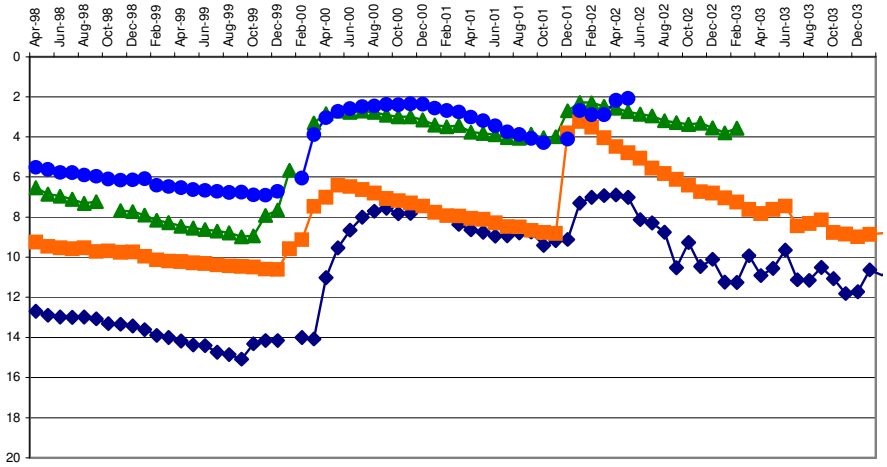
water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

LIMPOPO REGION

DIRECTORATE
WATER REGULATION AND USE

STATUS REPORT ON MONITORING & GROUNDWATER LEVEL TRENDS NOVEMBER 2009 – NOVEMBER 2010



H VERSTER
DECEMBER 2010

Data collection assisted by:
P F TSHELANE
K MOREKGURE
S C MUTHEIWANA
D A TLEANE
T P SEAKAMELA
N F POOPEDI

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1) EXECUTIVE SUMMARY

Groundwater levels

Water levels at the corresponding period last year, November 2009, midway through the dry season, August 2010 and end of the dry season, November 2010.are discussed. Data collection was done in November 2010 including the 34 stations in the Kruger National Park. The 30 Special purpose monitoring stations (Projects) will be visited in December (**MAPS 1 & 2)**

Comparison of water levels with the corresponding time last year: (NOVEMBER 2009 TO NOVEMBER 2010)

Stations with data available for the whole period = 153/174 (87.9% of stations)

	No of stations	**% of stations**
Station with lower water levels	64	41.8%
No difference in water level	1	0.7%
Stations with higher water levels	88	57.5%
Total	**153**	**100%**

Groundwater levels at the majority of stations, 57.5% is currently higher than the same time last year.
Some areas have a concentration of higher levels while lower water levels are concentrated in other areas. Delineation of the concentration of stations with similar water level trends is depicted on **(Map 4).** The blue area indicates the areas with higher water levels with orange for lower water levels.

GRAPHS 45 to 47 were included to gain better perspective of the current situation in relation to past trends
The graphs illustrate the current water level situation in relation to the past 20 years. The stations used are widely spread over the 3 drainages and is regarded as representative of the general conditions. Linear trend lines were added and clearly indicate the healthy state of groundwater levels in general.
The trend at station A6Klipput as seen on graph 45 represent a declining trend, opposed to the rising trend elsewhere. This reverse in trend started around 2000 when irrigation abstraction was hugely increased in the area. This indicates that local anomalies may occur and highlight the effect of non management of the resource.

2) STATUS OF MONITORING NETWORK

Limpopo Province's Groundwater Level Monitoring Network currently consists of 238 active monitoring stations, including 34 in the KNP. 1 Caved in borehole still have to be re-drilled, 5 new boreholes are currently planned to be drilled additionally to fill gaps in the existing network.. **(Maps 1 & 2)**

Upgrading of existing stations and delivering of concrete outer rings to stations continues and construction of the concrete structures were completed at 38 stations.

Regional and Head Office jointly service a total of 55 stations for the National Groundwater Quality Program in the Limpopo Province which is sampled bi-annually. Sampling to verify the suitability

of selected sites for extension of the National Groundwater Quality Monitoring was done at 138 boreholes. 95% of analysis results were received from the laboratory **(Map 3)**

3) DATA COLLECTION, EVALUATION AND REPORTING

Data was collected and processed during November 2010 with data for 1 November 2010 being the last data used for this report.

4) LIMPOPO WATER MANAGEMENT AREA.

The area consists of secondary drainage areas A4, A5, A6, A7 and A8.

4.1 A4 Drainage Area. (Matlabas, Mokolo Rivers)

Hardly any fluctuations water levels over the past year **(GRAPH 1)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
9 Stations indicate lower water levels and 3 higher. **GRAPH 2)**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
An equal number of stations indicate lower or higher levels over the past year (**GRAPHS 3 &4)**

4.2 A5 Drainage Area. (Lephalale River)

Hardly any fluctuations water levels over the past year but some late recharge evident **(GRAPH 5)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
5 of 6 stations, indicate lower water levels. **(GRAPH 6)**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
4 of 6 stations indicate lower levels **(GRAPHS 7 & 8)**

4.3 A6 Drainage Area. (Nile, Sterk, Mogalakwena & Dorps Rivers)

Clear seasonal fluctuation in this drainage **(GRAPH 9)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
31 of 33 Stations indicate lower water levels **(GRAPHS 10 & 12)**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
57.1% of stations indicate higher water levels than last year and 42.91%) rise in water levels. An overall rise of 0,59m was recorded over the past year **(GRAPH 11 & 12)**

4.4 A7 Drainage Area. (Sand, Blood, Diep, Hout, Dwars & Brak Rivers)

Mostly no large fluctuations in water levels **(GRAPH 13)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
33 of 38 stations indicate lower, water levels **(GRAPHS 14&16).**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
26 stations (68.4%) Indicate higher water levelsand 12 stations (31.6%) indicate lower water levels..
Overall a rise of 0,77m was recorded for the period **(GRAPHS 15&16)**

4.5 A8 Drainage Area ((Nwanedzi, Nzhelele Rivers)

Water levels are generally very stable with little fluctuation **(GRAPH 17)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
All stations indicate lower water levels, average -0,23m **(GRAPHS 18 & 20)**.

Past year; NOVEMBER 2009 TO NOVEMBER 2010
7 Stations indicate higher and 2 lower water levels **(GRAPHS 19 & 20)**.

5) LEVHUVHU-LETABA WATER MANAGEMENT AREA.

The area consists of secondary drainage areas A9, B8 & B9.

5.1 A9 Drainage Area. (Mutale, Levhuvhu Rivers)

Some late recharge at most stations **(GRAPH 21)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
All stations indicate lower water levels (**GRAPHS 22 & 24)**.

Past year; NOVEMBER 2009 TO NOVEMBER 2010
13 of 18 stations indicate declining water levels for the past year **(GRAPHS 25&26)**.

5.2 B8 Drainage Area. (Groot, Middel & Klein Letaba Rivers)

Little fluctuation in groundwater levels is evident the past year **(GRAPH 24).**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
12 of 14 stations indicate lower water levels **(GRAPHS 25 & 27)**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
10 of 14 stations indicate higher water levels, average 0.6m. (**GRAPHS 26& 27)**

5.3 B9 Drainage Area. (Shingwidzi, Mphongolo Rivers)

Very stable water levels is indicated **(GRAPH 28)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
All 3 stations indicate lower water levels **(GRAPHS 29 & 31)**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
2 stations indicate a decline in water level and 1 rising **(GRAPHS 303 & 31)**

6) OLIFANTS WATER MANAGEMENT AREA.

The part of this Water Management Area within the Limpopo Province mostly consists of the B3, B5 & B7 secondary drainage areas.

6.1 B3 Drainage Area. (Elands, Gotwane Rivers (Springbok flats area)

The water levels at Tuinplaas & Settlers rose considerably over the past year but Settlers has since started to decline again **(GRAPH 32)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
2 of the 3 stations indicate higher levels, **(GRAPH 33)**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
Also 2 of the 3 with rising levels (**GRAPH 34)**

The water levels at Settlers and Tuinplaas are well above the worst recorded (**GRAPH 35)**

6.2 B5 Drainage Area. (Olifants, Nkumpi Rivers)
Late season recharge very clear at Modderfontein on te dolomite aquifer **(GRAPH 36)**

Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
Water levels lower at 5 of 7 stations **(GRAPHS 37 & 39)**

Past year; NOVEMBER 2009 TO NOVEMBER 2010
6 of 7 stations indicate higher water levels than the same time last year **GRAPHS 38 & 39**

Current average water levels compare very favorable with long-term average and the lowest average recorded at stations with long-term data **(GRAPH 39)**

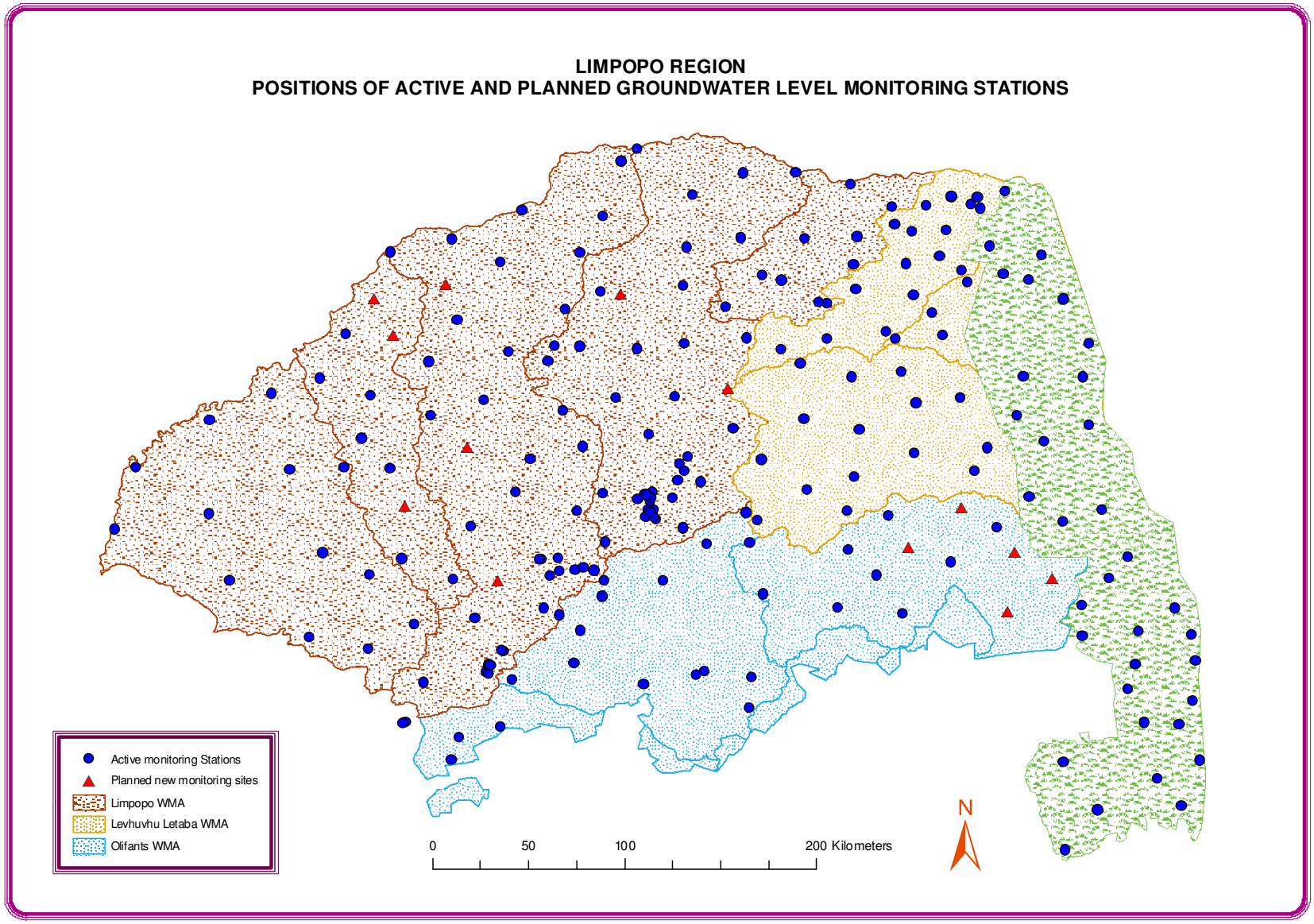
6.3 B7 Drainage Area (Olifants, Selati, Klaserie, Makhutswi Rivers)

Relative stable water levels **(GRAPH 40)**

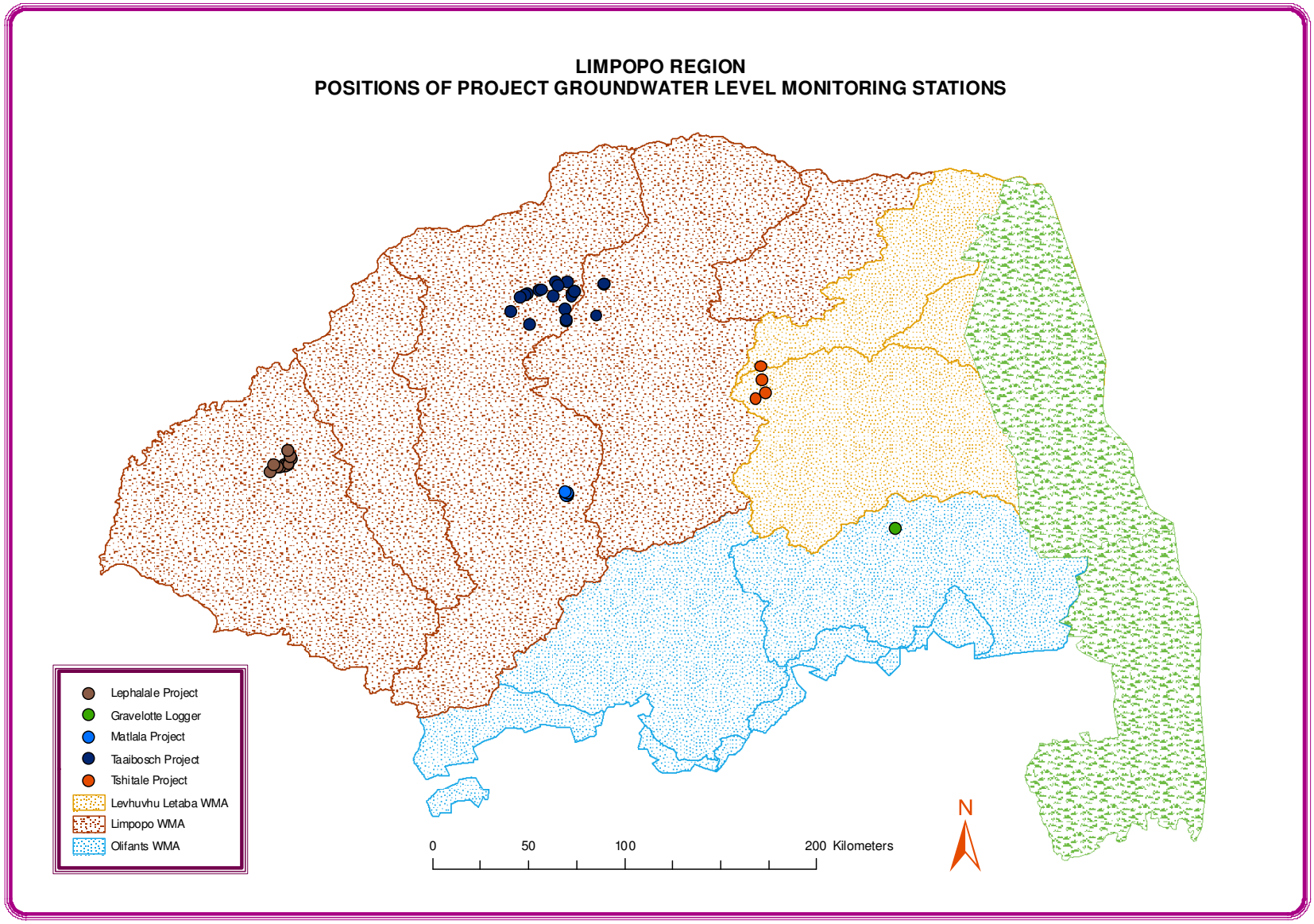
Comparison with previous levels:

Last quarter; AUGUST 2010 TO NOVEMBER 2010 (Midway to the end of the past dry season)
7 of the 8 stations with data indicate lower water levels **(GRAPHS 41 & 43)**

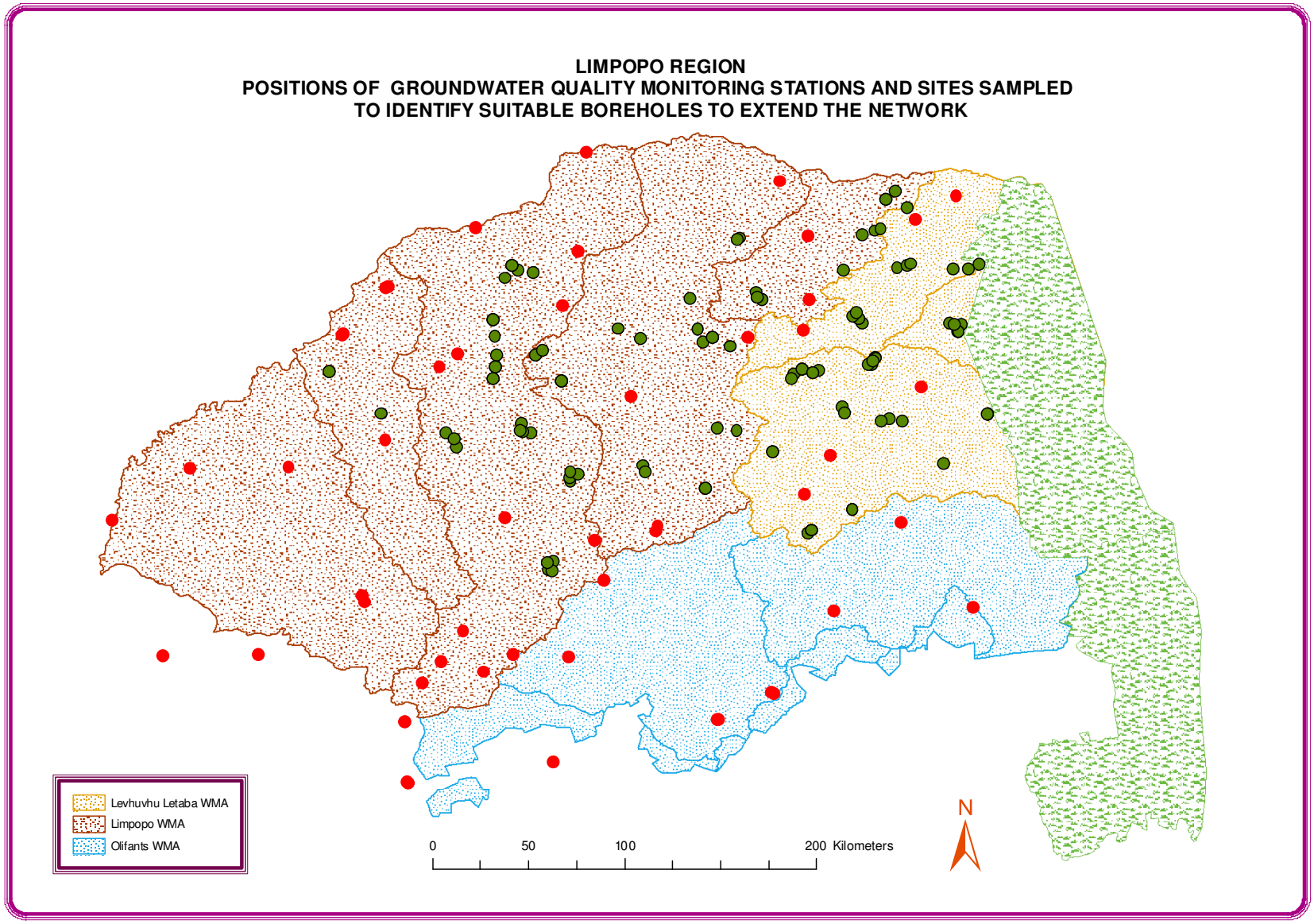
Past year; NOVEMBER 2009 TO NOVEMBER 2010
3 Stations indicate higher water levels and 5 lower **(GRAPHS 44 & 45)**.


LIMPOPO REGION
POSITIONS OF ACTIVE AND PLANNED GROUNDWATER LEVEL MONITORING STATIONS
Active monitoring Stations
Planned new monitoring sites
Limpopo WMA
Levhuvhu Letaba WMA
Olifants WMA
0
50
100
200 Kilometers
N

MAP 1

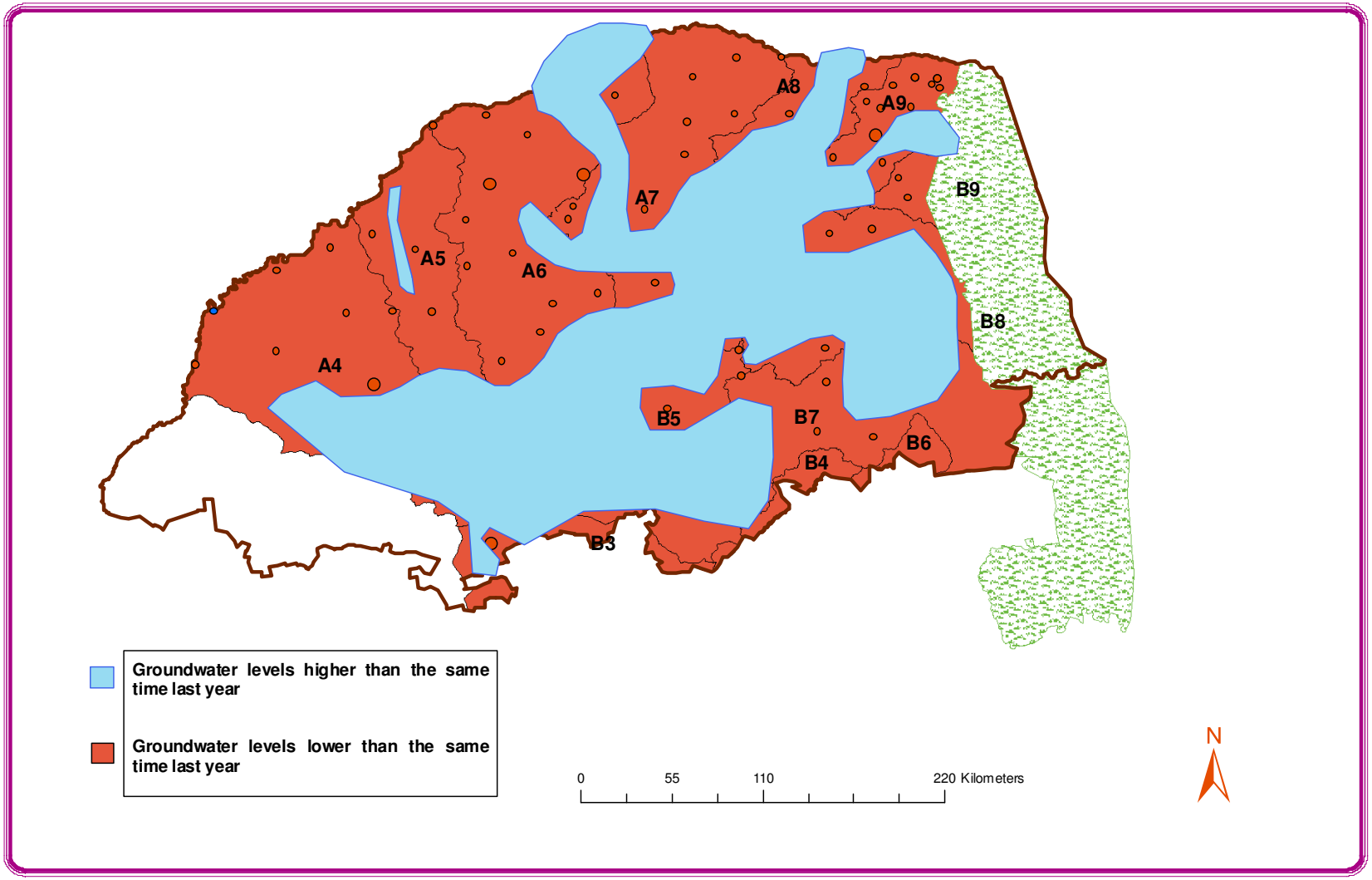

LIMPOPO REGION
POSITIONS OF PROJECT GROUNDWATER LEVEL MONITORING STATIONS
Lephalale Project
Gravelotte Logger
Matlala Project
Taaibosch Project
Tshitale Project
Levhuvhu Letaba WMA
Limpopo WMA
Olifants WMA
0
50
100
200 Kilometers
N

MAP 2

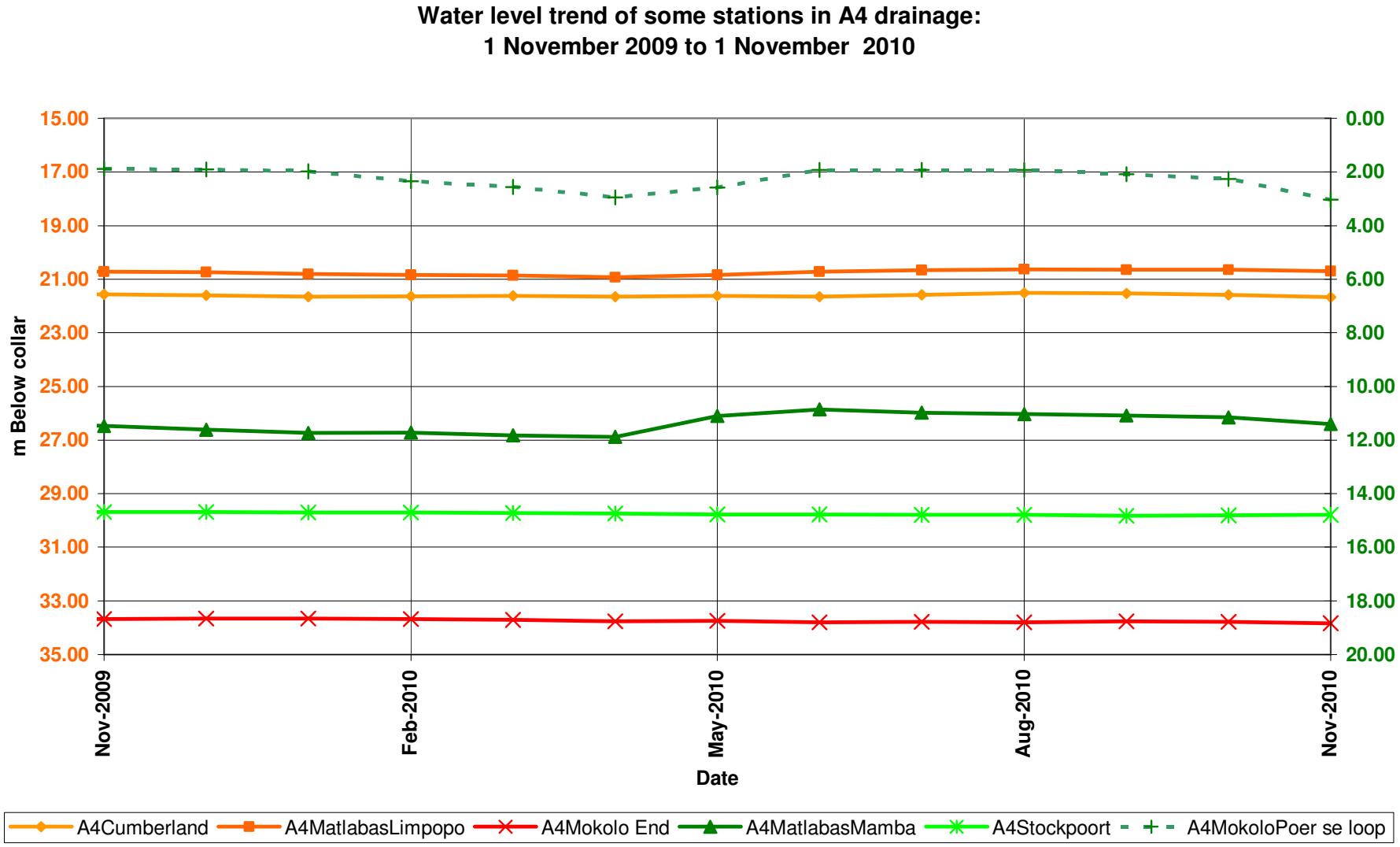

LIMPOPO REGION
POSITIONS OF GROUNDWATER QUALITY MONITORING STATIONS AND SITES SAMPLED
TO IDENTIFY SUITABLE BOREHOLES TO EXTEND THE NETWORK
Levhuvhu Letaba WMA
Limpopo WMA
Olifants WMA
0
50
100
200 Kilometers
N

