

GH4455



## water & sanitation

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Department:  
Water and Sanitation  
**REPUBLIC OF SOUTH AFRICA**

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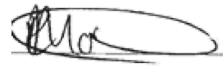
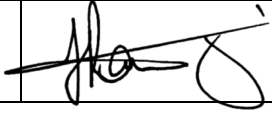
ANNUAL HYDROLOGICAL YEAR REPORT :2024/25  
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## Contents

1.	Introduction .....	6
1.1.	Purpose of report .....	6
2.	Monitoring programmes overview .....	6
3.	Status of Surface Water Monitoring Programme and Analysis .....	8
3.1.	Surface Water Data Availability.....	8
3.2.	River Conditions .....	10
3.2.1.	Limpopo .....	12
3.2.2.	Olifants.....	13
3.2.3.	Inkomati-Usuthu .....	14
3.2.4.	Pongola-Umzimkulu .....	15
3.2.5.	Vaal .....	16
3.2.6.	Orange .....	17
3.2.7.	Mzimvubu-Tsitsikamma .....	19
3.2.8.	Breede-Gouritz.....	20
3.2.9.	Berg-Olifants .....	21
3.3.	Status of National Reservoir Water Storage.....	22
4.	The Status of Groundwater Monitoring Programme.....	30
4.1.	Groundwater level monitoring programme .....	30
4.2.	Groundwater Quality monitoring programme .....	32
4.3.	National Groundwater Rainfall/Recharge Monitoring Network .....	34
4.4.	Data acquisition and management.....	34
4.5.	Groundwater level Fluctuation.....	35
4.5.1.	Calculation of annual groundwater levels fluctuation .....	35
4.5.2.	Long term trend analysis.....	39
4.5.3.	Case studies .....	40
4.6.	Groundwater Quality Status.....	50
4.6.1.	Background and Introduction .....	50
4.6.2.	Data availability.....	50
4.6.3.	Results and analysis: 2020-2025 .....	53
5.	Conclusion.....	71
5.1.	Status of Surface water monitoring programme and analysis .....	71
5.2.	Groundwater Level .....	71
5.3.	Groundwater Quality.....	72
6.	Challenges.....	73
7.	Recommendations .....	73
	<b>References.....</b>	<b>74</b>

## List of figures

FIGURE 3. 1: DATA AVAILABILITY PER REGION GRAPH .....	9
FIGURE 3. 2: DATA AVAILABILITY PER TYPE GRAPH .....	9
FIGURE 3. 3: GAUGING STATIONS MAP .....	11
FIGURE 3. 4: LIMPOPO WMA ANALYSIS .....	12
FIGURE 3. 5: OLIFANTS WMA ANALYSIS .....	13
FIGURE 3. 6: INKOMATI-USUTHU WMA ANALYSIS.....	15
FIGURE 3. 7: PONGOLA–UMZIMKULU WMA ANALYSIS .....	16
FIGURE 3. 8: VAAL WMA ANALYSIS.....	17
FIGURE 3. 9: ORANGE WMA ANALYSIS.....	18
FIGURE 3. 10: MZIMVUBU–TSITSIKAMMA WMA ANALYSIS.....	19
FIGURE 3. 11: BREEDE-GOURITZ WMA ANALYSIS .....	20
FIGURE 3. 12: BERG-OLIFANTS WMA ANALYSIS .....	21
FIGURE 3. 13: WEEKLY NATIONAL RESERVOIRS (% FSC).....	22
FIGURE 3. 14: NATIONAL AND PROVINCIAL MONTHLY RESERVOIR STORAGE (% FSC).....	24
FIGURE 3. 15: MONTHLY WSS RESERVOIRS STORAGE (% FSC).....	26
FIGURE 4. 1: OVERVIEW OF GROUNDWATER MONITORING PROGRAMMES .....	30
FIGURE 4. 2: DISTRIBUTION OF THE NATIONAL GROUNDWATER QUALITY MONITORING GEOSITES (JANUARY 2026) .....	31
FIGURE 4. 3: DISTRIBUTION OF THE NATIONAL GROUNDWATER QUALITY MONITORING GEOSITES (DECEMBER 2025) .....	33
FIGURE 4. 4: DISTRIBUTION OF DWS RAINFALL STATION ACROSS THE COUNTRY .....	34
FIGURE 4. 5: GROUNDWATER LEVEL FLUCTUATIONS BETWEEN 2023/24 AND 2024/25 HYDROLOGICAL YEARS. .	35
FIGURE 4. 6: NUMBER OF BOREHOLES INCREASED AND DECLINED DURING 2024/25 HYDROLOGICAL YEAR .....	36
FIGURE 4. 7: SPATIAL DISTRIBUTION OF GROUNDWATER LEVEL FLUCTUATION 2024/25 HYDROLOGICAL YEAR ...	38
FIGURE 4. 8: HYDROGEOLOGICAL REGIONS COVERING THE EASTERN CAPE AND KWAZULU NATAL PROVINCES. ....	41
FIGURE 4. 9: GROUNDWATER LEVEL STATUS FOR THE HYDROGEOLOGICAL REGIONS IN EASTERN CAPE AND KWAZULU-NATAL PROVINCES .....	42
FIGURE 4. 10: HYDROGEOLOGICAL REGION FOR THE WESTERN CAPE, NORTHERN CAPE AND FREE STATE PROVINCES .....	44
FIGURE 4. 11: GROUNDWATER LEVELS FOR THE HYDROGEOLOGICAL REGIONS IN THE WESTERN CAPE.....	46
FIGURE 4. 12: GROUNDWATER LEVELS FOR THE HYDROGEOLOGICAL REGIONS IN THE NORTHERN CAPE AND FREE STATE PROVINCES .....	46
FIGURE 4. 13: HYDROGEOLOGICAL REGION FOR THE GAUTENG, NORTHWEST, MPUMALANGA AND THE LIMPOPO PROVINCES .....	48
FIGURE 4. 14: GROUNDWATER LEVEL FLUCTUATIONS FOR THE HYDROGEOLOGICAL REGIONS IN THE GAUTENG, AND NORTHWEST PROVINCES.....	49
FIGURE 4. 15: GROUNDWATER LEVEL FLUCTUATIONS FOR THE HYDROGEOLOGICAL REGIONS IN THE LIMPOPO AND MPUMALANGA PROVINCE.....	49
FIGURE 4. 16: SPATIAL DISTRIBUTION OF NITRATE: 2025 .....	54
FIGURE 4. 17: SPATIAL DISTRIBUTION OF EC: 2025 .....	68
FIGURE 4. 18: SPATIAL DISTRIBUTION OF FLUORIDE: 2025 .....	69
FIGURE 4. 19: SPATIAL DISTRIBUTION OF SULPHATE: 2025 .....	70

## List of Tables

TABLE 2. 1: MONITORING PROGRAMMES IN THE DEPARTMENT OF WATER AND SANITATION .....	6
TABLE 3. 1: NUMBER OF SITES WITH DATA IN THE PERIOD 01/10/2023 TO 29/09/2024 .....	8
TABLE 4. 1: TOTAL NUMBER OF SAMPLED GEOSITES: SEPTEMBER 2024-APRIL-MAY 2025.....	51
TABLE 4. 2: TOTAL NUMBER OF SAMPLED GEOSITES: SEPTEMBER 2025 .....	52
TABLE 4. 3: LIST OF GEOSITES WITH HIGH NITRATE CONCENTRATION (GREATER THAN 35 MG/L) (2022/23-2023/24).....	55
TABLE 4. 4: LIST OF GEOSITES WITH EC GREATER THAN 370 MS/M.....	56
TABLE 4. 5: LIST OF GEOSITES WITH FLUORIDE CONCENTRATION IN GROUNDWATER (2023/24 – 2024/25).....	59
TABLE 4. 6: LIST OF GEOSITES WITH SULPHATE GREATER THAN 200 MG/L .....	62

## 1. Introduction

The overall objective of this report is to provide annual hydrological monitoring activities undertaken during 2024/25 hydrological year. The hydrological year is defined as the year-long cycle of the development of hydrologic processes. In the Department of Water and Sanitation the hydrological year is considered from October to September. This report therefore reports only on all surface and groundwater monitoring activities that took place from October 2024 to September 2025. Groundwater quality data is not available therefore reporting for groundwater quality will be excluded for this reporting quarter.

### 1.1. Purpose of report

The main objective of this report is to give an overview of hydrological status for 2024/2025 hydrological year (October 2024 to September 2025). Specifically, the report aims to address the following areas:

- Active hydrological monitoring programmes
- Status of surface water availability,
- Status of river conditions,
- Status of reservoir water storage
- Status of Groundwater levels
- Status of Groundwater Quality
- Challenges encountered during the 2024/25 hydrological year

## 2. Monitoring programmes overview

Chapter 14 of the National Water Act No. 36 of 1998 requires the establishment and management of national monitoring programmes to facilitate the continued and coordinated monitoring of water resources by collecting relevant data and information that are adequate and responsive to the present and future challenges of efficient management of the country's water resources.

Table 2. 1: Monitoring programmes in the Department of Water and Sanitation

Programme	Parameters	Number of Station (Est)	Frequencies	Database
Groundwater Level Monitoring Programme	Groundwater levels and Rainfall*	1877	Various (daily, monthly, and quarterly)	Hydstra & NGA
National Groundwater	Groundwater quality (chemical	424	Twice a year (before and after Rainfall) –	WMS – Database

Quality Monitoring Programme	and physical parameters)		March/ April and September/ October	CHART - Analysis
Rainfall	Quantity		No frequency	Hydstra
Rivers	Water levels/stream flows	662		Hydstra
Reservoirs	Storage volume	235	Monthly	Hydstra
Dam monitoring	Dam water levels	222	Weekly	Hydstra
Evaporation monitoring	Evaporation	162	Varied	Hydstra
Streamflow (including calculated reservoir inflows)	streamflow (including calculated reservoir inflows)	1300	Varied	Hydstra

### 3. Status of Surface Water Monitoring Programme and Analysis

#### 3.1. Surface Water Data Availability

The Department of Water and Sanitation and the National Hydrological services are mandated by the National Water Act No. 36 of 1998 (Chapter 14), The National Water Resources Strategy (NWRS-2), The National Water and Sanitation Master Plan, and the National Development Plan (2030) to establish and manage national monitoring programmes to facilitate the continued and coordinated monitoring of water resources by collecting relevant data and information that are adequate and responsive to the present and future challenges for efficient management of the country's water resources.

According to the DWS *Scientific Review Report of the 2016 study*, about 1066 surface water monitoring sites are required to sufficiently meet the National Water Resource Monitoring Objectives. Table 3.1 below shows that there are currently 661 active surface water monitoring sites, which, according to the report, are not satisfactory. More sites need to be constructed; also, closed (inactive) sites, which, based on the Scientific Review Report (DWS, 2016), were recommended as sites that need replacement or an upgrade; therefore, these sites will need to be prioritised for reopening in order to meet the National Water Resource Monitoring Objective. The department is currently monitoring 150 pipelines, which measure the cumulative volumes of water transported from dams to different water users (e.g. farmers, industries, filtration plants, industries, etc.) or from one dam to another. There are also 54 and 12 stations that measure and monitor water levels at estuaries and river eyes, respectively. Table 3.1 further indicates that there are 235 dams that the department is currently monitoring.

Table 3. 1: Number of sites with data in the period 01/10/2023 to 29/09/2024

Department of Water and Sanitation Summary of active sites as of 2024/09/29									
REGION	Region Name	RIVER	CANAL	PIPELINE	EYE	RESERVOIR	MET	ESTUARY	TOTAL
1	Western Cape	137	43	41	0	50	24	21	316
2	Eastern Cape	87	23	28	0	32	27	9	206
3	KwaZulu-Natal	103	14	16	0	39	24	24	220
4	Gauteng	82	30	20	10	33	23	0	198
5	Mpumalanga	102	15	16	0	25	21	0	179
6	Free State	61	17	13	0	22	14	0	127
7	Northern Cape	35	11	1	2	11	14	0	74
8	Limpopo	54	20	15	0	23	15	0	127
	<b>TOTALS</b>	661	173	150	12	235	162	54	1447

The availability of data on the sites is fluctuating each year in each region. Most regions have not reached 100% data availability due to physical constraints such as access, vandalism, structural problems, theft, the unavailability of equipment and lack of human resources. This has been a challenge that the department has been facing throughout the years, and

programmes like Citizen Science, where the public is urged to participate and collaborate with the department in the collection of data in areas where our observers cannot access, have been proposed and are awaiting implementation.

