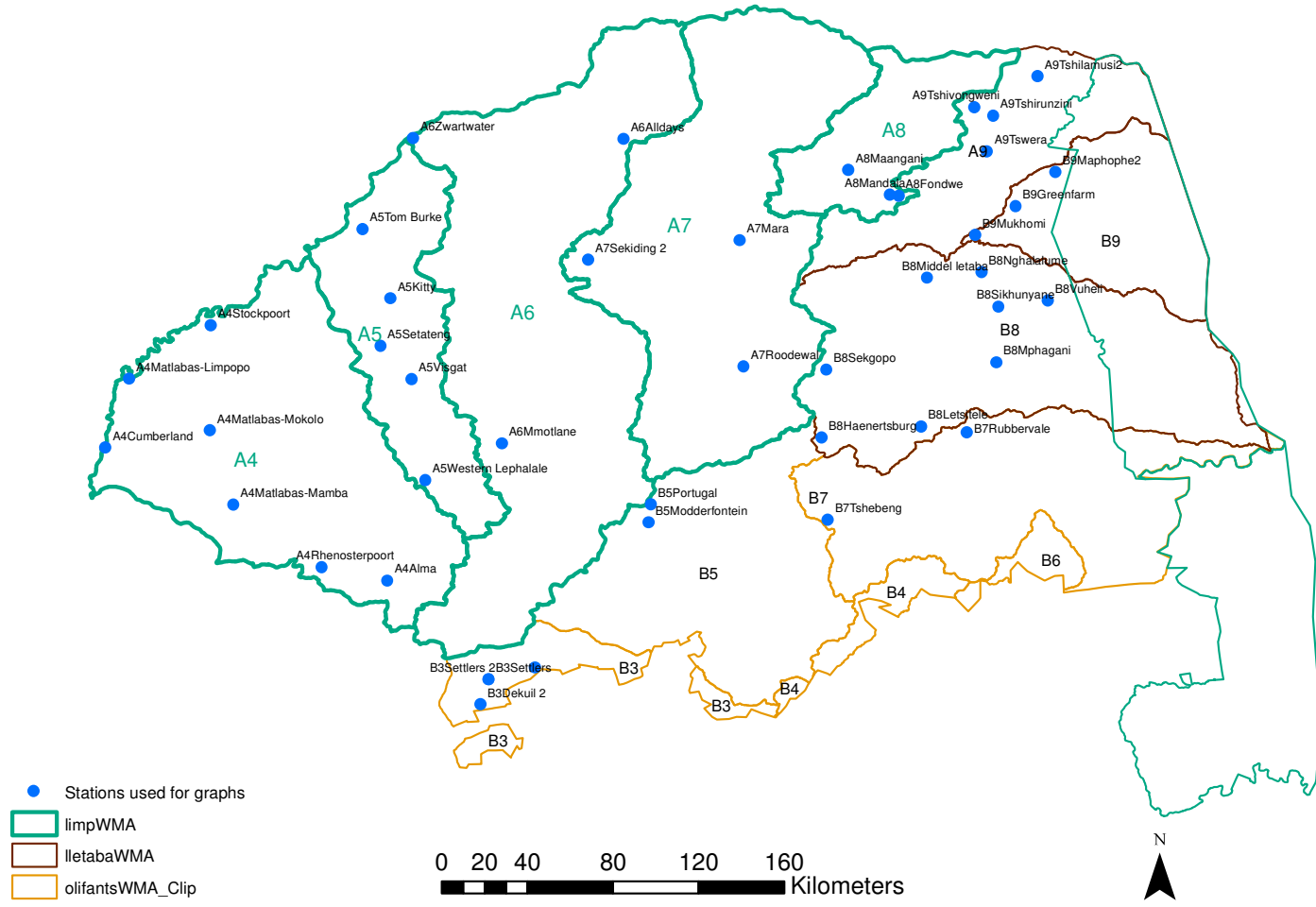
MAP 4

A4 DRAINAGE (MOKOLO) POSITIONS OF STATIONS USED IN RECHARGE AND DISCHARGE GRAPHS

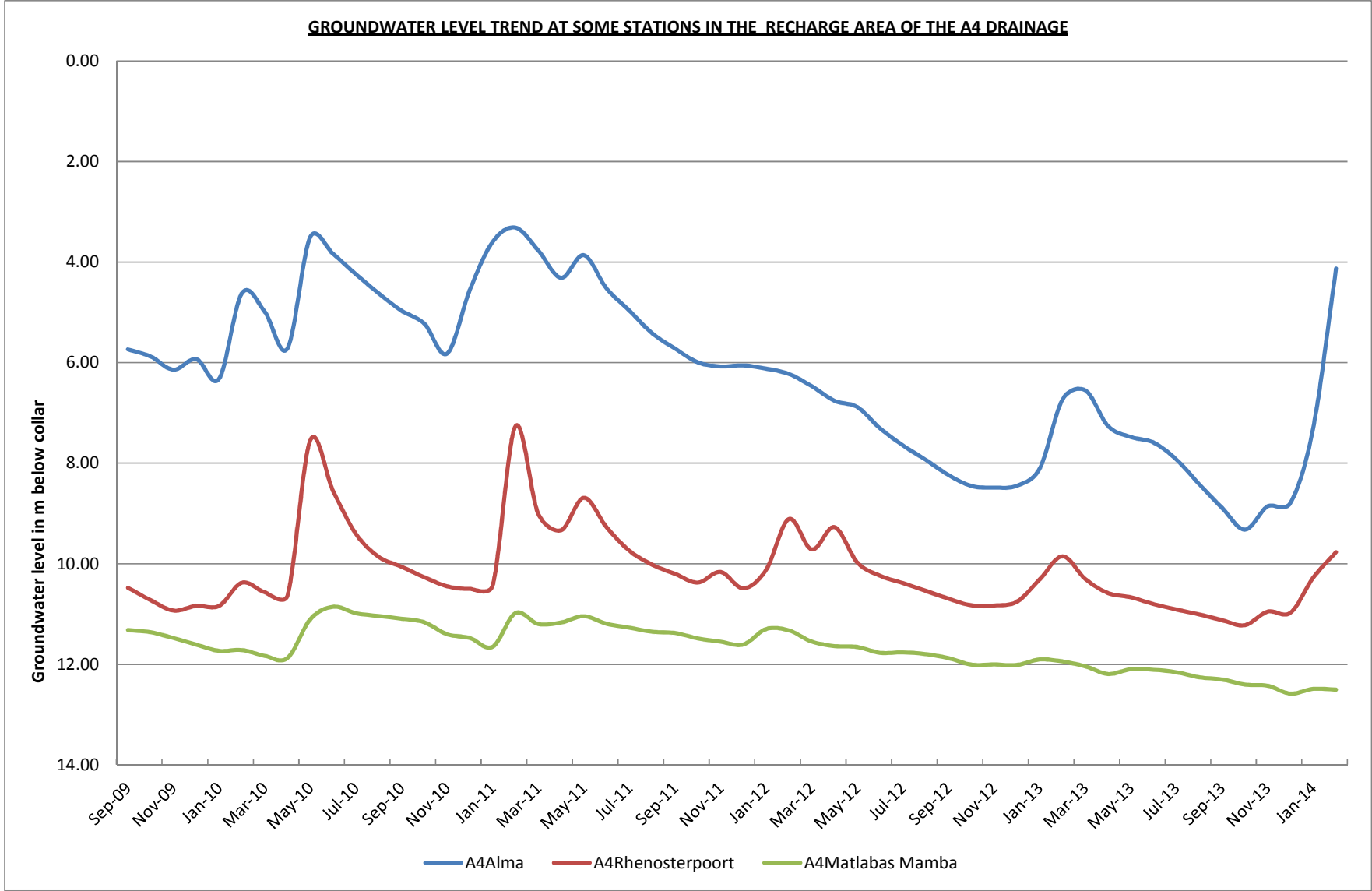


MAP 5

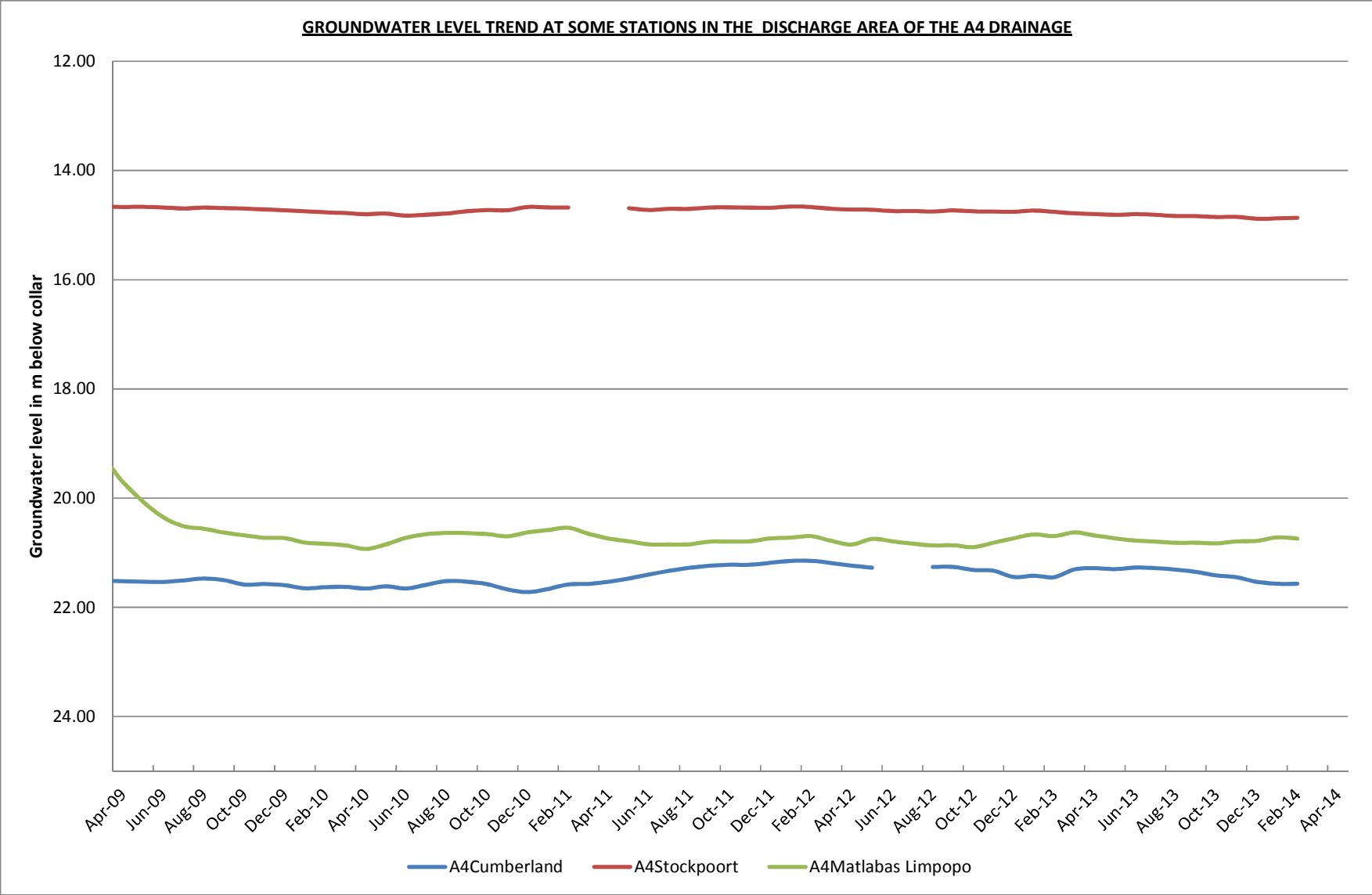
Positions of stations used for groundwater level graphs