MAP 3

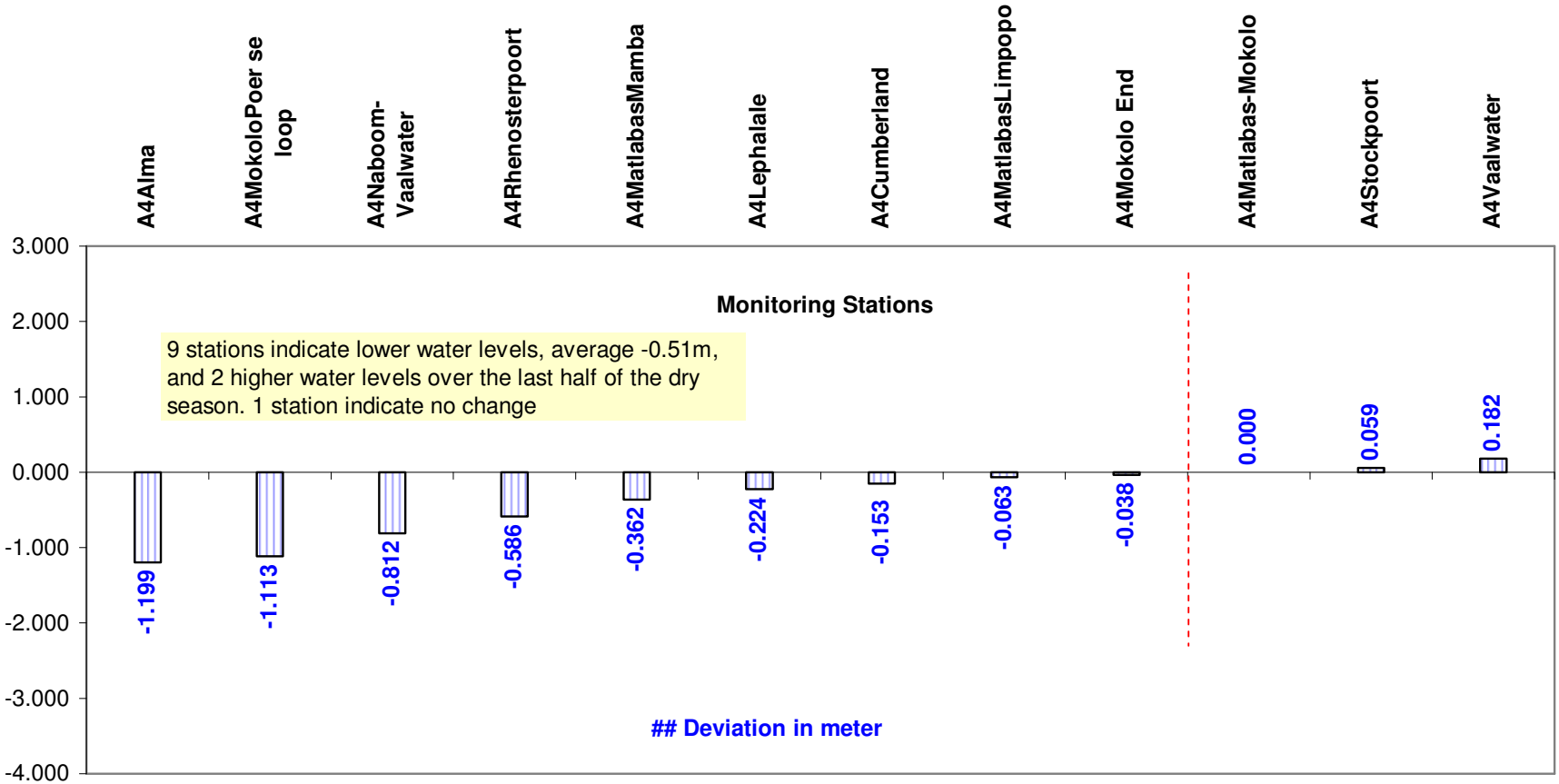
LIMPOPO REGION
PATTERN OF GROUNDWATER LEVEL BEHAVIOUR OVER THE PAST YEAR



MAP 4

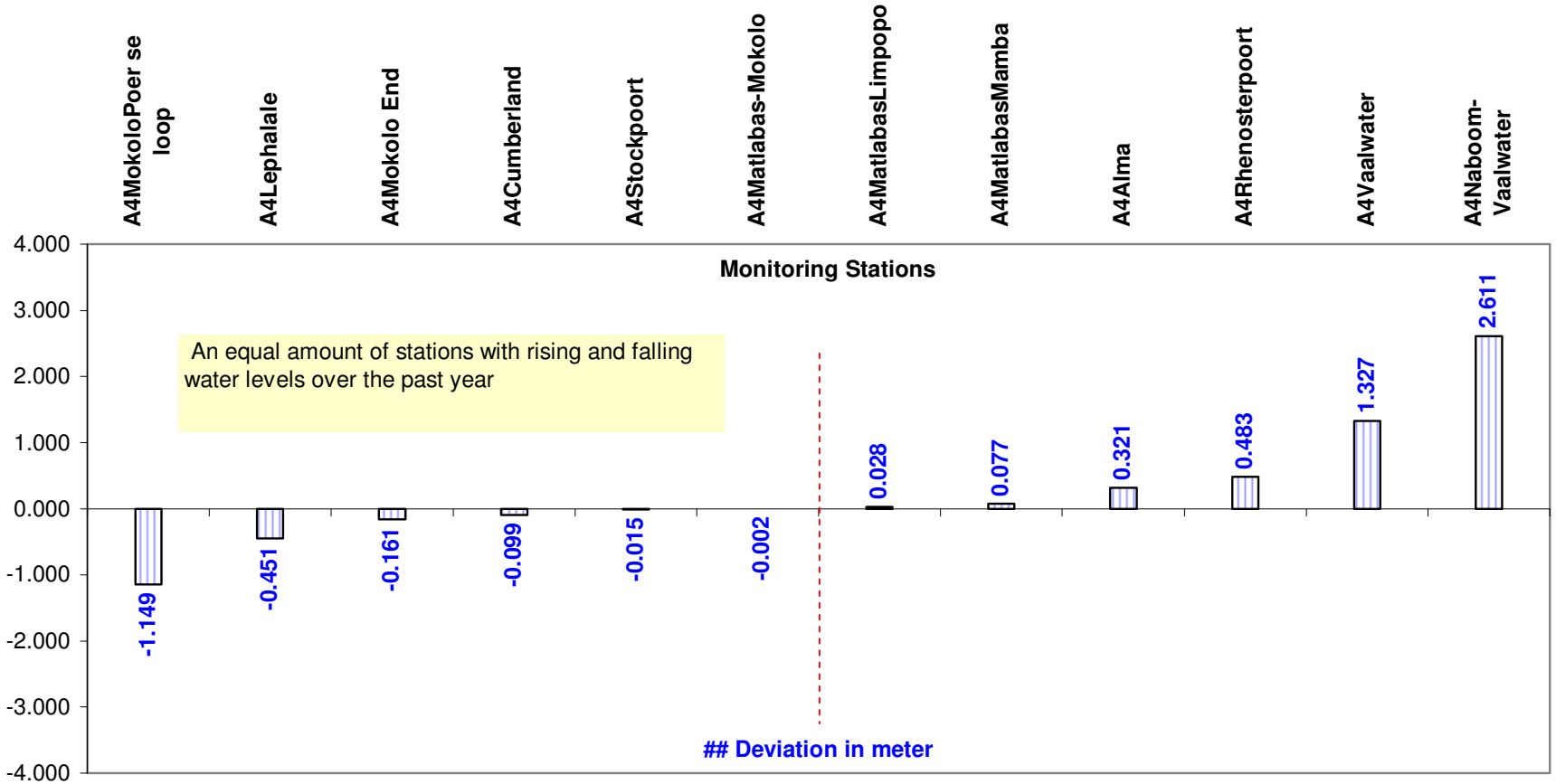

Water level trend of some stations in A4 drainage:
1 November 2009 to 1 November 2010
m Below collar
15.00
17.00
19.00
21.00
23.00
25.00
27.00
29.00
31.00
33.00
35.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Nov-2009
Feb-2010
May-2010
Aug-2010
Nov-2010
Date
A4Cumberland
A4MatlabasLimpopo
A4Mokolo End
A4MatlabasMamba
A4Stockpoort
A4MokoloPoer se loop

GRAPH 1

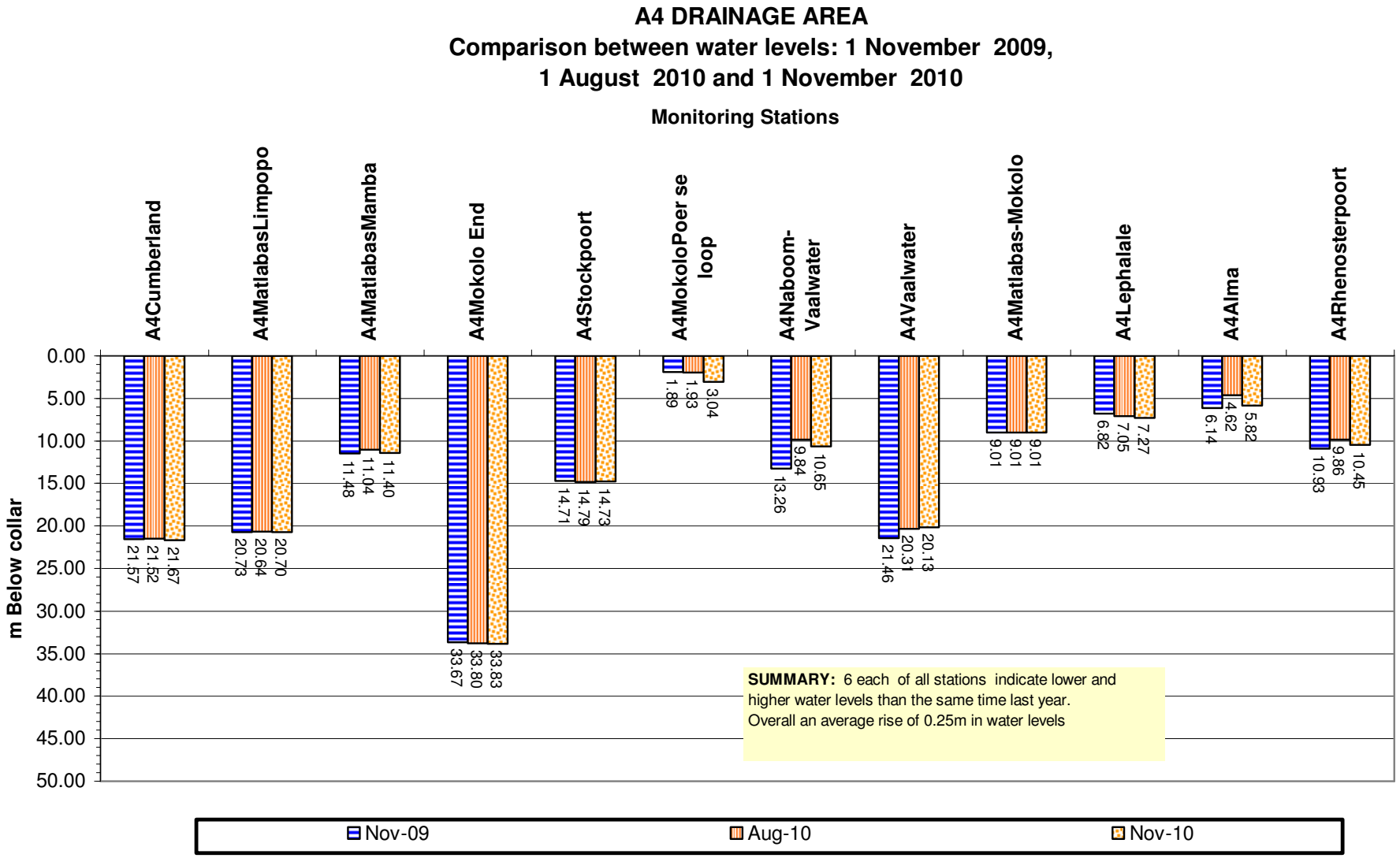

A4 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
A4Alma
A4MokoloPoer se loop
A4Naboom-Vaalwater
A4Rhenosterpoort
A4MatlabasMamba
A4Lephalale
A4Cumberland
A4MatlabasLimpopo
A4Mokolo End
A4Matlabas-Mokolo
A4Stockpoort
A4Vaalwater
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
Monitoring Stations
9 stations indicate lower water levels, average -0.51m, and 2 higher water levels over the last half of the dry season. 1 station indicate no change
-1.199
-1.113
-0.812
-0.586
-0.362
-0.224
-0.153
-0.063
-0.038
0.000
0.059
0.182
Deviation in meter

GRAPH 2

A4 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010

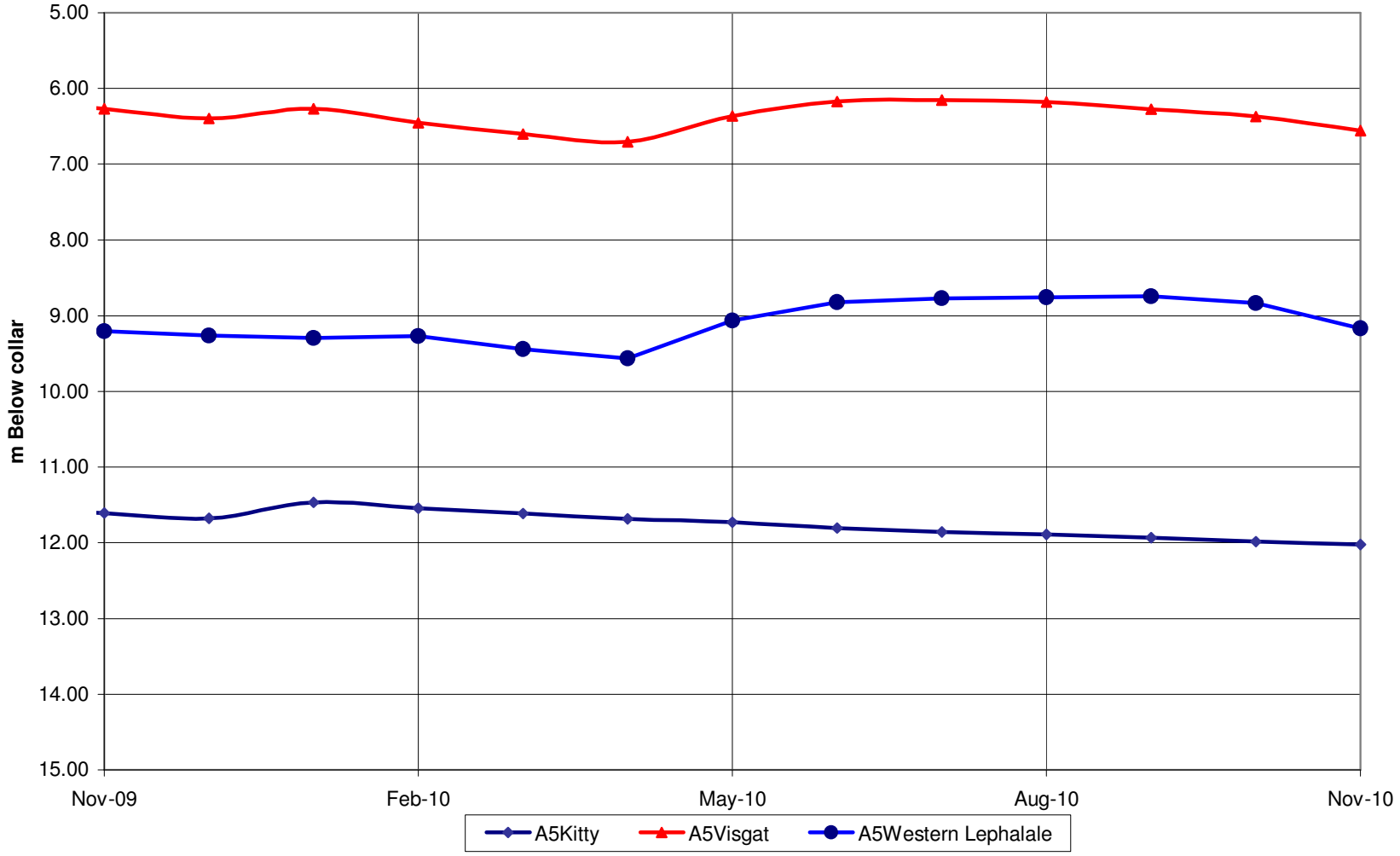


GRAPH 3

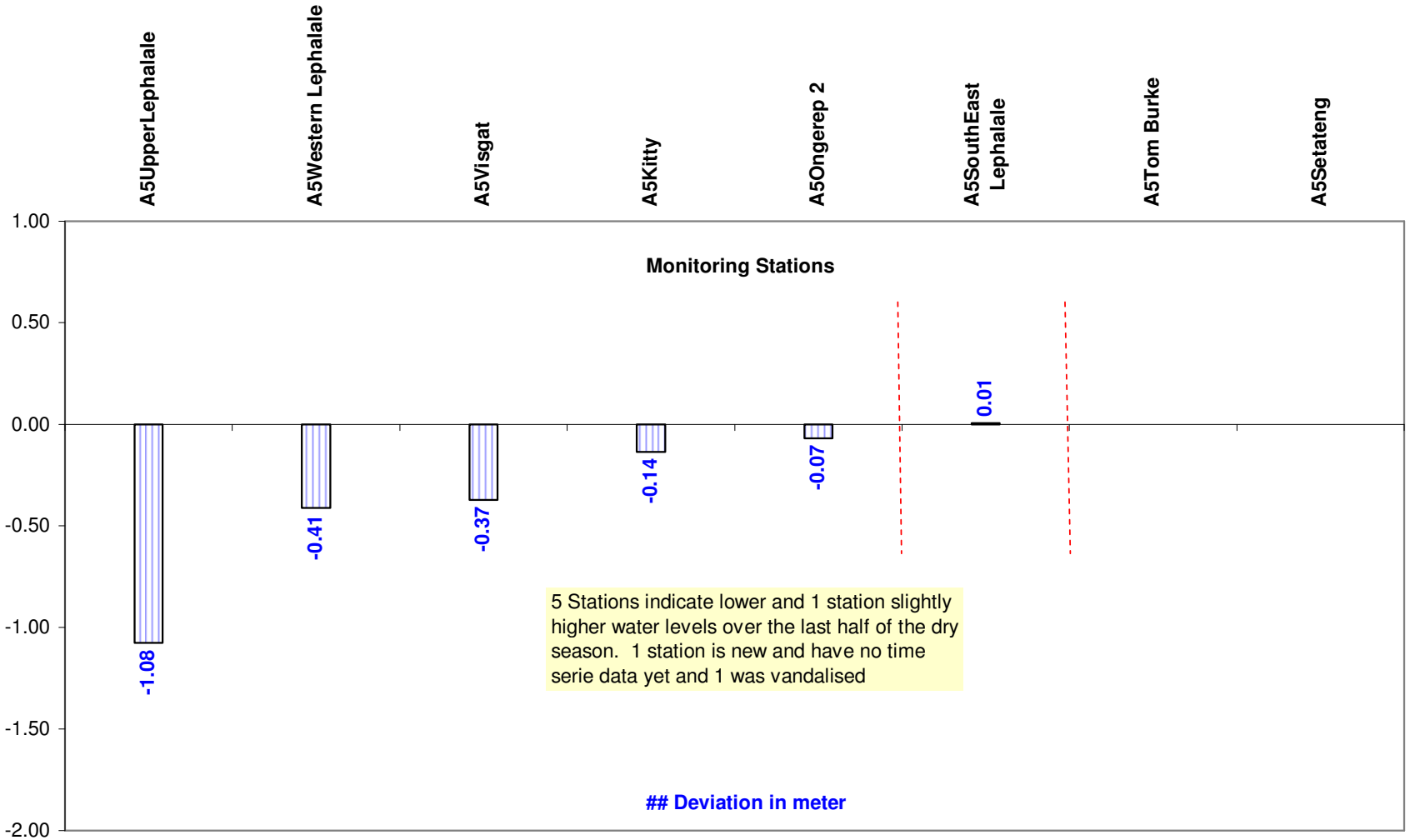

A4 DRAINAGE AREA
Comparison between water levels: 1 November 2009,
1 August 2010 and 1 November 2010
Monitoring Stations
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
A4Cumberland
21.57
21.52
21.67
A4MatlabasLimpopo
20.73
20.64
20.70
A4MatlabasMamba
11.48
11.04
11.40
A4Mokolo End
33.67
33.80
33.83
A4Stockpoort
14.71
14.79
14.73
A4MokoloPoer se loop
1.89
1.93
3.04
A4Naboom-Vaalwater
13.26
9.84
10.65
A4Vaalwater
21.46
20.31
20.13
A4Matlabas-Mokolo
9.01
9.01
9.01
A4Lephalale
6.82
7.05
7.27
A4Alma
6.14
4.62
5.82
A4Rhenosterpoort
10.93
9.86
10.45
SUMMARY: 6 each of all stations indicate lower and higher water levels than the same time last year.
Overall an average rise of 0.25m in water levels
Nov-09
Aug-10
Nov-10

GRAPH 4

Comparison of water level trends at some stations in A5 drainage: 1 November 2009 to 1 November 2010

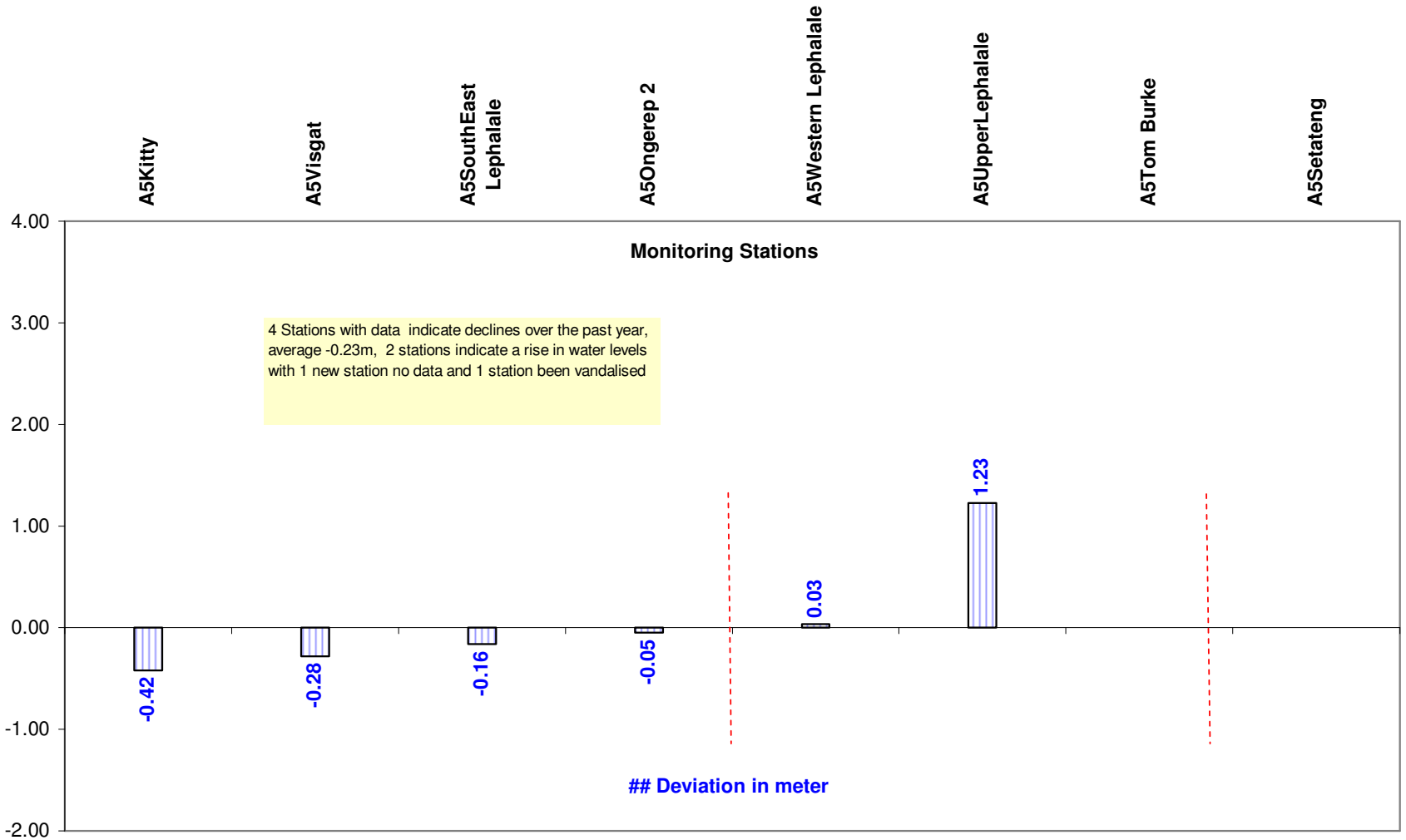


GRAPH 5

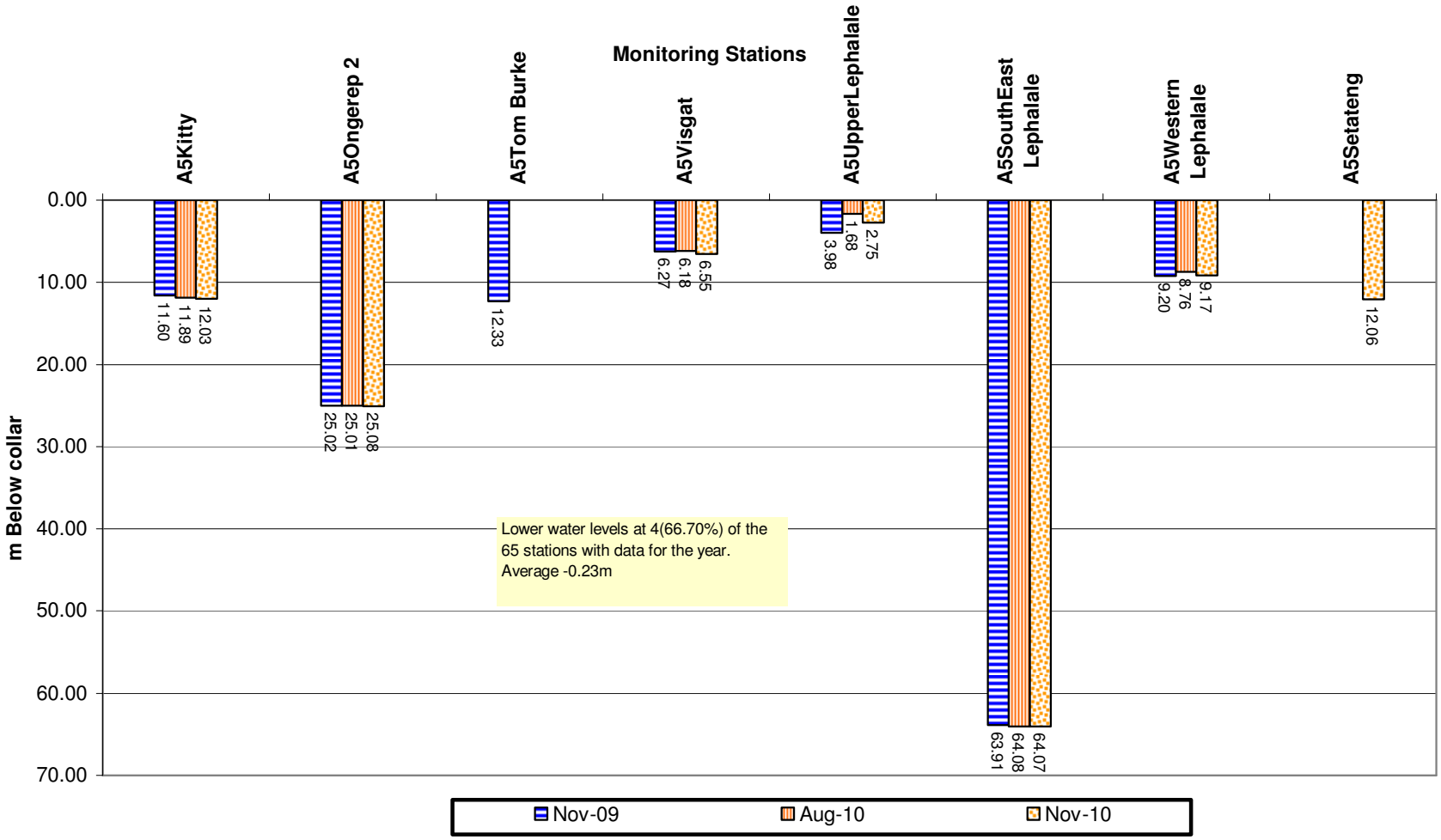

A5 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
A5UpperLephalale
A5Western Lephalale
A5Visgat
A5Kitty
A5Ongerep 2
A5SouthEast Lephalale
A5Tom Burke
A5Setateng
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
Monitoring Stations
-1.08
-0.41
-0.37
-0.14
-0.07
0.01
5 Stations indicate lower and 1 station slightly higher water levels over the last half of the dry season. 1 station is new and have no time serie data yet and 1 was vandalised
Deviation in meter