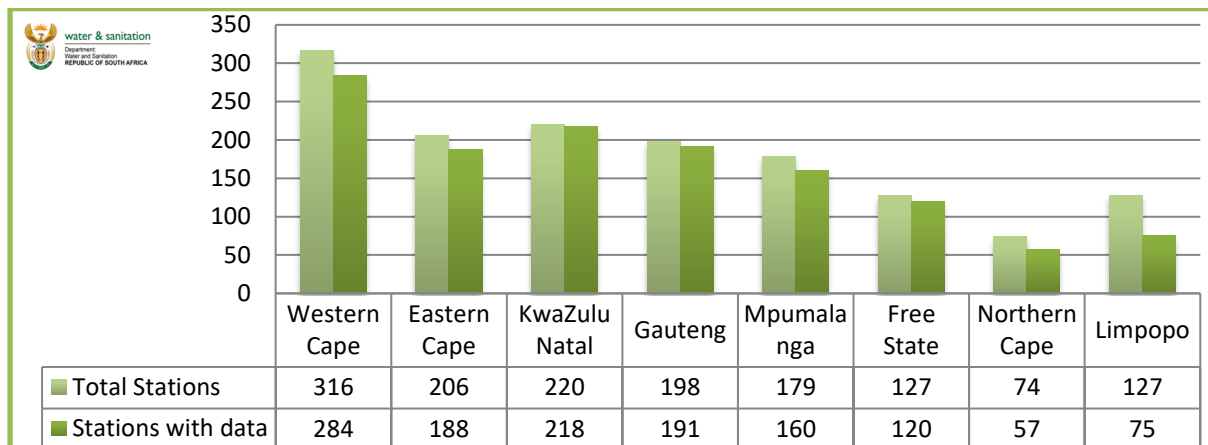


Figure 3. 1: Data availability per region graph

**Error! Reference source not found.** shows the total number of active stations for each region in the country vs the number of stations that have data for the 2024/25 hydrological year. All regions have more than 90% stations that have data, with the exception of the Western Cape, Mpumalanga, Northern Cape, and Limpopo. The KwaZulu-Natal region is leading with data availability, followed by Gauteng and the Free State region, with only 2, 7, and 7 stations that are behind with data, respectively. The Limpopo region is way behind in updating its data, as the figure depicts that 52 stations are behind with data. KwaZulu-Natal, Gauteng, Mpumalanga and the Free State regions have shown a great improvement with data availability as compared with the previous hydrological year.

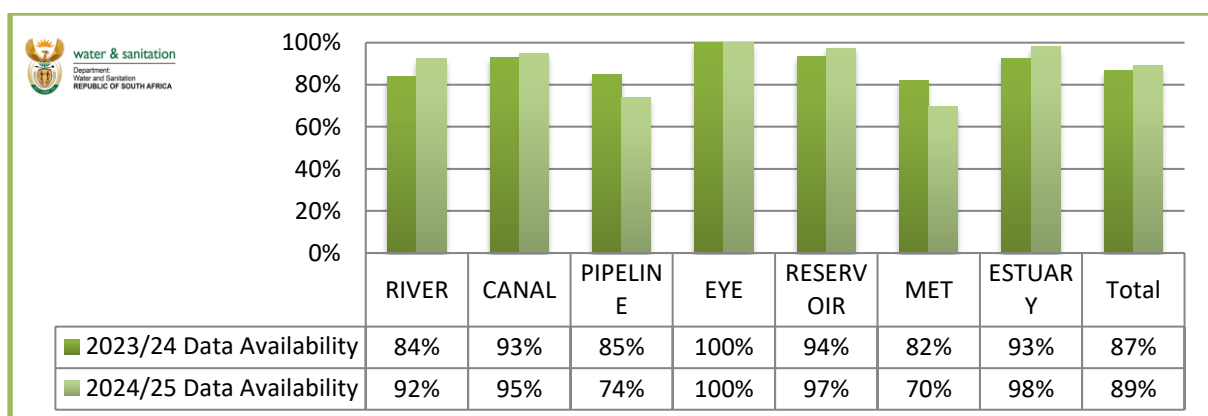


Figure 3. 2: Data availability per type graph

**Error! Reference source not found.** shows the percentage of data available for the 2023/24 and 2024/25 hydrological years. Pipelines and meteorological stations show a decrease in data availability compared to the previous hydrological year. River and estuary sites show a significant increase of 8% and 5% in data from the 2023/24 hydrological year, respectively,

while the data availability for eye stations remains at 100%. A slight improvement is also noted for canals and reservoir stations as compared to the 2024/25 hydrological year.

### **3.2. River Conditions**

The total cumulative volume (discharge) of water moving downstream during a hydrological year, compared to the naturalised flow, was set as a baseline. This indicates the reduction from natural flows, obtained by removing man-made influences such as dams, irrigation schemes, abstractions for mines, industries and towns, and return flows from treatment works. Change in discharge is measured as naturalised Mean Annual Runoff minus present-day mean annual runoff divided by naturalised mean annual runoff times one hundred:

The last naturalised flow and present-day analysis was done in the Water Resources of South Africa, 2012 Study (WR2012), WRC Report K5/2143/1 by Pitman, WV and Bailey, AK. The study was commissioned by the Department of Water and Sanitation and Water Research Council (WRC) (<http://waterresourceswr2012.co.za/resource-centre/>). Naturalised flows are for the 1920 to 2009 hydrological years.

After the WR2012, there is no official study that has been done to calculate the Mean Annual Runoff for RSA. As a result, the 1981 – 2010 mean period was set as a baseline or a reference period; this is also because most stations do not have historical data that stretches as far as 1920. The average volume (discharge) in Million Cubic Meters (MCM) flowing downstream during the 2024/25 hydrological year is compared to the set baseline, which 1981 – 2010 mean period.

For measuring the country's river water levels and the calculation of the related water volume and discharge, the Department operate a national surface water level monitoring network of 661 river gauging stations. However, due to some operational and technical challenges that the department faces, only 611 of the stations have data for this reporting period. A total of 83 representative hydrological stations were selected. The analysis of selected hydrological stations was done by comparing the average volume for the 2024/25 hydrological year with the 1981 – 2010 mean period and the Mean Annual Runoff (MAR). However, due to a lack of sufficient historical data, an average mean for the whole period was used on 27 stations out of the 83 instead of the 1981 – 2010 mean period baseline. Figure 3.3 indicates the location of the gauging sites used for this reporting. Furthermore, a comparison of the river volume for the past five hydrological years and the period mean at 39 stations is depicted in the graphs.