MAP 6

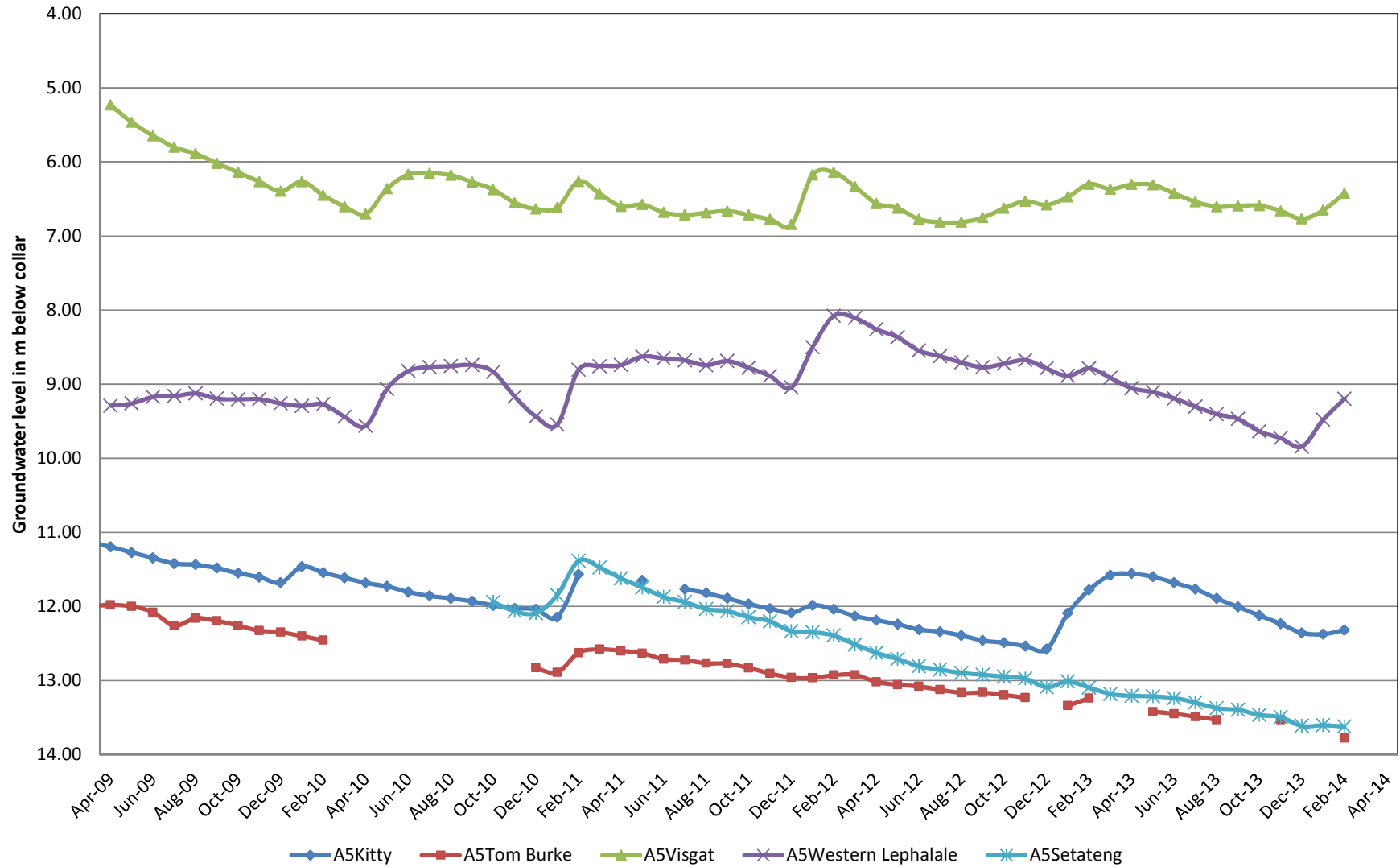


GRAPH 1



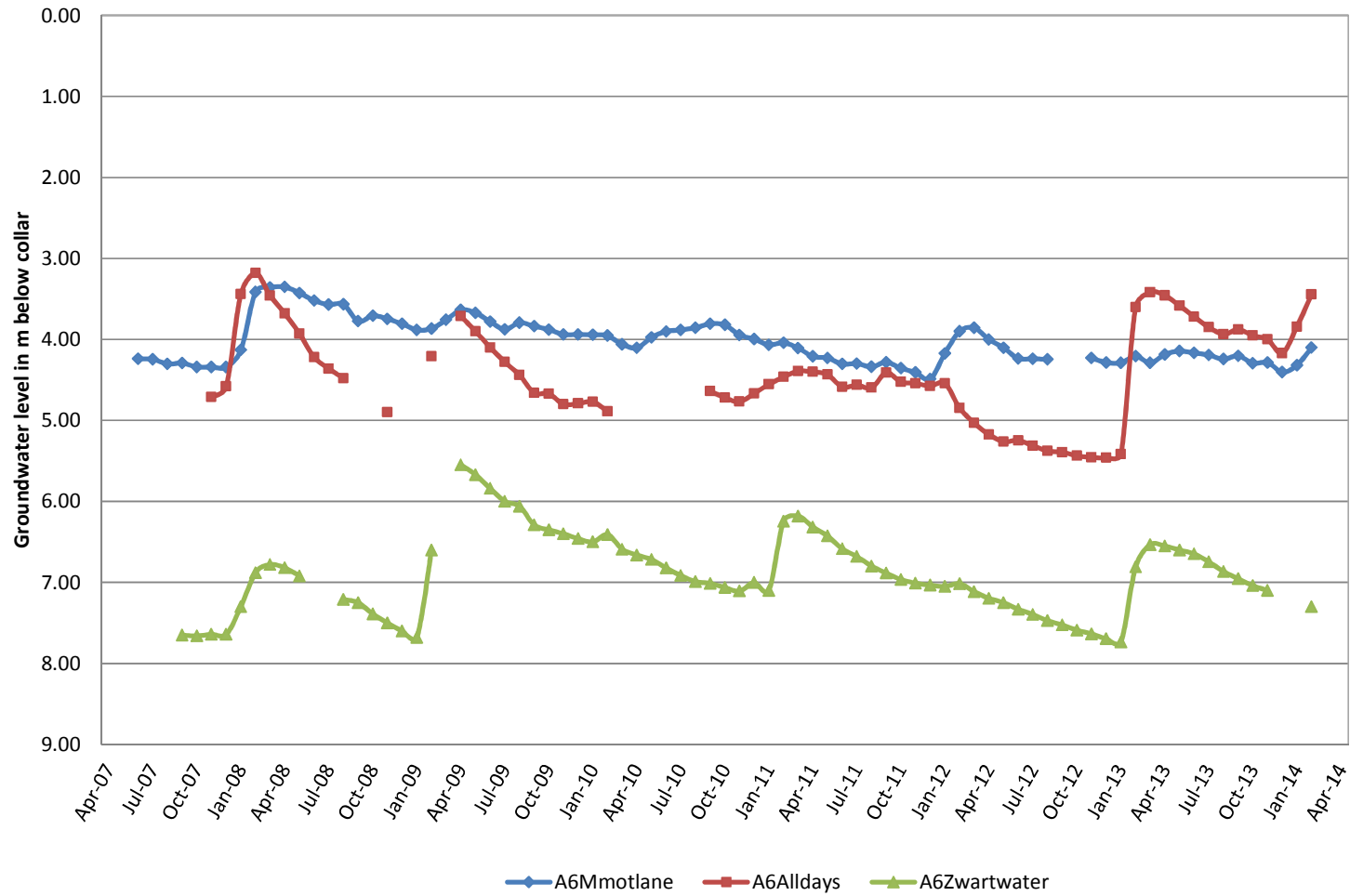
GRAPH 2

GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A5 DRAINAGE (Lephalale)



