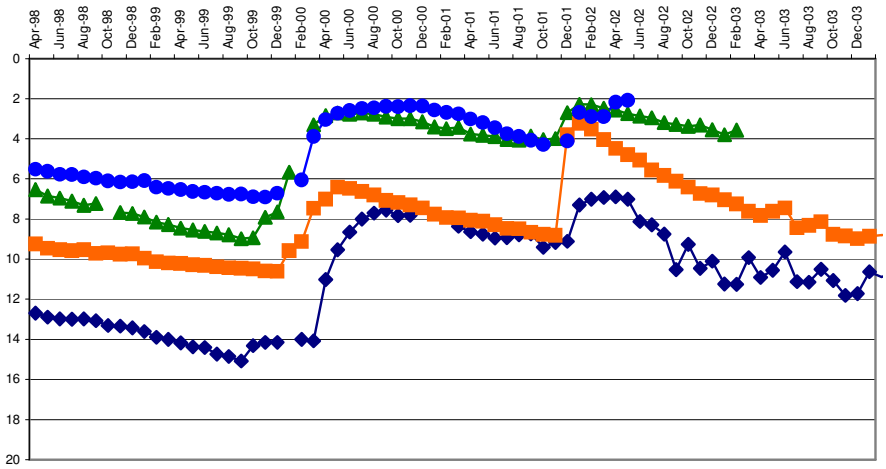
LIMPOPO REGION

DIRECTORATE
WATER REGULATION AND USE

STATUS REPORT ON
GROUNDWATER LEVELS
30 APRIL 2010 – 30 APRIL 2011



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JUNE 2011

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SUMMARY

Groundwater level trends vary across the province but fluctuations over the past year and/or season is generally small for semi un-impacted groundwater. Despite receiving normal to under normal rainfall the past season for a large part of Limpopo, is higher groundwater levels indicated at 65% of monitoring stations. The average decline for those with lower water levels is only ± 40cm. Al water levels are to some extend being influenced by abstraction but to a smaller degree where no direct pumping effects can be recognized. The water level trends and current status at such stations indicate, compared to long-term data that the resource is in a healthy state with regard to quantity.

Some local deviations and anomalies do exist and uncontrolled or poorly managed abstraction will without exception result in borehole failure and aquifer damage. Sound aquifer management practices such as scientifically sited boreholes, correct pumping test practices and analysis, adherence to recommendations regarding volumes and rates of abstraction, well-field/aquifer monitoring etc. should be practiced at all times.

1. BACKGROUND

This report aims to give an overview of the current status and trends of groundwater levels in the Limpopo Region over the past twelve months, especially the response to the past rainy season. To provide better perspective some historic trends are included.

The distribution of monitoring stations used is given in (MAP1)
Not all of the 175 water level monitoring stations currently active have data for all dates used for comparison. Some stations are new, some are currently inaccessible due to wet conditions and some have been vandalized.

Monthly rainfall data from 126 rainfall recording stations distributed over Limpopo were provided by the South African Weather Services (info@weathersa.co.za) and is acknowledged. The data is preliminary data and is not available for all stations for the last 1-2 months yet. Acknowledgement is given to the South African Weather services for (MAP 4) that was obtained from the website weathersa.co.za.

2. THE PERIOD APRIL 2010 TO APRIL 2011

2.1. RAINFALL (MAP 2)

The rainfall data used for this period is from the 1st of May 2010 to the 30th of April 2011.

Available data indicates that a few isolated stations; as well a small area in the north-east of the province, from Giyani in the south to Punda Maria in the north has recorded less than 300mm of rain over the past year. Most of the Province received between 300 – 600mm with a large part receiving up to 1500mm. Two small areas around Thoyandou and Tzaneen recorded above 1500mm.

2.2. COMPARISON BETWEEN RAINFALL AND PATTERNS IN GROUNDWATER LEVEL BEHAVIOUR (MAP 3)

The groundwater level data used to determine the difference in water level over 12 months is the water level for the 1st of May, at 12H00 for both years.

All available data, irrespective of the magnitude in water level difference were used when compiling a map indicating the spatial distribution of stations with higher or lower water levels. The data from a few stations reflecting direct effects of nearby pumping were however ignored.

The positions, indicating either higher or lower levels were overlain on the rainfall distribution map and the area with predominantly higher groundwater levels delineated with a polygon. From the map the close correlation between higher water levels and higher rainfall is very clear. The lower reaches of the Mokolo and Matlabas River drainages in the south-western part of the province indicate higher water levels despite being in the lower rainfall area. This is a low impact on groundwater area with land use mostly concentrated on game farming with irrigation limited to river areas. The good recharge received in the upper reaches of the catchment is evident lower down. Groundwater levels over the larger part of the Province are somewhat lower than the corresponding time last year. The differences is generally very small and no reason for concern.

Using all data irrespective of the magnitude in difference, the following is the case over the past 12 months:

- Stations with data for the year: 144
- Lower water levels: 75 (52%) Average: -0.65m lower
- Higher water levels: 69 (48%) Average: 1.1m higher
- 144 Stations overall: Average: 0.19m higher

To provide better perspective (MAP 4) is included. The eastern part of the Province recorded normal to above normal rainfall while the larger central to western part recorded normal to below normal rainfall. (MAP 4 Courtesy of S A Weather Services)

Despite the past rainy season being reasonably good rainy season in most parts, a large part received somewhat less than normal rainfall and lower water levels may be expected.

3. THE PERIOD 1 OCTOBER 2010 TO 30 APRIL 2011

3.1. THE STATUS OF GROUNDWATER LEVELS AFTER THE PAST RAINY SEASON (MAP 5)

65.5 % of the stations indicate higher water levels after the rainy season. Two discernable areas with a concentration of lower water levels can be identified. A few stations with lower levels are scattered singularly over the Province without any pattern. The difference from the previous water levels in the two areas is generally very small with an average of around 25 cm for both areas.
The lower levels scattered around also mostly indicate small declines. Except for A6Volspruit, all others are to some extend influenced by abstraction in the area. The differences from October to end of April are indicated on the map next to each of these stations. A6Volspruit and A6Kromhoek are the two with the largest declines and can be explained as follows:

- Kromhoek: Water levels in the area are affected by pumping for the new Alldays groundwater supply water scheme. A time series graph for A6 Kromhoek is included as (GRAPH 1). The operation of the scheme with regard to pumping hours, volumes and abstraction rates are currently being investigated. The situation is monitored.

- Volspruit: As noted in the previous report, water level at this station is characterized by large seasonal fluctuations and the current decline is no reason for concern. The groundwater level is closely related to flow in the Nile River and is actually returning to the stable level from an abnormal high.

The groundwater level response to rainfall is illustrated in (GRAPHS 2 to 8) Rainfall and groundwater level response graphs were complied for some stations from different areas. The nearest rainfall station with data for all six months was used. The positions of rainfall and groundwater monitoring stations used is depicted on (MAP 6)

- Stations A4Rhenosterpoort and A4Matlabas Mamba (GRAPH 2)

Rainfall data from the stations “Waterberg Koppie Alleen” some 24 km from Rhenosterpoort and ‘Bulge Rivier” 26km from Matlabas Mamba was used. 608 and 323 mm rain was recorded at the two stations respectively. The water level at Rhenosterpoort in the area of higher rainfall indicates a more pronounced rise but the trend is the same. The response at both stations is a month and more delayed with regard to rainfall.

- Station A9Elim (GRAPH 3)

Rainfall data from the station "Elim Hospital" some 1.5 km away was used. A somewhat delayed response in water level can be noted but not as much as the previous stations.

- Station B7Mica (GRAPH 4)

Rainfall data from the station "Phalaborwa Excellence 5km away that received 424mm of rain was used.
The same trend as the others with also the clear delay in response can be noted.

- Station A7Sekiding 2 (GRAPH 5)

Rainfall data from the station "Dendron" 43 km away that received 399.5mm of rain was used.
Unfortunately no rainfall data nearer is available. The fast response and good relation to the rainfall graph suggest that similar rain was received near or at the station.

- Station B8 Ngalalume serves as an example of water level still lower after the rainy season. (GRAPH 6)

Some stations either give no indication of influence by rain or too little to make any difference in the downward trends. The reason may be that not enough rain to cause recharge was received but available rainfall data suggest otherwise. Most of these stations are relatively new with no long-term data yet. It may also be that the aquifers are fully saturated and actually returning to stable state after a previous good recharge period.

- Station A7Tweefontein is one of the stations with lower water level after the rainy season and put perspective on the long-term trend (GRAPH 7)

Although the declining trend is predominant since 2004, the current water level still reflects an excellent situation. The slow decline and apparent lack of significant recharge at some stations may be due to a similar situation.