GRAPH 6

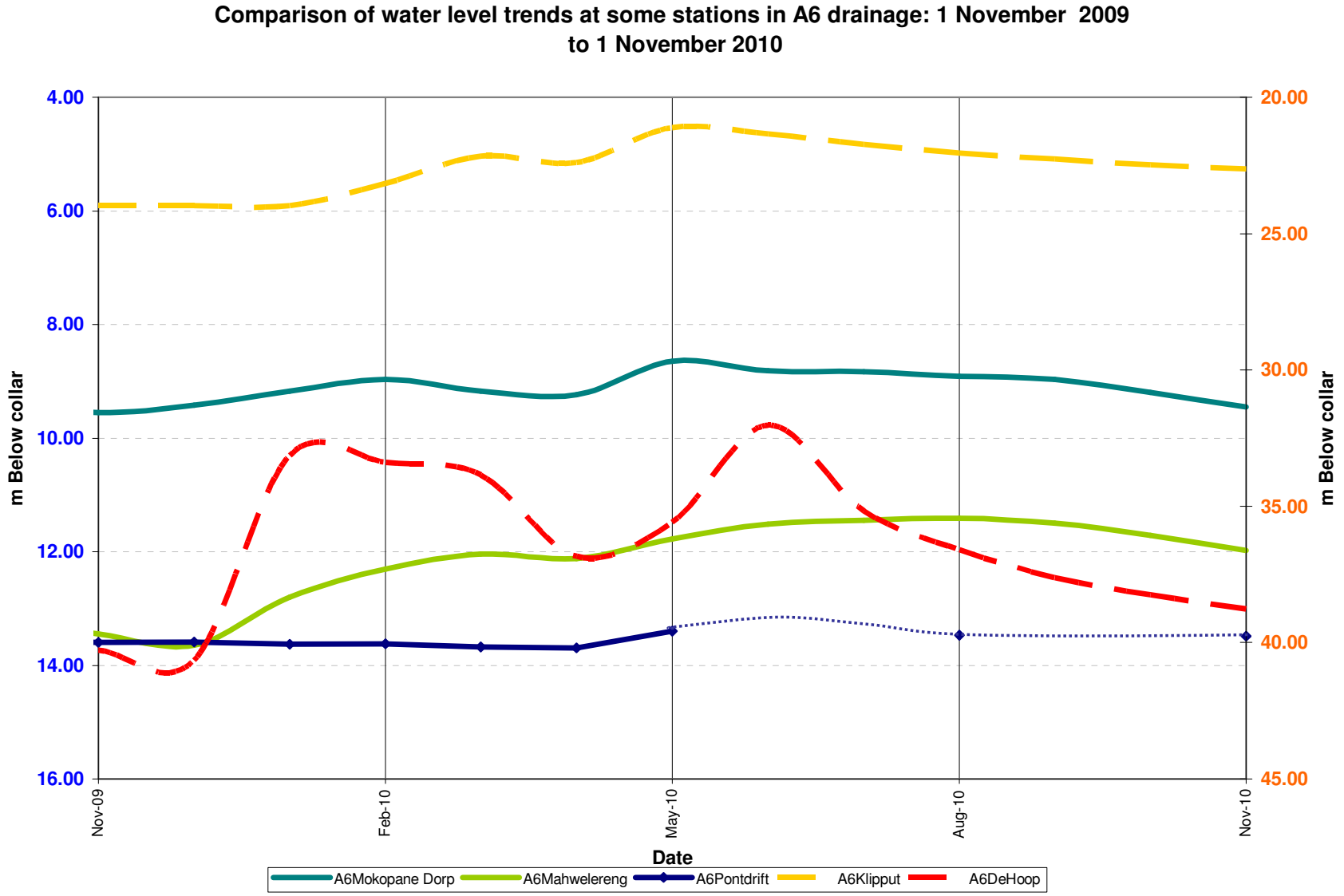
A5 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010



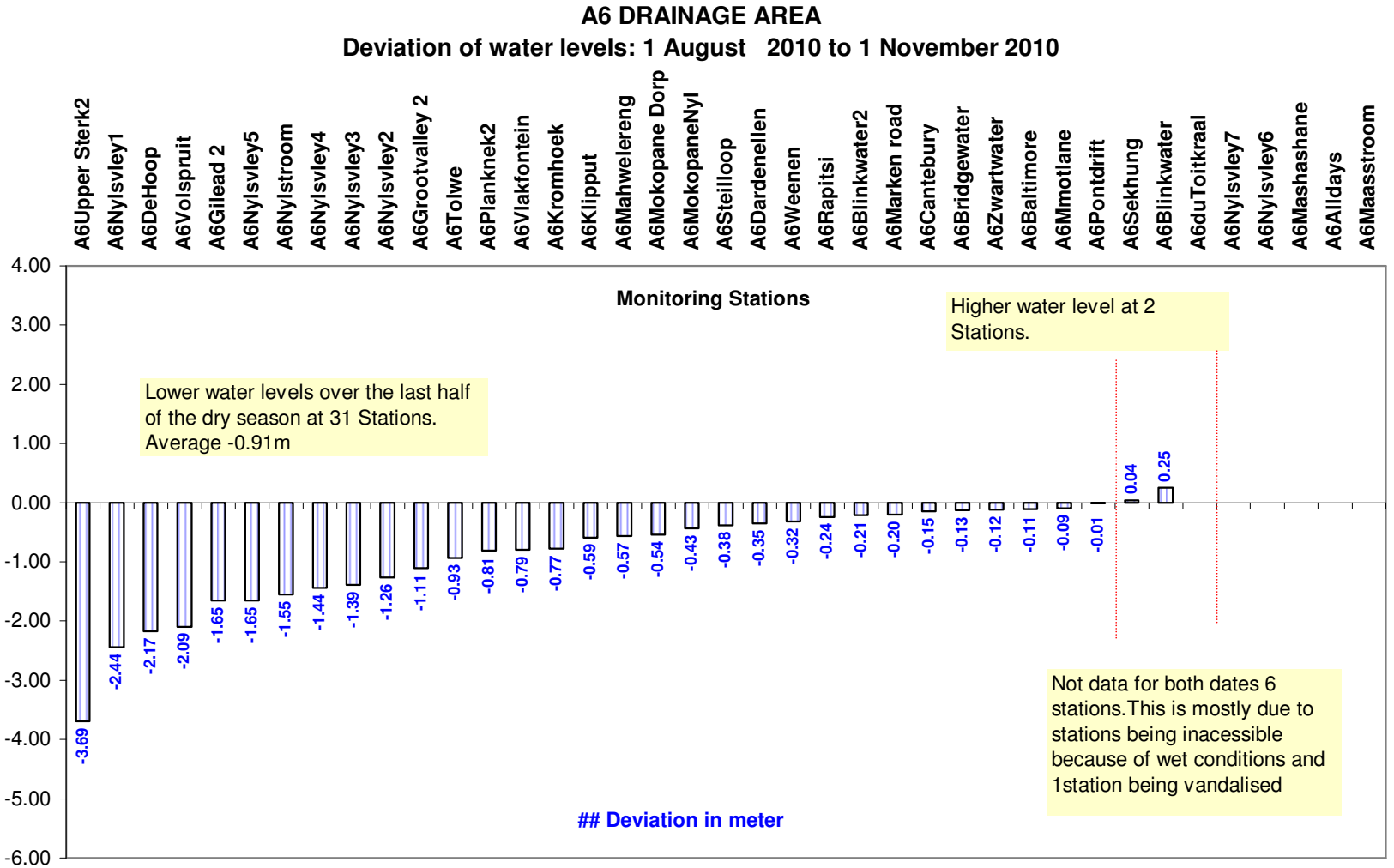
GRAPH 7


A5 DRAINAGE AREA
Comparison between water level depths : 1 November 2009,
1 August 2010 and 1 November 2010
Monitoring Stations
A5Kitty
A5Ongerep 2
A5Tom Burke
A5Visgat
A5UpperLephalale
A5SouthEast Lephalale
A5Western Lephalale
A5Setateng
m Below collar
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
11.60
11.89
12.03
25.02
25.01
25.08
12.33
6.27
6.18
6.55
3.98
1.68
2.75
63.91
64.08
64.07
9.20
8.76
9.17
12.06
Lower water levels at 4(66.70%) of the 65 stations with data for the year.
Average -0.23m
Nov-09
Aug-10
Nov-10

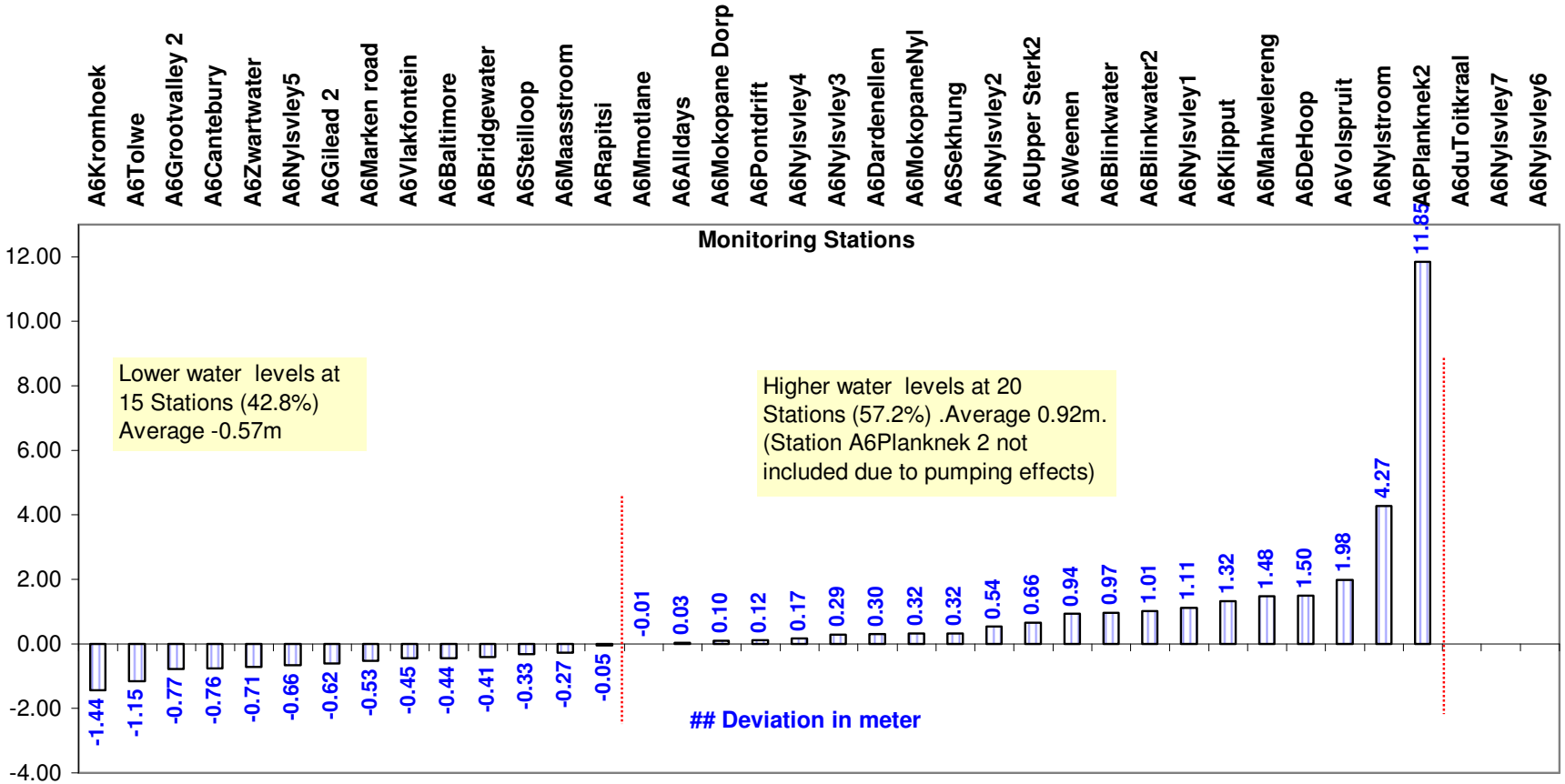
GRAPH 8


Comparison of water level trends at some stations in A6 drainage: 1 November 2009 to 1 November 2010
4.00
6.00
8.00
10.00
12.00
14.00
16.00
m Below collar
20.00
25.00
30.00
35.00
40.00
45.00
m Below collar
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Date
A6Mokopane Dorp
A6Mahwelereng
A6Pontdrift
A6Klipput
A6DeHoop

GRAPH 9

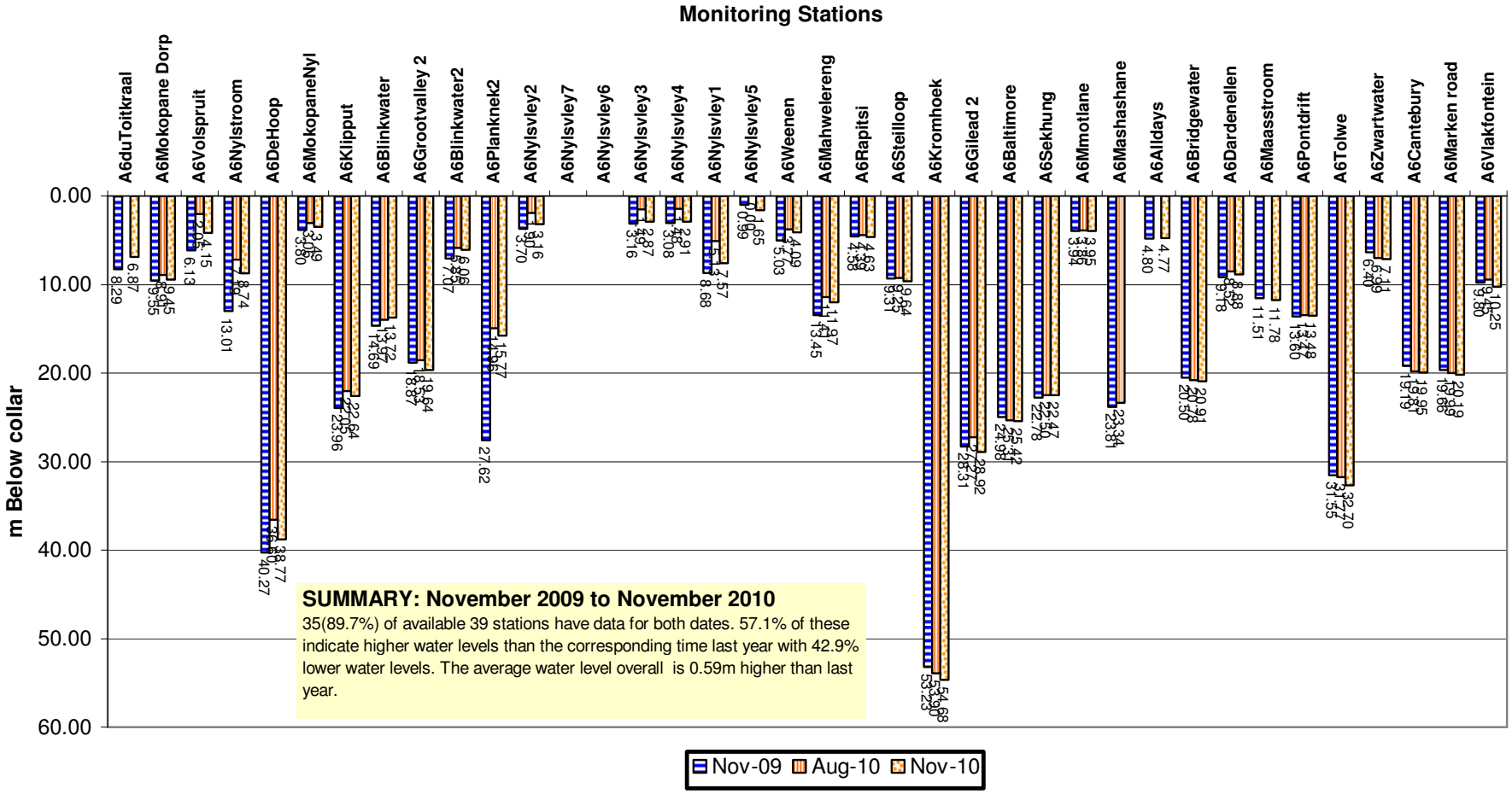

A6 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
A6Upper Sterk2
A6Nylsvley1
A6DeHoop
A6Volspruit
A6Gilead 2
A6Nylsvley5
A6Nylstroom
A6Nylsvley4
A6Nylsvley3
A6Nylsvley2
A6Grootvalley 2
A6Tolwe
A6Planknek2
A6Vlakfontein
A6Kromhoek
A6Klipput
A6Mahwelereng
A6Mokopane Dorp
A6MokopaneNyl
A6Steilloop
A6Dardenellen
A6Weenen
A6Rapitsi
A6Blinkwater2
A6Marken road
A6Cantebury
A6Bridgewater
A6Zwartwater
A6Baltimore
A6Mmotlane
A6Pontdrift
A6Sekhung
A6Blinkwater
A6duToitkraal
A6Nylsvley7
A6Nylsvley6
A6Mashashane
A6Alldays
A6Maasstroom
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
Monitoring Stations
Higher water level at 2 Stations.
Lower water levels over the last half of the dry season at 31 Stations. Average -0.91m
-3.69
-2.44
-2.17
-2.09
-1.65
-1.65
-1.55
-1.44
-1.39
-1.26
-1.11
-0.93
-0.81
-0.79
-0.77
-0.59
-0.57
-0.54
-0.43
-0.38
-0.35
-0.32
-0.24
-0.21
-0.20
-0.15
-0.13
-0.12
-0.11
-0.09
-0.01
0.04
0.25
Not data for both dates 6 stations.This is mostly due to stations being inacessible because of wet conditions and 1station being vandalised
Deviation in meter

GRAPH 10

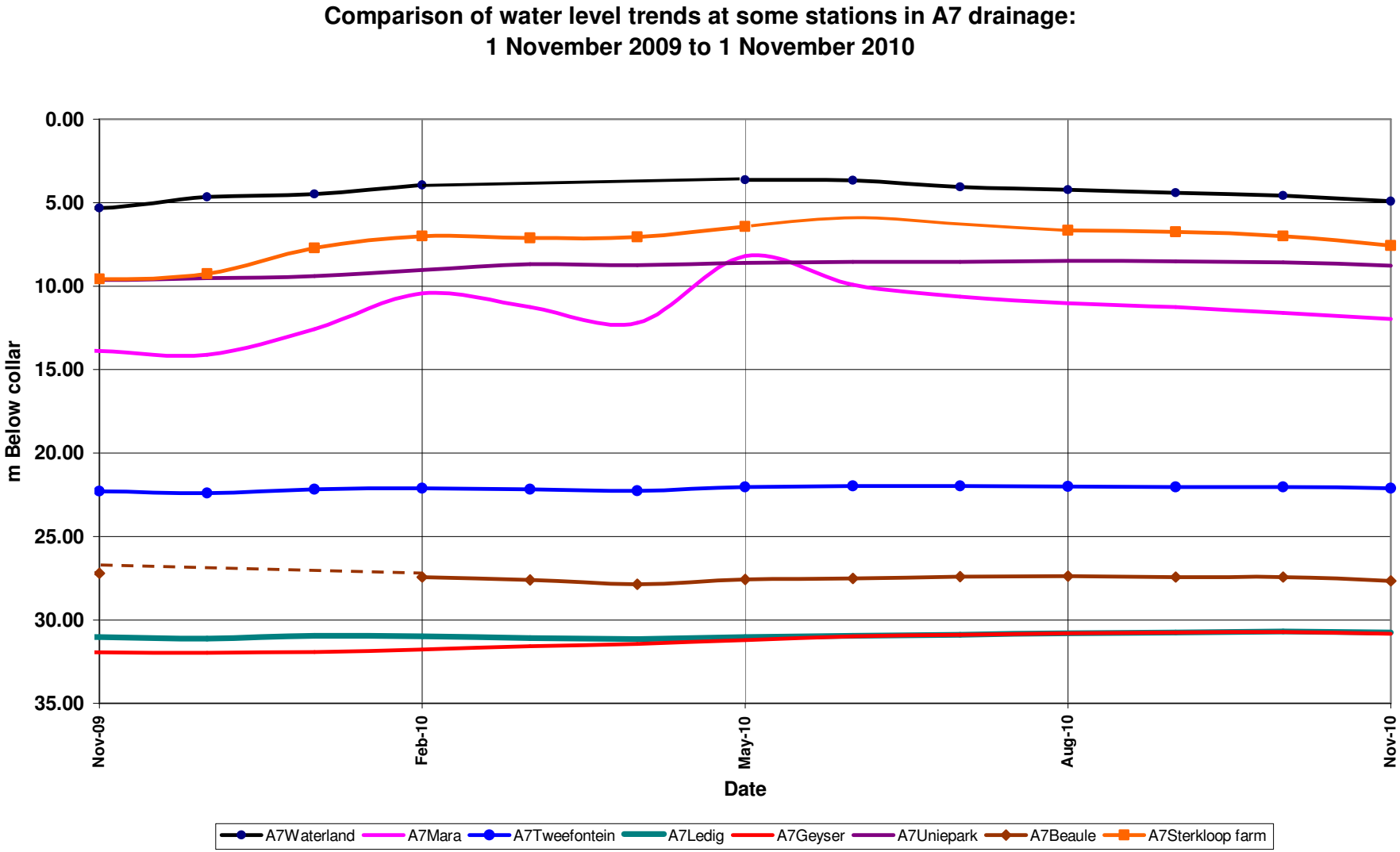

A6 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010
A6Kromhoek
A6Tolwe
A6Grootvalley 2
A6Cantebury
A6Zwartwater
A6Nylsvley5
A6Gilead 2
A6Marken road
A6Vlakfontein
A6Baltimore
A6Bridgewater
A6Steilloop
A6Maasstroom
A6Rapitsi
A6Mmotlane
A6Alldays
A6Mokopane Dorp
A6Pontdrift
A6Nylsvley4
A6Nylsvley3
A6Dardenellen
A6MokopaneNyl
A6Sekhung
A6Nylsvley2
A6Upper Sterk2
A6Weenen
A6Blinkwater
A6Blinkwater2
A6Nylsvley1
A6Klipput
A6Mahwelereng
A6DeHoop
A6Volspruit
A6Nylstroom
A6Planknek2
A6duToitkraal
A6Nylsvley7
A6Nylsvley6
Monitoring Stations
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
Lower water levels at 15 Stations (42.8%) Average -0.57m
Higher water levels at 20 Stations (57.2%) .Average 0.92m. (Station A6Planknek 2 not included due to pumping effects)
-1.44
-1.15
-0.77
-0.76
-0.71
-0.66
-0.62
-0.53
-0.45
-0.44
-0.41
-0.33
-0.27
-0.05
-0.01
0.03
0.10
0.12
0.17
0.29
0.30
0.32
0.32
0.54
0.66
0.94
0.97
1.01
1.11
1.32
1.48
1.50
1.98
4.27
11.85
Deviation in meter

GRAPH 11

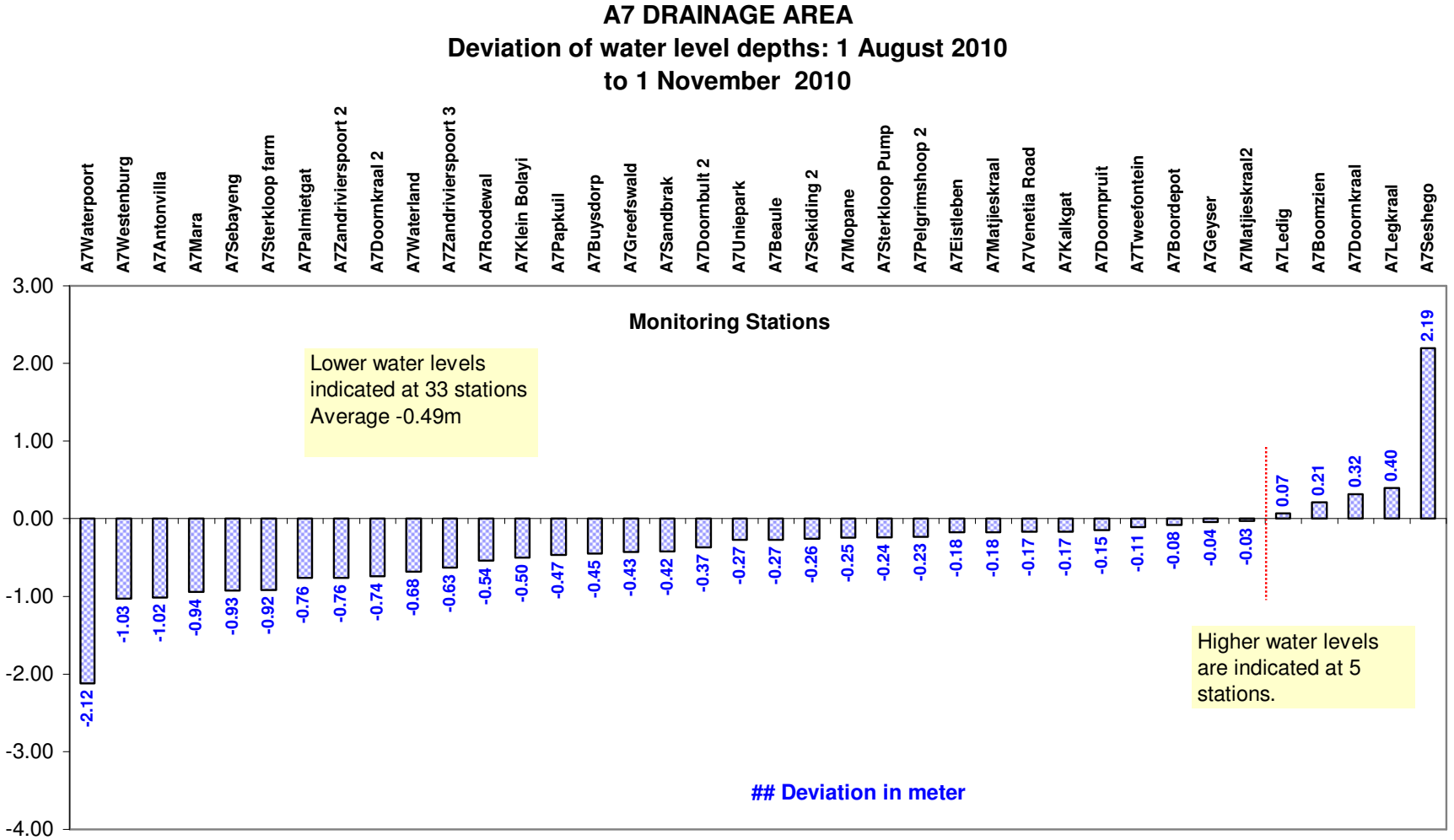
A6 DRAINAGE AREA
Comparison between water level depths: 1 November 2009, 1 August 2010, and 1 November 2010