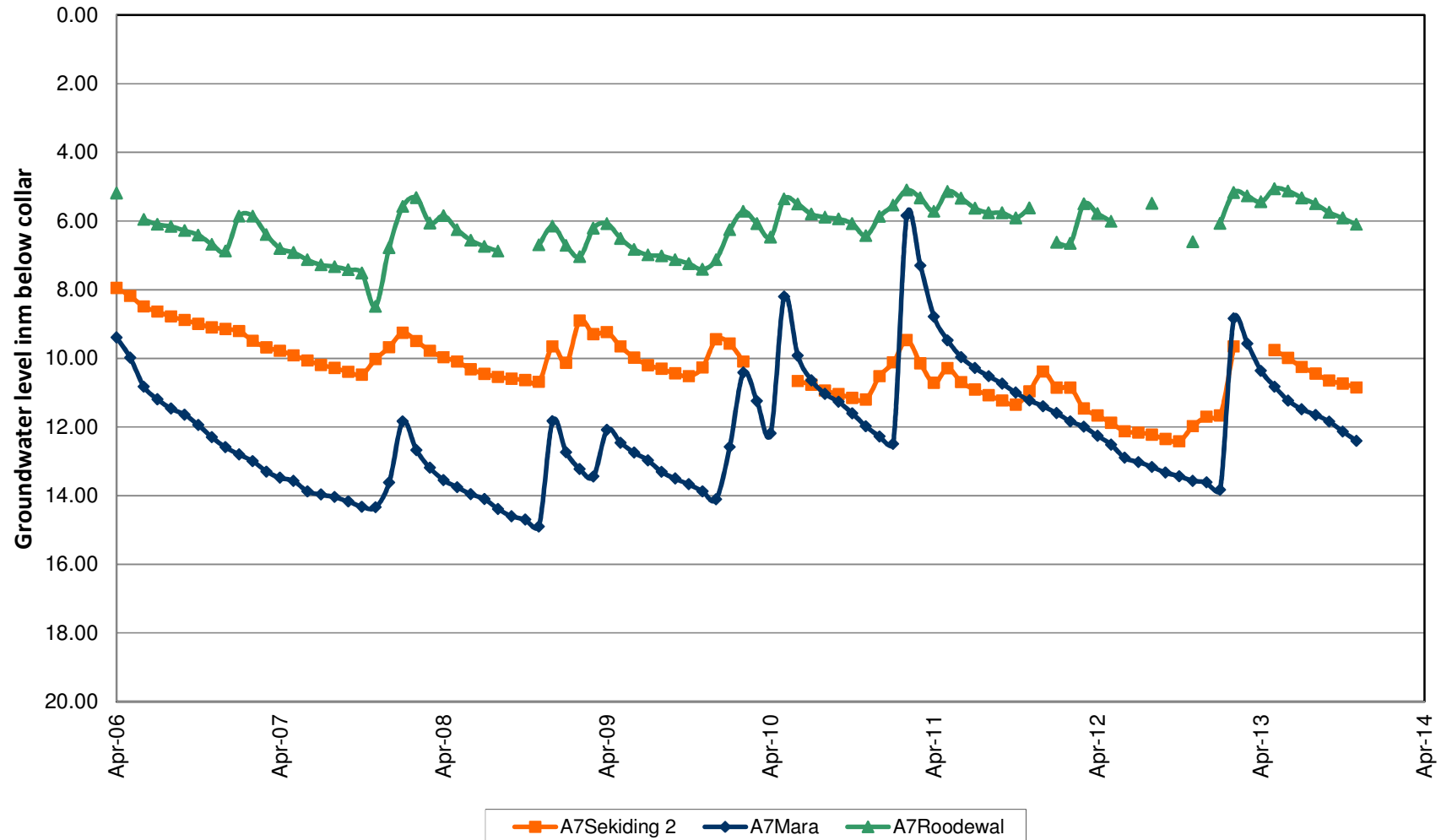
GRAPH 3

GROUNDWATER LEVEL TREND AT SOME STATIONS IN THE A6 DRAINAGE

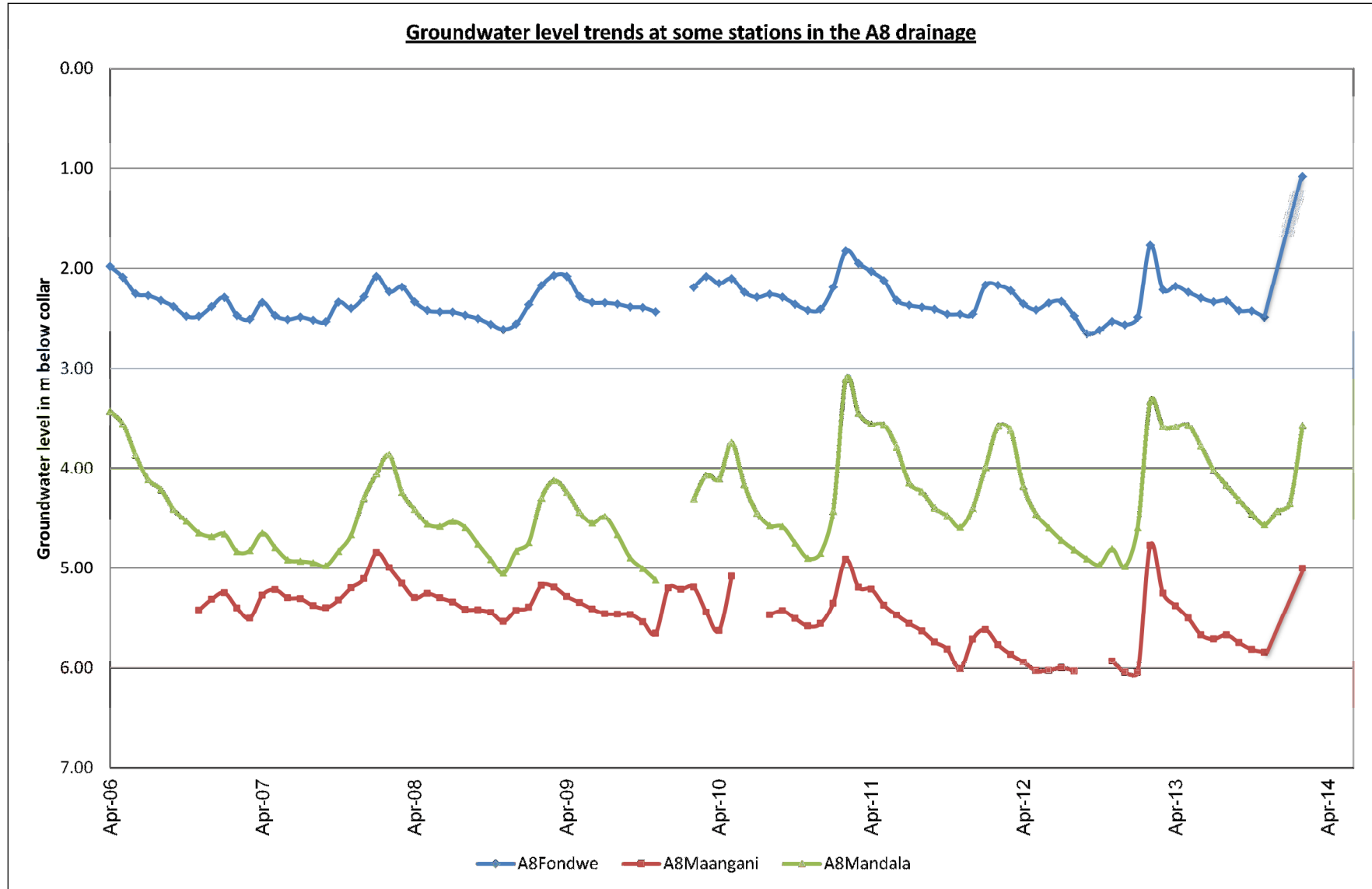