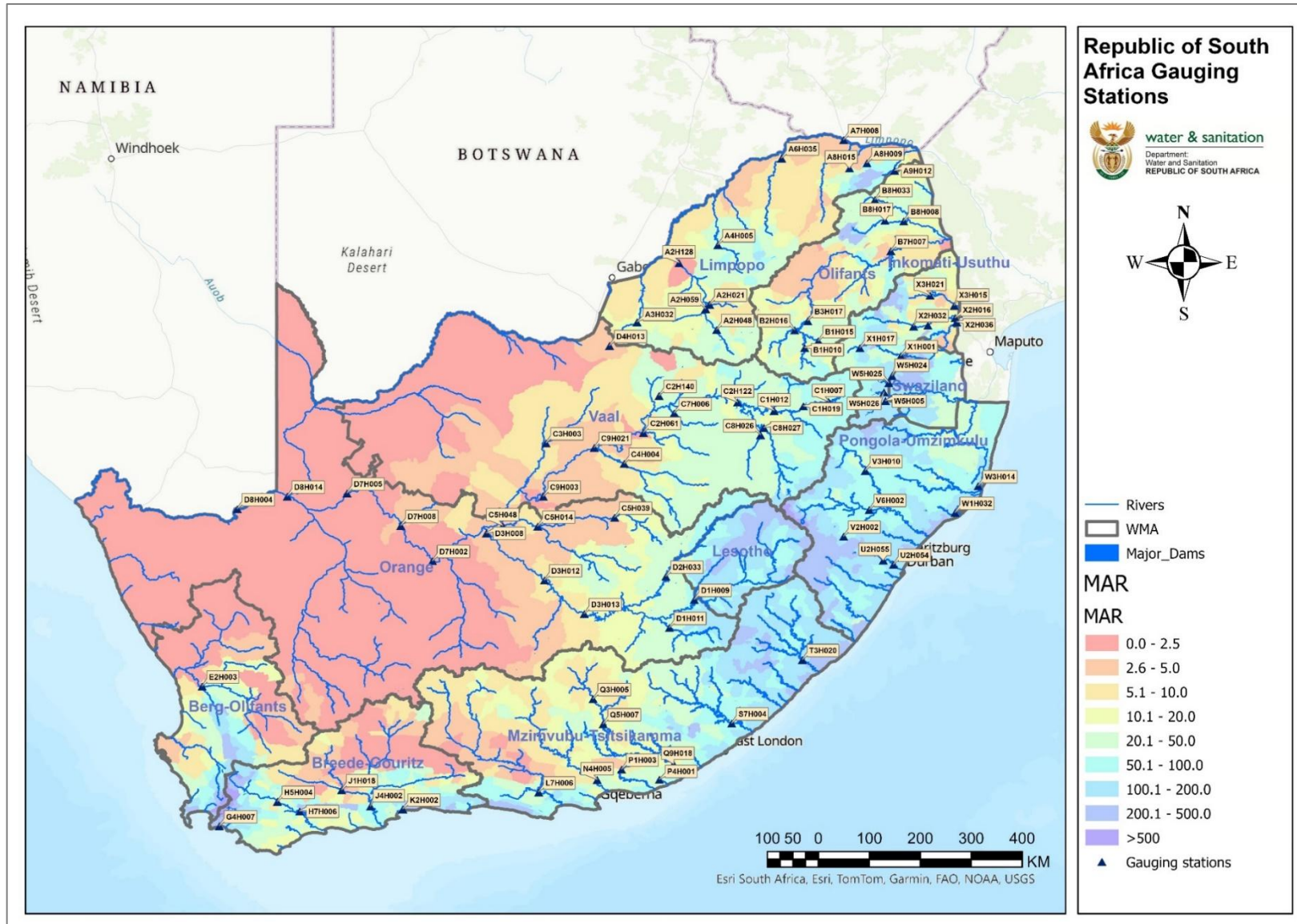


Figure 3. 3: Gauging stations map

### 3.2.1. Limpopo

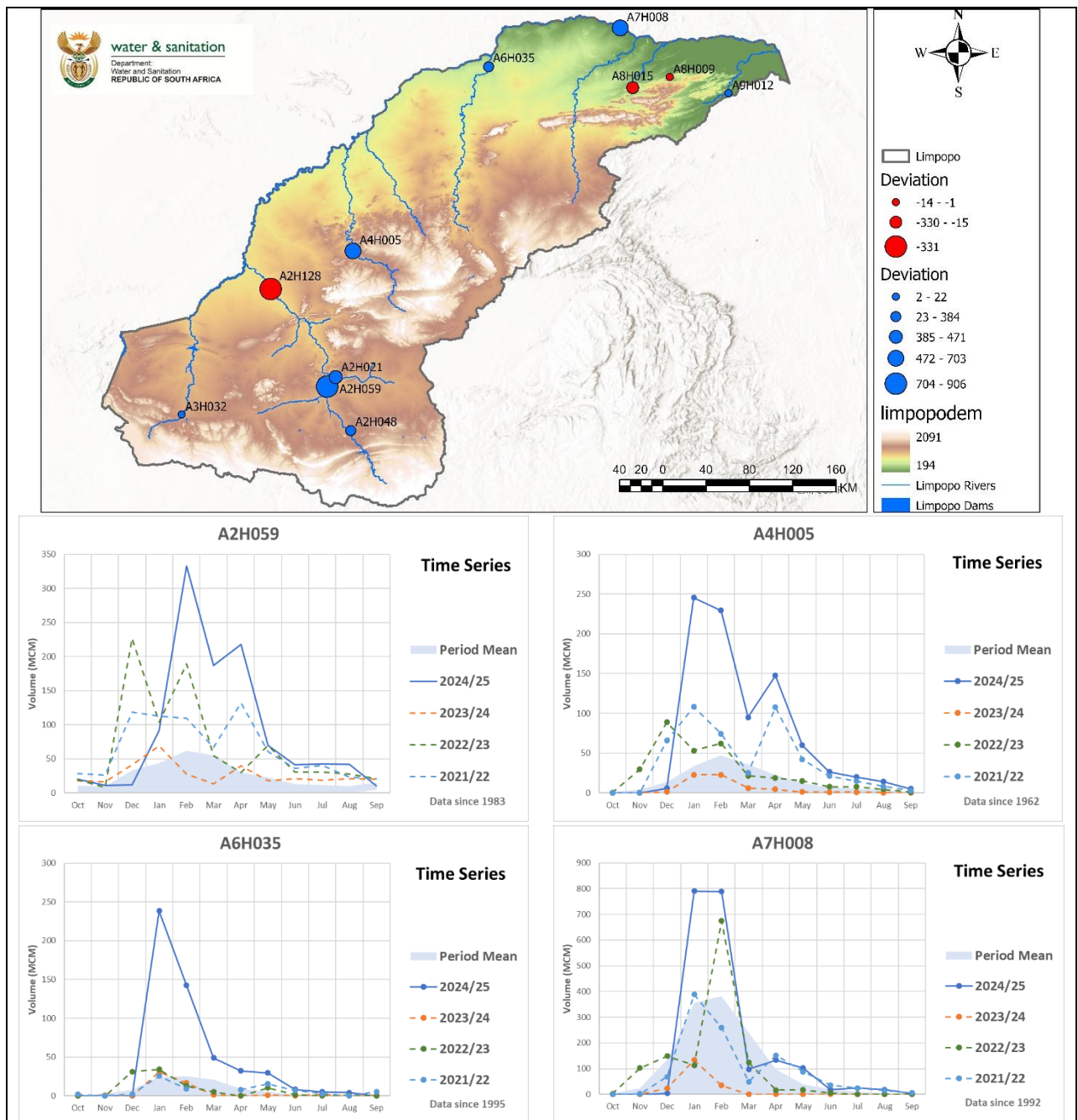


Figure 3. 4: Limpopo WMA Analysis

The Limpopo Water Management Area (WMA) is located in the Northern part of South Africa and has an area of 109,531 km<sup>2</sup>. Its major rivers include the Limpopo, Matlabas, Mokolo, Lephhalala, Mogalakwena, Sand, Nzhelele, Mutale, and Luvuvhu. The Mean Annual Run-off (MAR) ranges from 0 m<sup>3</sup>/s to 364.5 m<sup>3</sup>/s. The stations in the WMA recorded relatively higher streamflow for the 2024/25 hydrological year compared to the previous three hydrological years, with most peaks recorded between December 2024 and June 2025. The flows were well above the period mean as well (5 to 7 times the period mean); however, stations such as

A2H128, A8H009, and A8H015 depict a negative anomaly compared to the 1981 – 2010 mean period (Figure 3.4).

### 3.2.2. Olifants

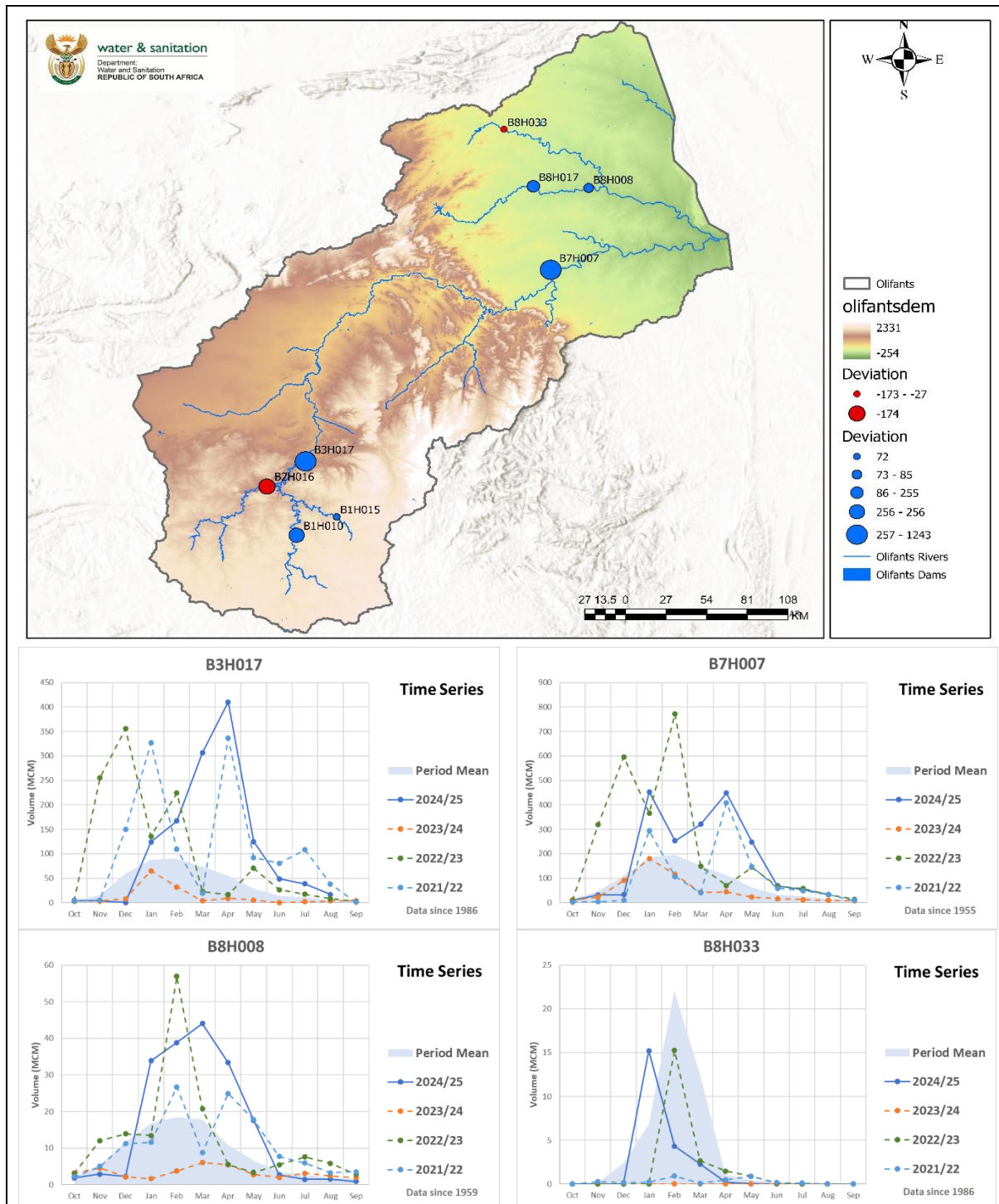


Figure 3. 5: Olifants WMA Analysis

The Olifants WMA is located in the Northeast of South Africa and has an area of 73,632 km<sup>2</sup>. Its major rivers include the Elands, Wilge, Steelpoort, Olifants, and Letaba River. The MAR ranges from 0.5 m<sup>3</sup>/s to 372 m<sup>3</sup>/s. The flow in the WMA depicts a positive anomaly mostly on

the main Olifant River as it flows into Mozambique, and the small tributaries, except for stations B2H016 and B8H033, which portrayed a below-average streamflow volume compared to the 1981 – 2010 mean period baseline. The 2024/25 flows started well below the period average until December 2024 and peaked between January and April 2025 (Figure 3.5), with stations such as B3H017 recording a peak of 410 MCM. The flows started dropping in winter, which is well expected as the Olifants WMA is located in a summer rainfall region.

### 3.2.3. Inkomati-Usuthu

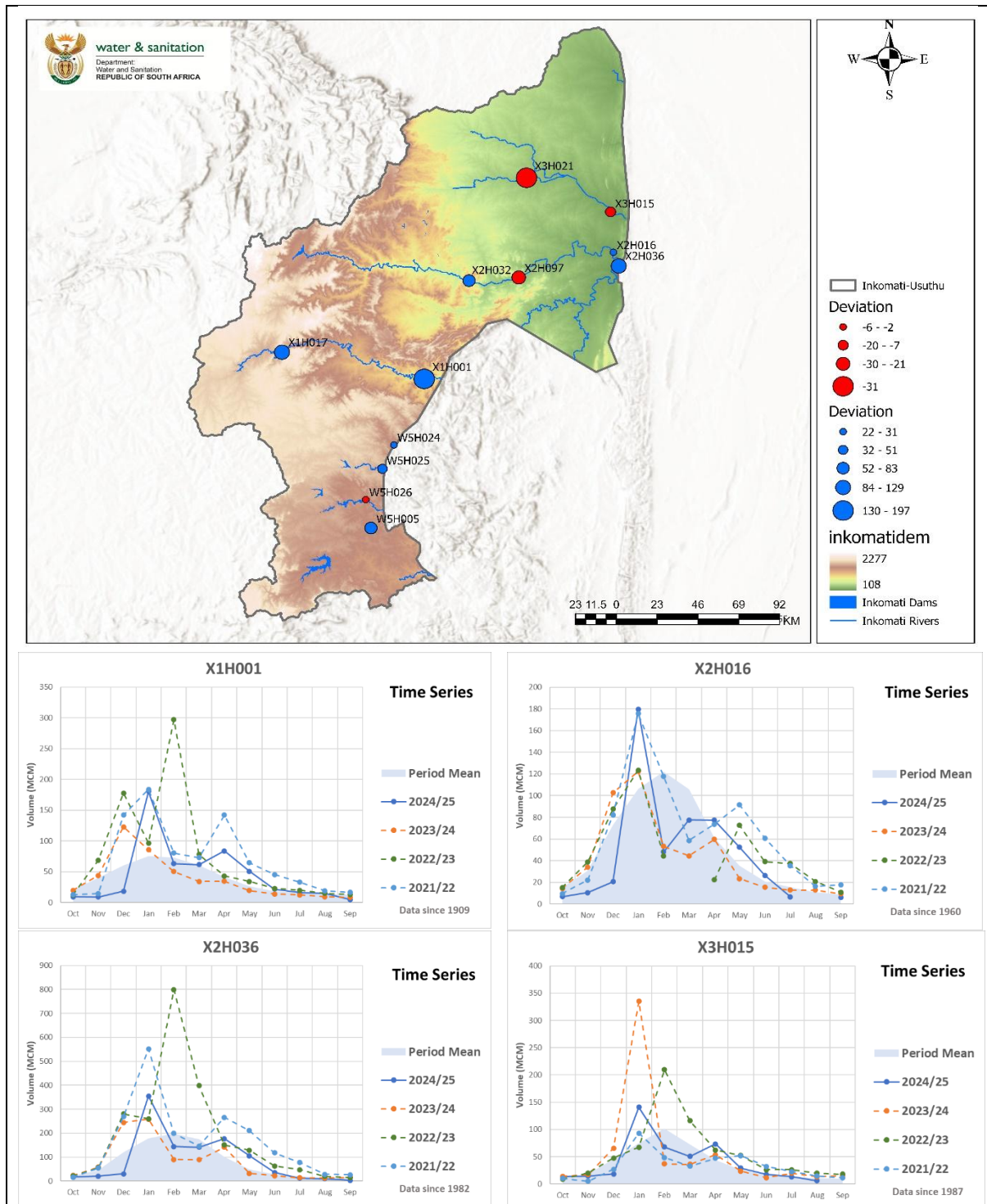
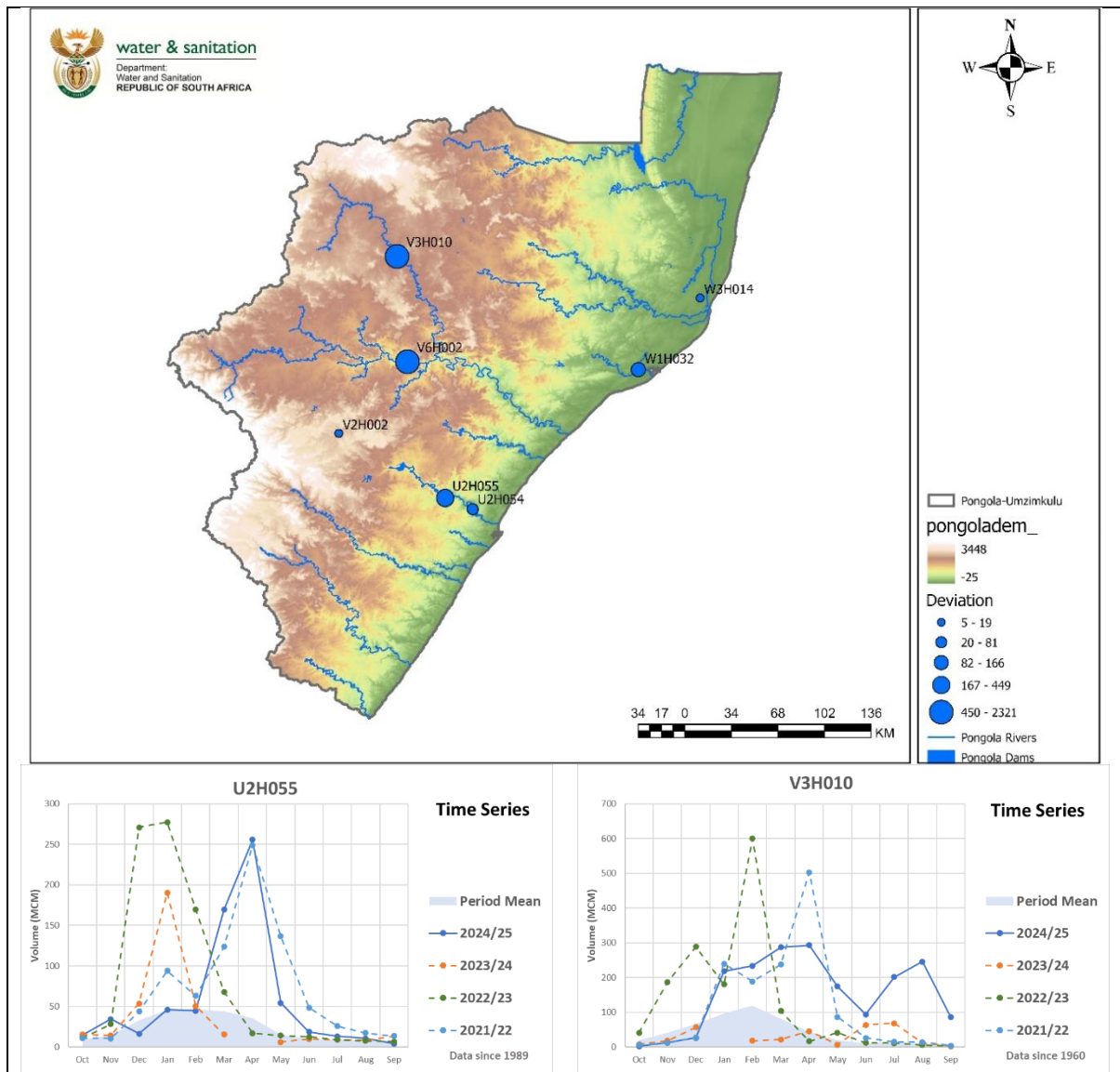