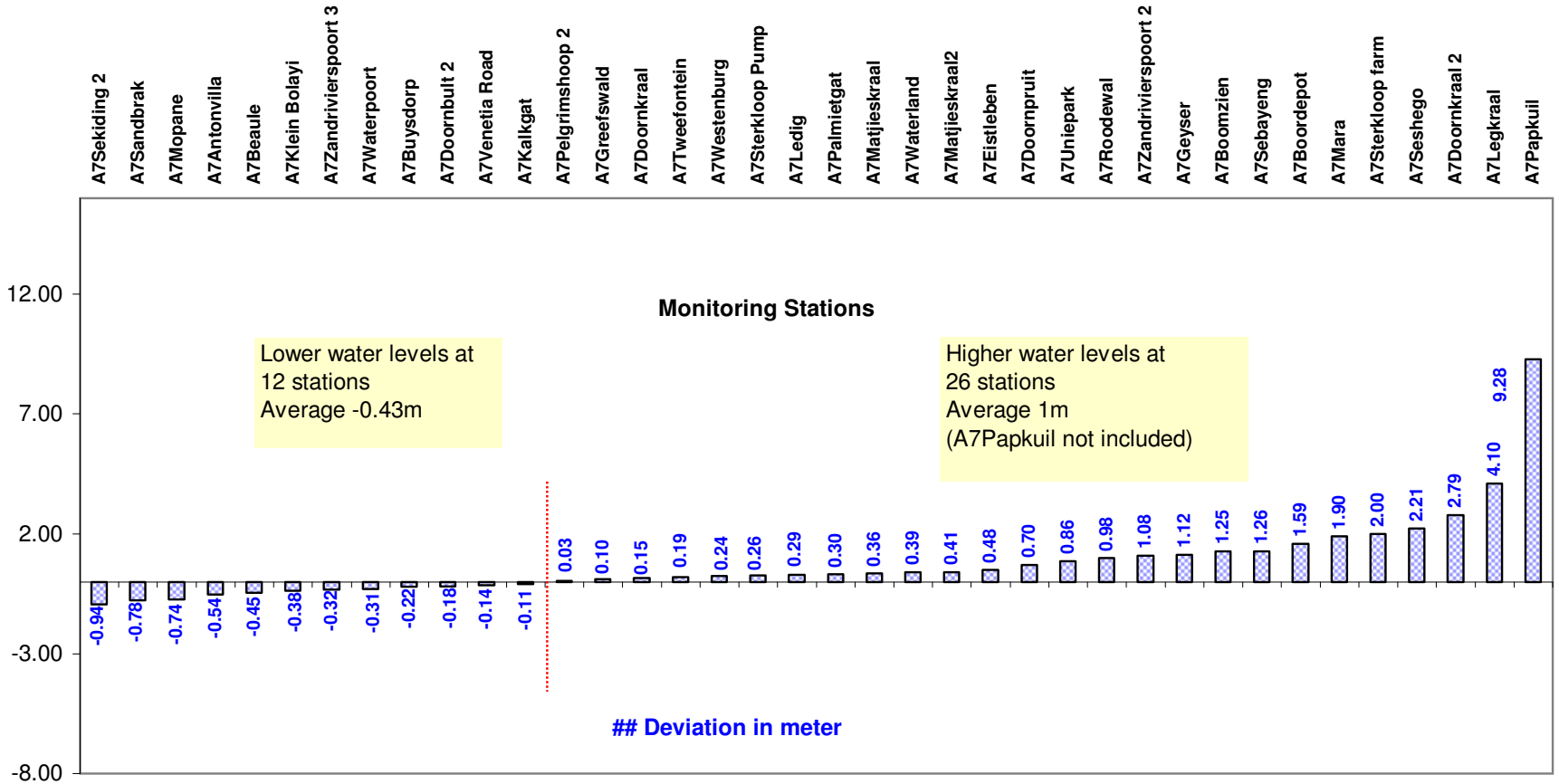
GRAPH 12


Comparison of water level trends at some stations in A7 drainage:
1 November 2009 to 1 November 2010
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
m Below collar
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Date
A7Waterland
A7Mara
A7Tweefontein
A7Ledig
A7Geyser
A7Uniepark
A7Beaule
A7Sterkloop farm

GRAPH 13

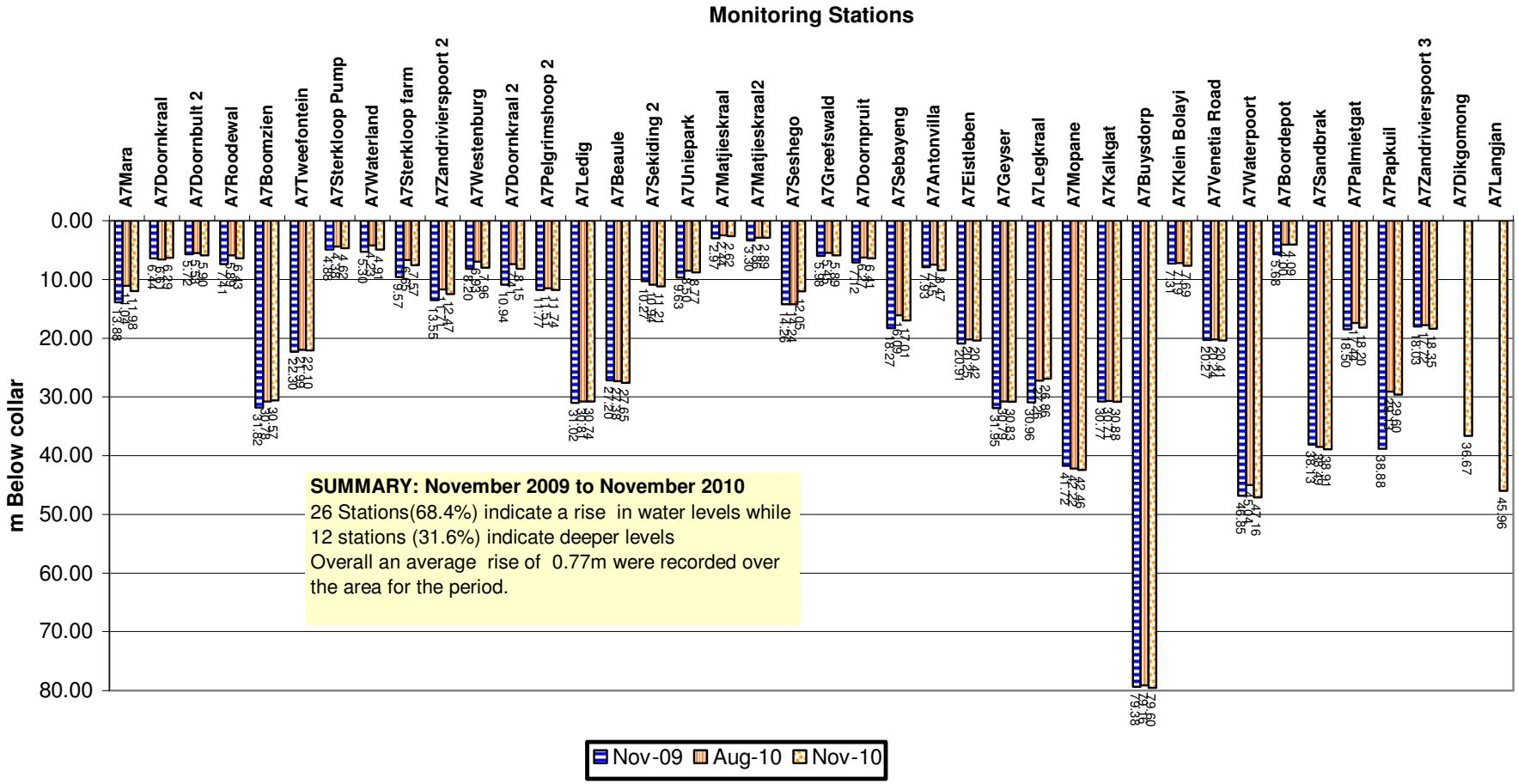

A7 DRAINAGE AREA
Deviation of water level depths: 1 August 2010
to 1 November 2010
A7Waterpoort
A7Westenburg
A7Antonvilla
A7Mara
A7Sebayeng
A7Sterkloop farm
A7Palmietgat
A7Zandrivierspoort 2
A7Doornkraal 2
A7Waterland
A7Zandrivierspoort 3
A7Roodewal
A7Klein Bolayi
A7Papkuil
A7Buysdorp
A7Greefswald
A7Sandbrak
A7Doornbult 2
A7Uniepark
A7Beaule
A7Sekiding 2
A7Mopane
A7Sterkloop Pump
A7Pelgrimshoop 2
A7Eistleben
A7Matjieskraal
A7Venetia Road
A7Kalkgat
A7Doornpruit
A7Tweefontein
A7Boordepot
A7Geyser
A7Matjieskraal2
A7Ledig
A7Boomzien
A7Doornkraal
A7Legkraal
A7Seshego
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Monitoring Stations
Lower water levels indicated at 33 stations
Average -0.49m
-2.12
-1.03
-1.02
-0.94
-0.93
-0.92
-0.76
-0.76
-0.74
-0.68
-0.63
-0.54
-0.50
-0.47
-0.45
-0.43
-0.42
-0.37
-0.27
-0.27
-0.26
-0.25
-0.24
-0.23
-0.18
-0.18
-0.17
-0.17
-0.15
-0.11
-0.08
-0.04
-0.03
0.07
0.21
0.32
0.40
2.19
Higher water levels are indicated at 5 stations.
Deviation in meter

GRAPH 14

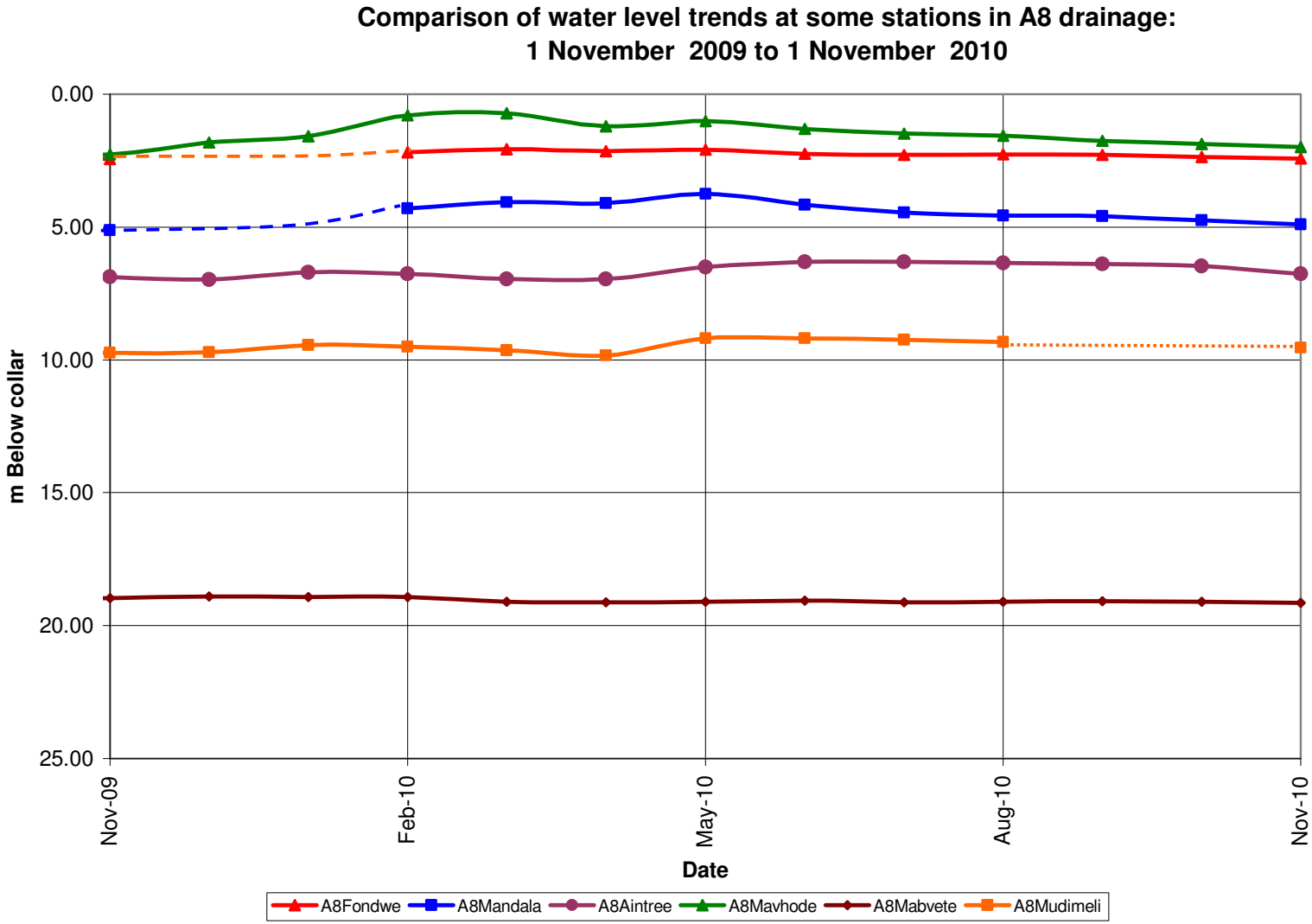

A7 DRAINAGE AREA
Deviation of water level depths: 1 November 2009 to 1 November 2010
A7Sekiding 2
A7Sandbrak
A7Mopane
A7Antonvilla
A7Beaule
A7Klein Bolayi
A7Zandrivierspoort 3
A7Waterpoort
A7Buysdorp
A7Doornbult 2
A7Venetia Road
A7Kalkgat
A7Pelgrimshoop 2
A7Greefswald
A7Doornkraal
A7Tweefontein
A7Westenburg
A7Sterkloop Pump
A7Ledig
A7Palmietgat
A7Matjieskraal
A7Waterland
A7Matjieskraal2
A7Eistleben
A7Doornpruit
A7Uniepark
A7Roodewal
A7Zandrivierspoort 2
A7Geyser
A7Boomzien
A7Sebayeng
A7Boordepot
A7Mara
A7Sterkloop farm
A7Seshego
A7Doornkraal 2
A7Legkraal
A7Papkuil
12.00
7.00
2.00
-3.00
-8.00
Monitoring Stations
Lower water levels at
12 stations
Average -0.43m
Higher water levels at
26 stations
Average 1m
(A7Papkuil not included)
-0.94
-0.78
-0.74
-0.54
-0.45
-0.38
-0.32
-0.31
-0.22
-0.18
-0.14
-0.11
0.03
0.10
0.15
0.19
0.24
0.26
0.29
0.30
0.36
0.39
0.41
0.48
0.70
0.86
0.98
1.08
1.12
1.25
1.26
1.59
1.90
2.00
2.21
2.79
4.10
9.28
Deviation in meter

GRAPH 15

A7 DRAINAGE AREA
Comparison between water level depths: 1 November 2009, 1 August 2010 and 1 November 2010

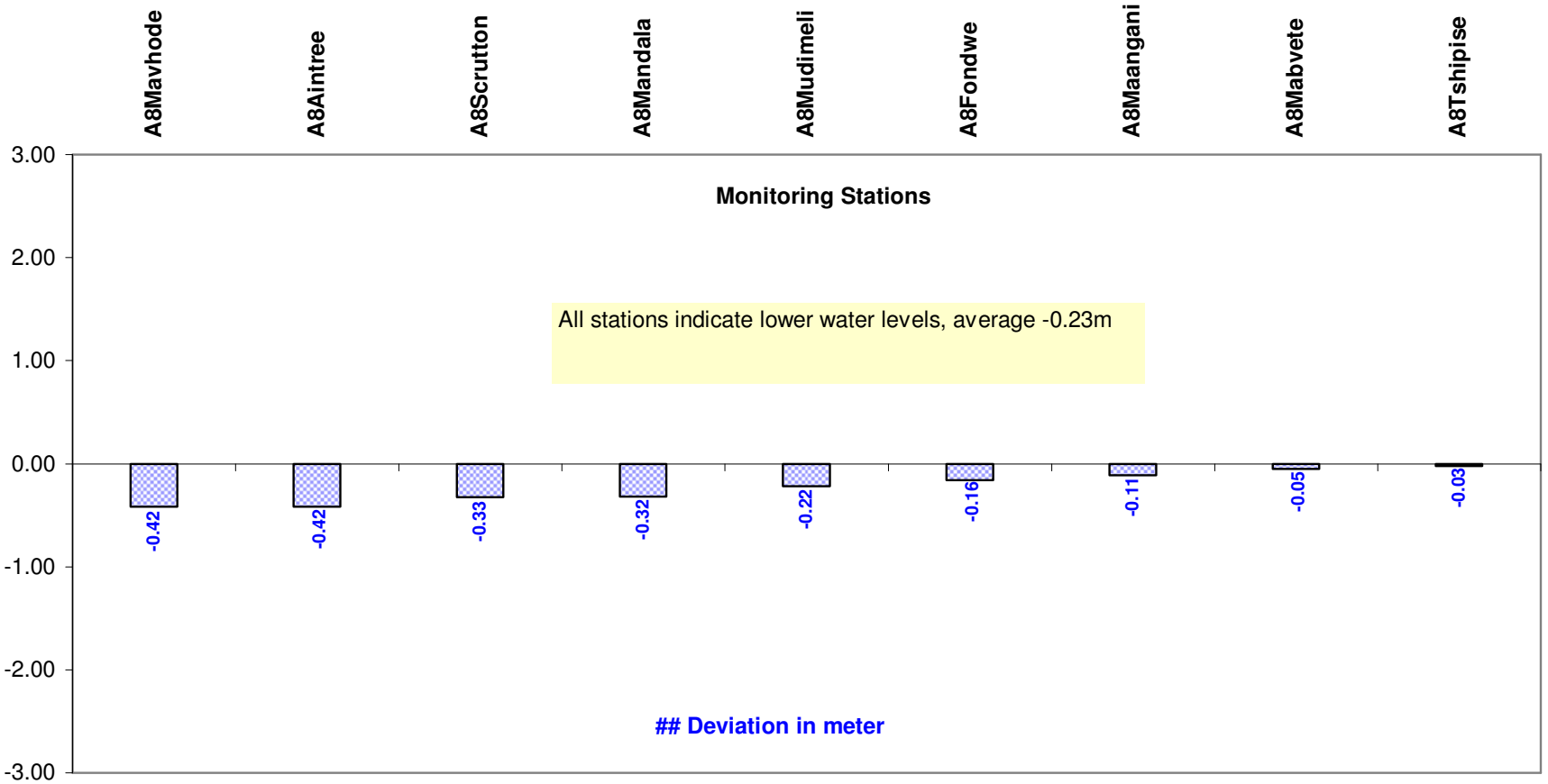


GRAPH 16


Comparison of water level trends at some stations in A8 drainage:
1 November 2009 to 1 November 2010
0.00
5.00
10.00
15.00
20.00
25.00
m Below collar
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Date
A8Fondwe
A8Mandala
A8Aintree
A8Mavhode
A8Mabvete
A8Mudimeli

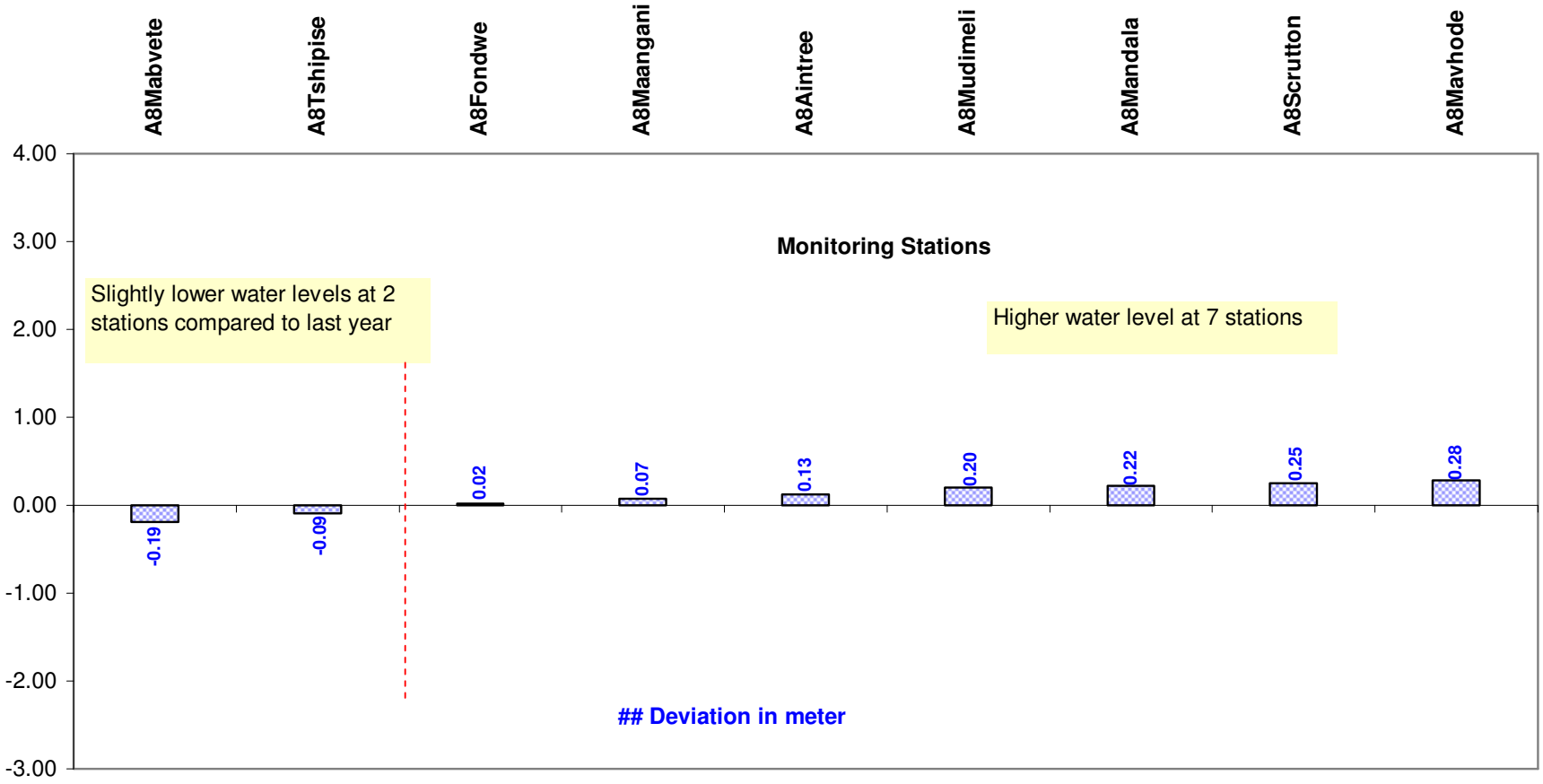
GRAPH 17

A8 DRAINAGE AREA
Deviation of water level depths: 1 August 2010 to 1 November 2010

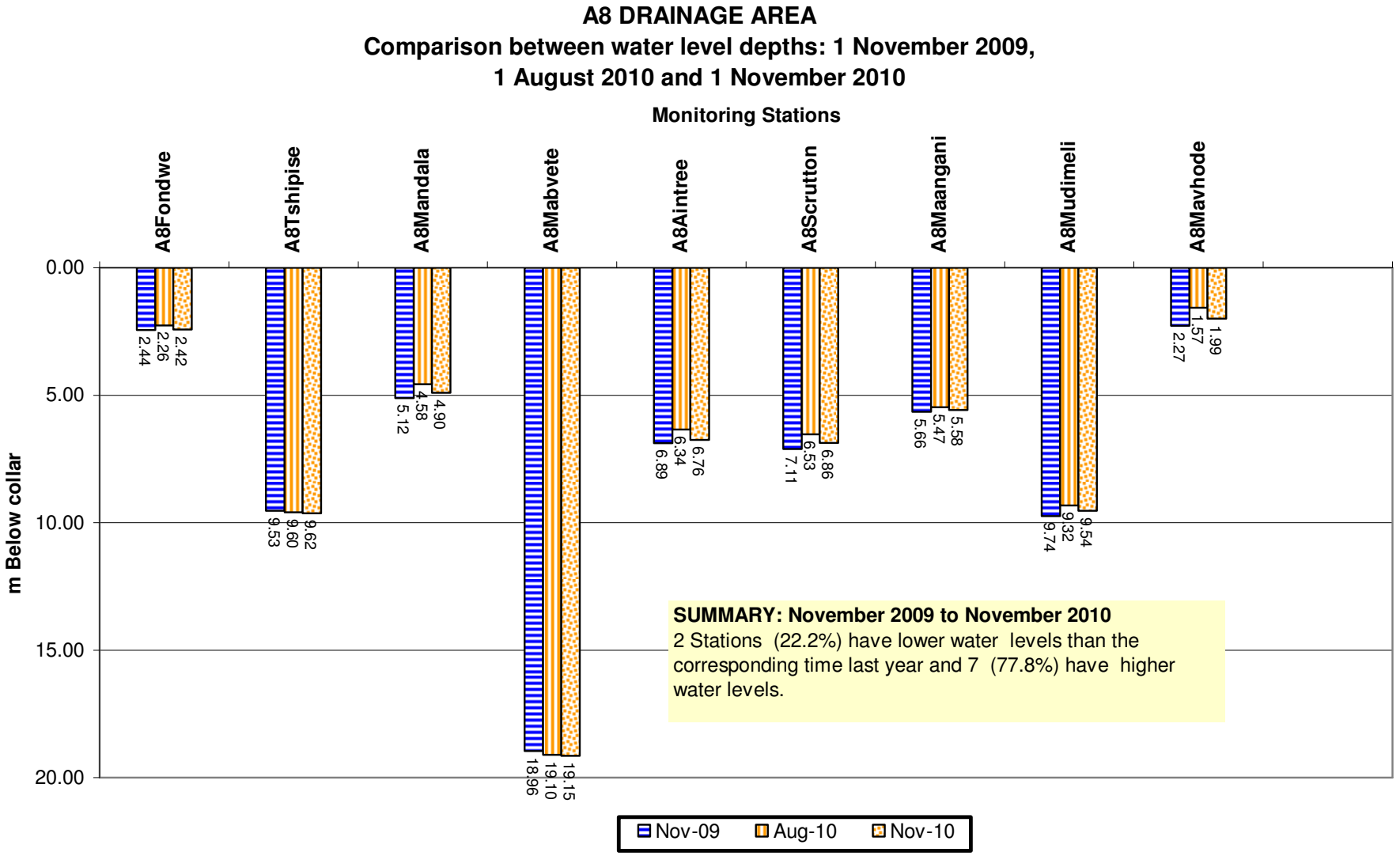


GRAPH 18

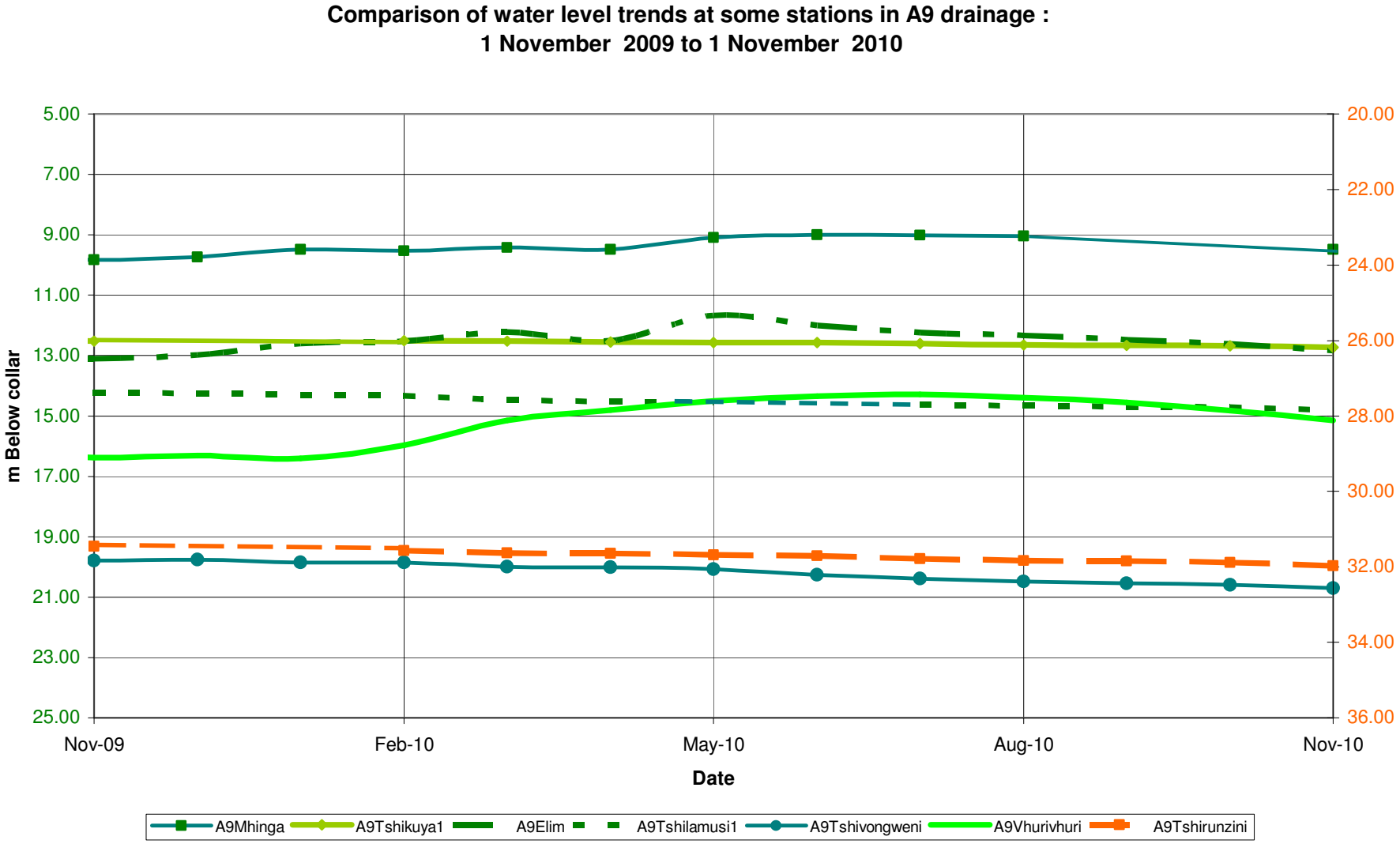
A8 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010