GRAPH 4

GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A7 DRAINAGE

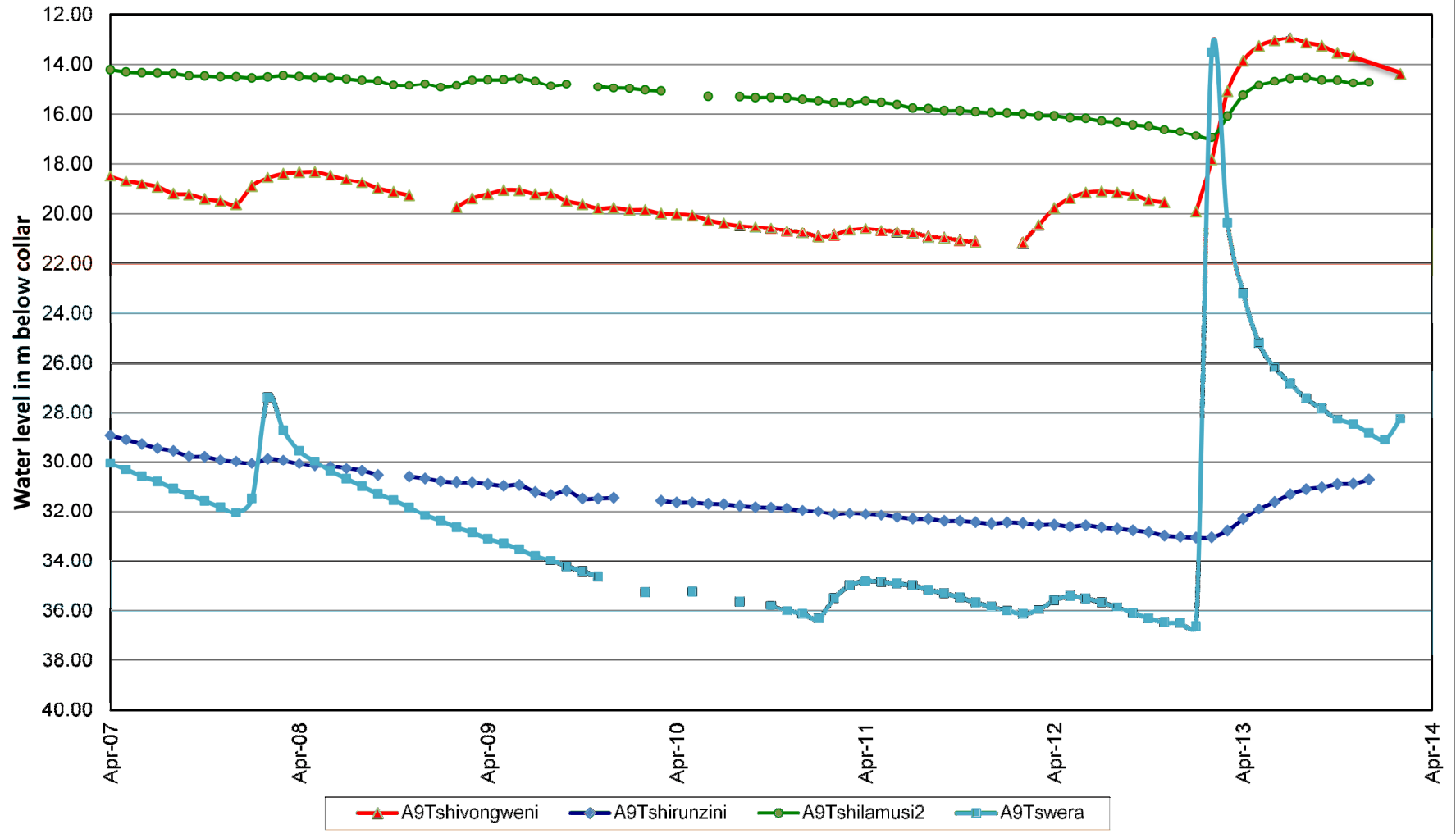


GRAPH 5

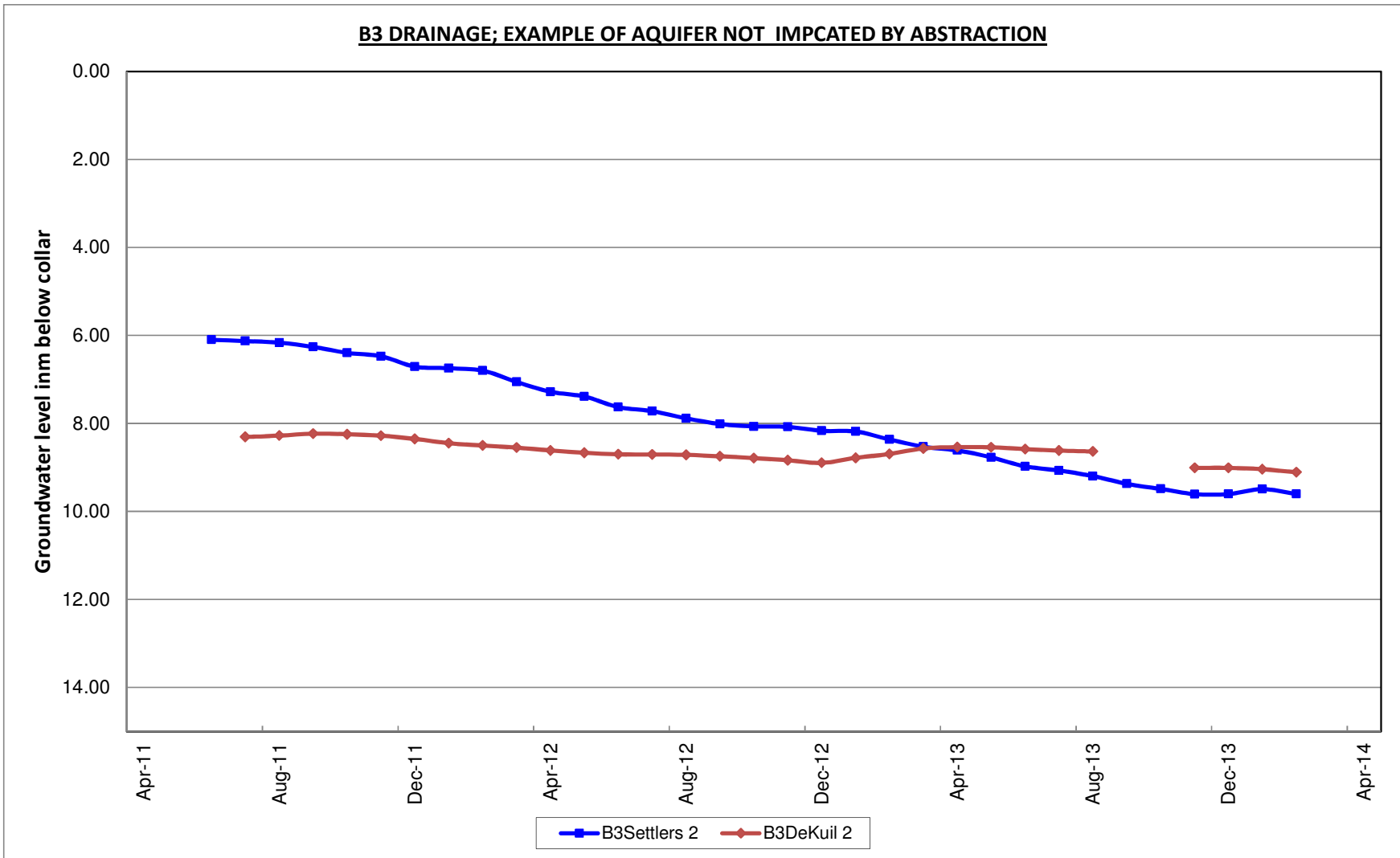