- Station B5Doelen is another point in case (GRAPH 8). Despite a lower water level, the current is that of a healthy state of affairs.

- The trend displayed at Station A6Klipput however is the opposite of the above. The lower water level seasonal and annual is due to over abstraction and reflects the state of an aquifer seriously stressed.

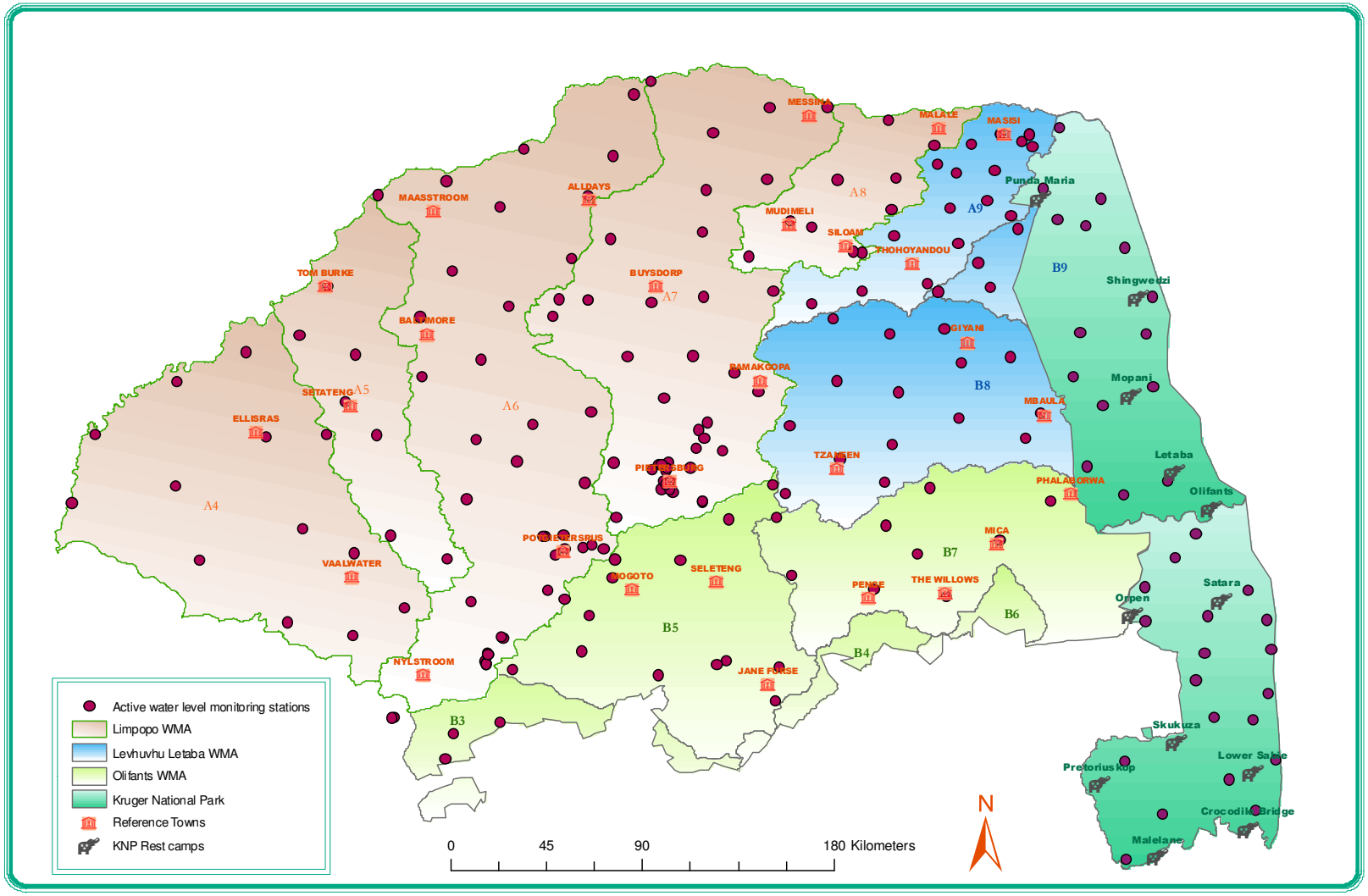
Using all data irrespective of the magnitude in difference the following is the case from October 2010 to April 2011

• Stations with data for the six months:		142	
• Lower water levels:	49	(34.5%)	Average: -0.42m lower
• Higher water levels:	93	(65.5%)	Average: 1.2m higher
• 153 Stations overall:			Average: 0.63m higher

4. ACKNOWLEDGEMENT

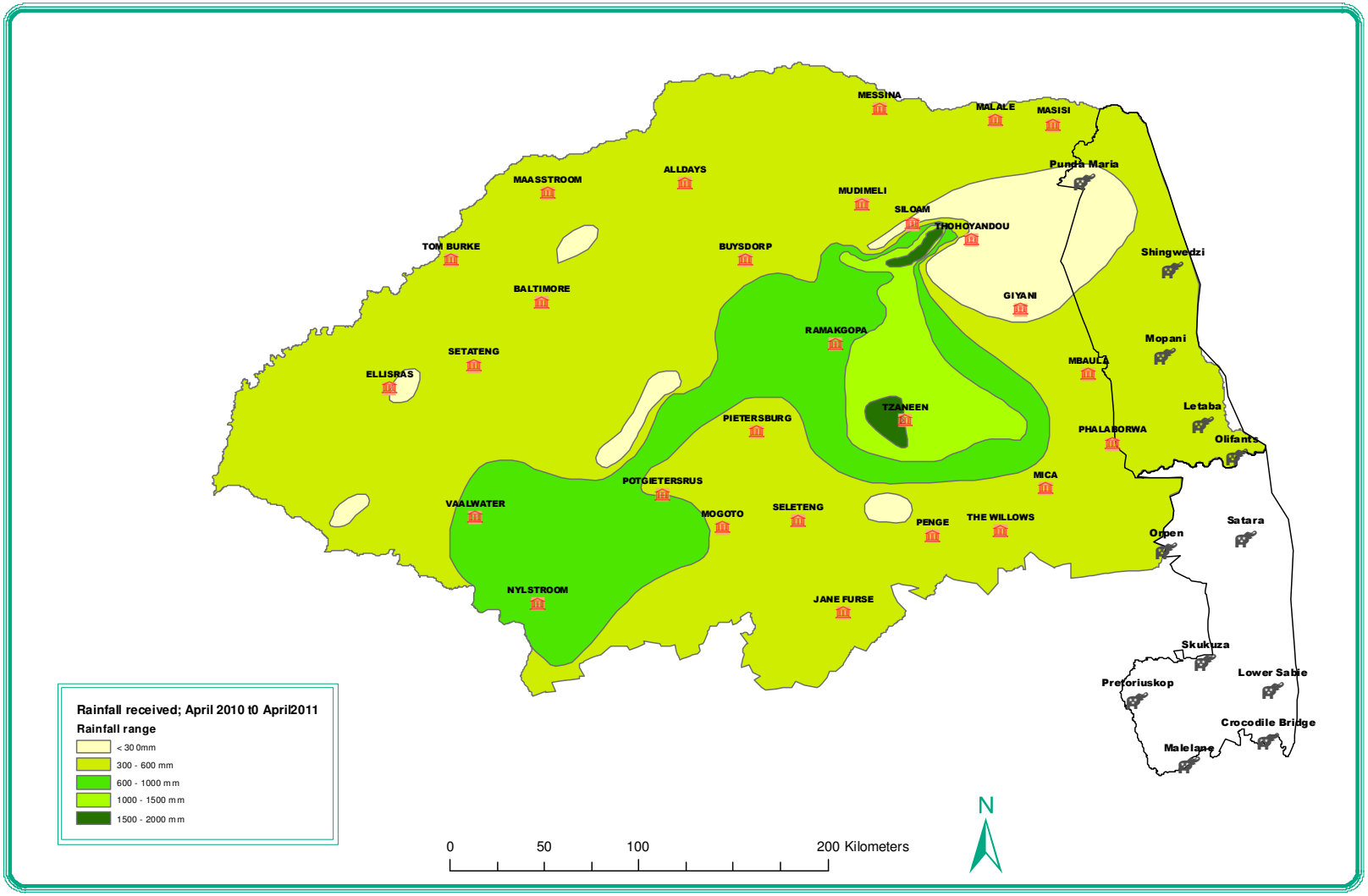
4.1 info@weathersa.co.za (Rainfall data for Limpopo Province)