Figure 3. 6: Inkomati-Usuthu WMA Analysis

The Inkomati–Usuthu WMA covers an area of 36,537 km<sup>2</sup> with MAR ranging from 2 m<sup>3</sup>/s to 451 m<sup>3</sup>/s. The WMA is located in the east of South Africa, bordered by Swaziland to the east. The major rivers include Nwanedzi, Sabie, Crocodile (East), Komati, and Usuthu (Figure 3.6). The flows recorded at the Sabie River (X3 Secondary catchment) show a negative anomaly, including one station (X2H097) in the Crocodile River and another one in the Ngwempisi River (W5H026). An improvement of flows from the previous hydrological year was recorded in most of the stations from January to June 2025, and in January, that is when the flows peaked in the 2024/25 hydrological year. The 2024/25 flows were lower compared to the 2021/22 and 2022/23 flows in most of the stations.

### 3.2.4. Pongola-Umzimkulu



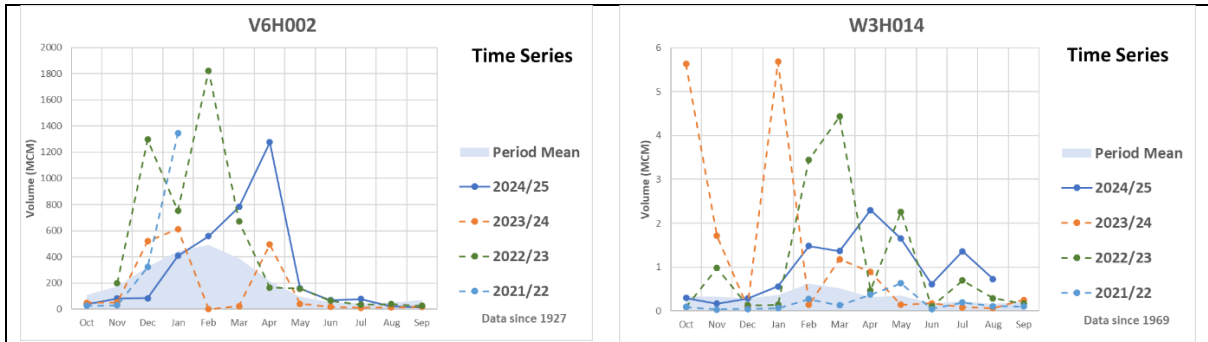
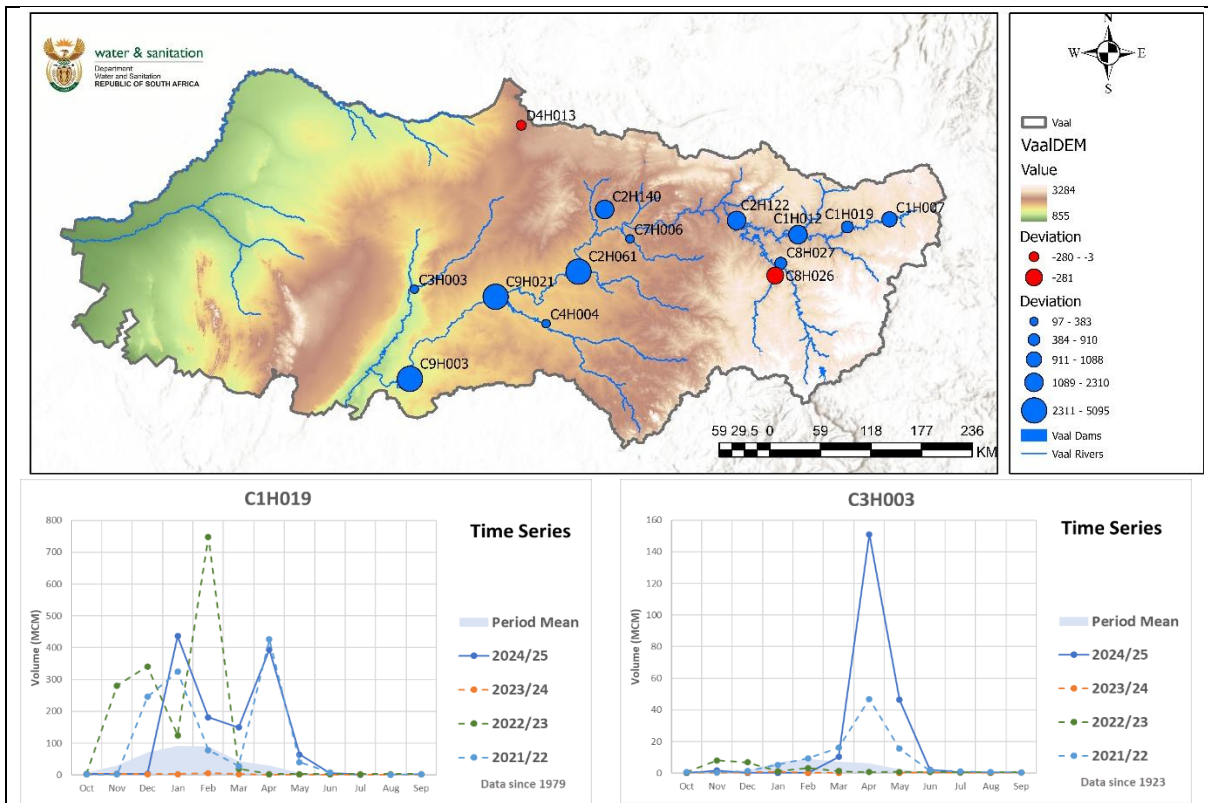


Figure 3.7: Pongola–Umzimkulu WMA Analysis

The Pongola–Umzimkulu WMA is located in the Southeast of the country, covering an area of 93,437 km<sup>2</sup>. The MAR of the WMA ranges between 18 m<sup>3</sup>/s and 594 m<sup>3</sup>/s, and the major rivers flowing in the WMA include Pongola, Mhlatuze, Mfolozi, Mkuze, Thukela, Mvoti, Umgeni, Umkomazi, Umzimkulu, and Mtamvuna (Figure 3.7). The WMA mostly recorded more streamflow, which shows a positive anomaly from the 1981 – 2010 mean period baseline. Although all the stations depict a positive anomaly, the 2024/25 flows were a bit low in most of the months compared to the three previous hydrological years. The flows started fairly low and below the period mean. They started rising in January 2025, peaking in April with the highest flow of 1275 MCM from station V6H002.

### 3.2.5. Vaal



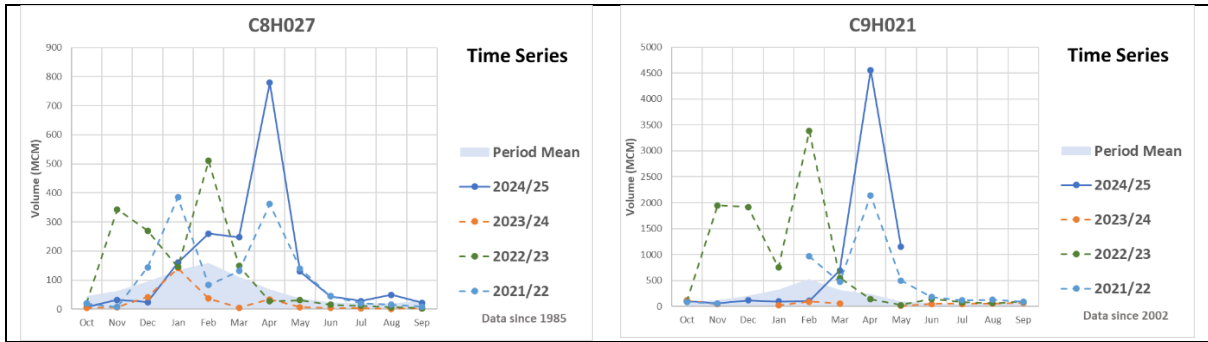
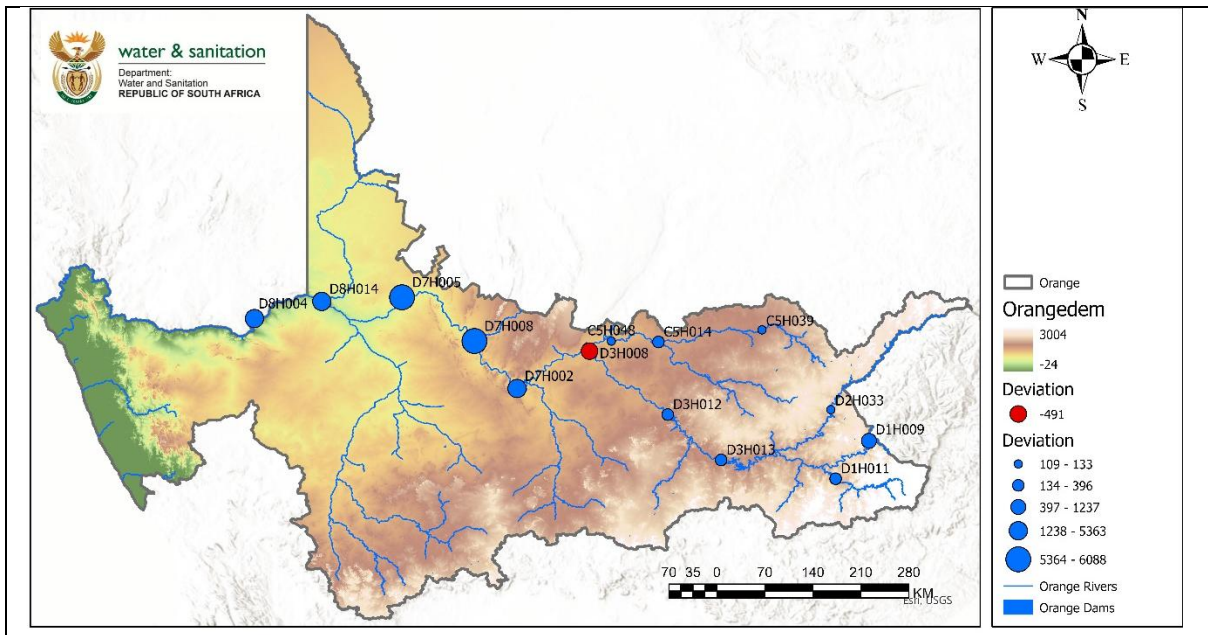