GRAPH 6

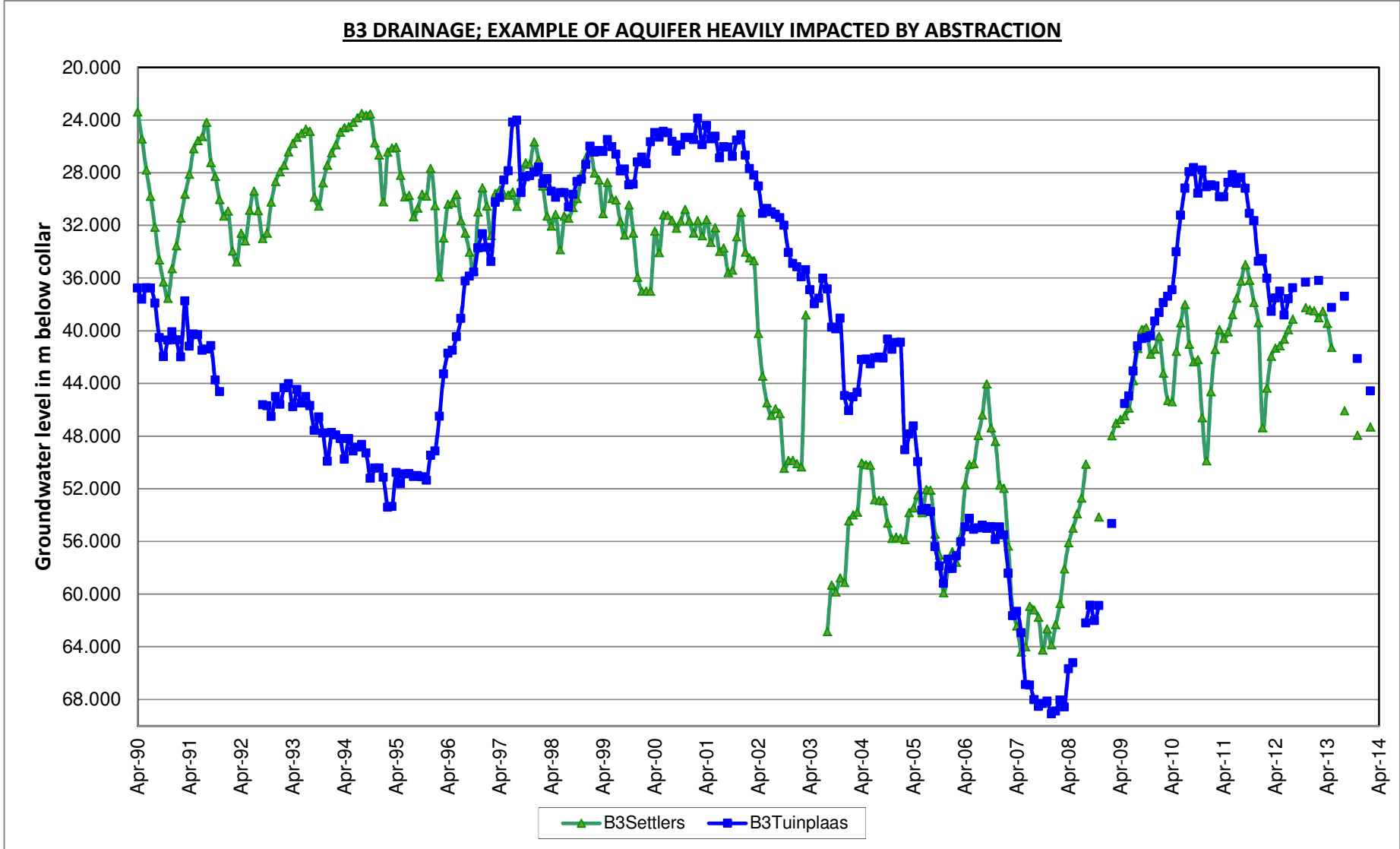
GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A9 DRAINAGE (Levhuvhu & Mutale)