GRAPH 19

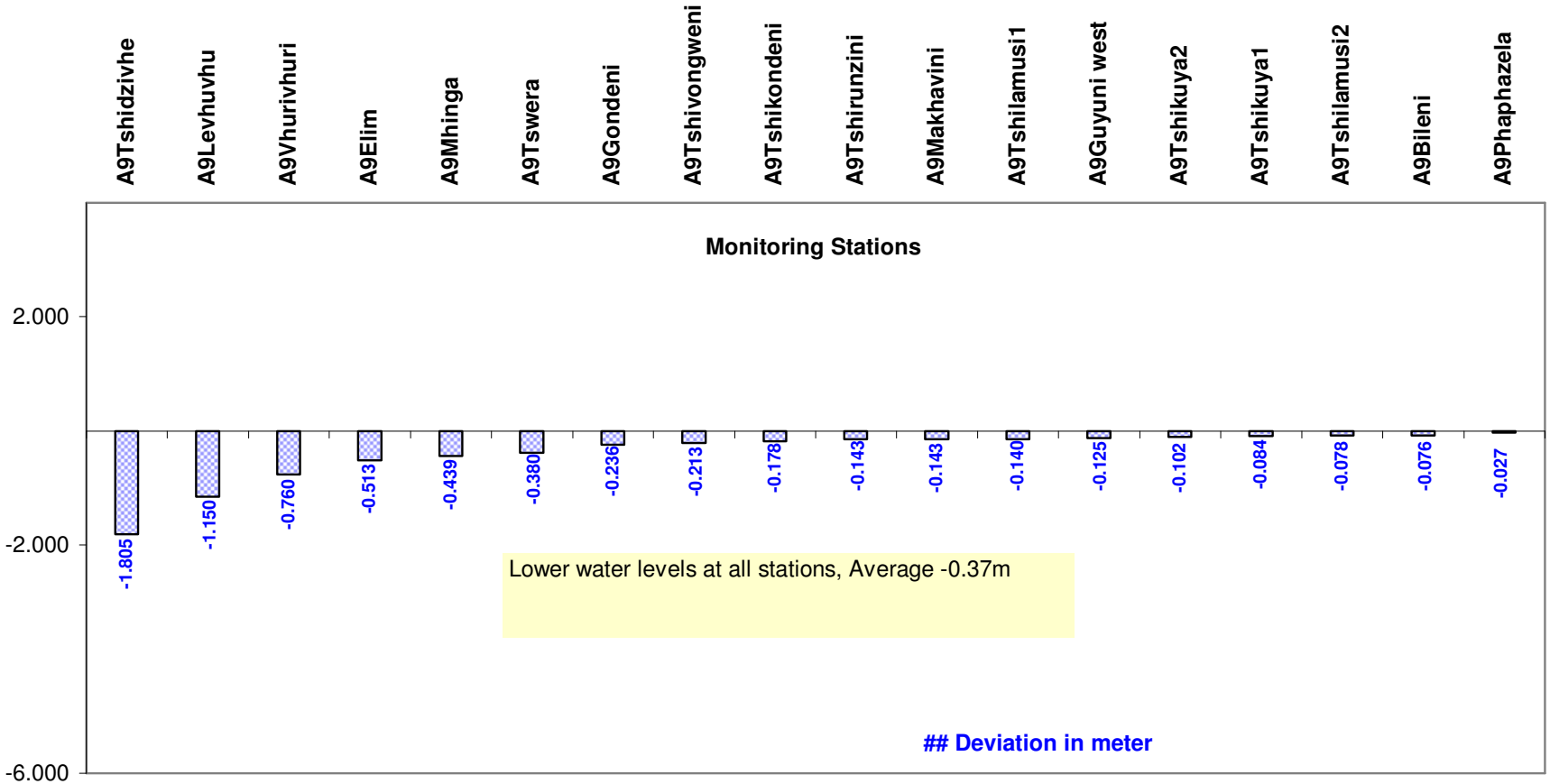

A8 DRAINAGE AREA
Comparison between water level depths: 1 November 2009,
1 August 2010 and 1 November 2010
Monitoring Stations
A8Fondwe
A8Tshipise
A8Mandala
A8Mabvete
A8Aintree
A8Scrutton
A8Maangani
A8Mudimeli
A8Mavhode
m Below collar
0.00
5.00
10.00
15.00
20.00
2.44
2.26
2.42
9.53
9.60
9.62
5.12
4.58
4.90
18.96
19.10
19.15
6.89
6.34
6.76
7.11
6.53
6.86
5.66
5.47
5.58
9.74
9.32
9.54
2.27
1.57
1.99
SUMMARY: November 2009 to November 2010
2 Stations (22.2%) have lower water levels than the corresponding time last year and 7 (77.8%) have higher water levels.
Nov-09
Aug-10
Nov-10

GRAPH 20

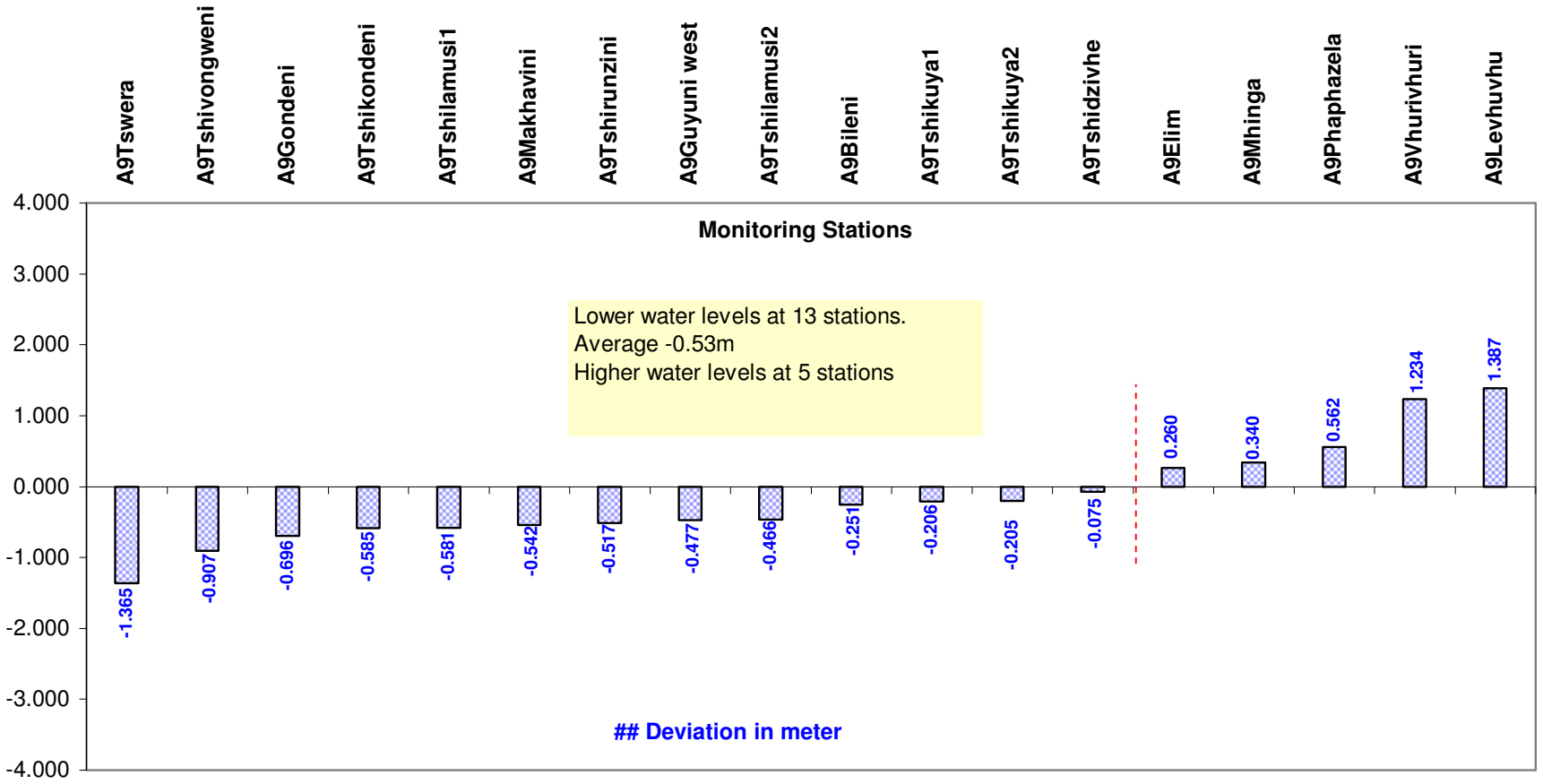

Comparison of water level trends at some stations in A9 drainage :
1 November 2009 to 1 November 2010
m Below collar
5.00
7.00
9.00
11.00
13.00
15.00
17.00
19.00
21.00
23.00
25.00
20.00
22.00
24.00
26.00
28.00
30.00
32.00
34.00
36.00
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Date
A9Mhinga
A9Tshikuya1
A9Elim
A9Tshilamusi1
A9Tshivongweni
A9Vhurivhuri
A9Tshirunzini

GRAPH 21

A9 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010

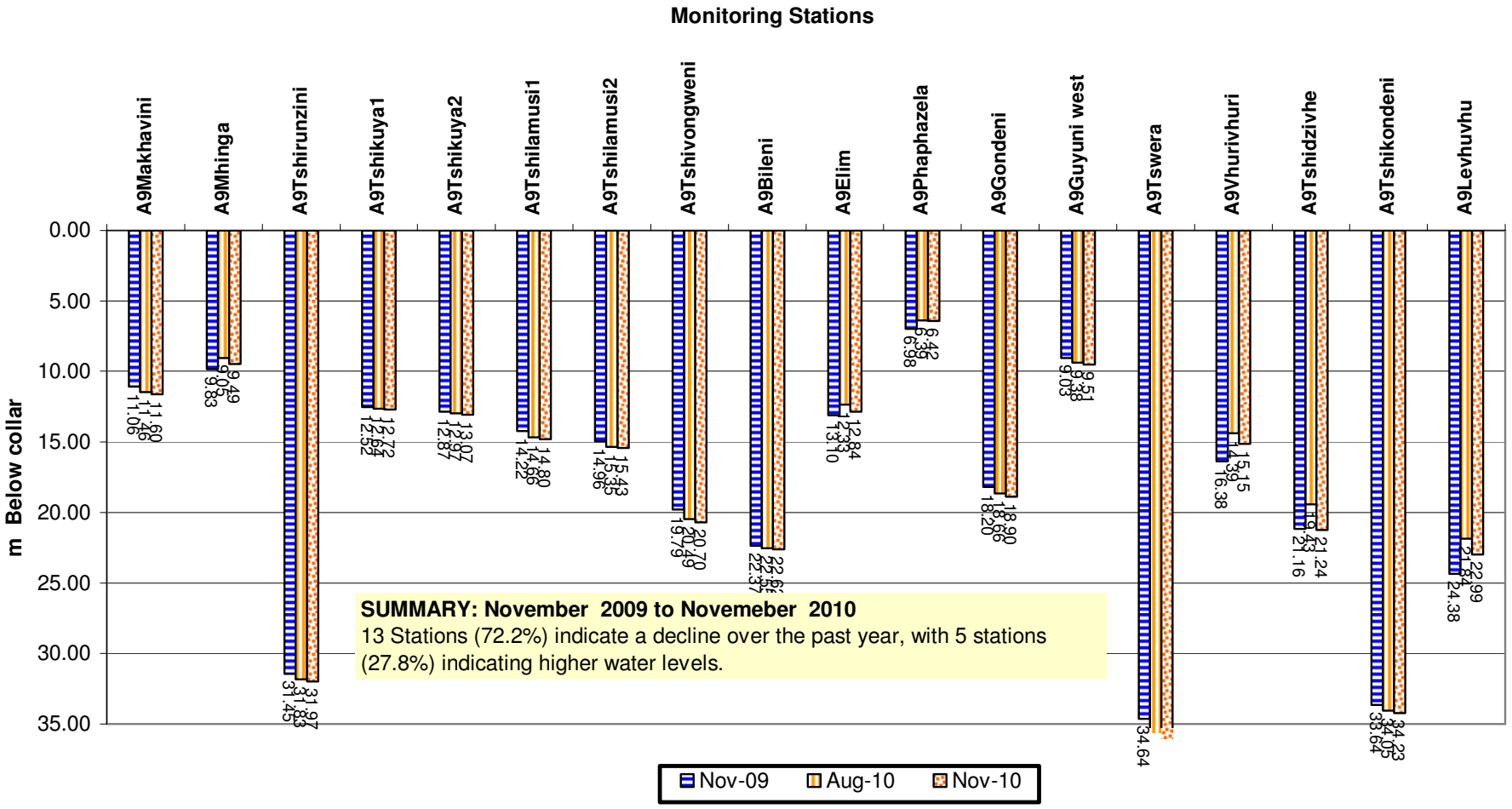


GRAPH 22


A9 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010
A9Tswera
A9Tshivongweni
A9Gondeni
A9Tshikondeni
A9Tshilamusi1
A9Makhavini
A9Tshirunzini
A9Guyuni west
A9Tshilamusi2
A9Bileni
A9Tshikuya1
A9Tshikuya2
A9Tshidzivhe
A9Elim
A9Mhinga
A9Phaphazela
A9Vhurivhuri
A9Levhuvhu
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
Monitoring Stations
Lower water levels at 13 stations.
Average -0.53m
Higher water levels at 5 stations
-1.365
-0.907
-0.696
-0.585
-0.581
-0.542
-0.517
-0.477
-0.466
-0.251
-0.206
-0.205
-0.075
0.260
0.340
0.562
1.234
1.387
Deviation in meter

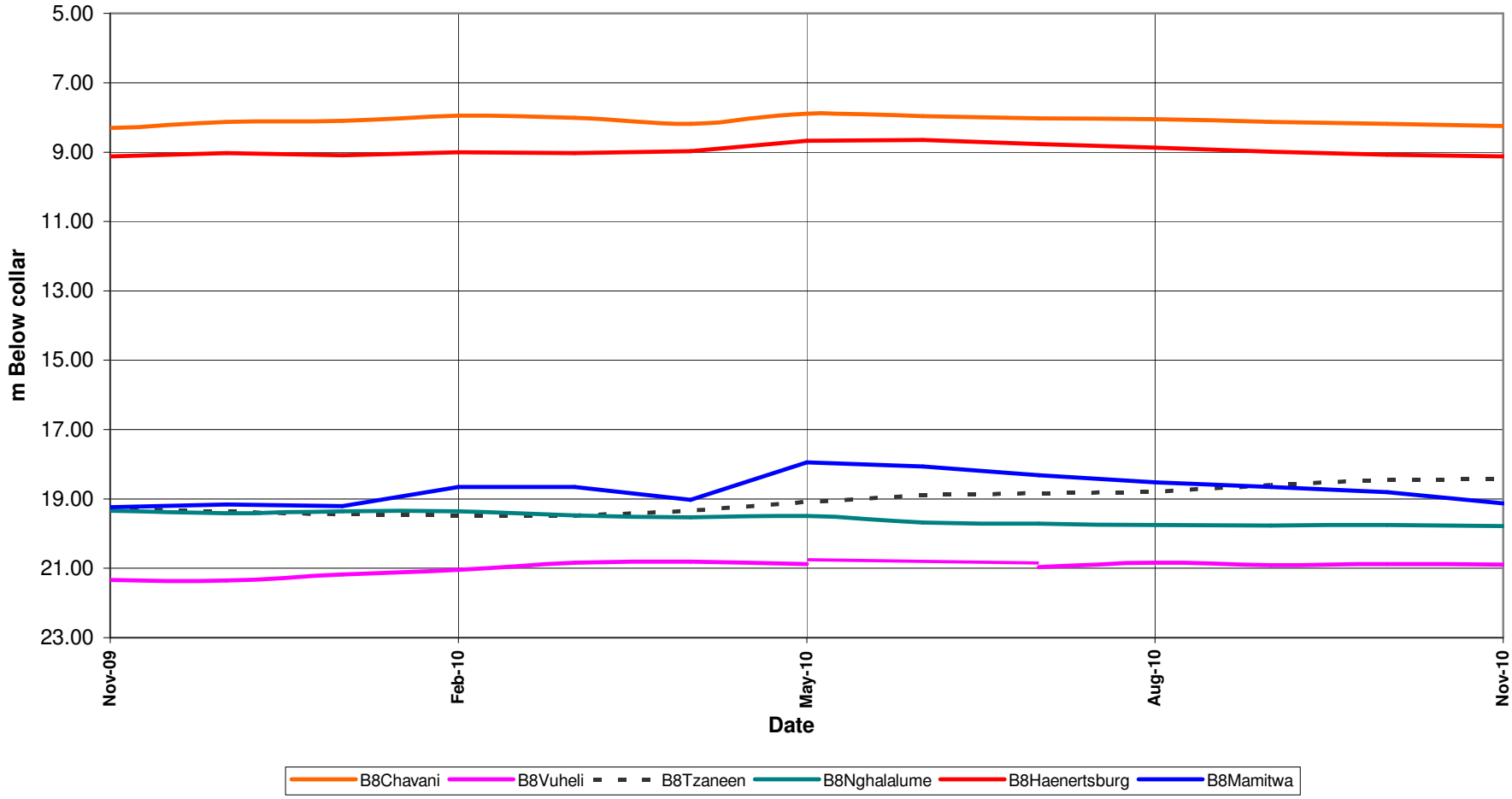
GRAPH 23

A9 DRAINAGE AREA
Comparison between water level depths: 1 November 2009,
1 August 2010 and 1 November 2010

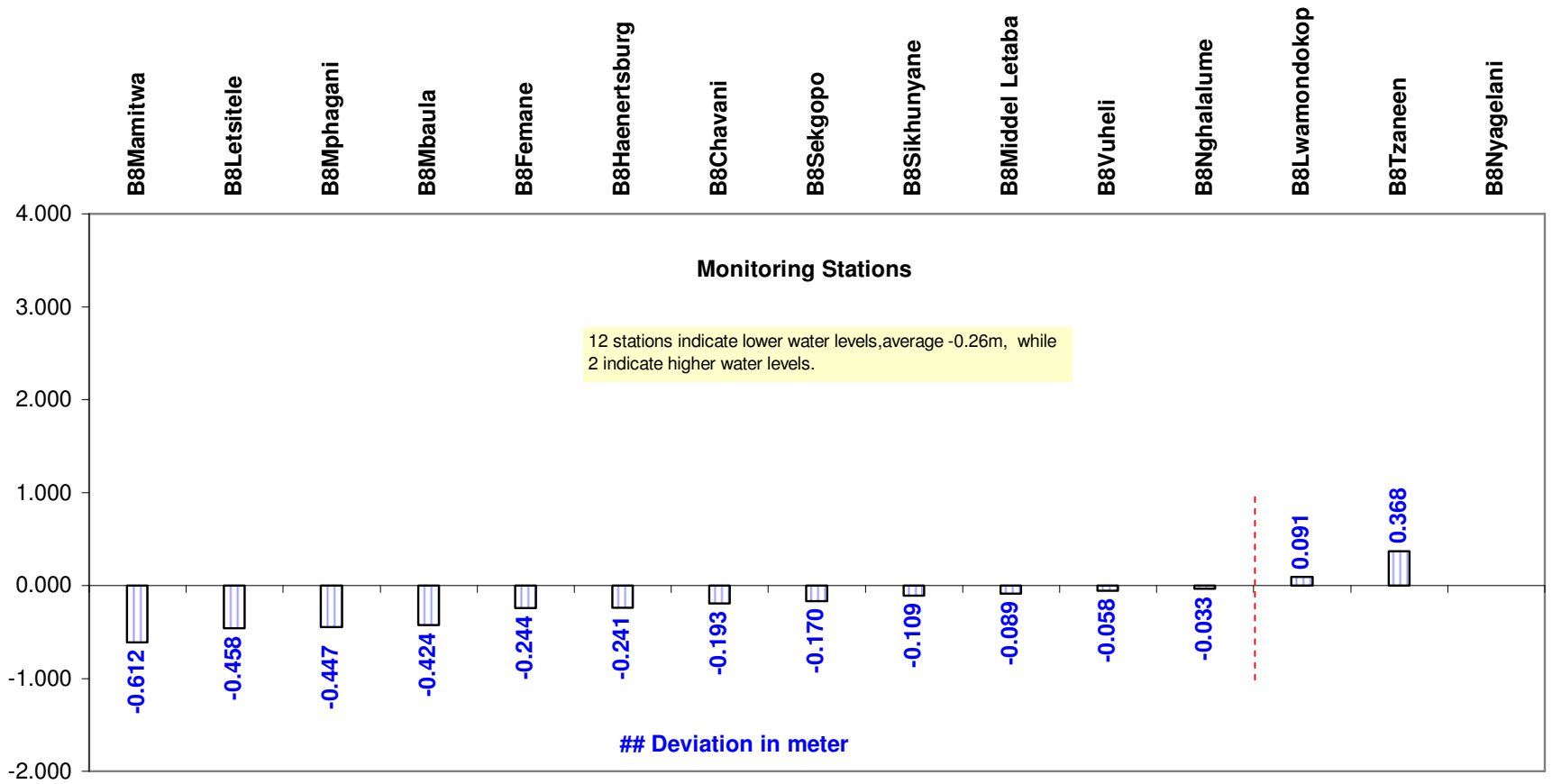


GRAPH 24

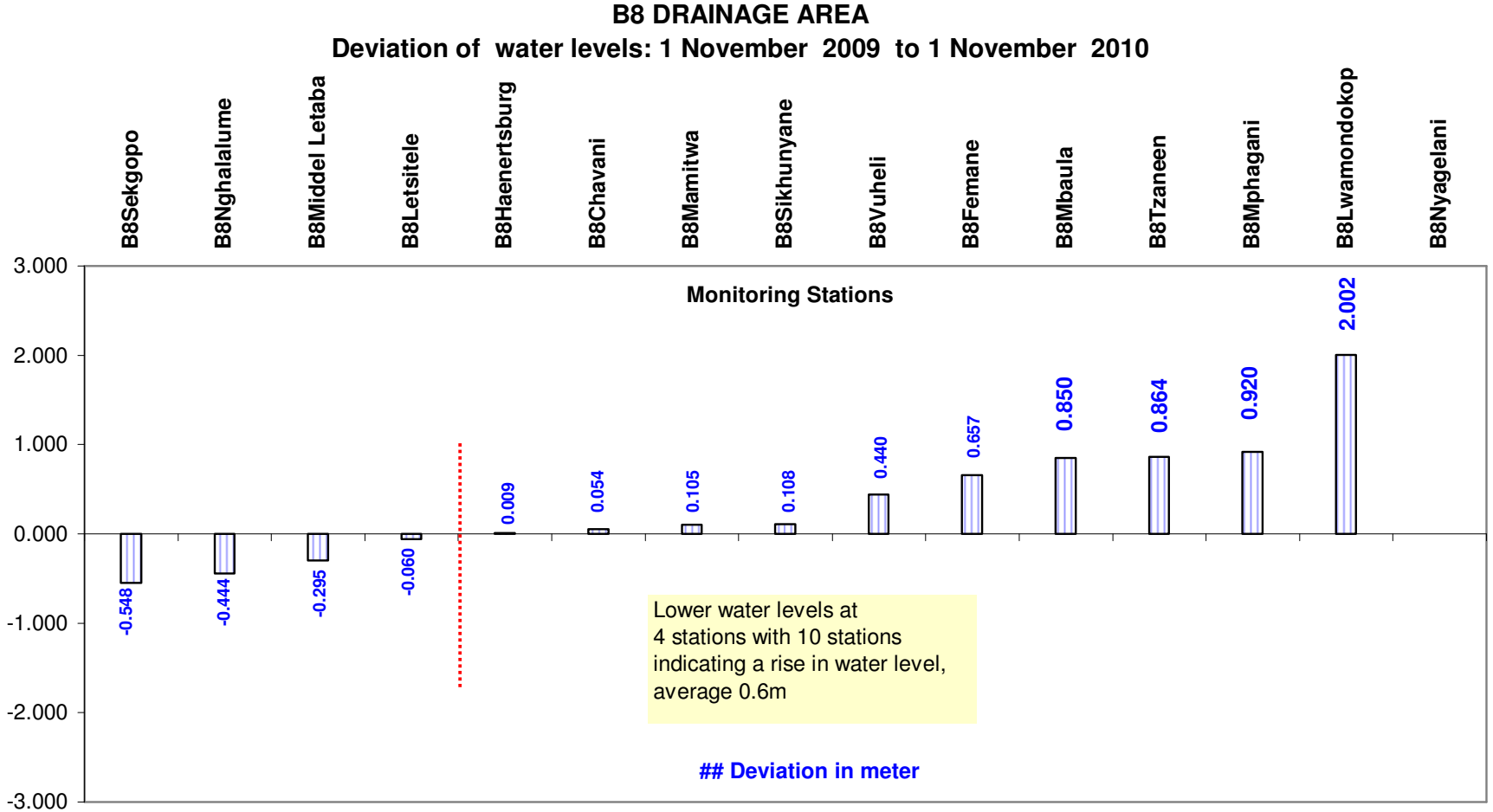
Comparison of water level trends at some stations in B8 drainage:
1 November 2009 to 1 November 2010