Figure 3. 8: Vaal WMA Analysis

The Vaal WMA covers the north-eastern and central part of South Africa and overlays a total area of approximately 246,237 km<sup>2</sup>. The main river in this WMA is the Vaal and is fed by several tributaries, which include Wilge, Mooi, Harts, Liebensbergvlei, Klip, Waterval, Suikerbos, Vals, Renoster, Sand, Vet, and Molopo. The MAR in the WMA ranges between 0 m<sup>3</sup>/s and 463 m<sup>3</sup>/s (Figure 3.8). The Vaal River, including all its tributaries, display a positive stream flow anomaly (mostly above 1096 MCM and the highest being 5095 MCM) for the 2024/25 hydrological year. Only two stations, C8H026 and D4H013, recorded a negative anomaly. The Vaal WMA is located in the summer rainfall regions, meaning it receives most of the rainfall during the summer period (December to February), hence the flows increase and peak during that period. Although the 2024/25 flows started below the 2021/22, 2022/23, and the period mean, they started increasing in January 2025 and reached a peak higher than the extreme spike of the three previous hydrological years and were well above the period mean.

### 3.2.6. Orange



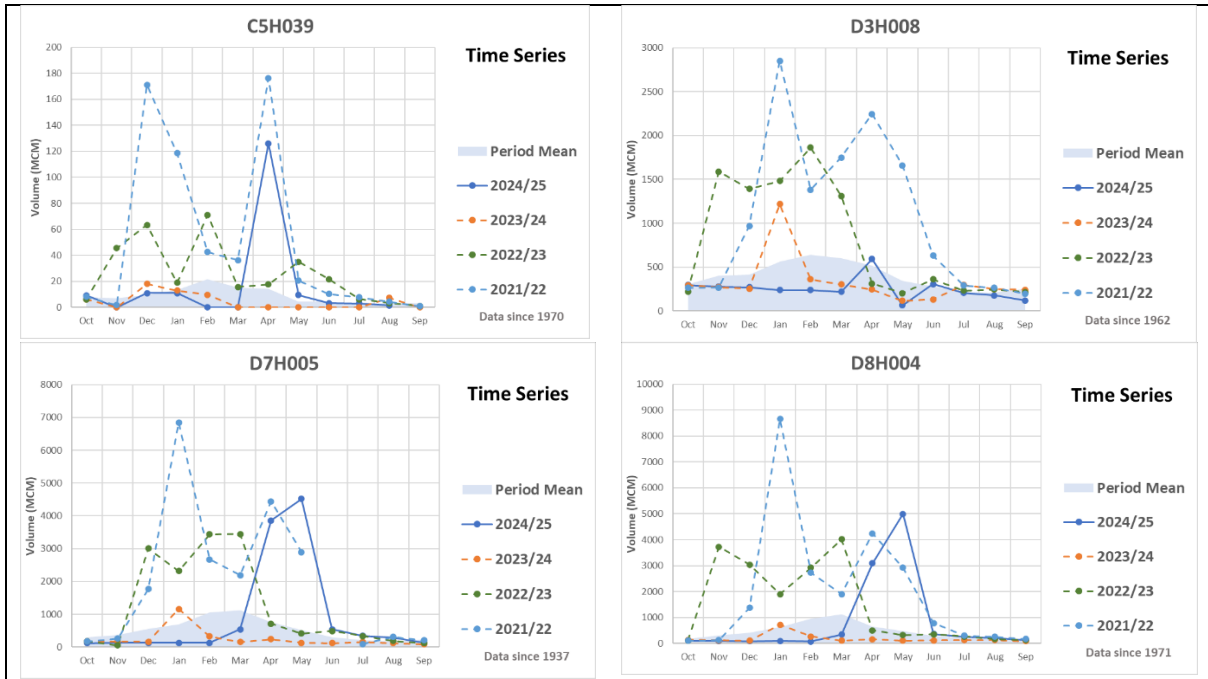


Figure 3.9: Orange WMA Analysis

The Orange WMA is located in the central-eastern and lower central part of South Africa and covers a total area of 354,735 km<sup>2</sup>. The main river in this WMA is the Orange River, and the tributaries include Modder, Riet, Caledon, Kraai, Ongers, and Hartbees. The MAR in the WMA ranges between 0 m<sup>3</sup>/s and 320 m<sup>3</sup>/s (Figure 3.9). This WMA is the biggest in terms of Area and the driest. The deviation of the streamflow recorded on the Orange River from the 1981 – 2010 mean period baseline is mostly positive and reaches as high as 6088 MCM, especially after the confluence with the Vaal River. Only one station (D3H008) displays a negative anomaly. The 2024/25 flows started relatively low compared to the three hydrological years and the period mean. The flows peaked around April and May 2025, with the highest recorded values of 4520 MCM and 5000 MCM for stations D7H005 and D8H004; respectively.

### 3.2.7. Mzimvubu-Tsitsikamma

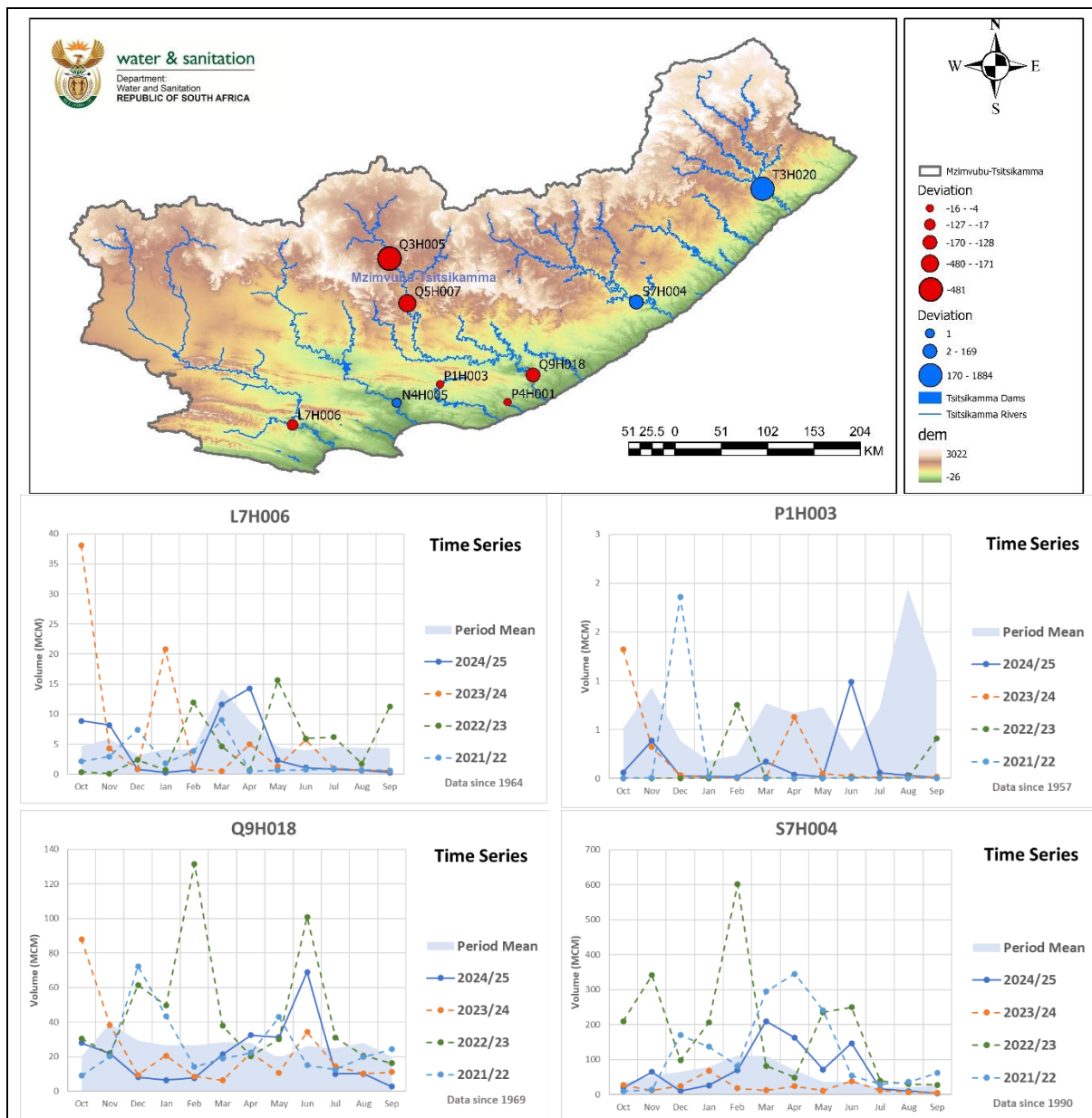


Figure 3. 10: Mzimvubu–Tsitsikamma WMA Analysis

The Mzimvubu–Tsitsikamma WMA is located in the south of the country and is bordered by Lesotho and Orange WMA in the North, Breede-Gouritz on the west, and Pongola-Mzimvubu on the East. The WMA overlays an area of 163,151 km<sup>2</sup> and an MAR ranging between 0.3 m<sup>3</sup>/s and 460 m<sup>3</sup>/s. The streamflow deviation in the WMA portrays a significant deterioration compared to the previous hydrological year, except for the stations in the Mzimvubu (T3H020) and Groot-Klei (S7H004) Rivers (Figure 3.10). The 2024/25 flows were also relatively low compared to the previous years in most months and fell below the period mean. The flows peaked between April and June 2025, indicating that some part of the WMA receives Winter rainfall.