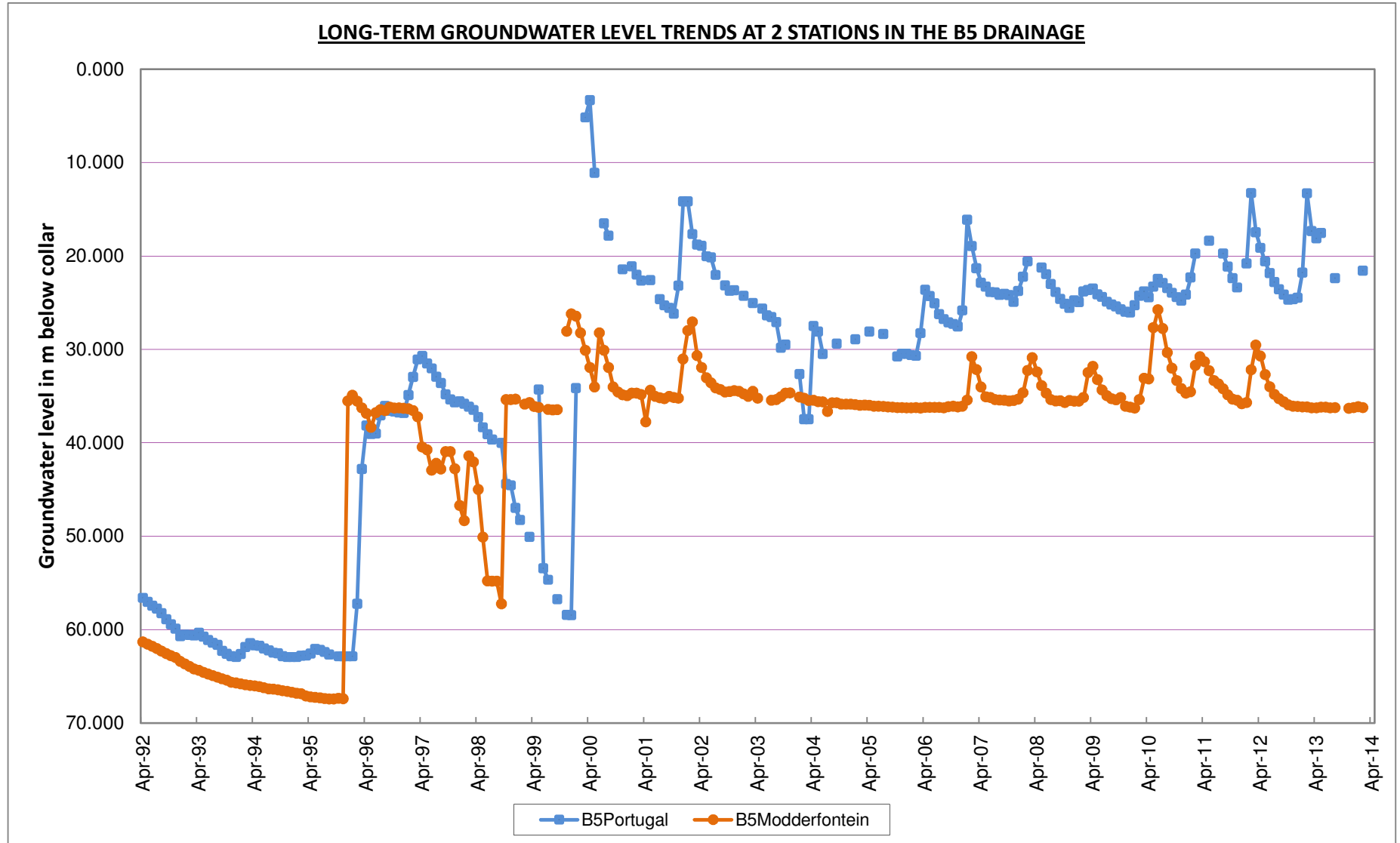
GRAPH 7



GRAPH 8

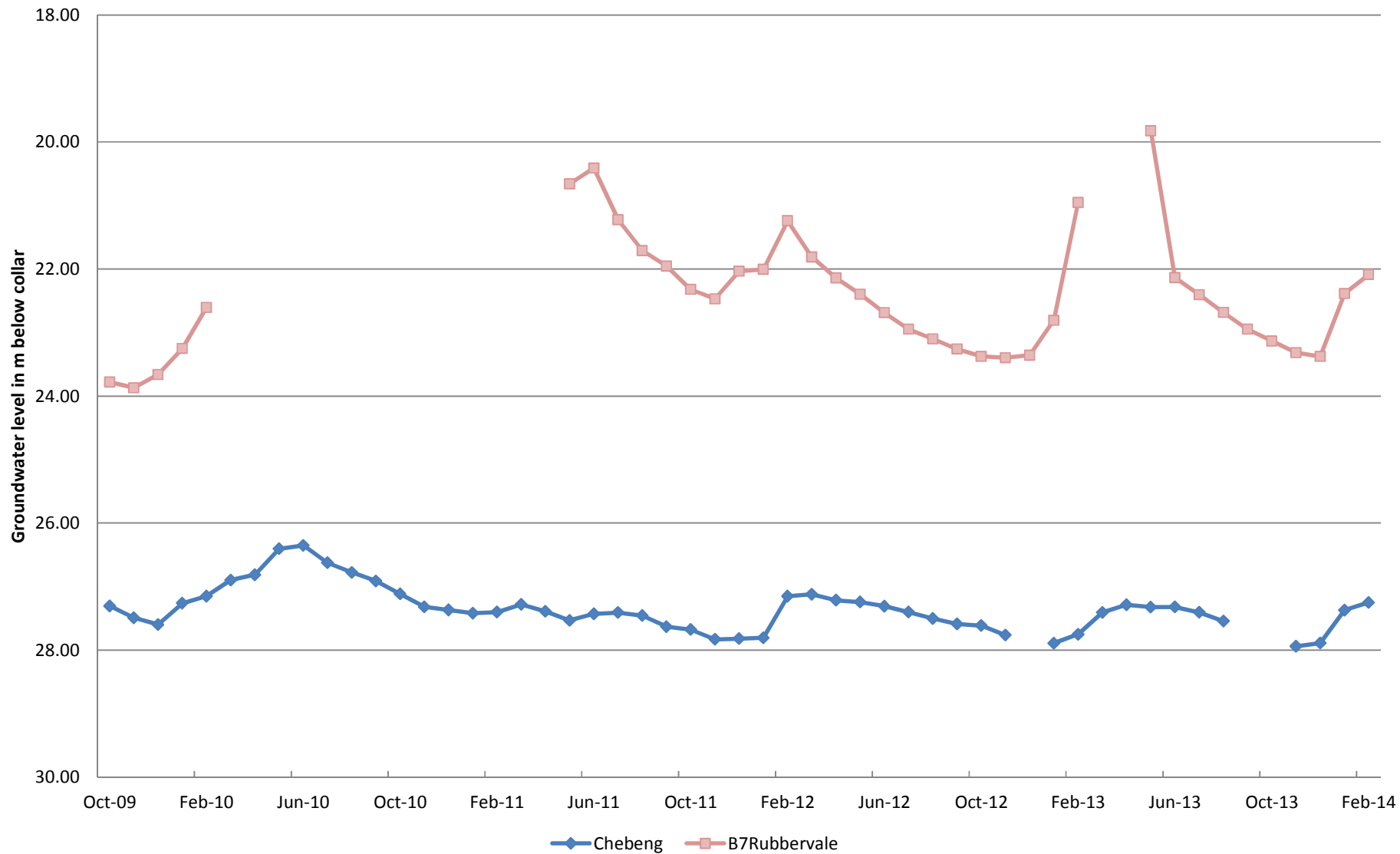


GRAPH 9



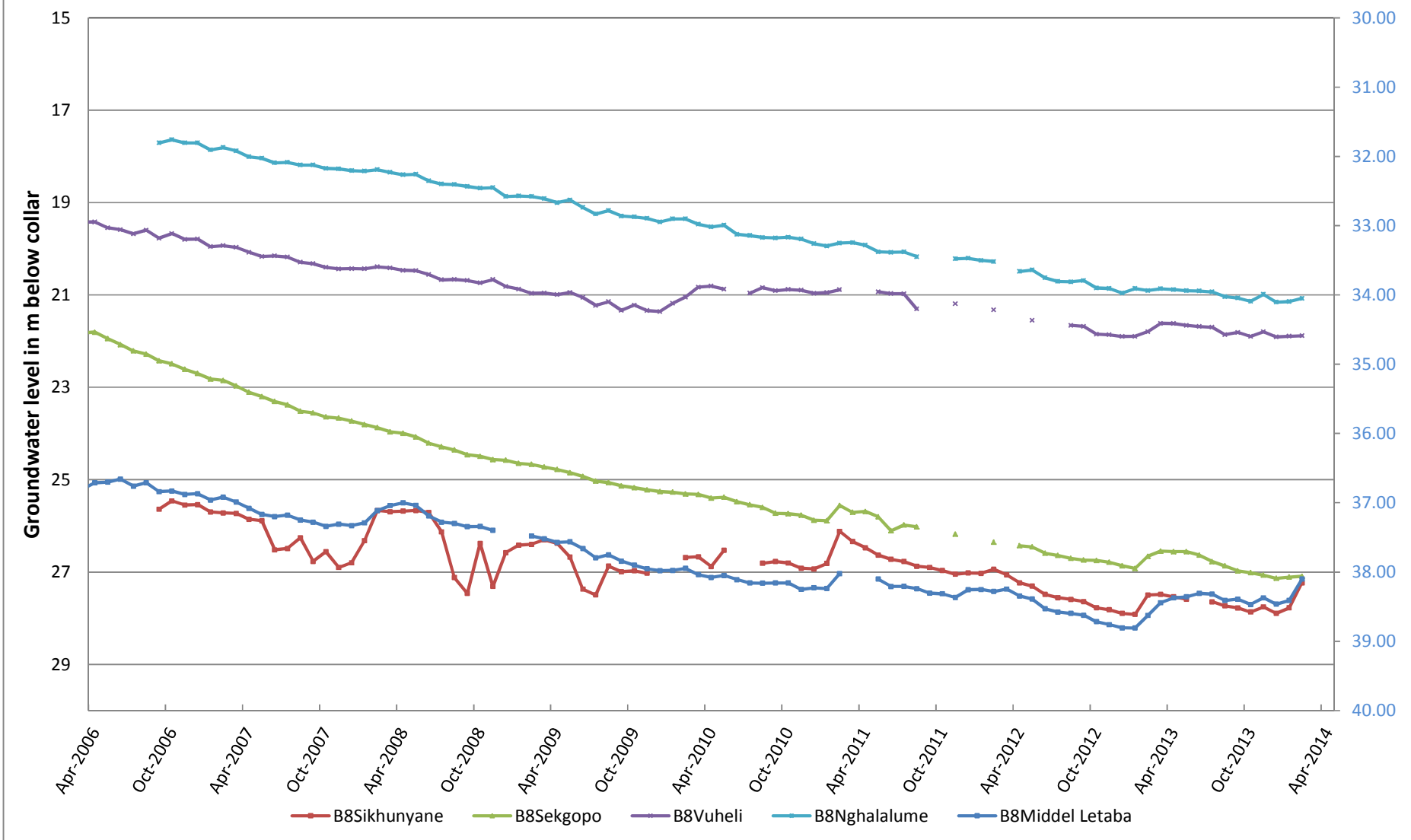
GRAPH 10

GROUNDWATER LEVEL TRENDS AT 2 STATIONS IN THE B7 DRAINAGE