LIMPOPO REGION
POSITIONS OF ACTIVE GROUNDWATER LEVEL MONITORING STATIONS
MAY 2011



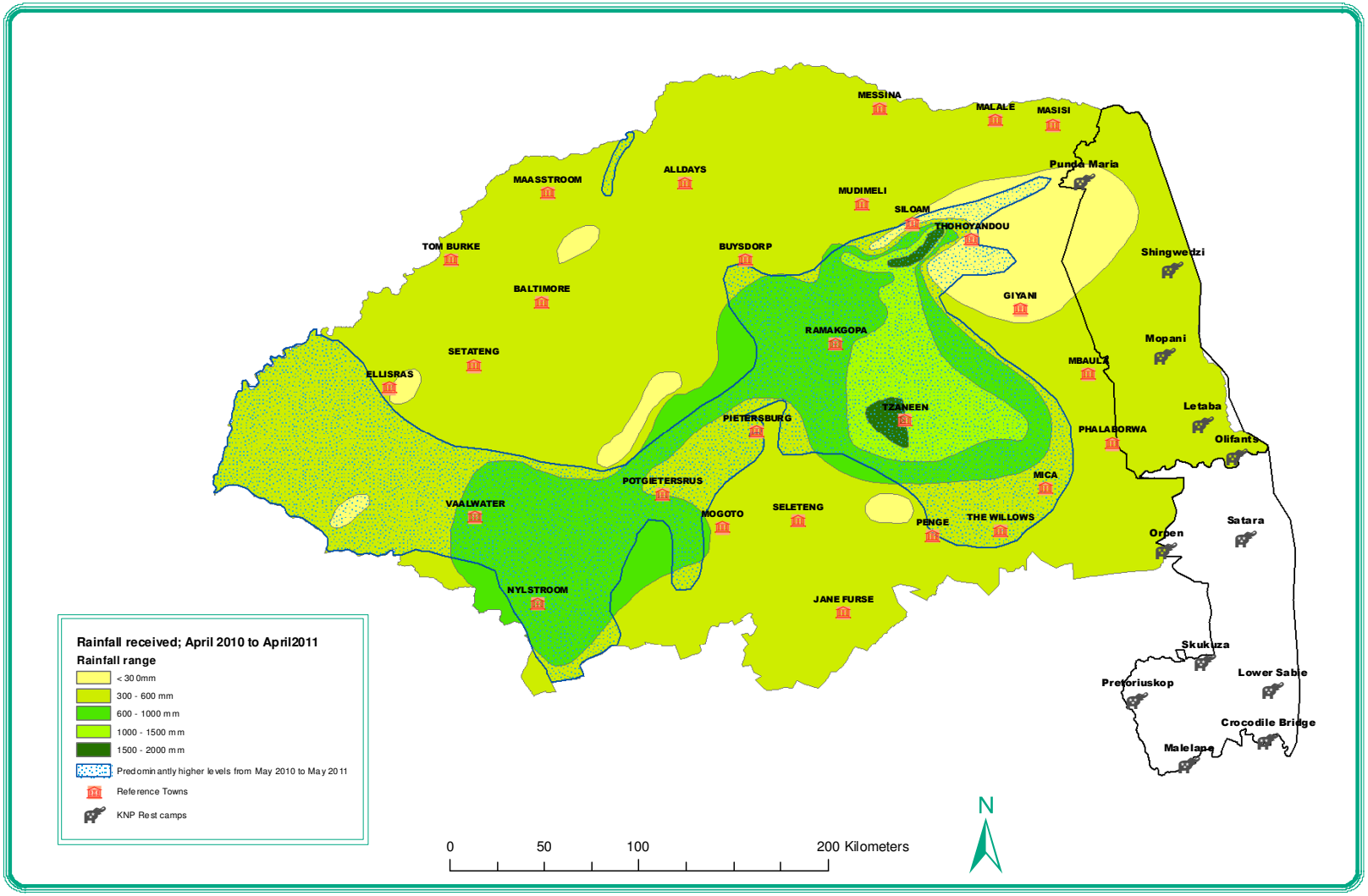
MAP 1

LIMPOPO GROUNDWATER MONITORING;
TOTAL RAINFALL RECEIVED FOR THE PERIOD
APRIL 2010 TO APRIL 2011

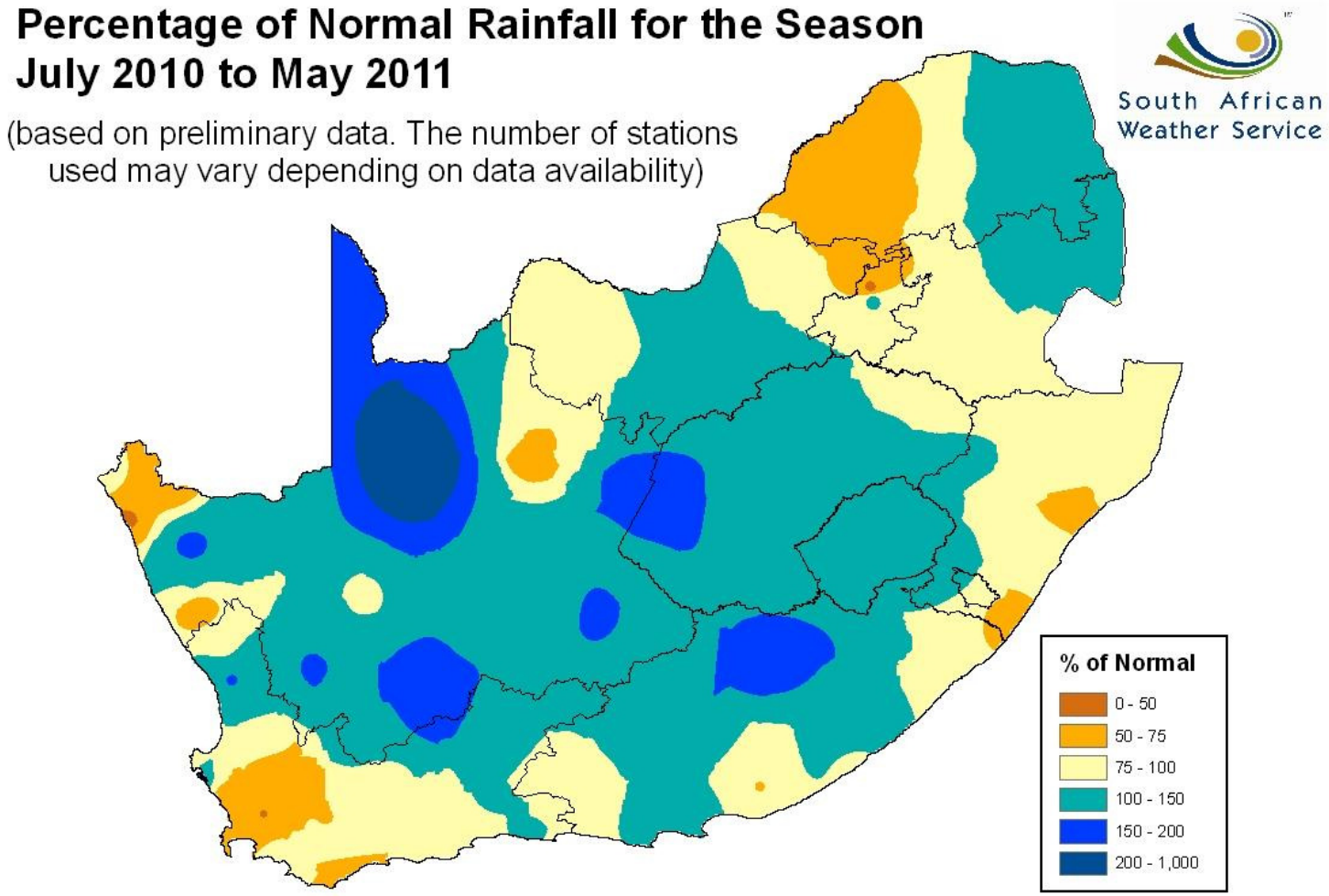


MAP 2

LIMPOPO GROUNDWATER MONITORING;
PATTERNS IN GROUNDWATER LEVEL BEHAVIOUR VERSUS RAINFALL RECEIVED
APRIL 2010 TO APRIL 2011