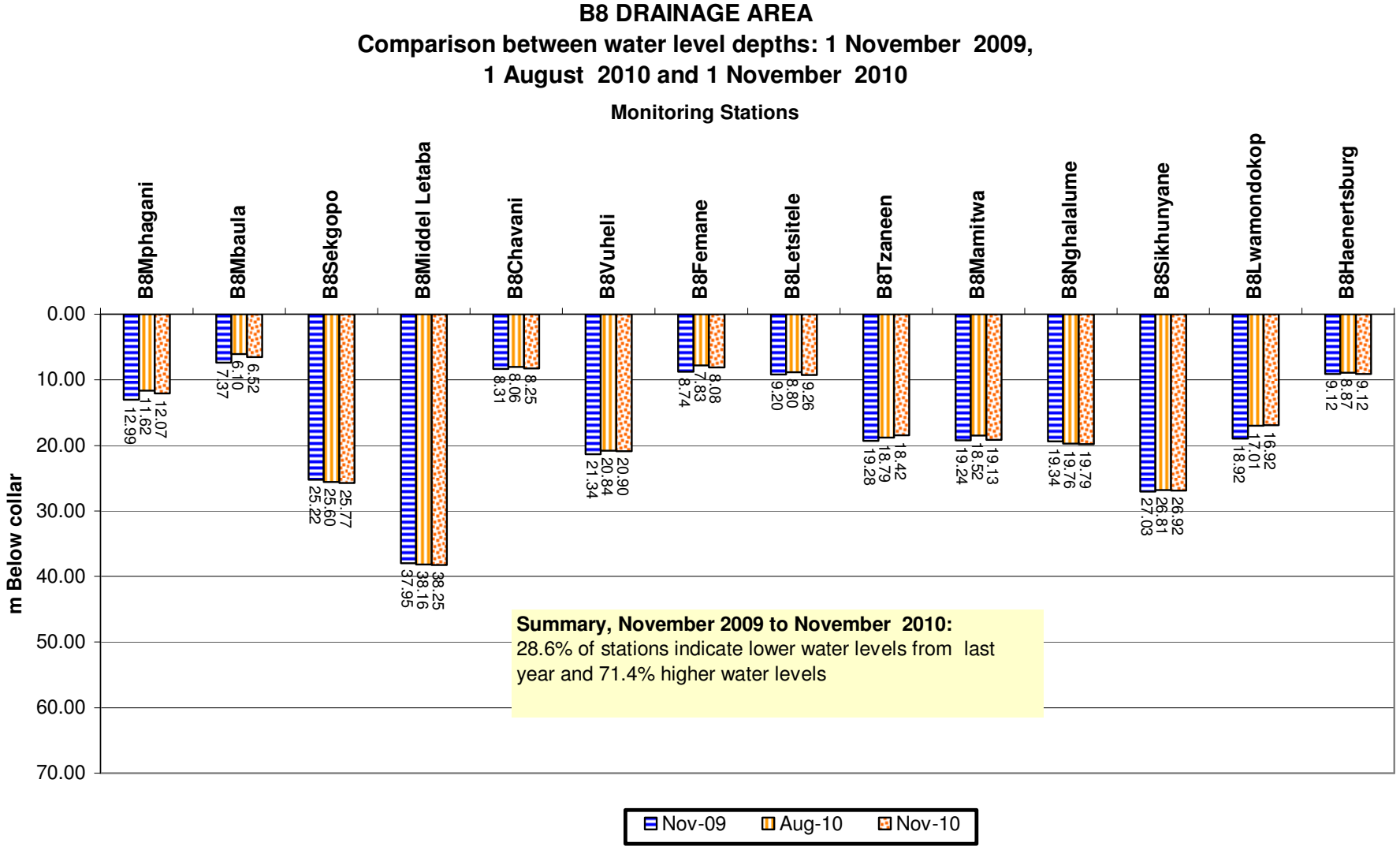
GRAPH 25


B8 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
B8Mamitwa
B8Letsitele
B8Mphagani
B8Mbaula
B8Femane
B8Haenertsburg
B8Chavani
B8Sekgopo
B8Sikhunyane
B8Middel Letaba
B8Vuheli
B8Nghalalume
B8Lwamondokop
B8Tzaneen
B8Nyagelani
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
Monitoring Stations
12 stations indicate lower water levels,average -0.26m, while
2 indicate higher water levels.
-0.612
-0.458
-0.447
-0.424
-0.244
-0.241
-0.193
-0.170
-0.109
-0.089
-0.058
-0.033
0.091
0.368
Deviation in meter

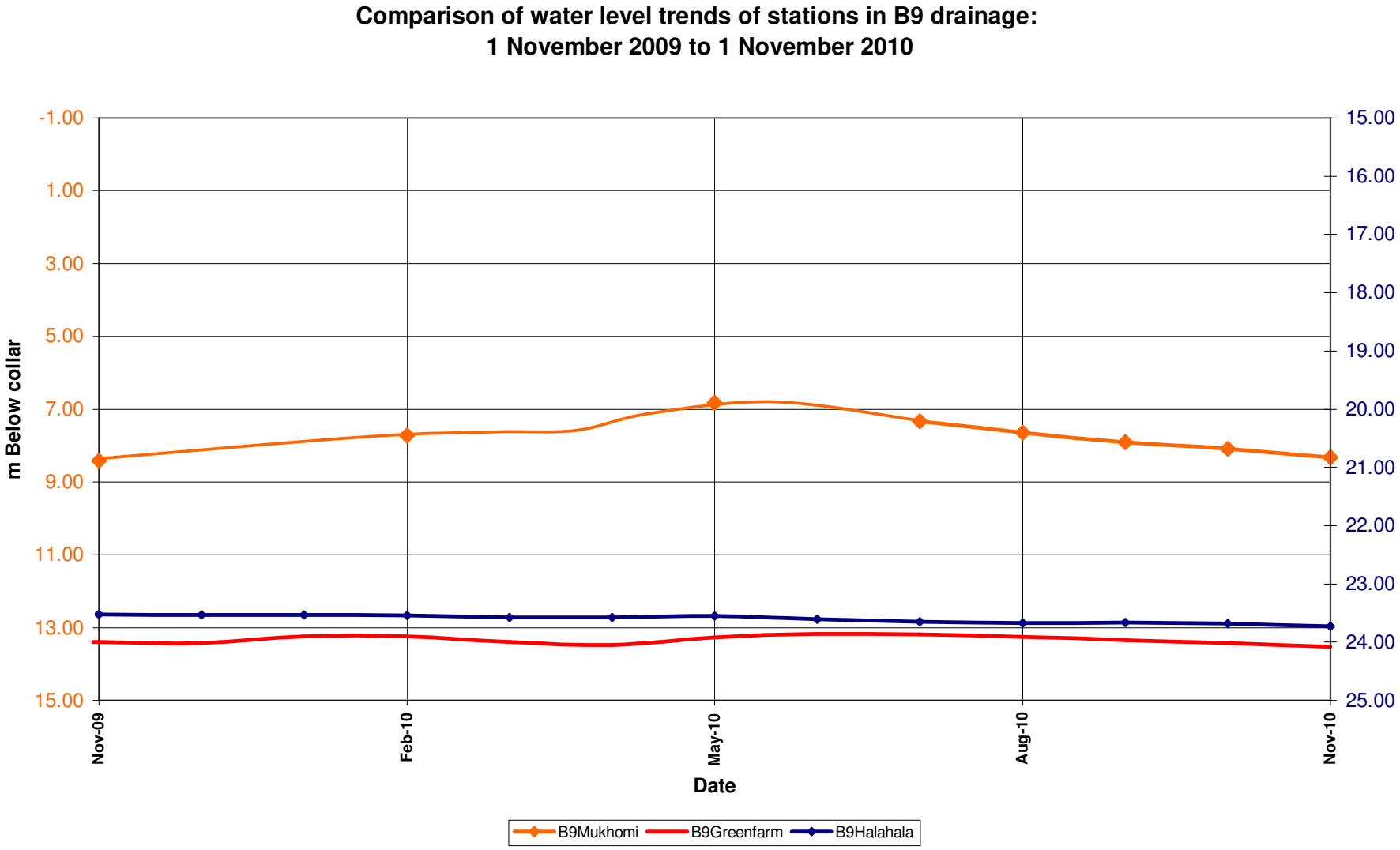
GRAPH 26


B8 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010
B8Sekgopo
B8Nghalalume
B8Middel Letaba
B8Letsitele
B8Haenertsburg
B8Chavani
B8Mamitwa
B8Sikhunyane
B8Vuheli
B8Femane
B8Mbaula
B8Tzaneen
B8Mphagani
B8Lwamondokop
B8Nyagelani
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
Monitoring Stations
-0.548
-0.444
-0.295
-0.060
0.009
0.054
0.105
0.108
0.440
0.657
0.850
0.864
0.920
2.002
Lower water levels at
4 stations with 10 stations
indicating a rise in water level,
average 0.6m
Deviation in meter

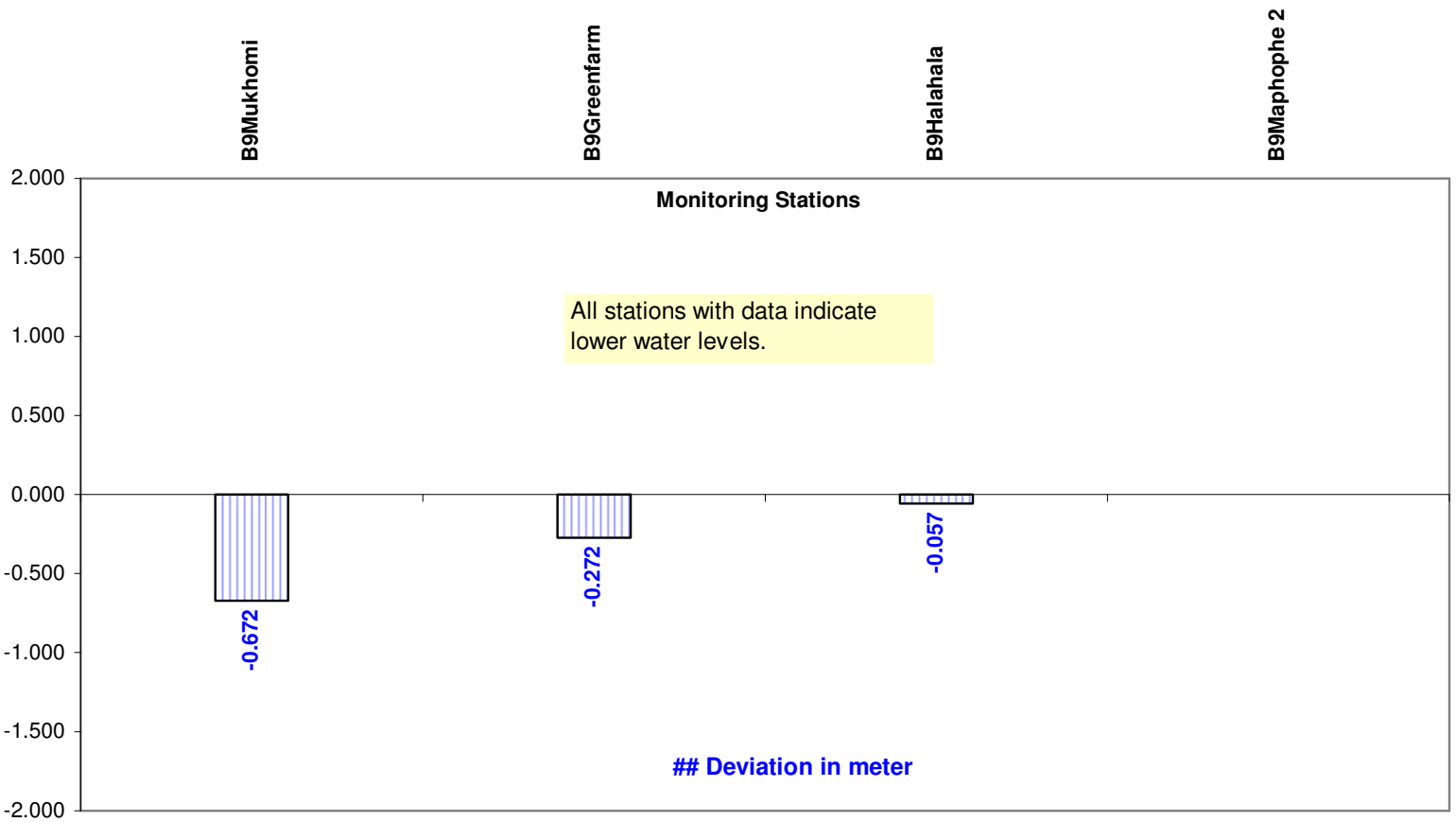
GRAPH 27


B8 DRAINAGE AREA
Comparison between water level depths: 1 November 2009,
1 August 2010 and 1 November 2010
Monitoring Stations
m Below collar
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
B8Mphagani
12.99
11.62
12.07
B8Mbaula
7.37
6.10
6.52
B8Sekgopo
25.22
25.60
25.77
B8Middel Letaba
37.95
38.16
38.25
B8Chavani
8.31
8.06
8.25
B8Vuheli
21.34
20.84
20.90
B8Femane
8.74
7.83
8.08
B8Letsitele
9.20
8.80
9.26
B8Tzaneen
19.28
18.79
18.42
B8Mamitwa
19.24
18.52
19.13
B8Nghalalume
19.34
19.76
19.79
B8Sikhunyane
27.03
26.81
26.92
B8Lwamondokop
18.92
17.01
16.92
B8Haenertsburg
9.12
8.87
9.12
Summary, November 2009 to November 2010:
28.6% of stations indicate lower water levels from last year and 71.4% higher water levels
Nov-09
Aug-10
Nov-10

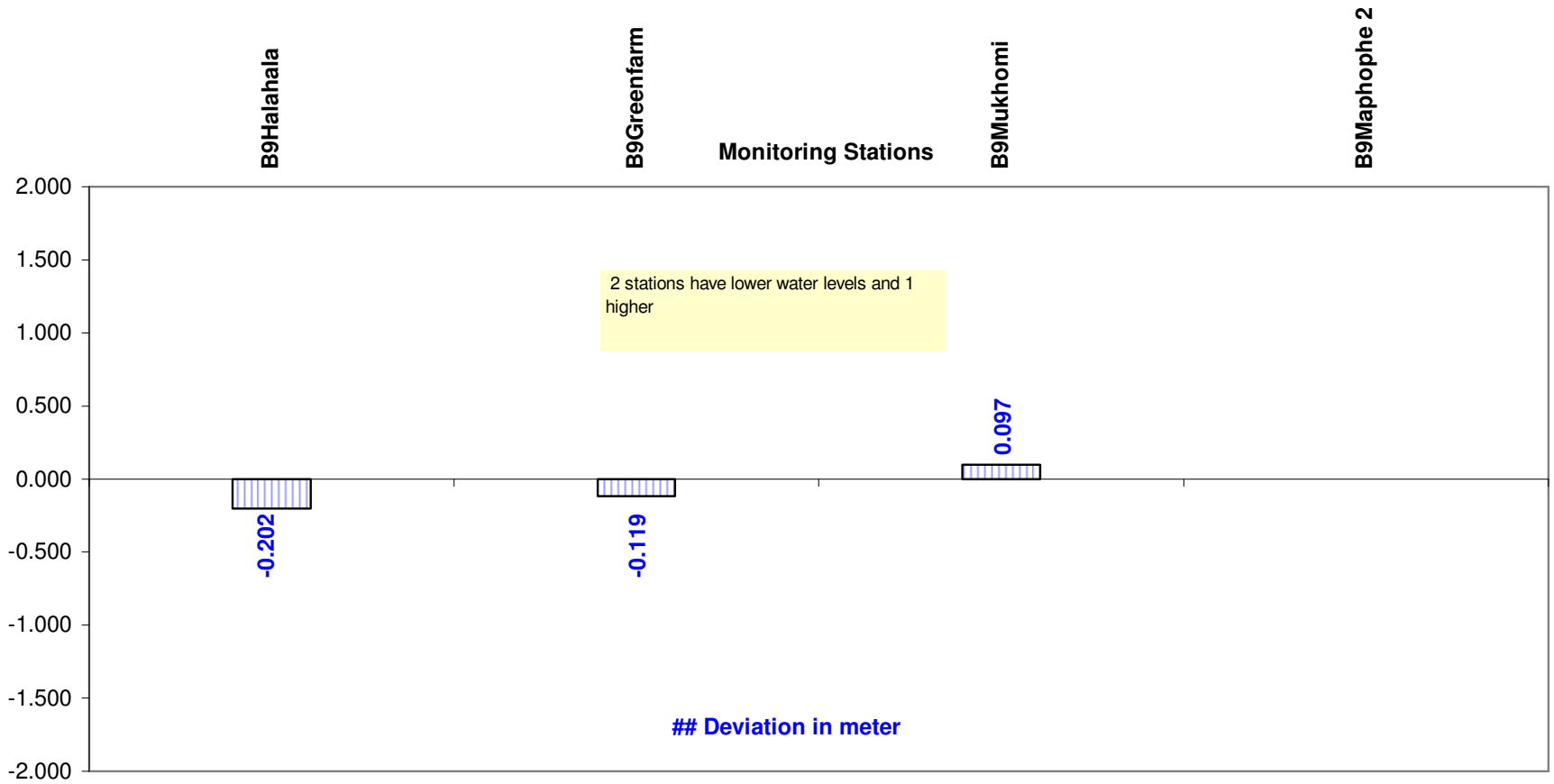
GRAPH 28


Comparison of water level trends of stations in B9 drainage:
1 November 2009 to 1 November 2010
m Below collar
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
15.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
24.00
25.00
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Date
B9Mukhomi
B9Greenfarm
B9Halahala

GRAPH 29

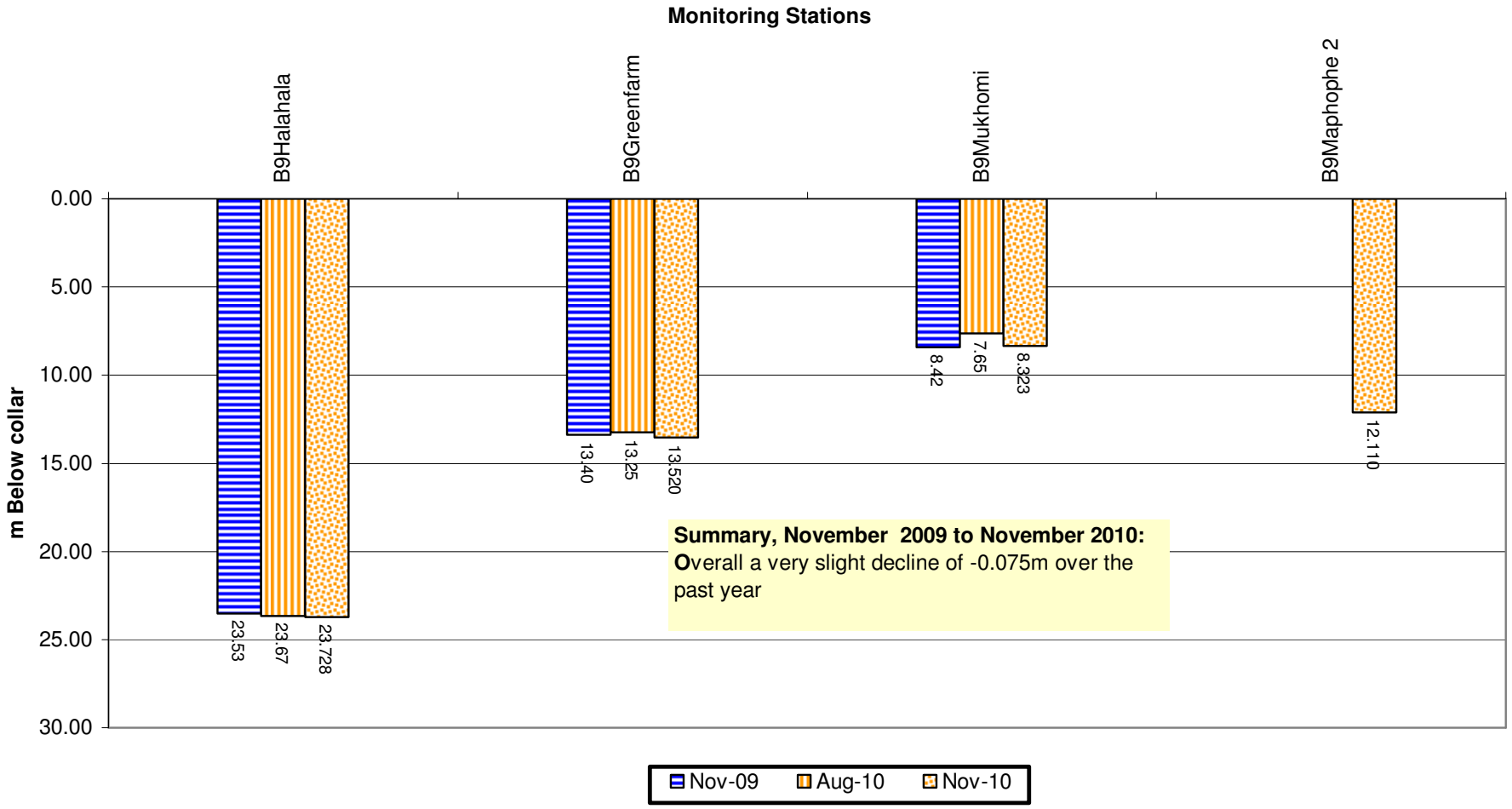

B9 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
B9Mukhomi
B9Greenfarm
B9Halahala
B9Maphophe 2
2.000
1.500
1.000
0.500
0.000
-0.500
-1.000
-1.500
-2.000
Monitoring Stations
All stations with data indicate lower water levels.
-0.672
-0.272
-0.057
Deviation in meter

GRAPH 30

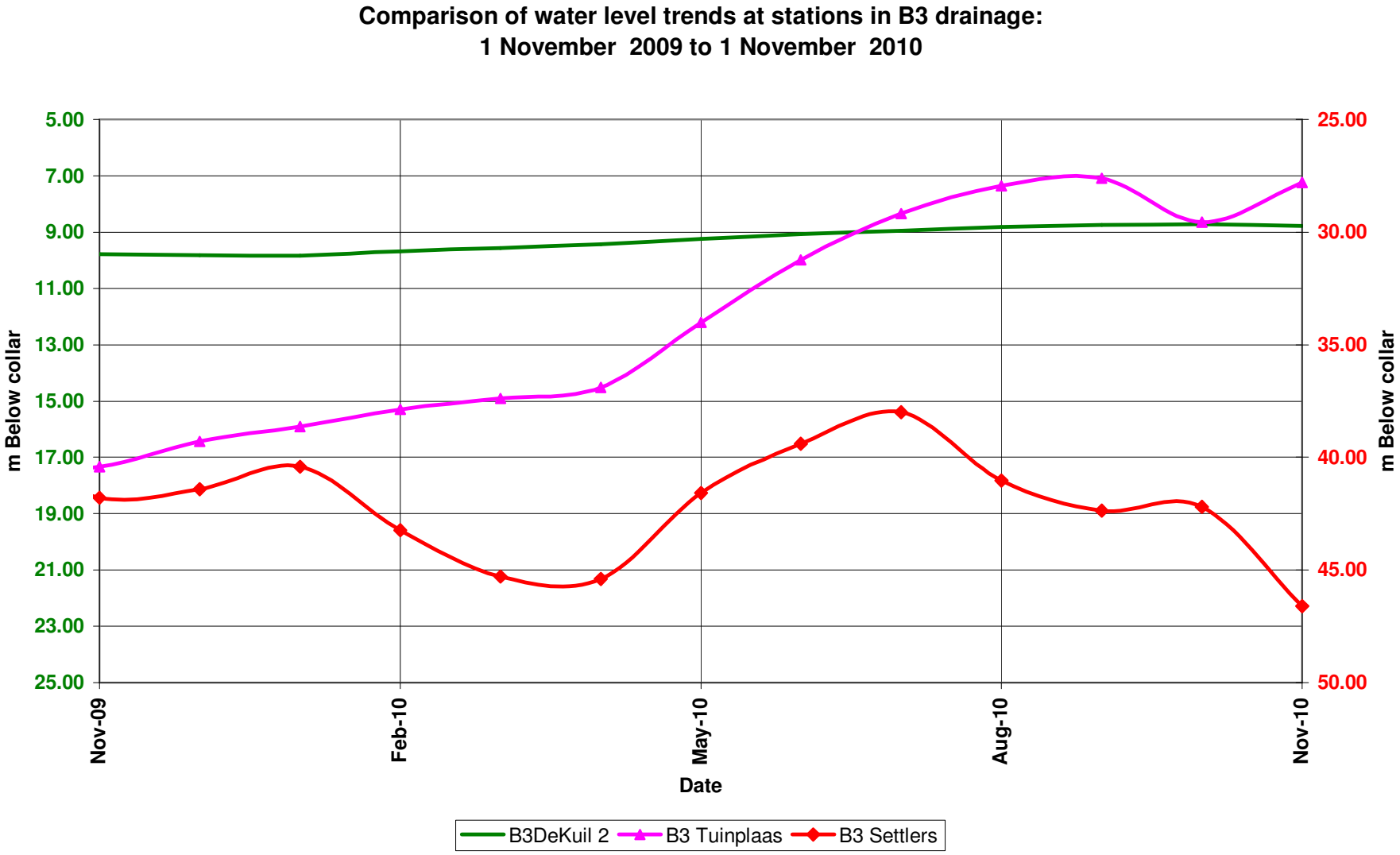

B9 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010
B9Halahala
B9Greenfarm
B9Mukhomi
B9Maphophe 2
Monitoring Stations
2.000
1.500
1.000
0.500
0.000
-0.500
-1.000
-1.500
-2.000
2 stations have lower water levels and 1 higher
0.097
-0.202
-0.119
Deviation in meter

GRAPH 31

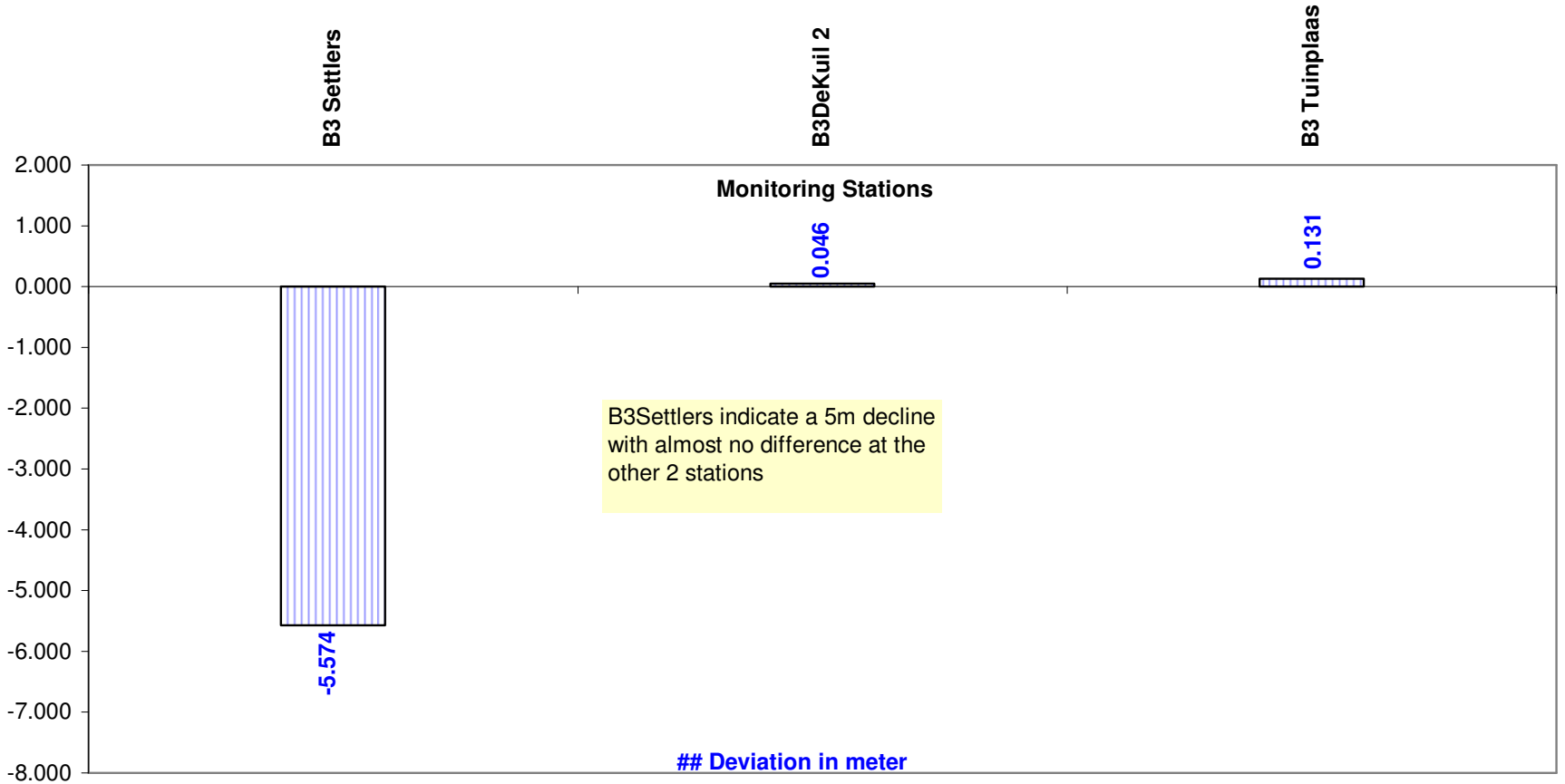
B9 DRAINAGE AREA
Comparison between water level depths: 1 November 2009, 1 August 2010 and 1 November 2010