### 3.2.8. Breede-Gouritz

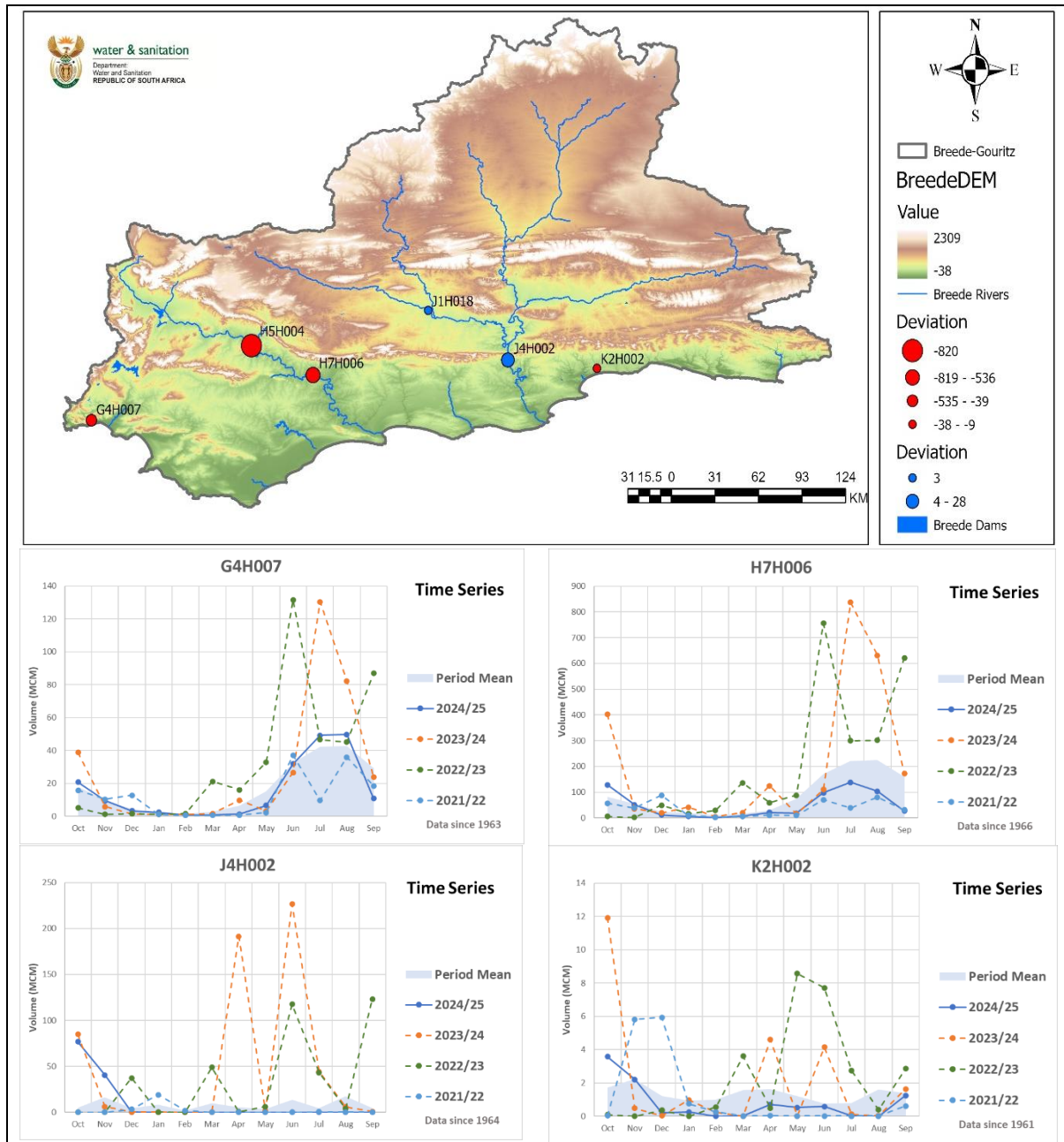


Figure 3.11: Breede-Gouritz WMA Analysis

The Breede-Gouritz WMA is located in the southwest part of South Africa with a total area of 72,293 km<sup>2</sup>, with an MAR ranging from 0.1 m<sup>3</sup>/s to 1535 m<sup>3</sup>/s (Figure 3.11). The WMA has a Mediterranean climate of warm, dry summers and mild, wet winters, and falls within a winter rainfall region. The tributaries in the H, G, and K primary catchment of the Breede-Gouritz WMA are showing a significant negative streamflow anomaly for the 2024/25 hydrological year, whereas the J primary catchment shows a positive anomaly with volume ranging between 0 and 28 MCM. The 2024/25 flow started slightly above the period mean, dropped around December 2024 and started increasing in May 2025 for most stations. The flows

peaked between July and August; however, some stations remained relatively low even during that period.

### 3.2.9. Berg-Olifants

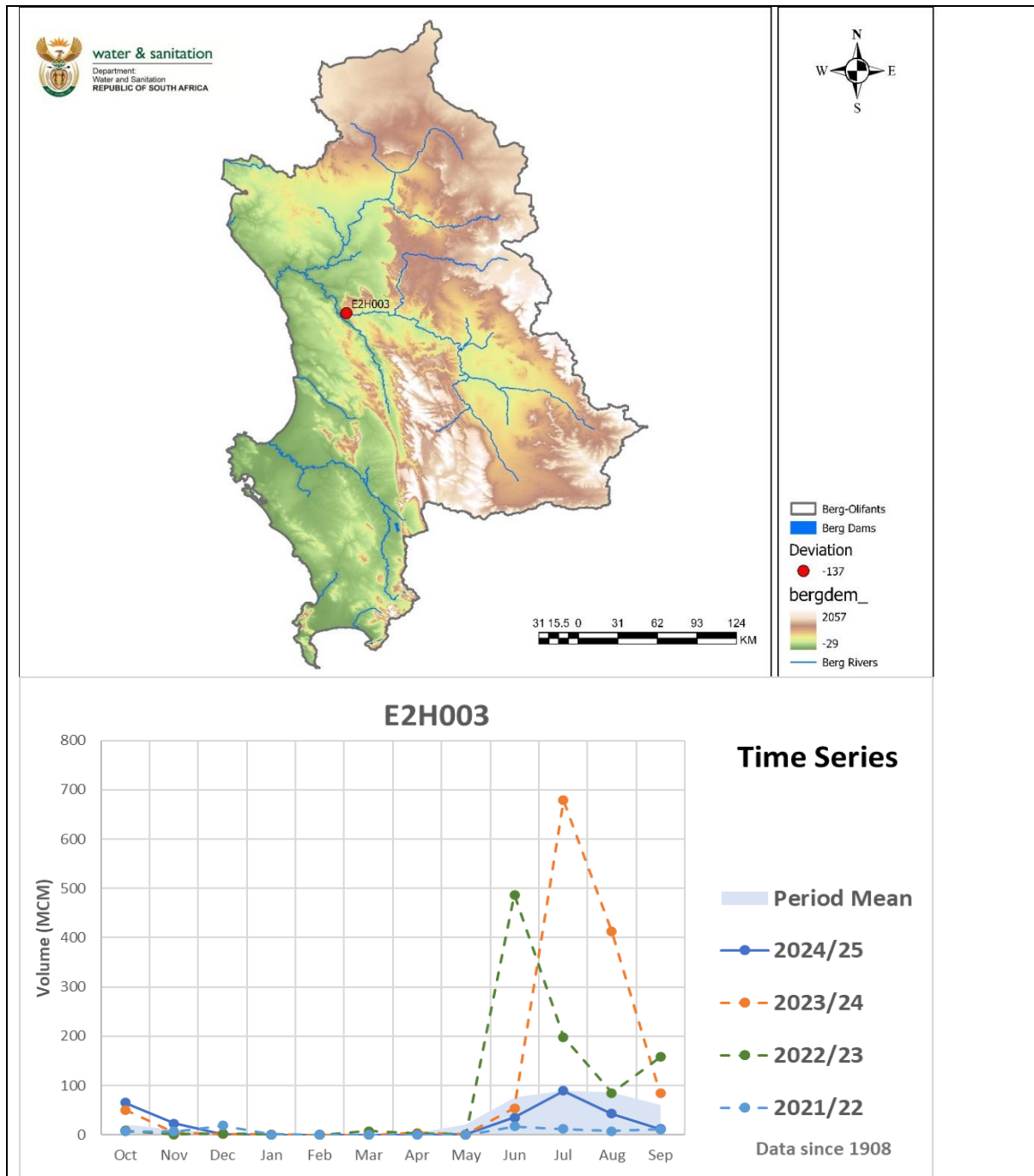


Figure 3.12: Berg-Olifants WMA Analysis

Berg–Olifants WMA is located in the southeast of South Africa and overlays an area of 70,187 km<sup>2</sup>. It is the smallest in area and the wettest WMA in the country, with an MAR ranging between 0 m<sup>3</sup>/s and 1535 m<sup>3</sup>/s (Figure 3.12). The WMA measured less streamflow this hydrological year as compared to the naturalised flow. The WMA is normally dry during summer and receives rainfall in winter. This is because mid-latitude cyclones migrate further

north during winter, allowing the edge of the cold front arm to sweep across the southernmost part of the country. The 2024/25 flow also started slightly above the period mean and the three previous hydrological years. The flow started dropping in November 2024 and remained low until May 2025. Although the flows peaked in July, they remained below the 2023/24 and 2022/23 hydrological years.

### 3.3. Status of National Reservoir Water Storage

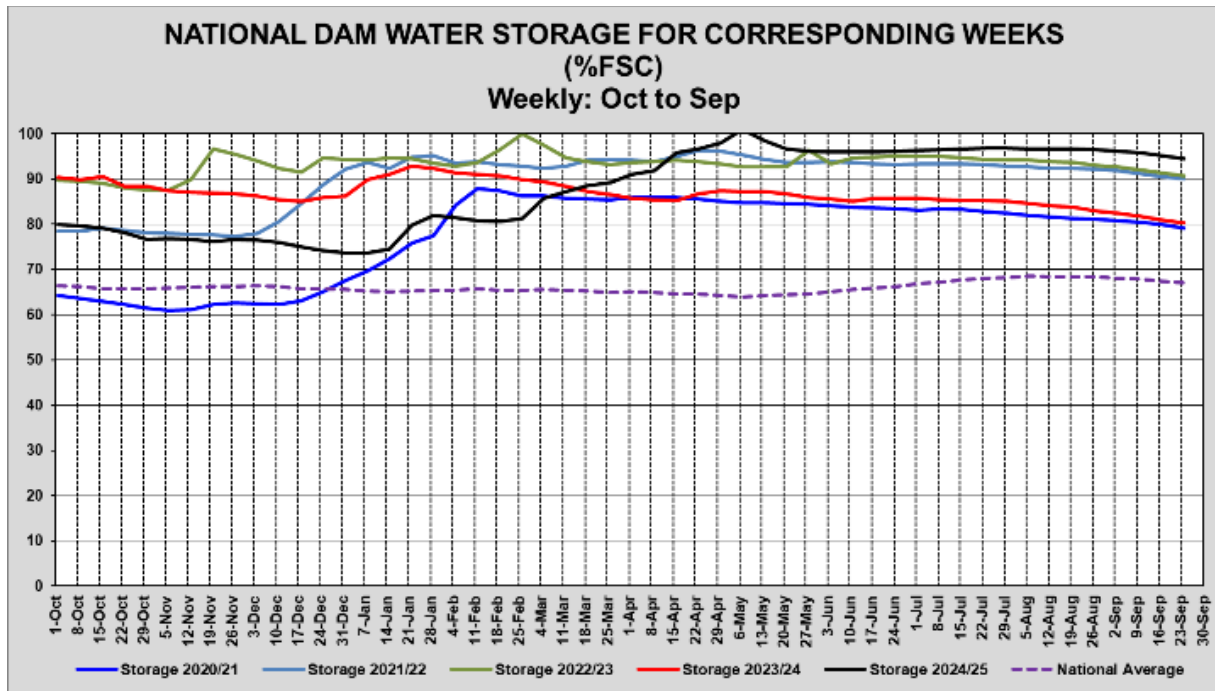


Figure 3. 13: Weekly National Reservoirs (% FSC).

The percentage full supply capacity of the national reservoirs over the last five hydrological years (2021/22 to 2024/25) is represented in Figure 3.13. The graph indicates that the national dam levels were above the national average water storage for this period. The hydrological year 2024/25 started with lower national dam levels compared to the past three hydrological years. The dam levels continued to decline until December 2024. After the country received the summer rainfall, the dam levels gradually increased until the national average was surpassed, recording the highest national dam levels in the last five hydrological years.