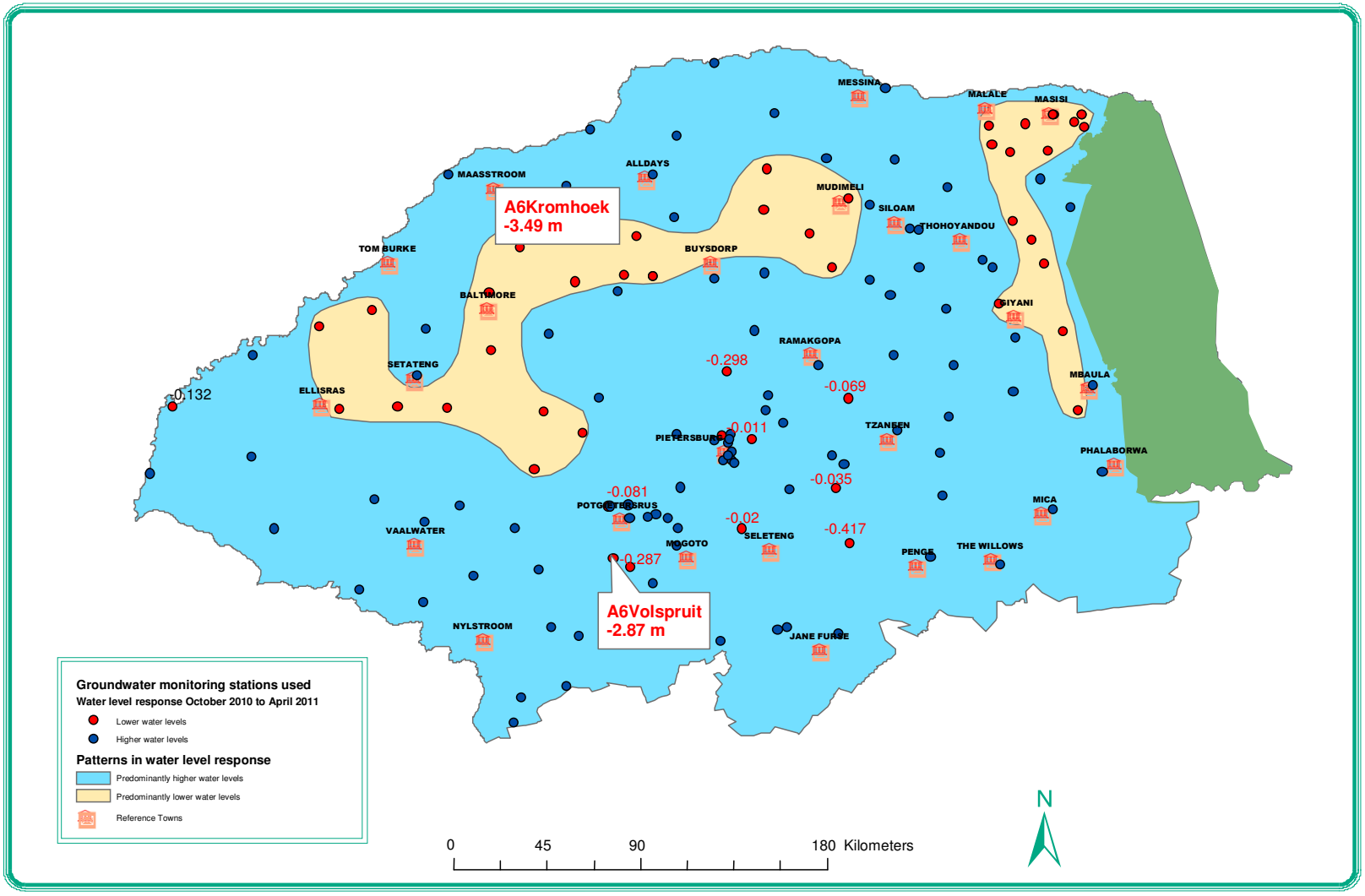


MAP 3


Percentage of Normal Rainfall for the Season
July 2010 to May 2011
(based on preliminary data. The number of stations used may vary depending on data availability)
South African Weather Service
% of Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
200 - 1,000