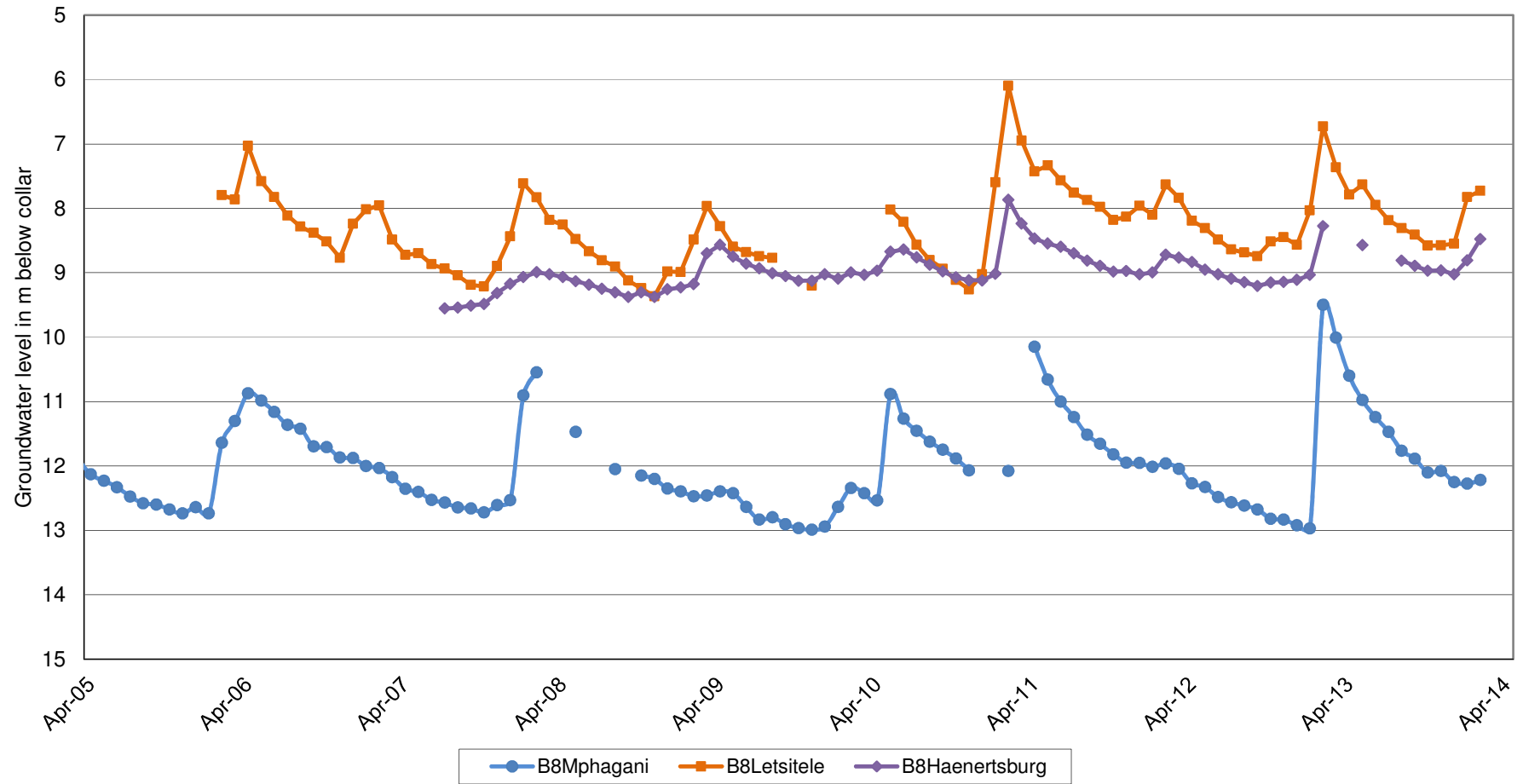
GRAPH 11

GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE B8 DRAINAGE
ASSOCIATED WITH THE KLEIN, MIDDEL LETABA & KOEDOES RIVERS



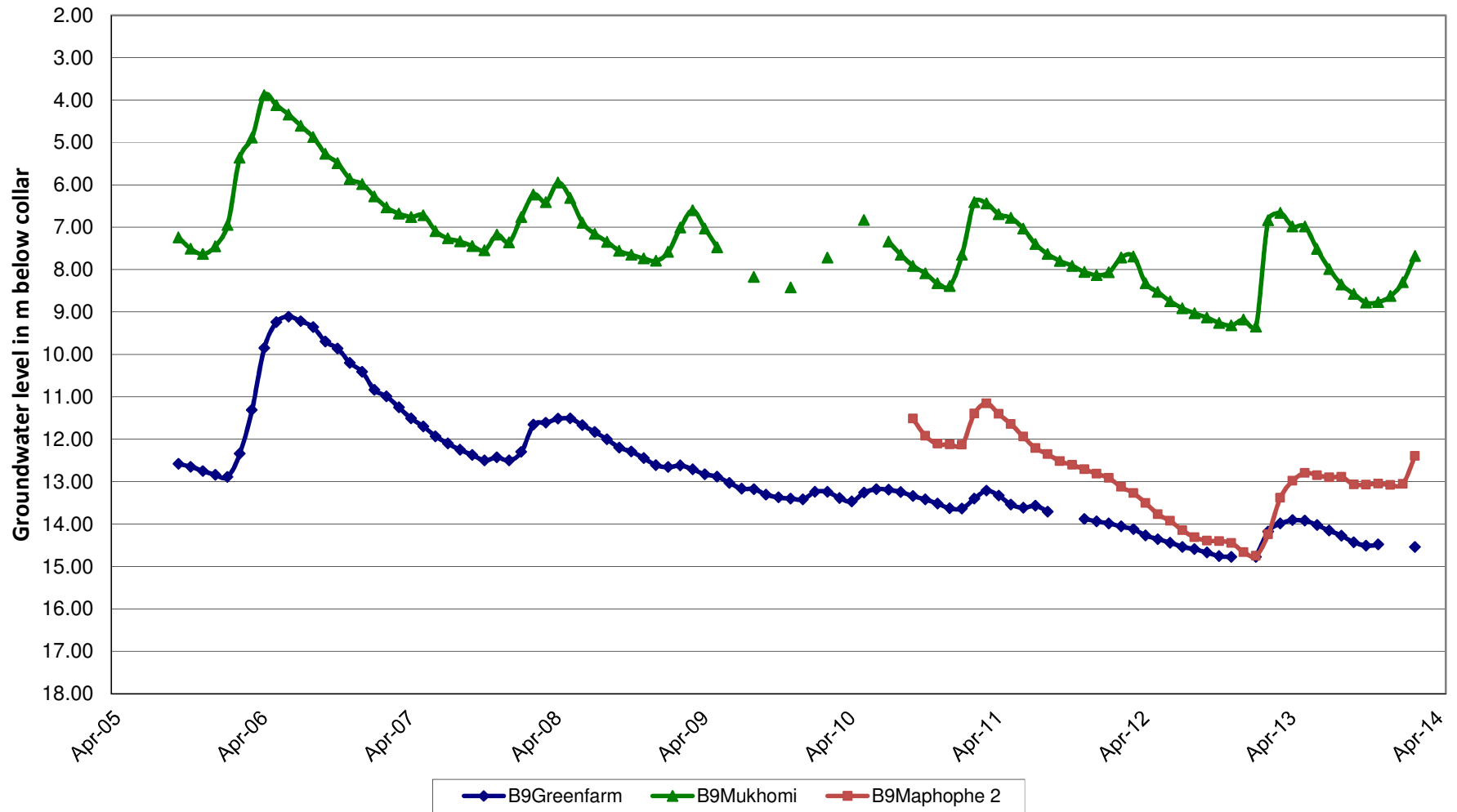
GRAPH 12

GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE B8 DRAINAGE
ASSOCIATED WITH GROOT LETABA RIVER



GRAPH 13

Groundwater level trends at some stations in the B9 drainage



GRAPH 14