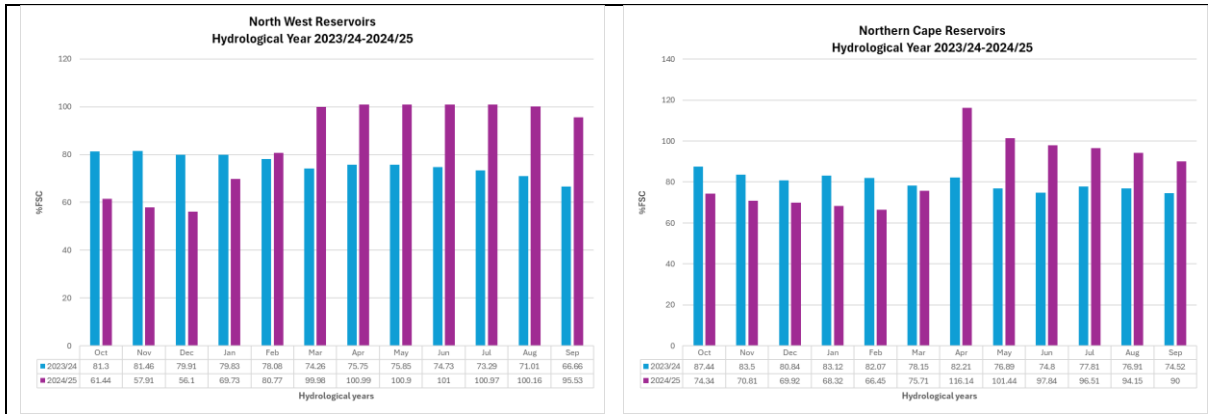
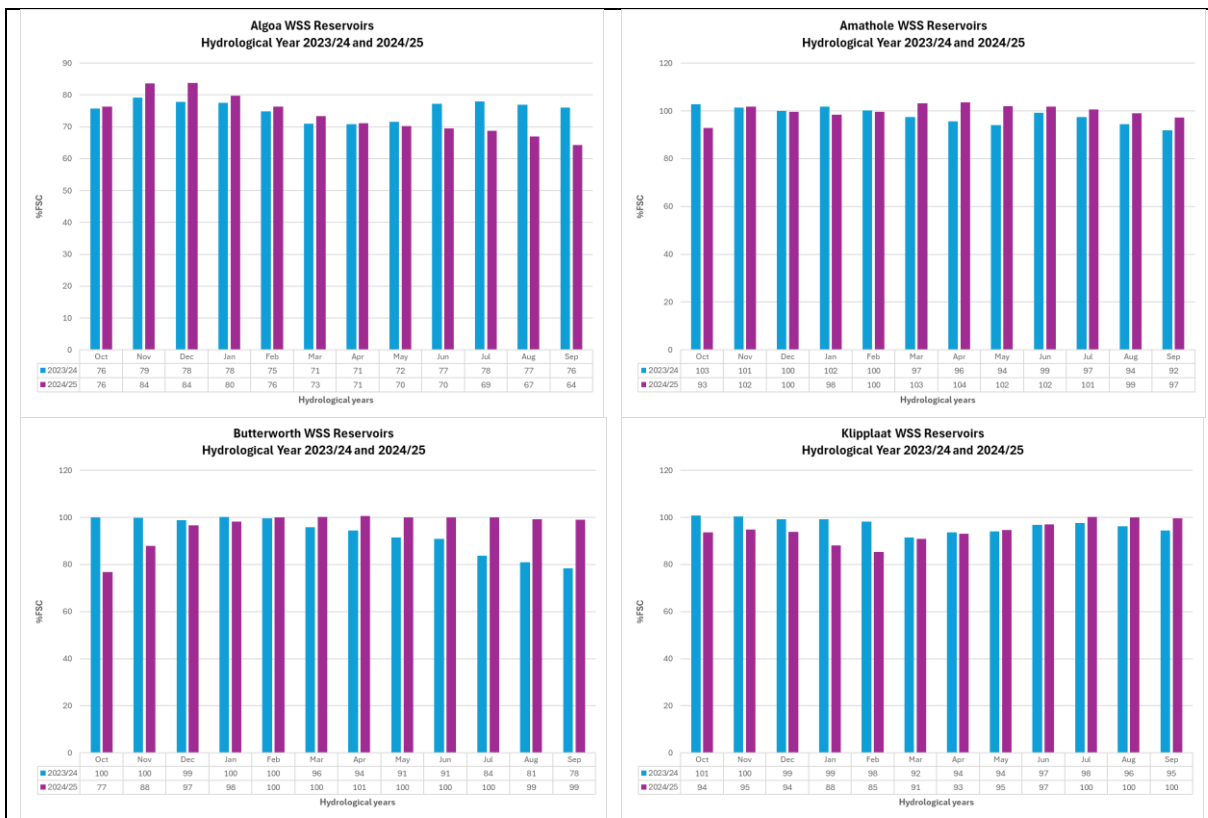
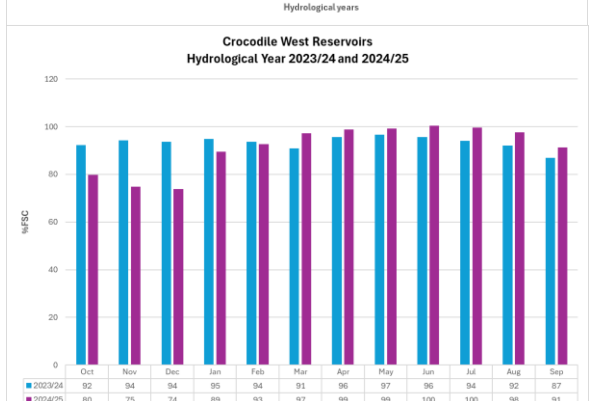
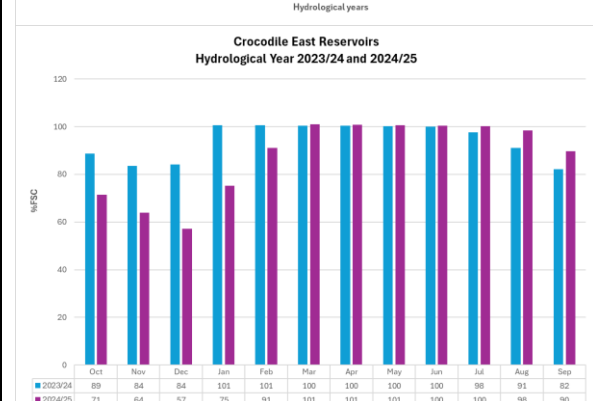
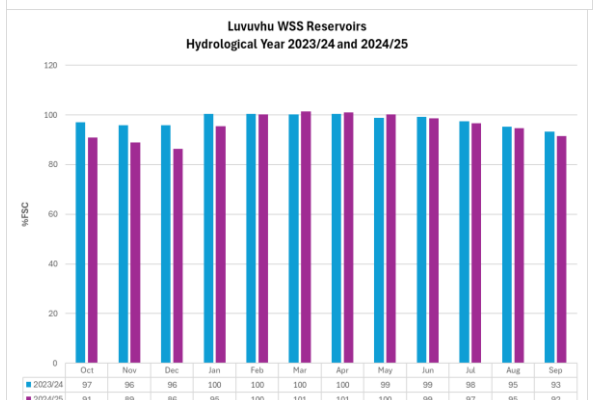
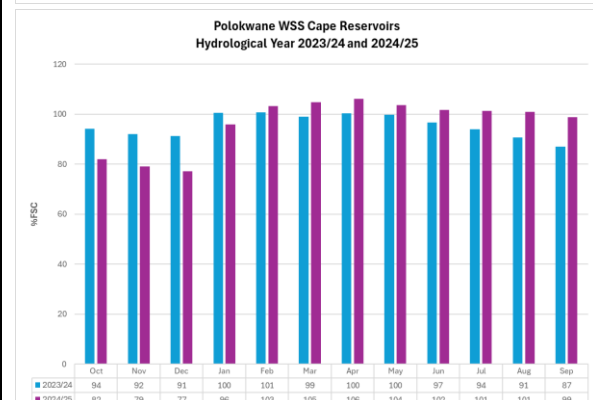
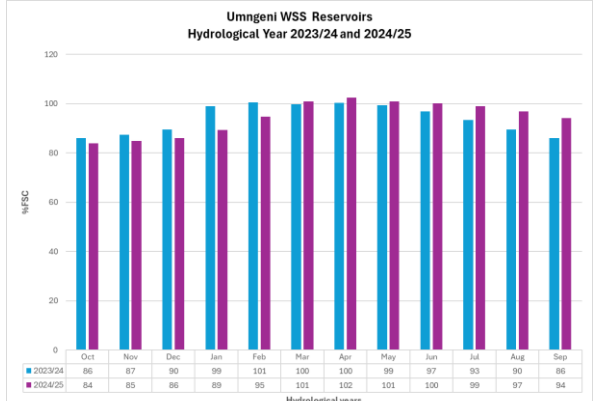
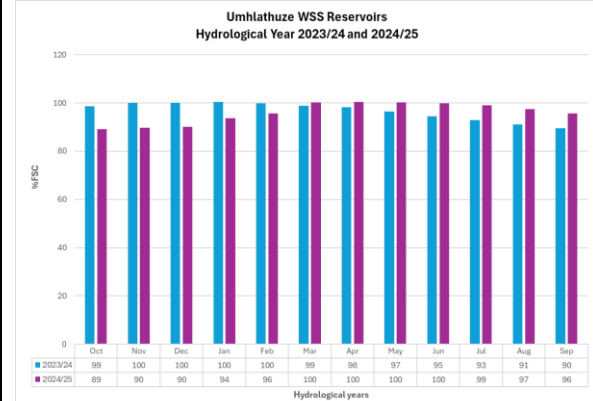
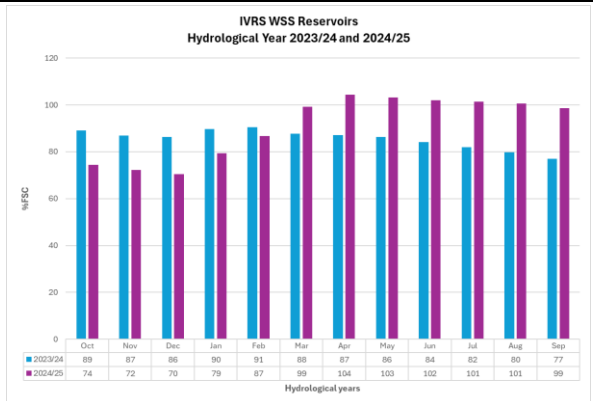
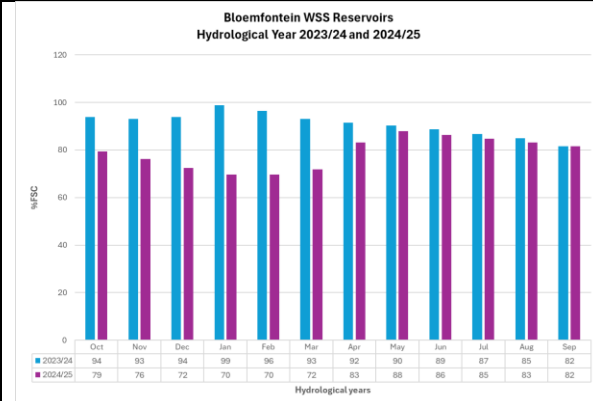


Figure 3.14 National and Provincial Monthly Reservoir Storage (% FSC)

Figure 3.14 depicts monthly reservoir storage for the country and each province. In the first half of the wet season (October to December 2024), Eastern Cape dam levels showed an increase of about 6%. However, the rest of the country experienced a decline; Free State, Gauteng, Mpumalanga and Northern Cape 5%, KwaZulu-Natal 2%, Limpopo 3%, North West and Western Cape 6%. The reduction continued until mid-January 2025, which can be linked, among other things, to the drought caused by El Niño and the high temperatures that the Southern African region experienced in mid-2024. This El Niño was followed by a neutral phase climate system at the beginning of the hydrological year 2024/25. Additionally, the dam levels were lower in this period when compared to the previous year, around the same time, subsequently, the monthly rainfall declined (SAWS, 2024).