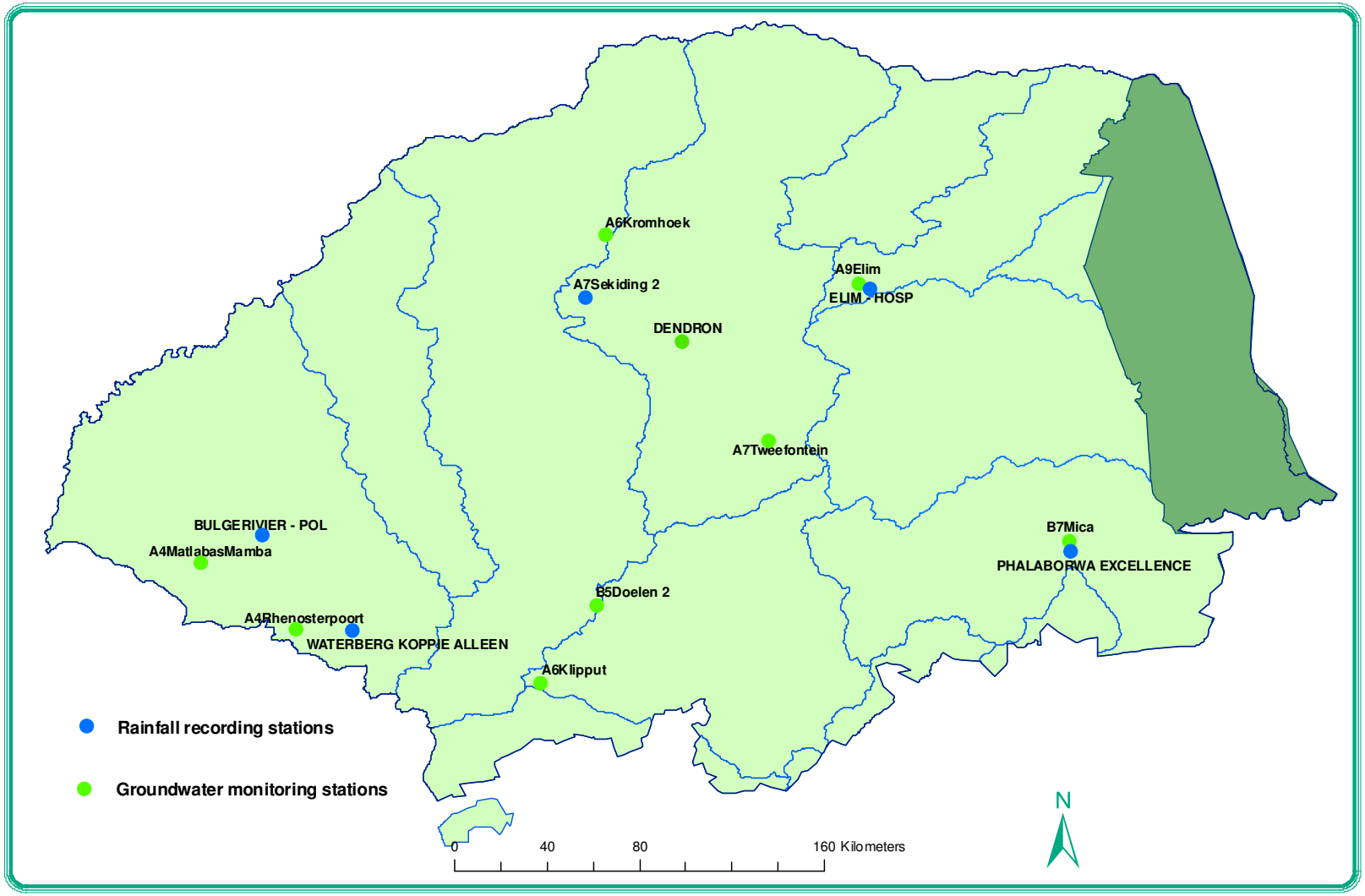
MAP 4

LIMPOPO GROUNDWATER MONITORING;
WATER LEVEL STATUS AFTER THE PAST RAINY SEASON
1 OCTOBER 2010 TO 30 APRIL 2011



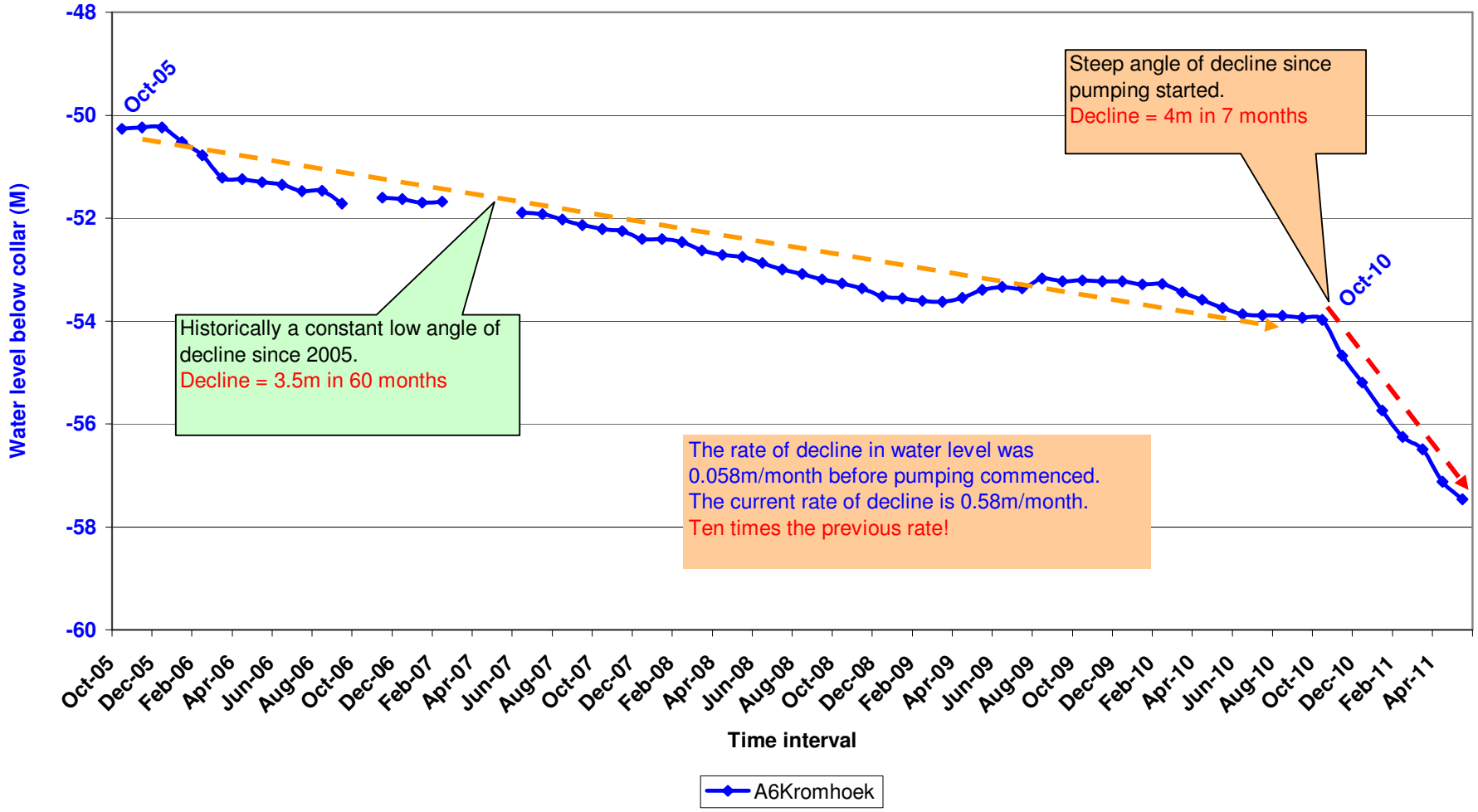
MAP 5

LIMPOPO GROUNDWATER MONITORING;
POSITIONS OF RAINFALL AND GROUNDWATER MONITORING STATIONS USED FOR COMPARISON GRAPHS



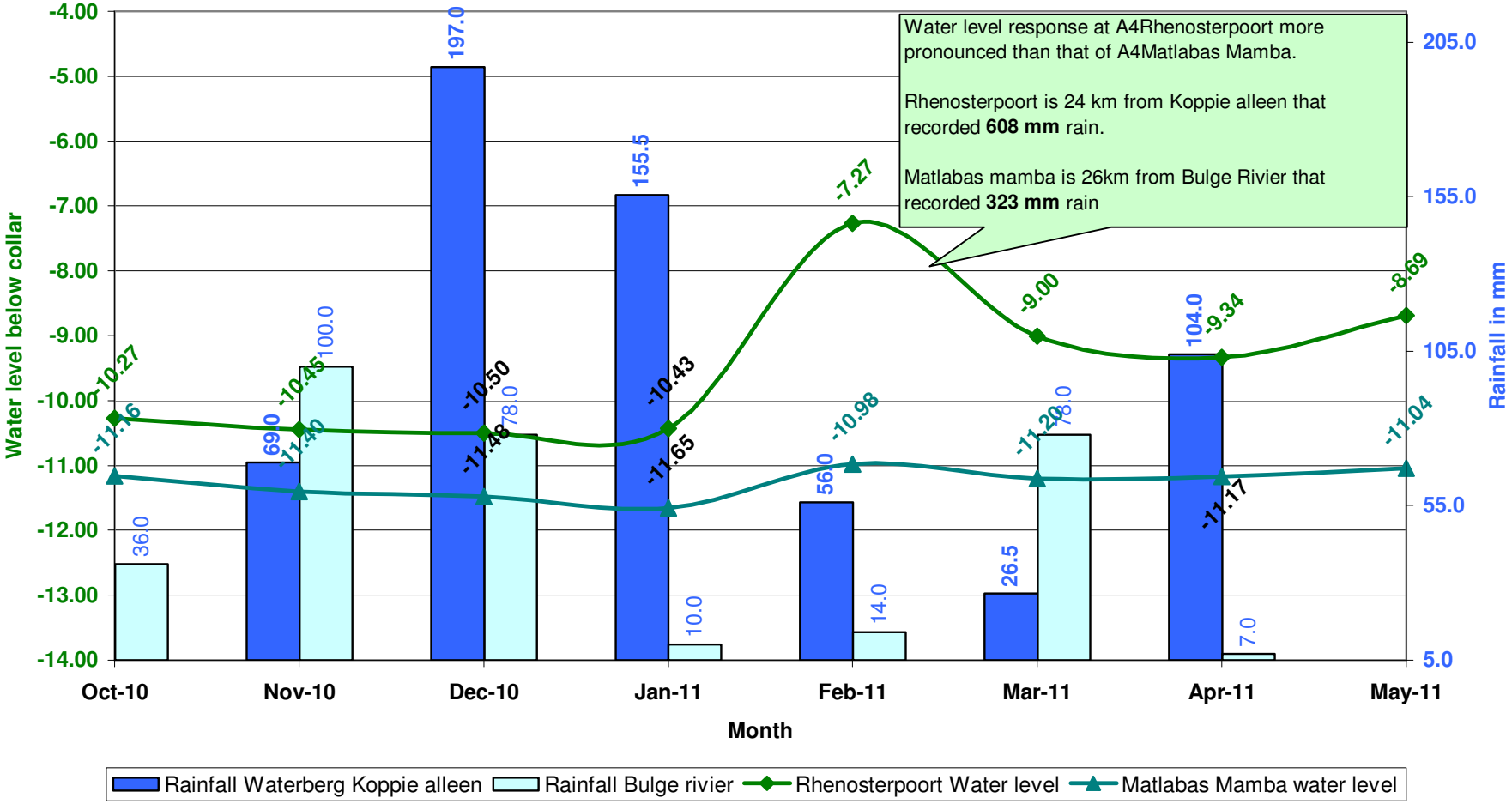
MAP 6