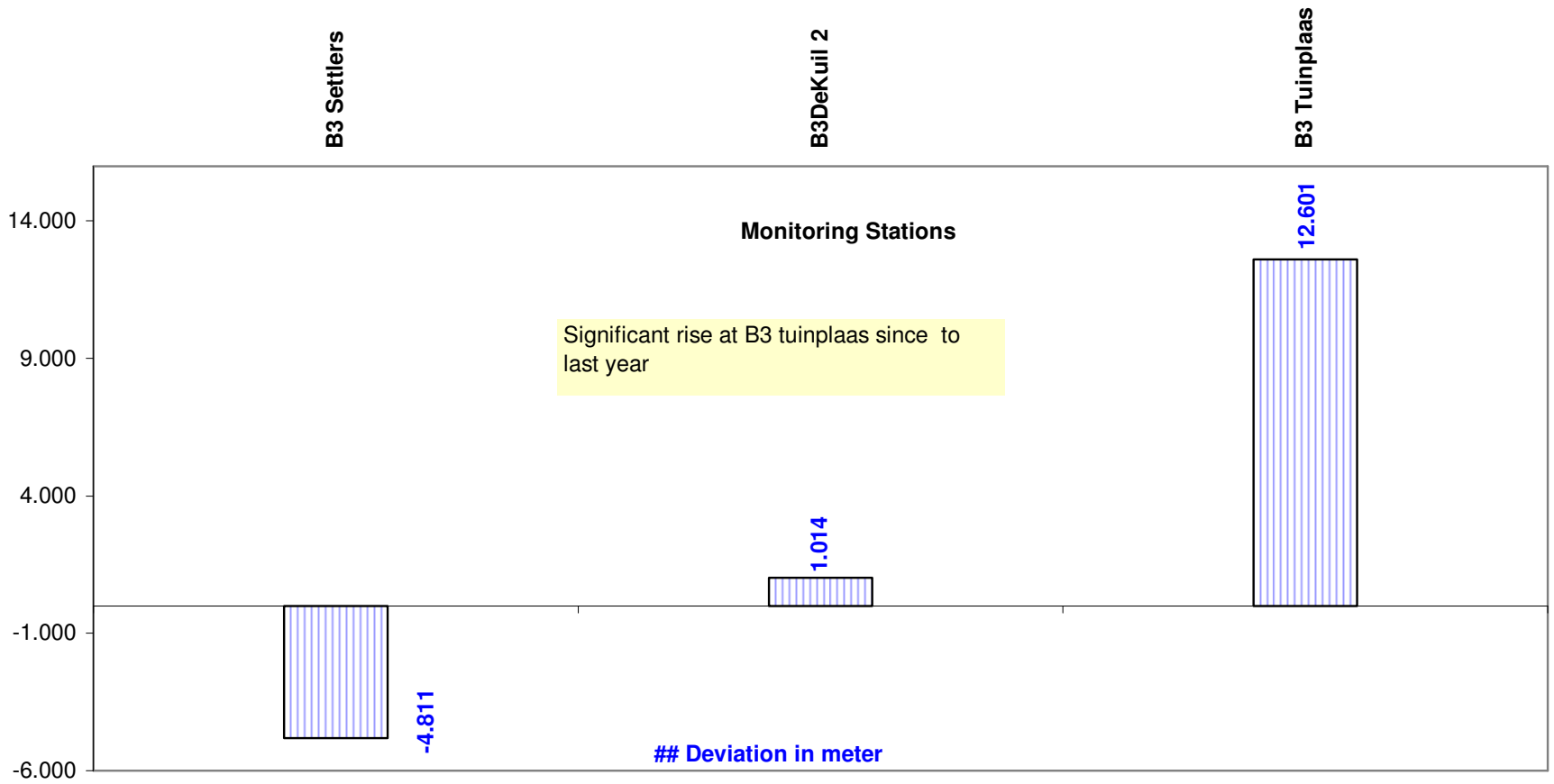
GRAPH 32


Comparison of water level trends at stations in B3 drainage:
1 November 2009 to 1 November 2010
5.00
7.00
9.00
11.00
13.00
15.00
17.00
19.00
21.00
23.00
25.00
m Below collar
25.00
30.00
35.00
40.00
45.00
50.00
m Below collar
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Date
B3DeKuil 2
B3 Tuinplaas
B3 Settlers

GRAPH 33

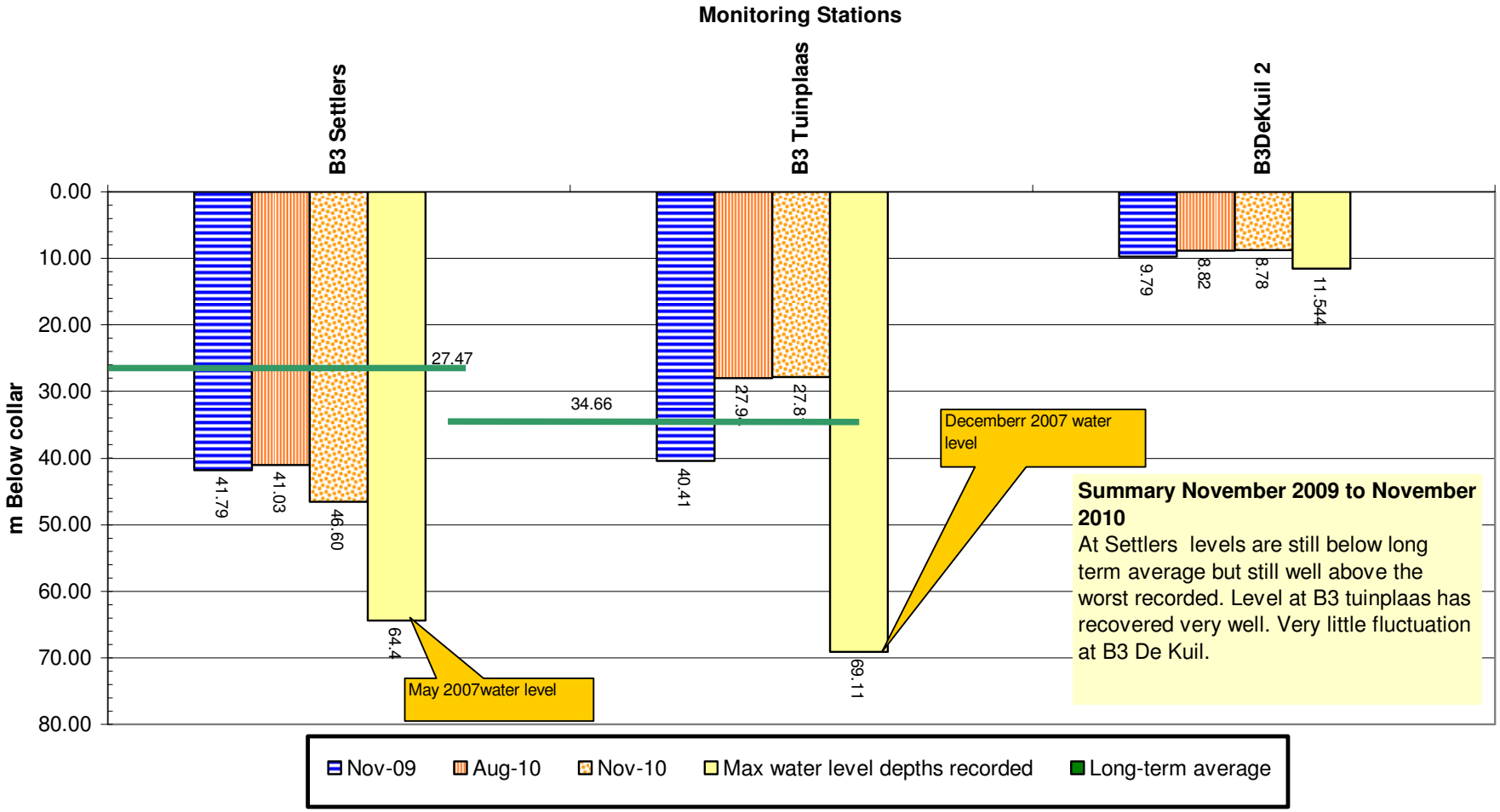

B3 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
B3 Settlers
B3DeKuil 2
B3 Tuinplaas
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
-5.000
-6.000
-7.000
-8.000
Monitoring Stations
0.046
0.131
-5.574
B3Settlers indicate a 5m decline with almost no difference at the other 2 stations
Deviation in meter

GRAPH 34

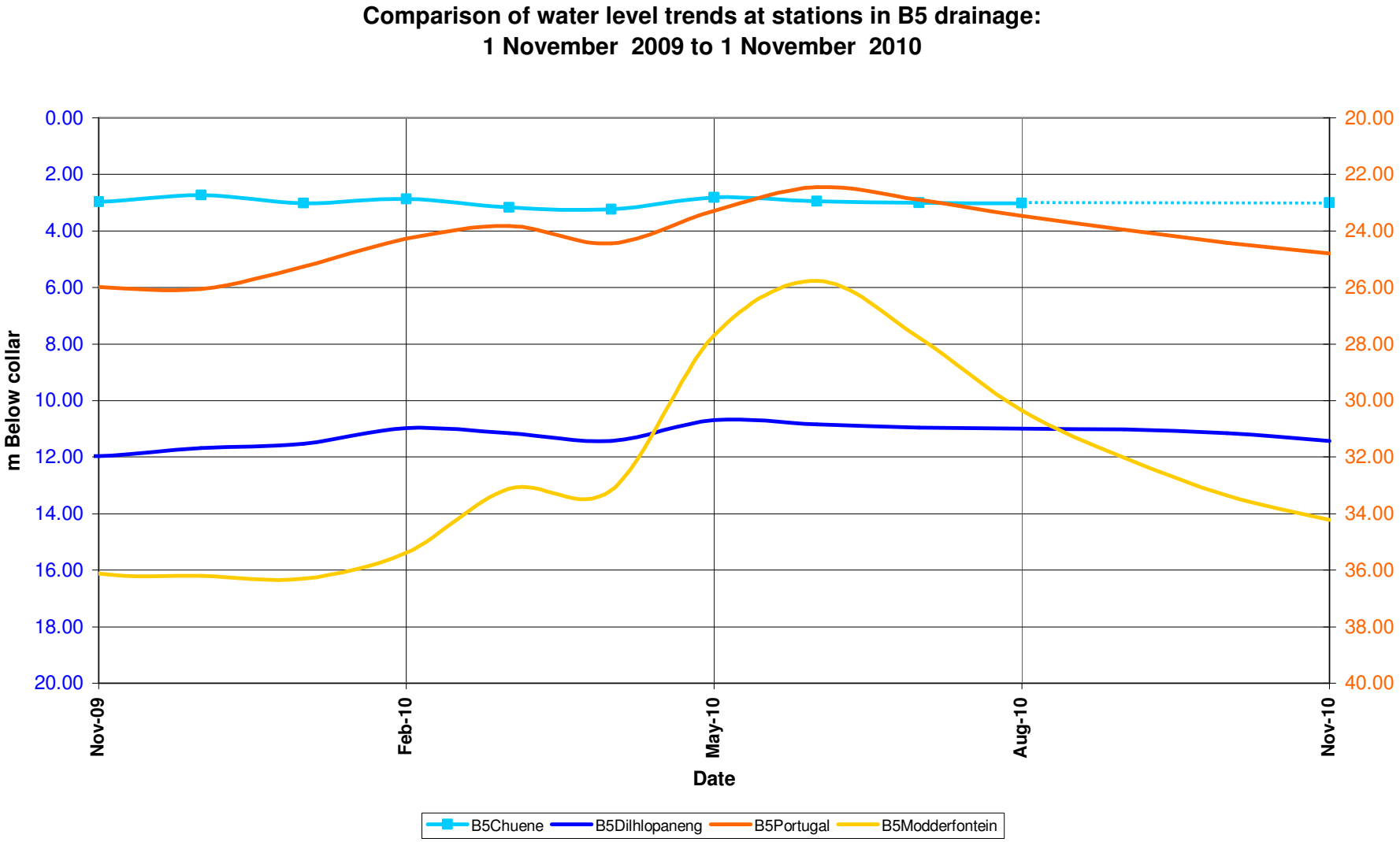

B3 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010
B3 Settlers
B3DeKuil 2
B3 Tuinplaas
14.000
9.000
4.000
-1.000
-6.000
Monitoring Stations
Significant rise at B3 tuinplaas since to last year
12.601
1.014
-4.811
Deviation in meter

GRAPH 35

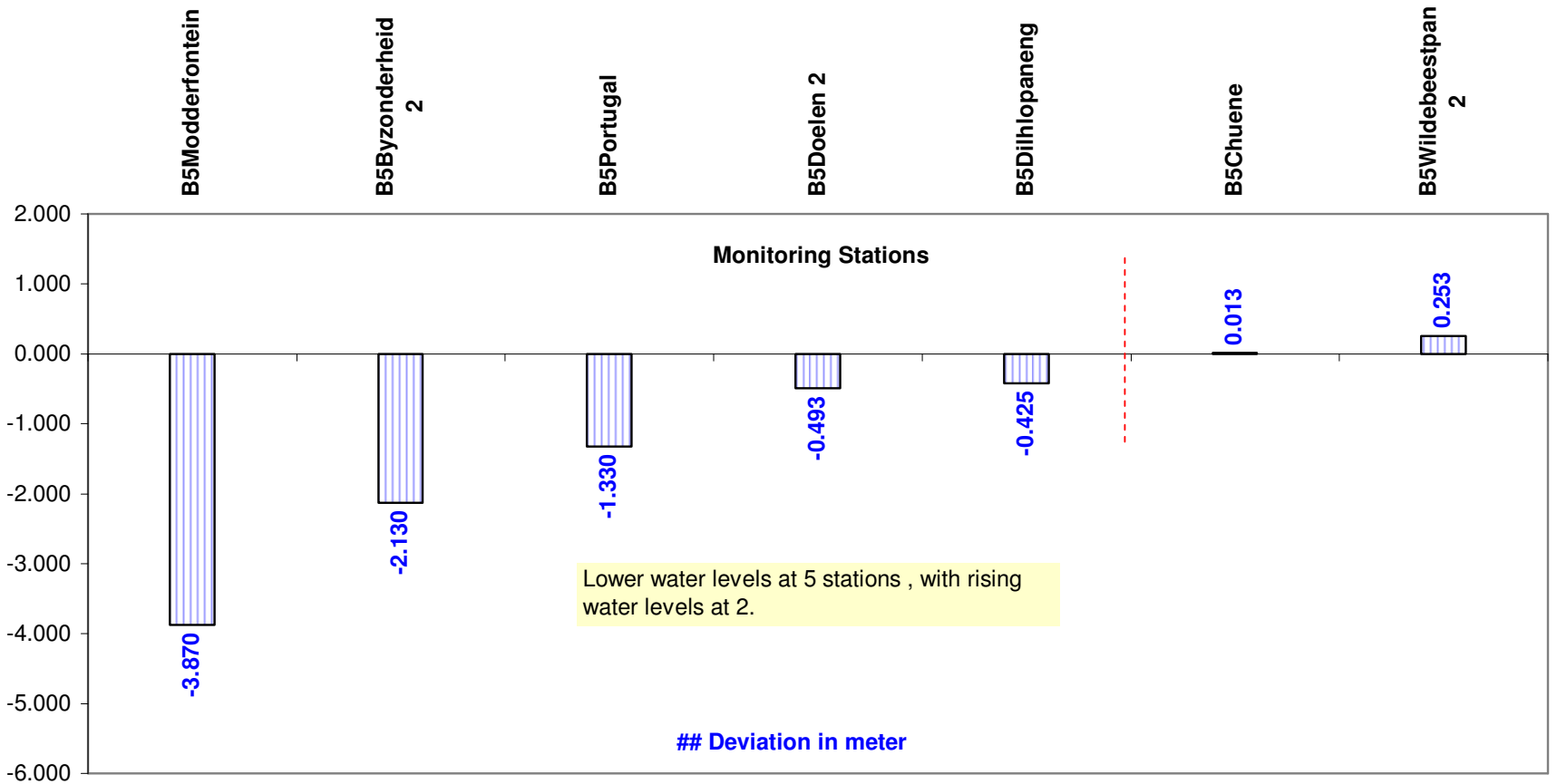
B3 DRAINAGE AREA
Comparison between water level depths: 1 November 2009
1 August 2010, 1 November 2010 and maximum depths recorded



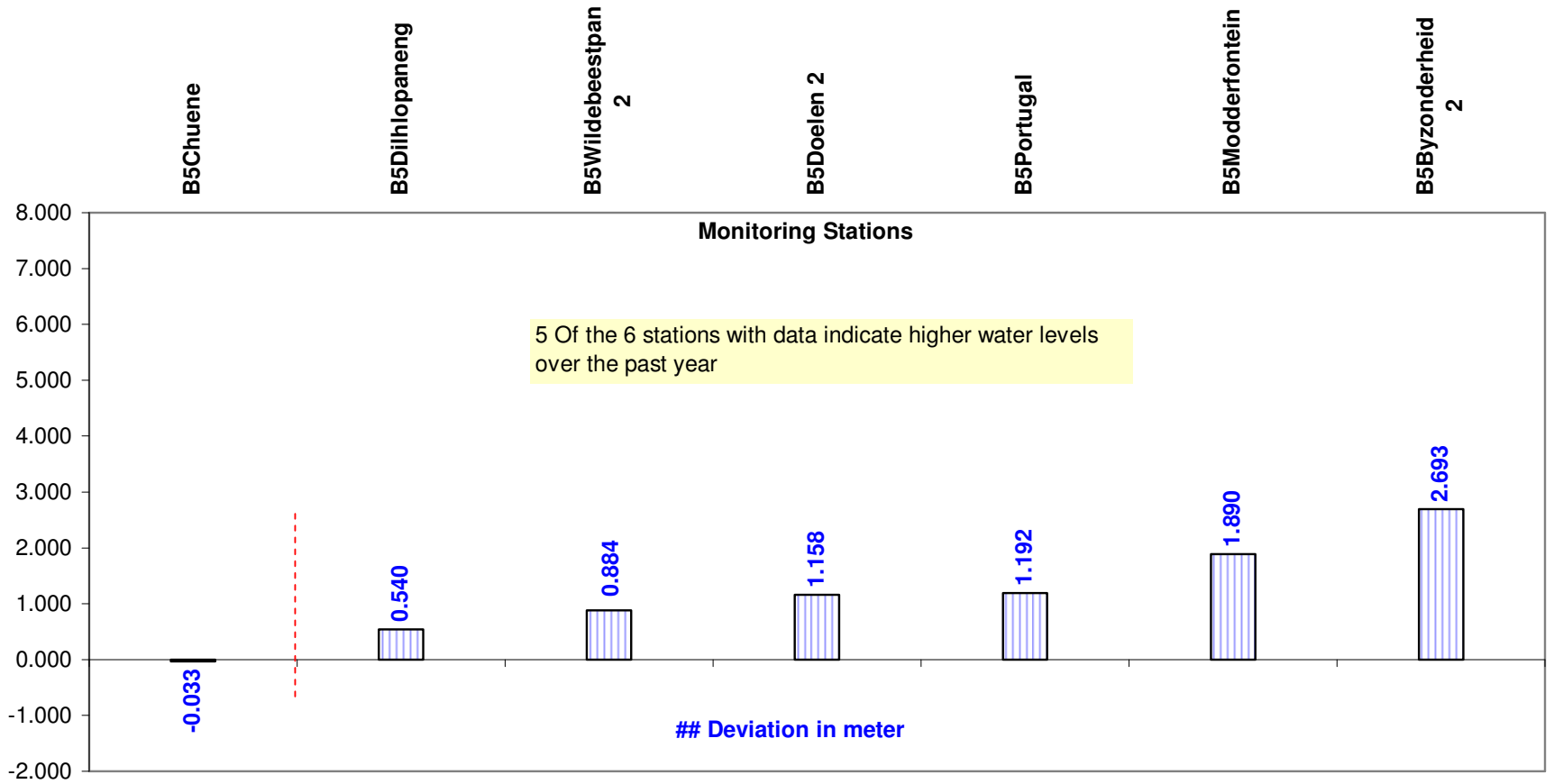
GRAPH 36


Comparison of water level trends at stations in B5 drainage:
1 November 2009 to 1 November 2010
m Below collar
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
20.00
22.00
24.00
26.00
28.00
30.00
32.00
34.00
36.00
38.00
40.00
Nov-09
Feb-10
May-10
Aug-10
Nov-10
Date
B5Chuene
B5Dilhlopaneng
B5Portugal
B5Modderfontein

GRAPH 37

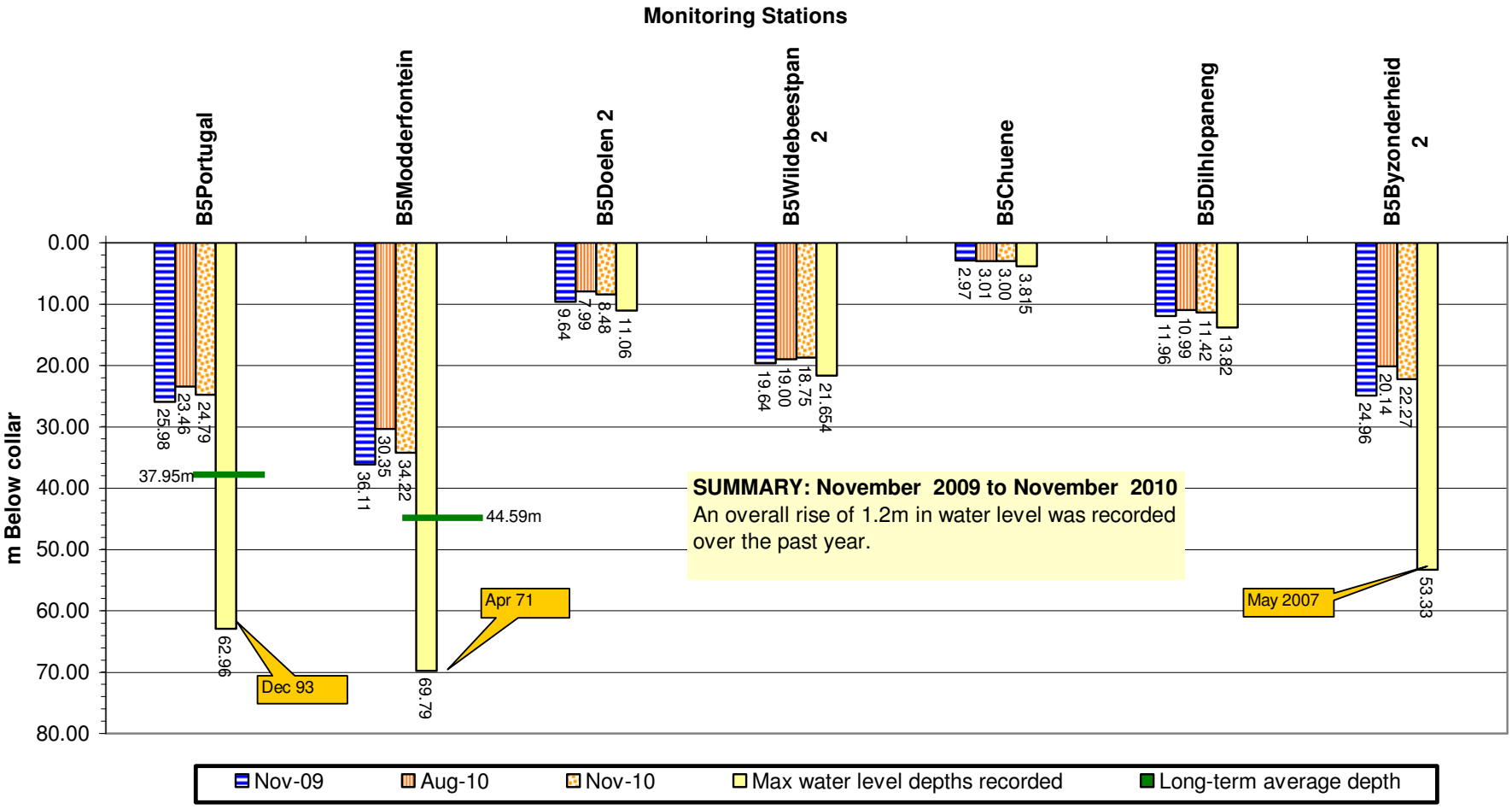

B5 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
B5Modderfontein
B5Byzonderheid 2
B5Portugal
B5Doelen 2
B5Dilhlopaneng
B5Chuene
B5Wildebeestpan 2
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
-5.000
-6.000
Monitoring Stations
-3.870
-2.130
-1.330
-0.493
-0.425
0.013
0.253
Lower water levels at 5 stations , with rising water levels at 2.
Deviation in meter