THE EFFECT OF SUSTAINED PUMPING ON THE WATER LEVEL AT KROMHOEK



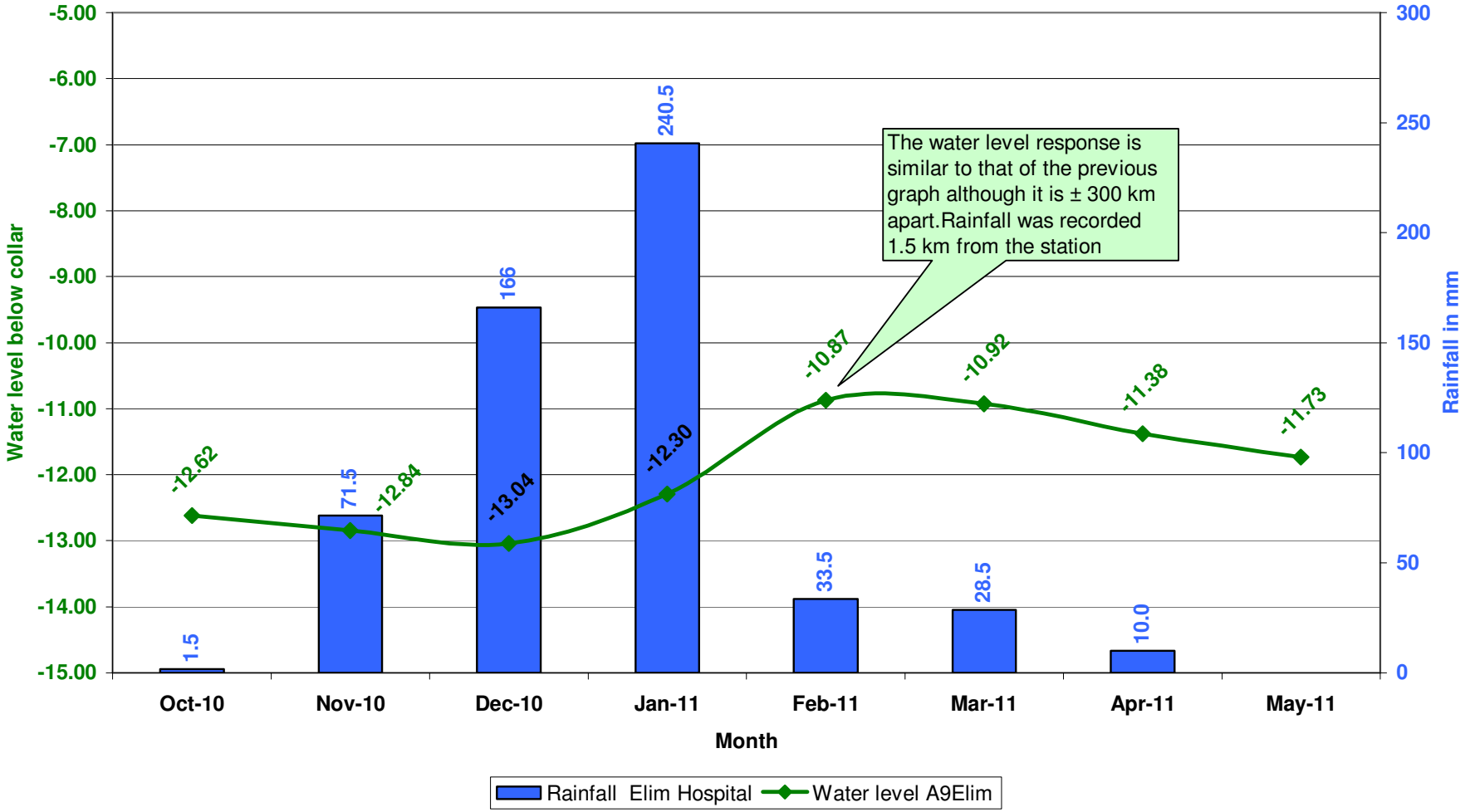
GRAPH 1

Groundwater level response at stations A4Rhenosterpoort & A4Matlabas Mamba to rainfall recorded at Koppie alleen & Bulge Rivier



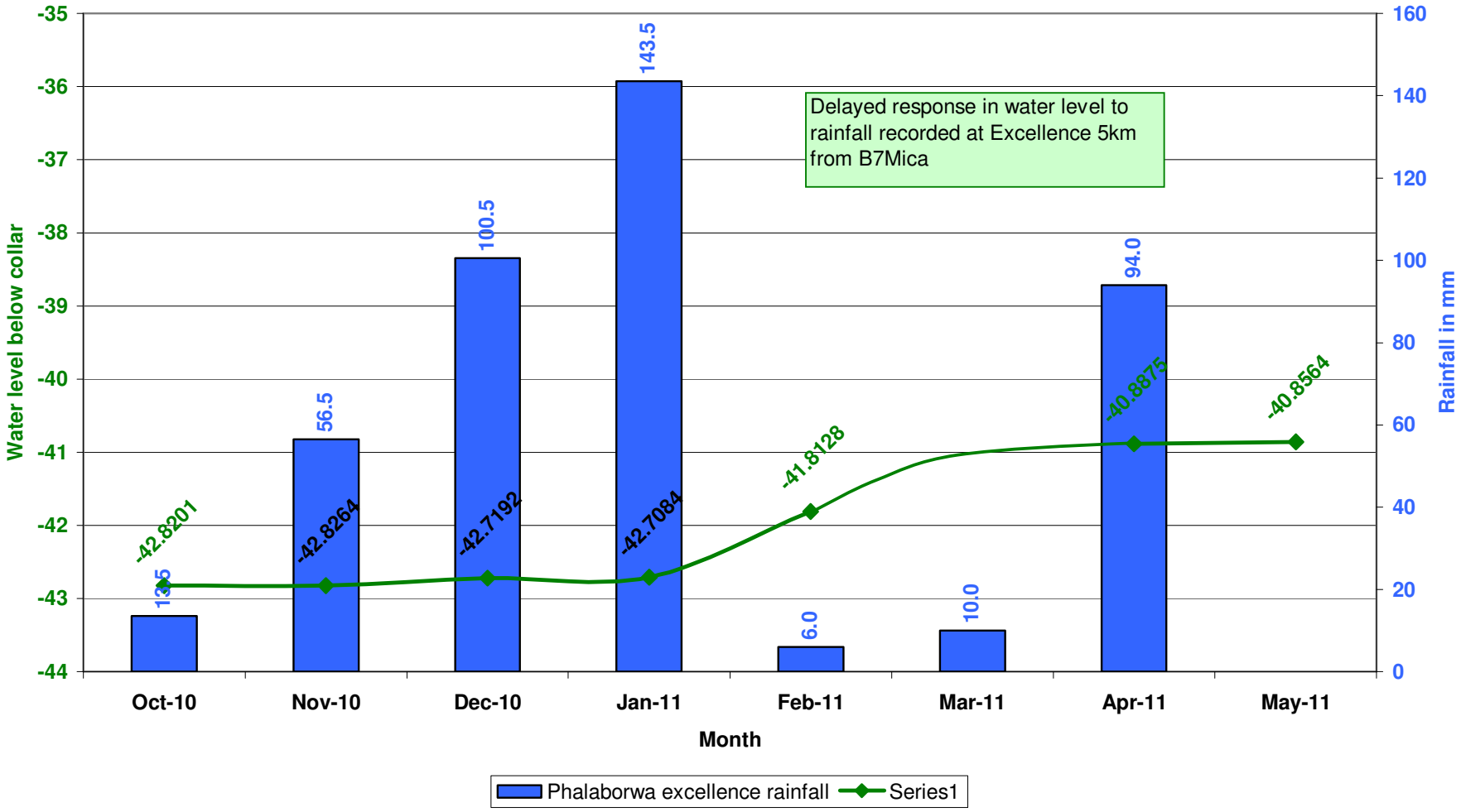
GRAPH 2

Groundwater level response at Station A90007Elim to rainfall recorded at Elim Hospital



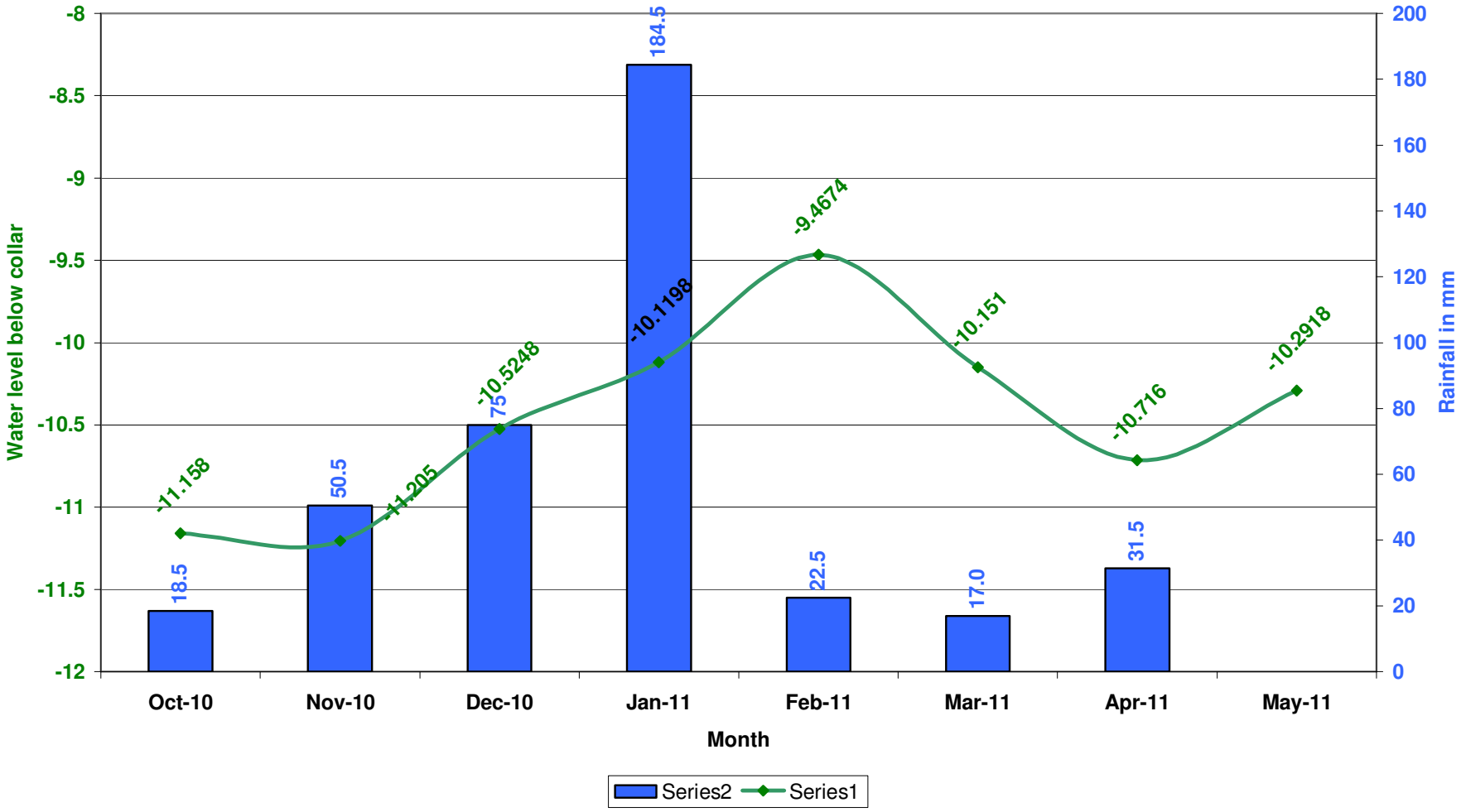
GRAPH 3

Groundwater response at Station B7Mica to rainfall recorded at Excellence



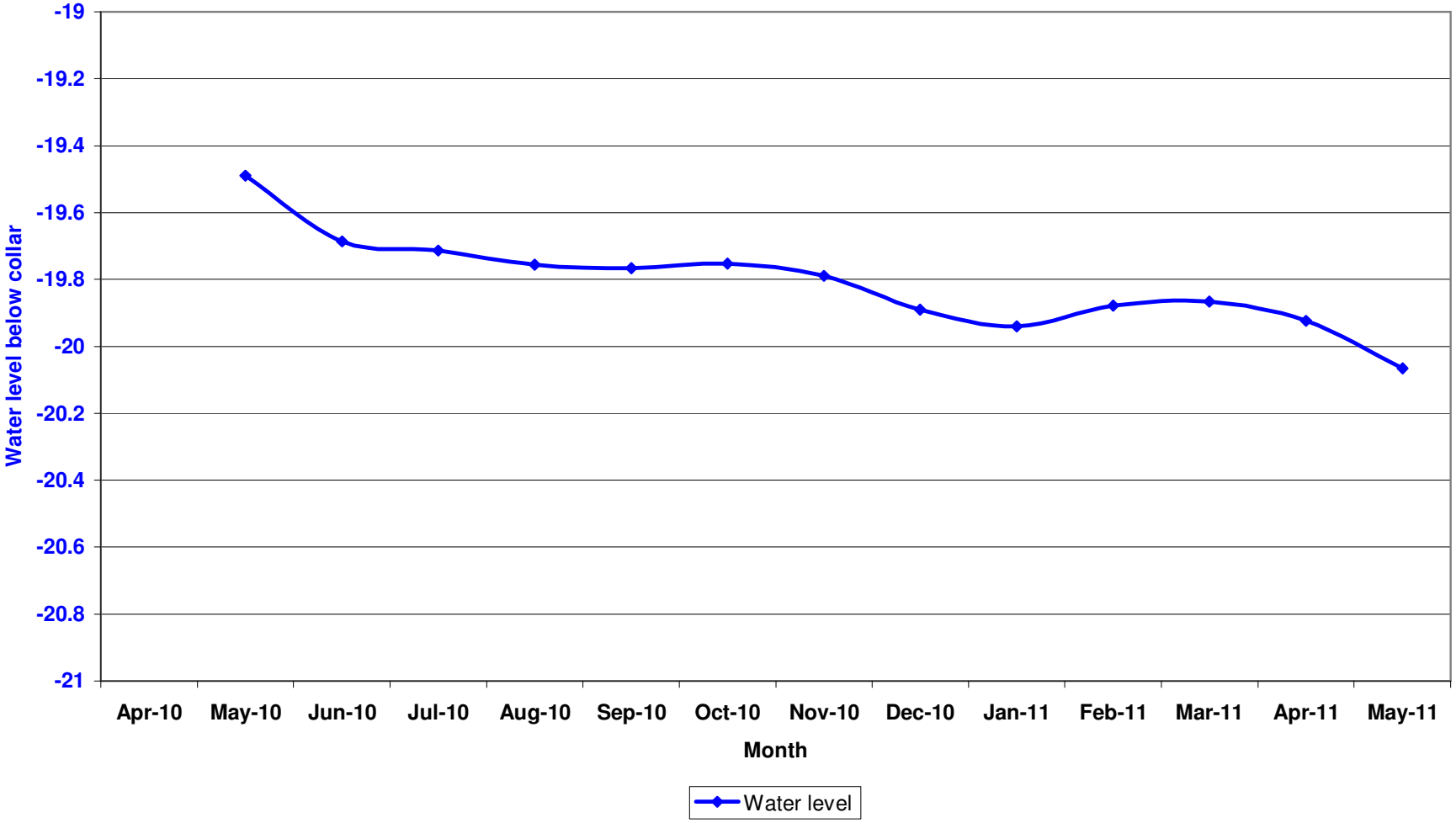
GRAPH 4

Groundwater response at Station A7N0648 Sekiding 2 to rainfall recorded at Dendron