GRAPH 38

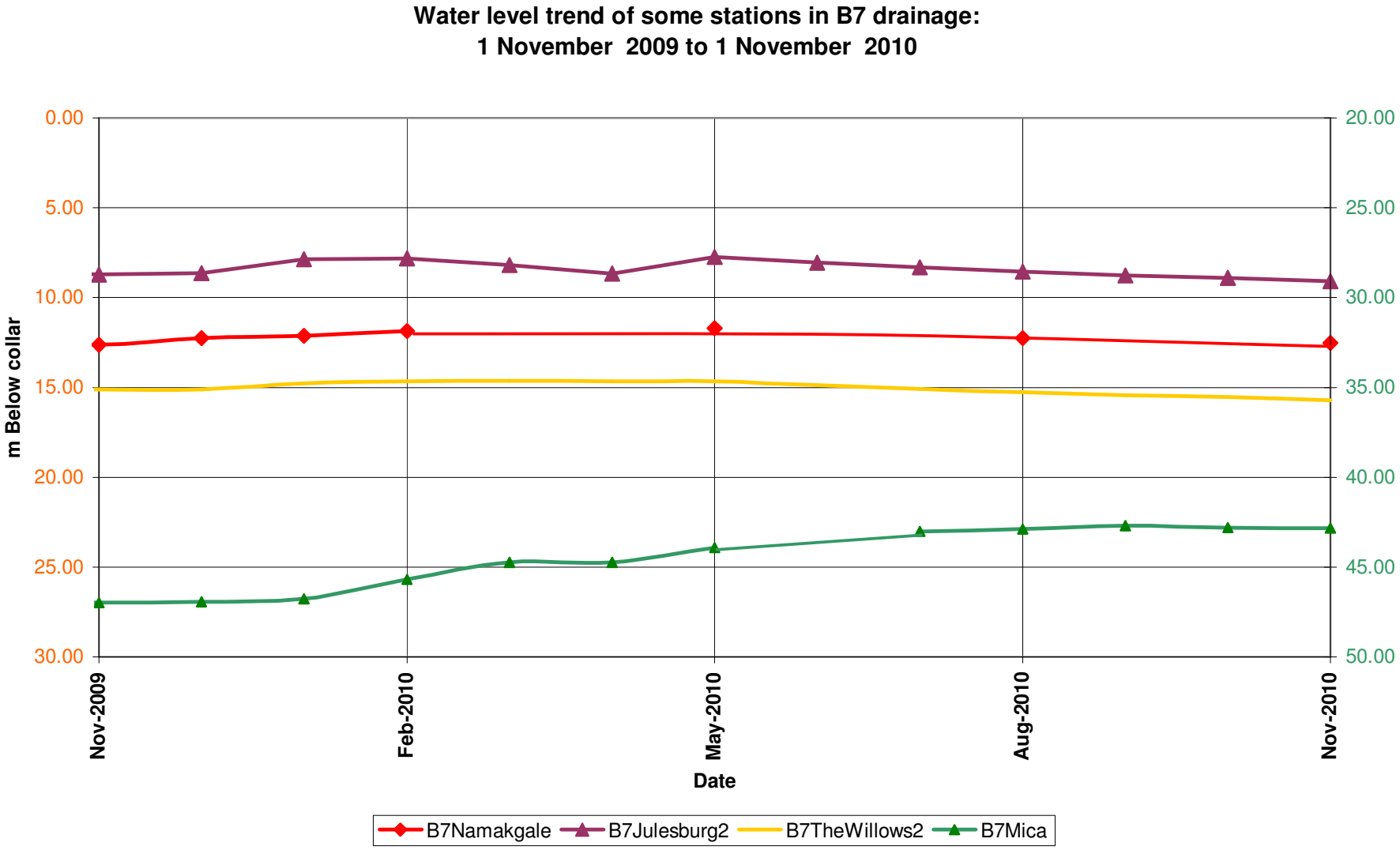

B5 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010
B5Chuene
B5Dilhlopaneng
B5Wildebeestpan 2
B5Doelen 2
B5Portugal
B5Modderfontein
B5Byzonderheid 2
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
Monitoring Stations
5 Of the 6 stations with data indicate higher water levels over the past year
-0.033
0.540
0.884
1.158
1.192
1.890
2.693
Deviation in meter

GRAPH 39

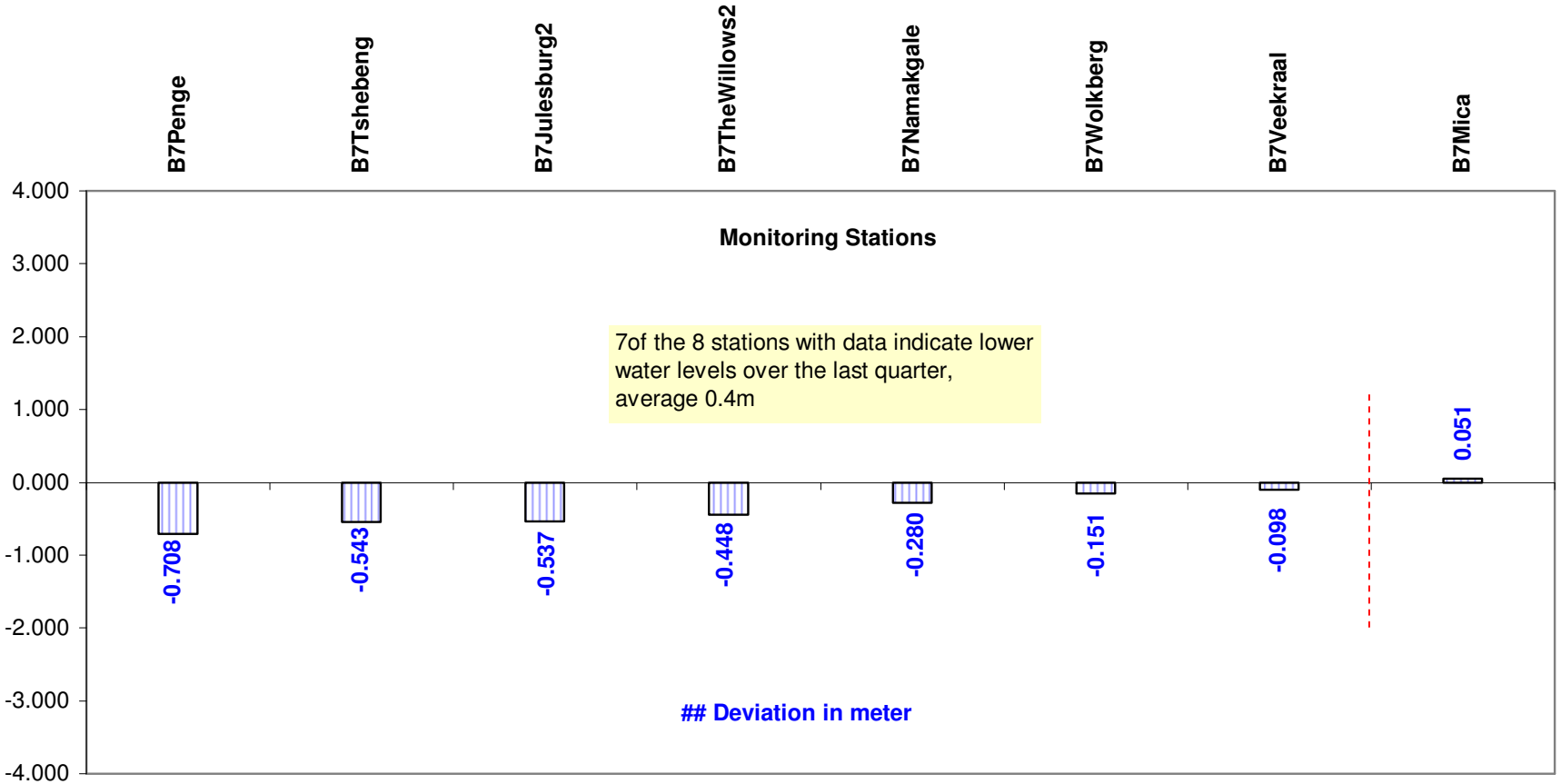
B5 DRAINAGE AREA
Comparison between water level depths: 1 November 2009, 1 August 2010, 1 November 2010 and maximum depths recorded



GRAPH 40

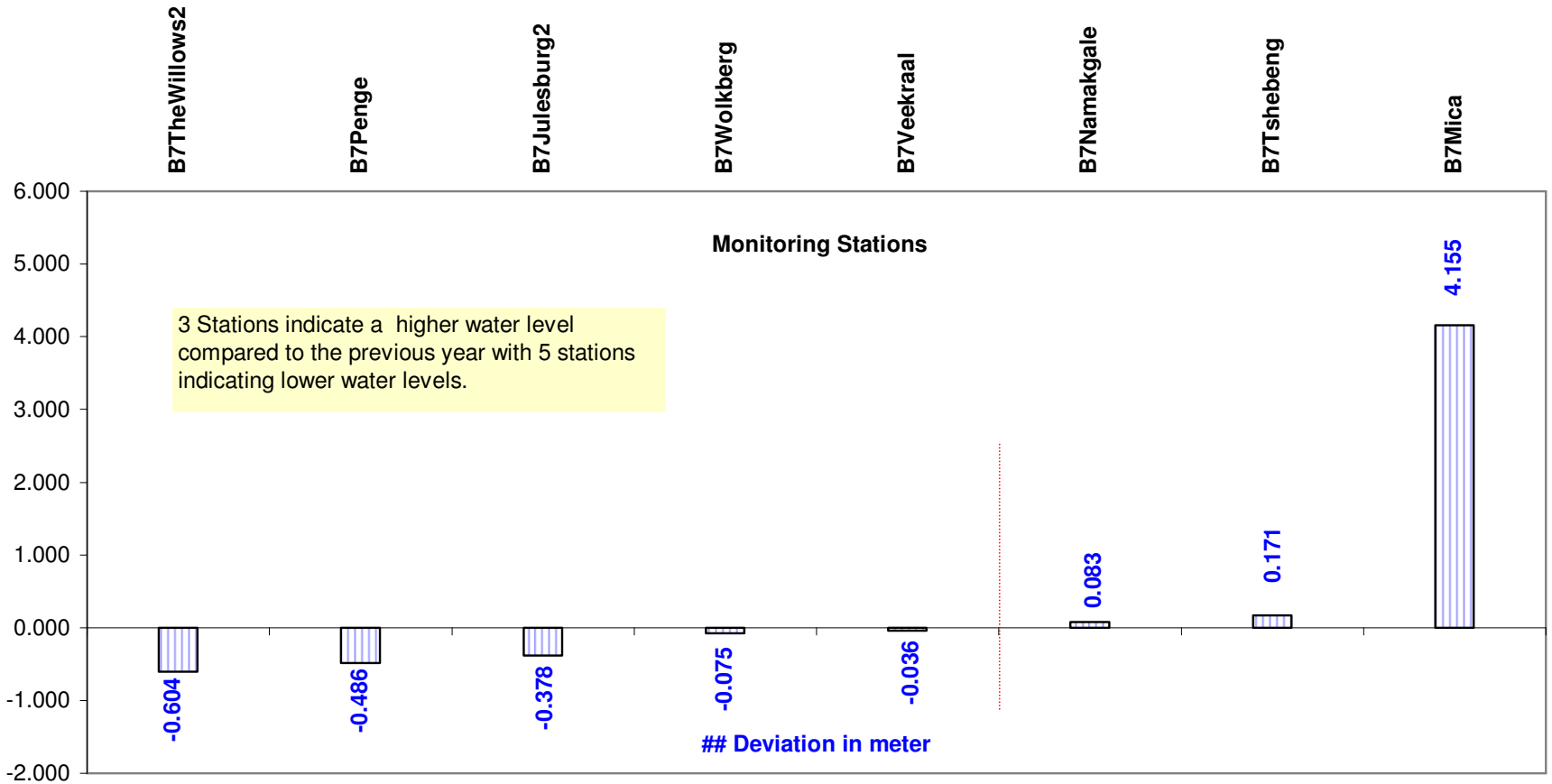

Water level trend of some stations in B7 drainage:
1 November 2009 to 1 November 2010
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Nov-2009
Feb-2010
May-2010
Aug-2010
Nov-2010
Date
B7Namakgale
B7Julesburg2
B7TheWillows2
B7Mica

GRAPH 41

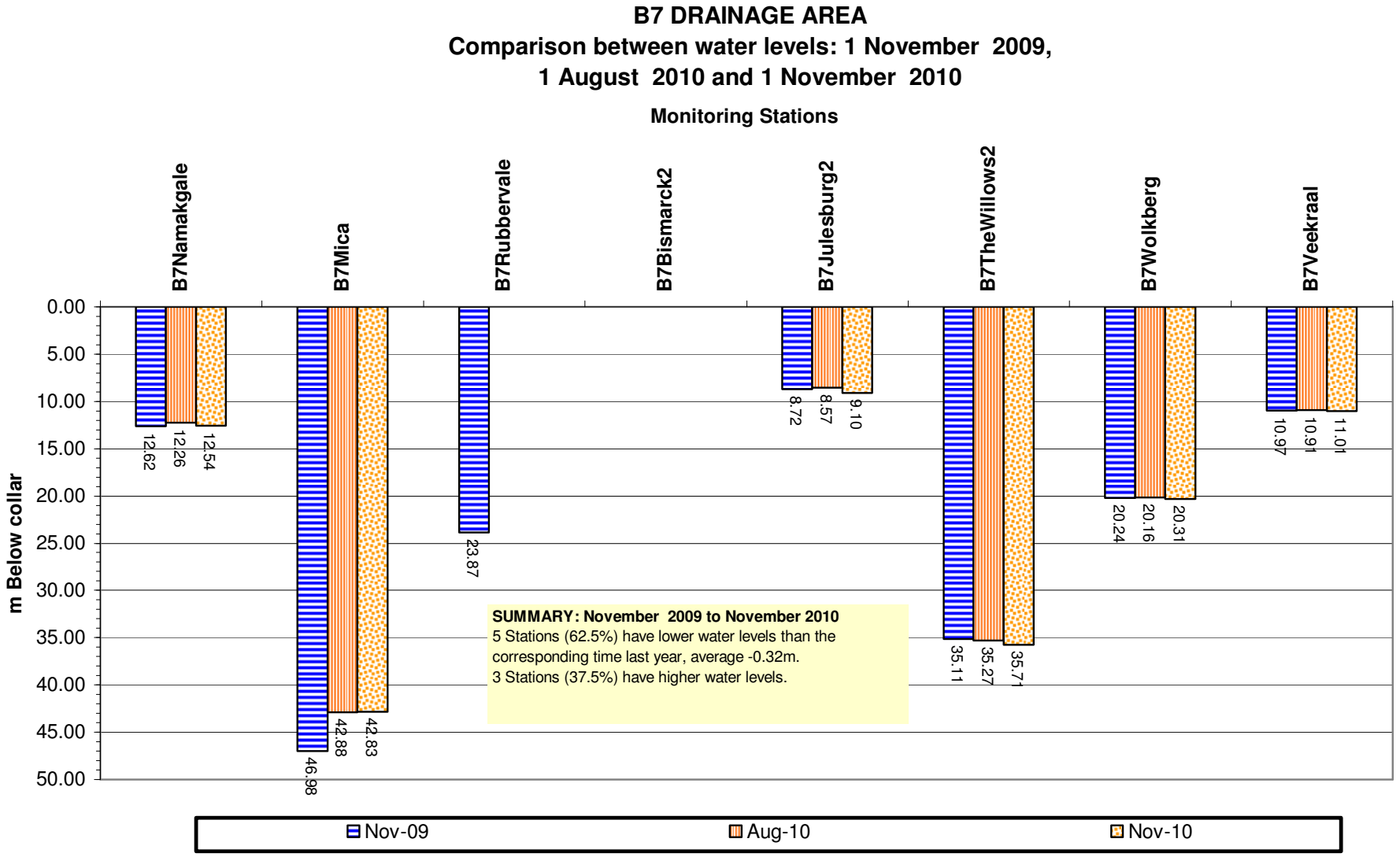

B7 DRAINAGE AREA
Deviation of water levels: 1 August 2010 to 1 November 2010
B7Penge
B7Tshebeng
B7Julesburg2
B7TheWillows2
B7Namakgale
B7Wolkberg
B7Veekraal
B7Mica
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
Monitoring Stations
7of the 8 stations with data indicate lower water levels over the last quarter, average 0.4m
-0.708
-0.543
-0.537
-0.448
-0.280
-0.151
-0.098
0.051
Deviation in meter

GRAPH 42

B7 DRAINAGE AREA
Deviation of water levels: 1 November 2009 to 1 November 2010

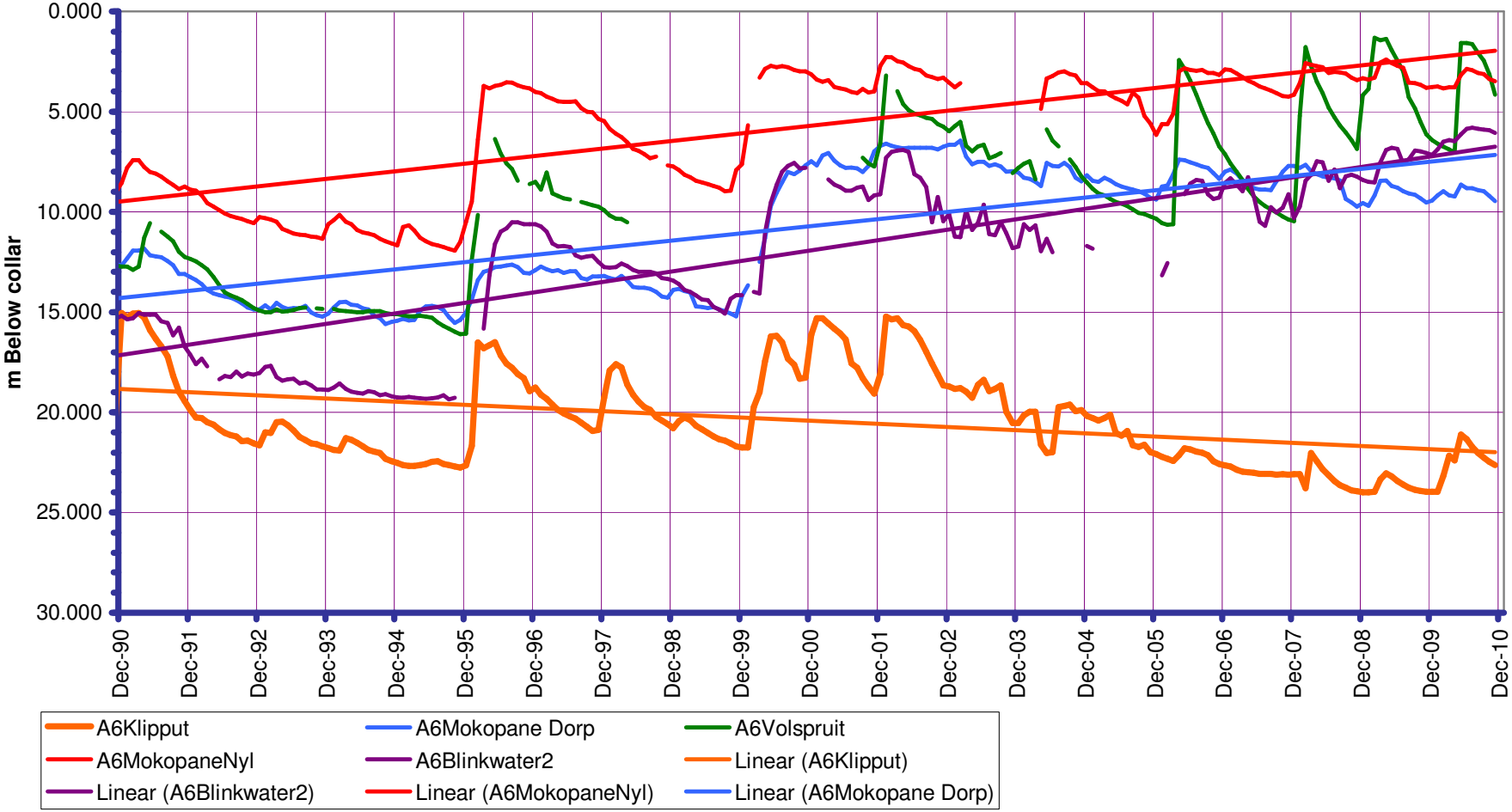


GRAPH 43

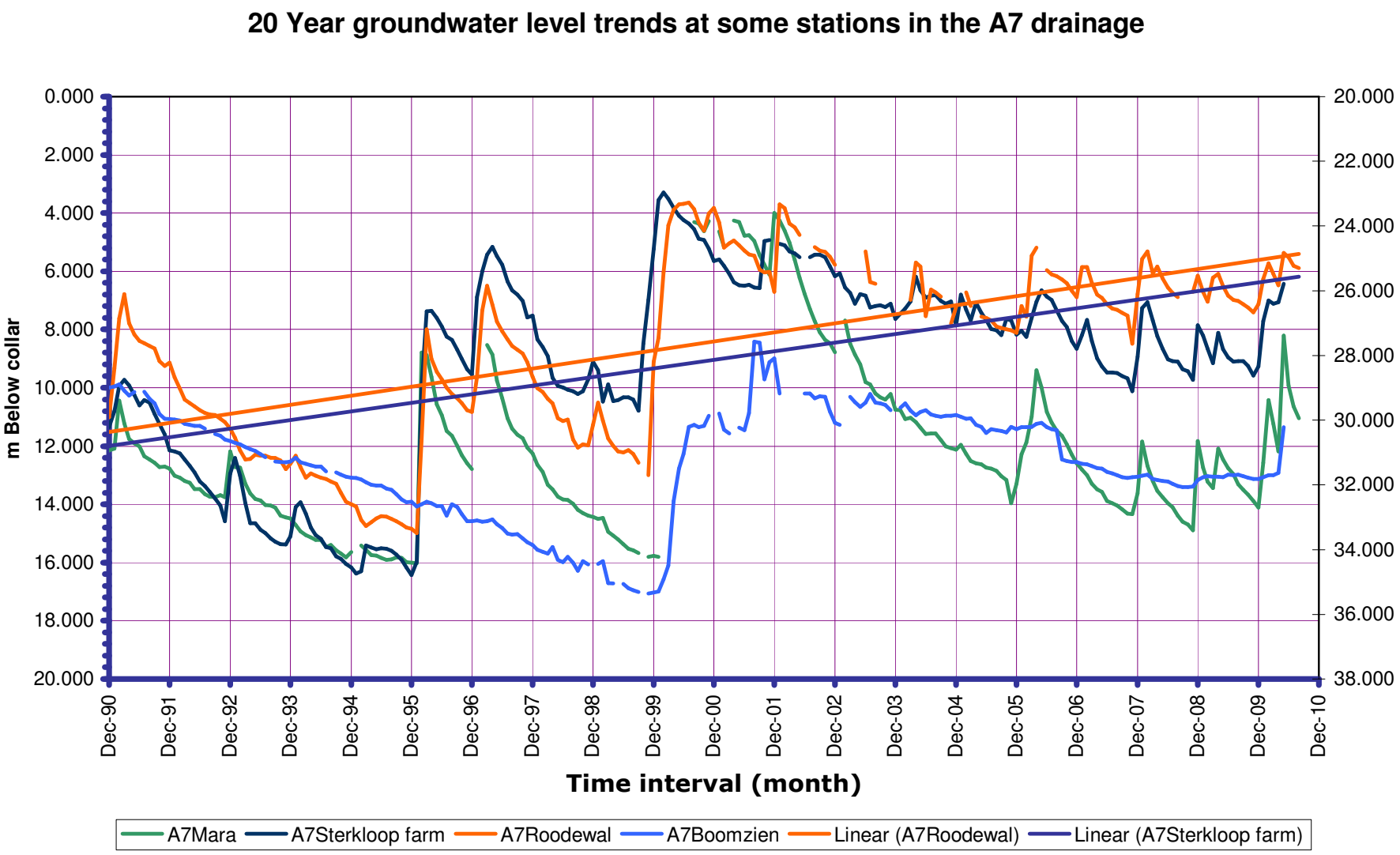

B7 DRAINAGE AREA
Comparison between water levels: 1 November 2009,
1 August 2010 and 1 November 2010
Monitoring Stations
B7Namakgale
B7Mica
B7Rubbervale
B7Bismarck2
B7Julesburg2
B7TheWillows2
B7Wolkberg
B7Veekraal
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
12.62
12.26
12.54
46.98
42.88
42.83
23.87
8.72
8.57
9.10
35.11
35.27
35.71
20.24
20.16
20.31
10.97
10.91
11.01
SUMMARY: November 2009 to November 2010
5 Stations (62.5%) have lower water levels than the corresponding time last year, average -0.32m.
3 Stations (37.5%) have higher water levels.
Nov-09
Aug-10
Nov-10

GRAPH 44

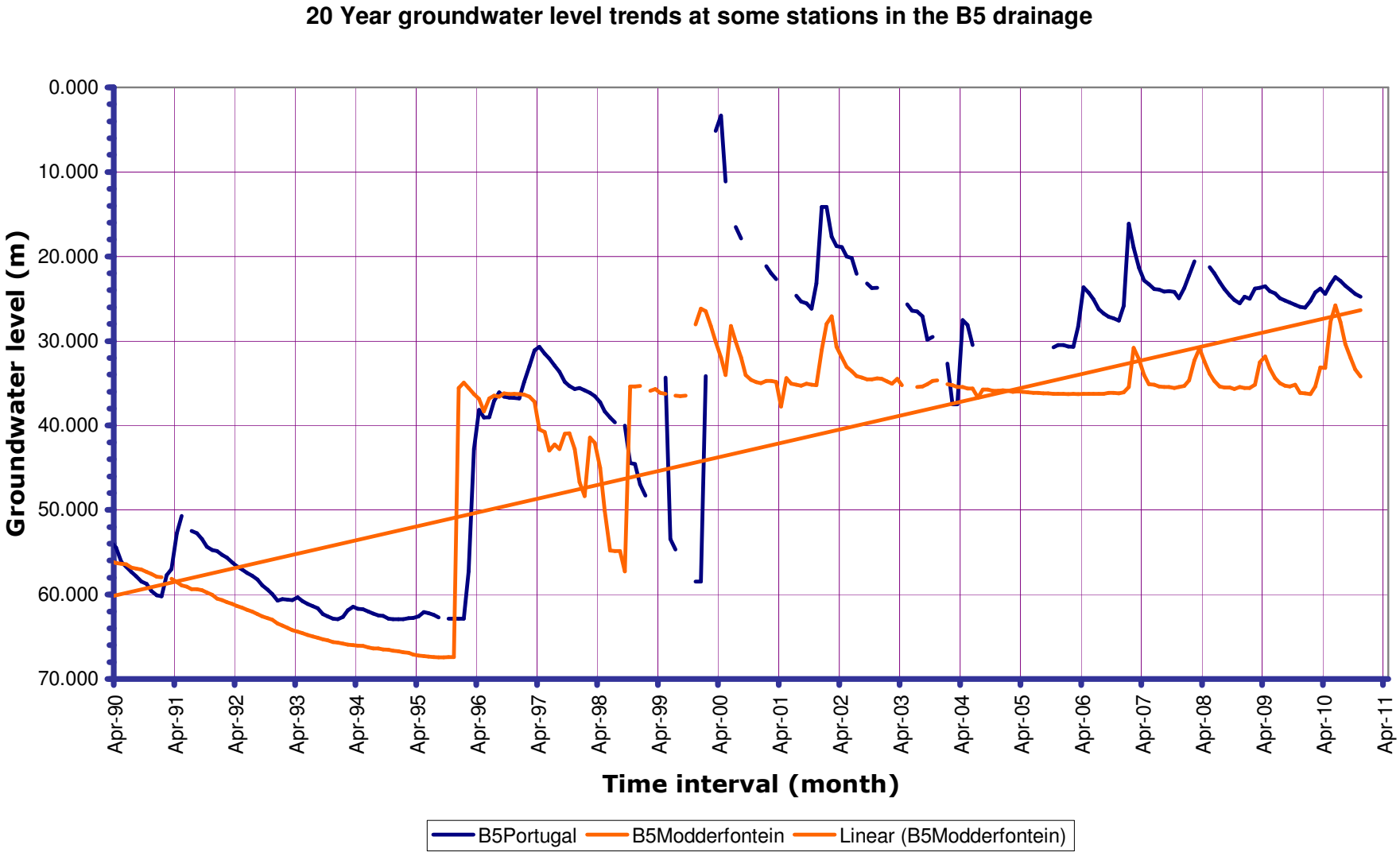
20 Year groundwater level trends at some stations in the A6 drainage



GRAPH 45


20 Year groundwater level trends at some stations in the A7 drainage
m Below collar
0.000
2.000
4.000
6.000
8.000
10.000
12.000
14.000
16.000
18.000
20.000
20.000
22.000
24.000
26.000
28.000
30.000
32.000
34.000
36.000
38.000
Dec-90
Dec-91
Dec-92
Dec-93
Dec-94
Dec-95
Dec-96
Dec-97
Dec-98
Dec-99
Dec-00
Dec-01
Dec-02
Dec-03
Dec-04
Dec-05
Dec-06
Dec-07
Dec-08
Dec-09
Dec-10
Time interval (month)
A7Mara
A7Sterkloop farm
A7Roodewal
A7Boomzien
Linear (A7Roodewal)
Linear (A7Sterkloop farm)

GRAPH 46


20 Year groundwater level trends at some stations in the B5 drainage
Groundwater level (m)
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
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
Time interval (month)
B5Portugal
B5Modderfontein
Linear (B5Modderfontein)

GRAPH 47