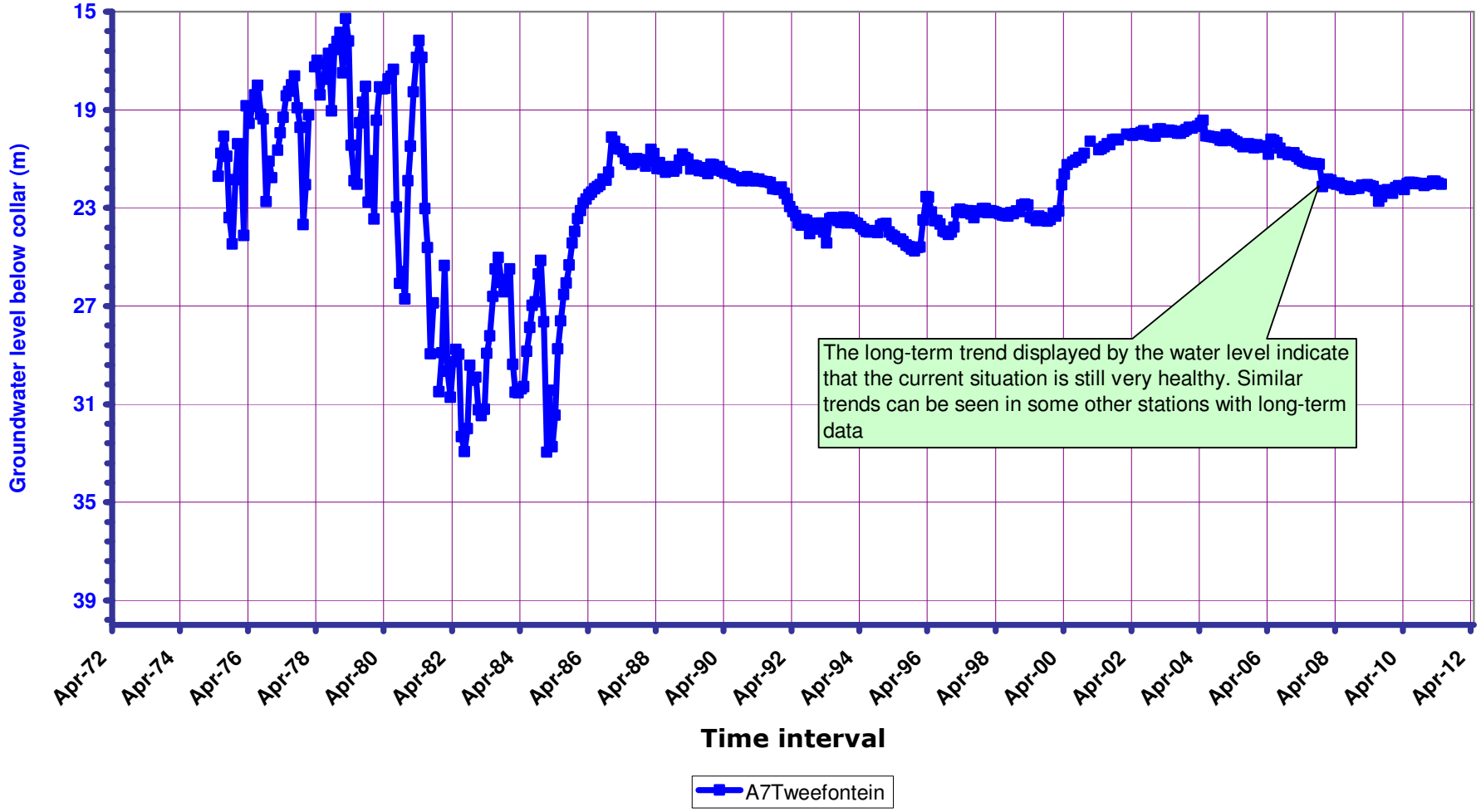
GRAPH 5

GROUNDWATER LEVEL TIME SERIES OF STATION B8NGALALUME



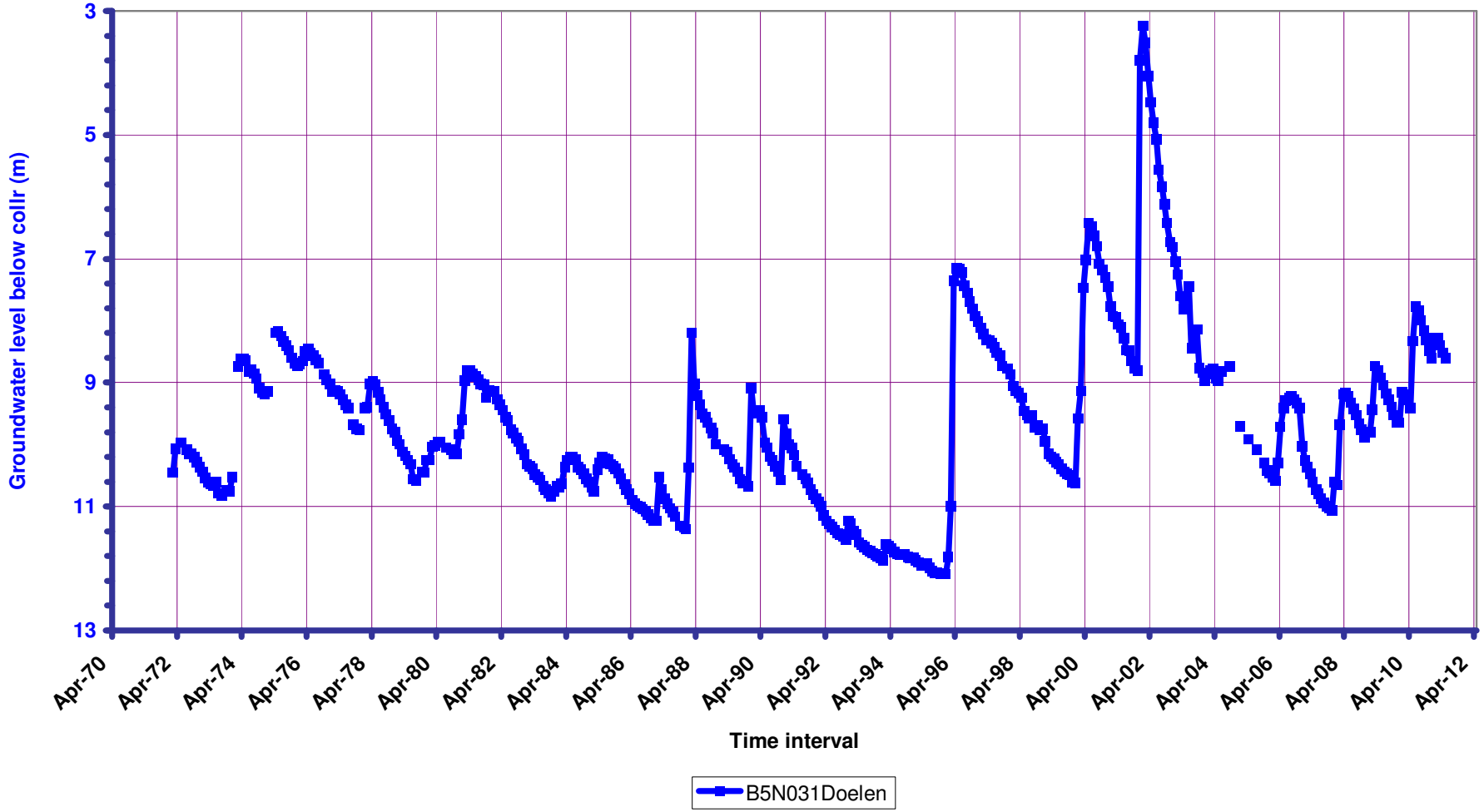
GRAPH 6

GROUNDWATER LEVEL TIME SERIES OF STATION A7N0525 TWEEFONTEIN



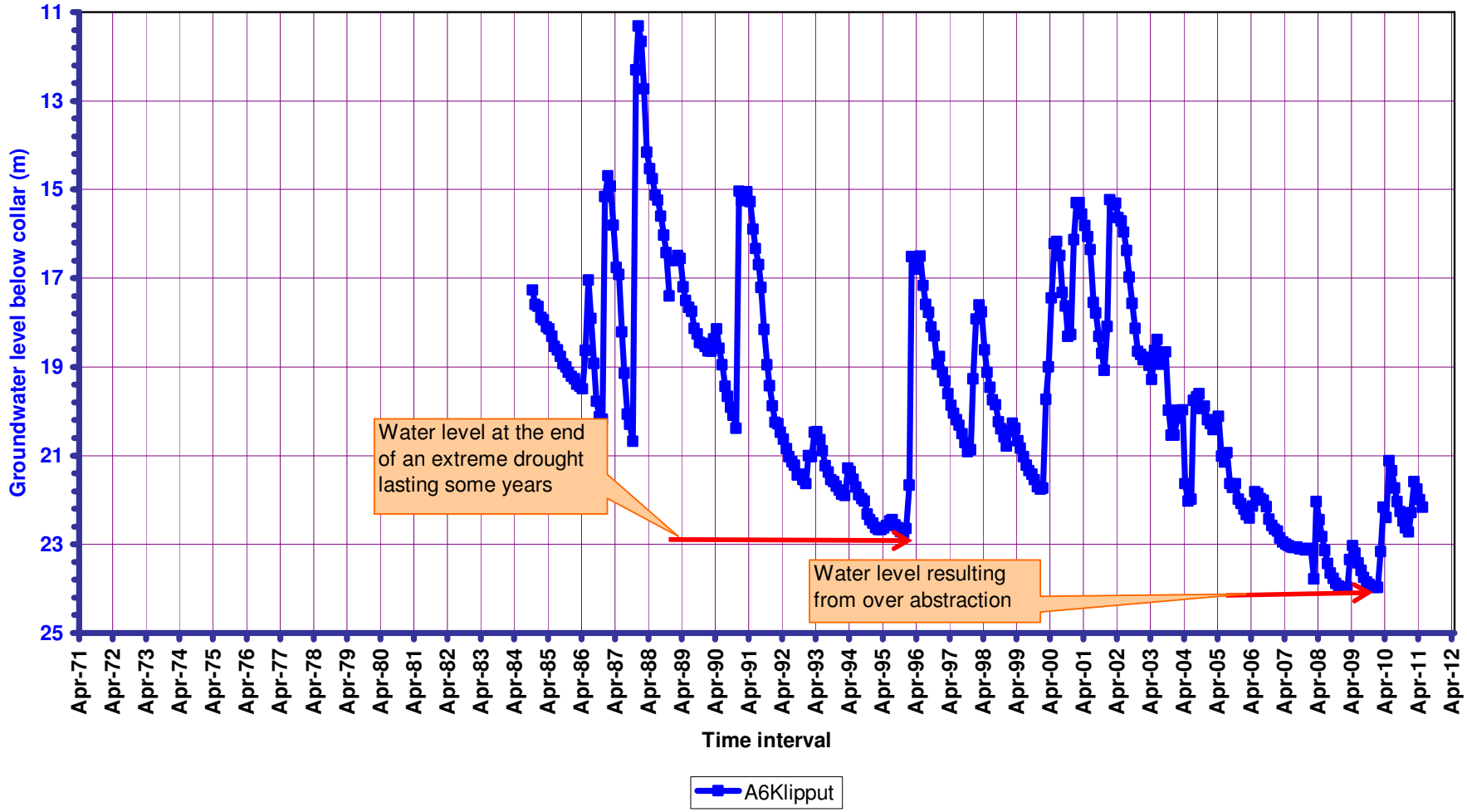
GRAPH 7

GROUNDWATER LEVEL TIME SERIES OF STATION B5N0031 DOELEN



GRAPH 8

GROUNDWATER LEVEL TIME SERIE OF STATION A6N0082 KLIPPUT



GRAPH 9