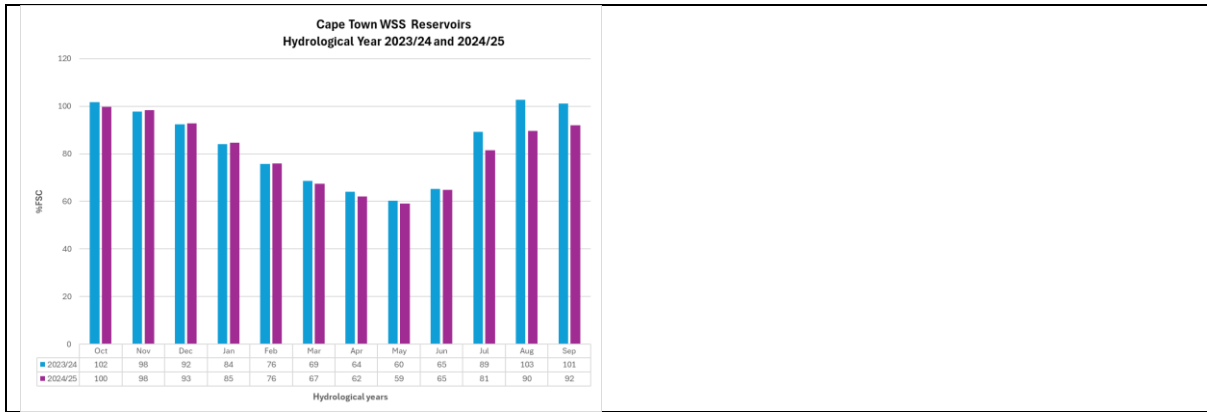


Figure 3. 15: Monthly WSS Reservoirs Storage (% FSC)

Figure 3.15 depicts the Monthly reservoir storage for each Water Supply System (WSS). Eastern Cape water supply systems: Algoa, Amathole, Kipplaat and Butterworth indicated an increase of about 7%, 9%, 1% and 20% respectively. Free State water supply systems: Bloemfontein decreased by 7%. Gauteng water supply system; IVRS decreased by 4%. KwaZulu-Natal water supply systems, Umhlathuze and Umngeni, increased by 1% and 2% respectively. Limpopo water supply systems: Polokwane, Luvuvhu decreased by 5 and 4% respectively. Mpumalanga water supply system; Crocodile East decreased by 6%. North West water supply systems: Crocodile West decreased by 15%. Western Cape water supply systems decreased by 7%.

The Western Cape province saw 45% of its dams spilling and only 2% of the dams below 50% storage capacity, as this was a few months after the end of its wet season (October 2024). There was then a gradual decrease from October 2024 to April 2025; this was expected since it was the dry season for the Western Cape. However, it can be noted that the storage levels were slightly higher when compared to the previous year, around the same period. The Cape Town WSS also showed a similar trend, starting with 100% full, and then a gradual decrease reaching about 60% full capacity from October 2024 to April 2025.

The national dam levels gradually increased from January to March 2025. This was expected as a large part of the country receives summer rainfall. In January 2025, SAWS reported some days filled with heavy, disruptive rain across the central and eastern regions of South Africa. These regions included North West, the Free State, KwaZulu-Natal, Limpopo and the southern parts of Mpumalanga and Gauteng. Significant rainfall amount ranging from 25 to 400 mm was received (SAWS, 2025). The water storage levels for these provinces showed an increase of 14%, 3%, 9%, 12%, 15%, and 3%, respectively. The water supply systems in these provinces also showed a significant increase: North West (Crocodile West WSS 16%), KwaZulu-Natal (Umngeni WSS and Umhlathuze WSS 3% and 4%, respectively), and Limpopo (Polokwane

WSS and Luvuvhu WSS 19 and 9%, respectively). This increase contributed to the National storage level having an increase of 5% in January 2025, with 31 dams spilling in the above-mentioned provinces (DWS, 2025). In addition, SAWS reported that a weak La Niña weather pattern developed in December 2024 and was expected to persist through February-April 2025. La Niña typically brings an increased likelihood of above-normal rainfall to South Africa's summer rainfall regions, particularly the northeast (SAWS, 2024). Hence, there was a noticeable steep increase that started and prevailed in March until April 2025.

All the summer rainfall regions showed a significant increase in the storage levels in the months of February and March 2025. SAWS reported that heavy on-and-off showers were expected due to the tropical moisture typically possessing a significant amount of energy at times in February 2025. This was across the North West and Gauteng provinces, including the northern region of Free State, Highveld areas of Mpumalanga and south-western Limpopo, Eastern Cape and southern coastline of KwaZulu-Natal (SAWS, 2025). There were 94 and 105 overflowing dams in February and March of 2025, respectively, in the country (DWS, 2025). Rainfall experienced during the month of February 2025 would have reached the dams by March 2025. During the dry season in the Western Cape, about 23% of the dams were below 50% and only 14% were overflowing in the province (DWS, 2025). About a 37% decline was seen at the end of its dry season.

In the month of April 2025, which is the end of the wet season for South Africa (excluding Western Cape winter rainfall region), the national dam levels saw a final increase of about 8%, sitting at 97% which was the peak of the whole hydrological year. Free State and Northern Cape showed a significant increase in the dam levels of 14% and 40% increase, respectively. In the Free State, 81% of the dams were overflowing (DWS, 2025), with the Bloemfontein WSS showing an increase of 11%, sitting at 83%. All the dams in the Northern Cape province were overflowing, Spitskop Dam at 119%, Vaalharts Weir Dam at 134%, Douglas Weir Dam at 134% and Boegoeberg Dam at 178%, excluding one (Karee dam at 47%). SAWS reported some days of persistent heavy rains and thundershowers affecting KwaZulu-Natal, the eastern half of the Eastern Cape, Free State, North West and parts of the Northern Cape (SAWS, 2025).

The months of May to August 2025, which would be a wet season for the Western Cape and dry season for the rest of the country, the dam levels correlate with the rainfall. In the Western Cape, the dam levels showed an increase of about 29% in this period, while the rest of the country showed a gradual decrease until the end of the season. On average, the national dam levels showed about 2% decrease for this period.

In June and July 2025, the Western Cape province saw a dam level increase of 5% and 16% respectively. During those months, between 50 to 200mm of rainfall was received, while some parts received rainfall up to 500mm monthly (SAWS, 2025). After the rainfall received in June 2025, in July, about 60% of the dams were above 80% full capacity. Nine dams were overflowing: De Bos, Keerom, Duiwenhoks, Berg River, Lakenvallei, Korentepoort, Stettynskloof, Buffeljags dam at just above 100% full capacity and Misverstand dam at 117% full capacity (DWS, 2025). The Eastern Cape also received a good amount of rainfall during the month of June 2025 (SAWS, 2025), and the provincial dam level remained at 82% until July. On average, the Western Cape received rainfall between 10 to 100 mm from May to September, with some parts receiving rainfall between 100 to 200mm. While the rest of the country, on average, received only about 0 to 50mm of monthly rainfall (SAWS, 2025).

At the end of the 2024/25 hydrological year, the national dam levels were sitting at 95%, which was about a 15% increase compared to the previous hydrological year when dam levels were 80% during the same period. In addition, about 21% of dams nationally were spilling (over 100%), which was about 5% increase compared to the previous year when 16% of the dams were spilling during the same period. Only about 2% of dams nationally were under critical condition (below 30%), which was about 3% improvement compared to the previous year, when 5% of the dams were under critical condition during the same period (DWS, 2025).

Almost throughout the wet season, the national dam levels were notably lower than they were during the same period last year, with a 6% decline on average for the whole wet season. Eastern Cape, Free State and Mpumalanga were slightly lower for 71% of the time in the wet season (October to February), with a decline of 3%,9% and 6%, respectively, on average for the whole wet season when compared to the previous year around the same period. Gauteng and KwaZulu-Natal were slightly lower for 43% of the time in the wet season (October to December), with an incline of 2% and 1%, respectively, on average for the whole wet season when compared to the previous year around the same period. Limpopo and North West were slightly lower for 57% of the time in the wet season (October to January), with a decline of 3% on average for the whole wet season when compared to the previous year around the same period. Northern Cape was slightly lower for 86% of the time in the wet season (October to March), with a decline of 5% on average for the whole wet season when compared to the previous year, around the same period. Western Cape was slightly lower the entire wet season (May to September), with a decline of 8% on average for the whole wet season when compared to the previous year around the same period.

However, in the dry season, the national dam levels were slightly higher than they were during the same period last year, with a 12% incline on average for the whole wet season. Eastern Cape was slightly higher, 33% of the time in the dry season (August), with an incline of 1% on average for the whole dry season when compared to the previous year, around the same period. Free State, Gauteng, KwaZulu Natal, Limpopo, Mpumalanga, North West, and Northern Cape were higher 100% of the time in the dry season (June to August), with an incline of 18%, 15%, 8%, 7%, 6%, 28%, and 20% respectively on average for the whole dry season when compared to the previous year around the same period. Western Cape was slightly higher 100% of the time in the dry season (December to March), with an incline of 2% on average for the whole dry season when compared to the previous year, around the same period.

#### 4. The Status of Groundwater Monitoring Programme

The national groundwater monitoring programme is made up of two programmes, the groundwater level and groundwater quality monitoring programme (Figure 4.1). The groundwater quality monitoring programme is subdivided into two sub-programmes; there is the national groundwater quality monitoring programme (ZQM) and the special monitoring programme (AMD) located in the Cradle of Humankind heritage site. Overall monitoring frequency differs per region and per geo-sites it ranges from daily, monthly, quarterly, bi-annually, twice to once a year. Out of the of 1879 monitoring stations active 1271 stations are equipped with a dip meter and 521 are equipped with electronic data logger.

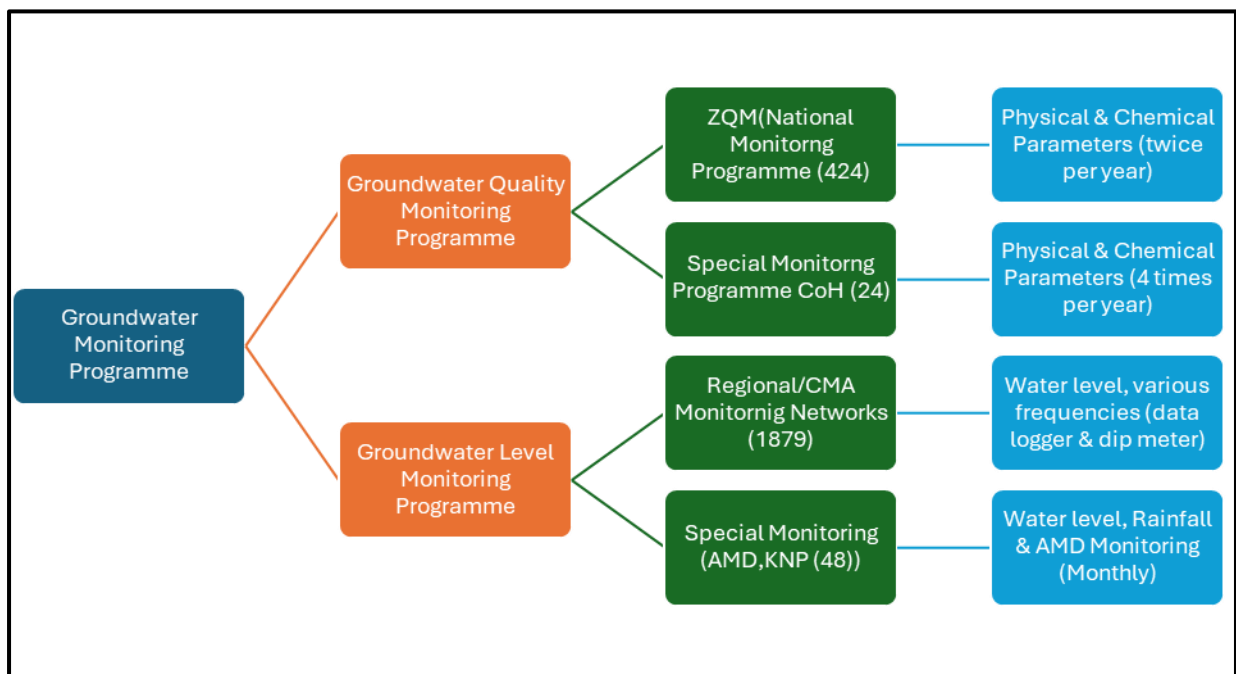


Figure 4. 1: Overview of Groundwater Monitoring Programmes

##### 4.1. Groundwater level monitoring programme

As for the groundwater level monitoring programme it consists of nine (9) regional monitoring networks, which are managed by the regional offices. The regional offices are responsible for data collection and the uploading of the data to the Hydstra system where it can be extracted and used for analysis (Annexure A). There is also special water level monitoring programme in the COH where Groundwater Level at Eastern, Central, and Western Basins are monitored on a monthly frequency in old mine voids (Figure 4.1). The distribution of groundwater level monitoring sites as of January 2026 is displayed in (Figure 4.2).

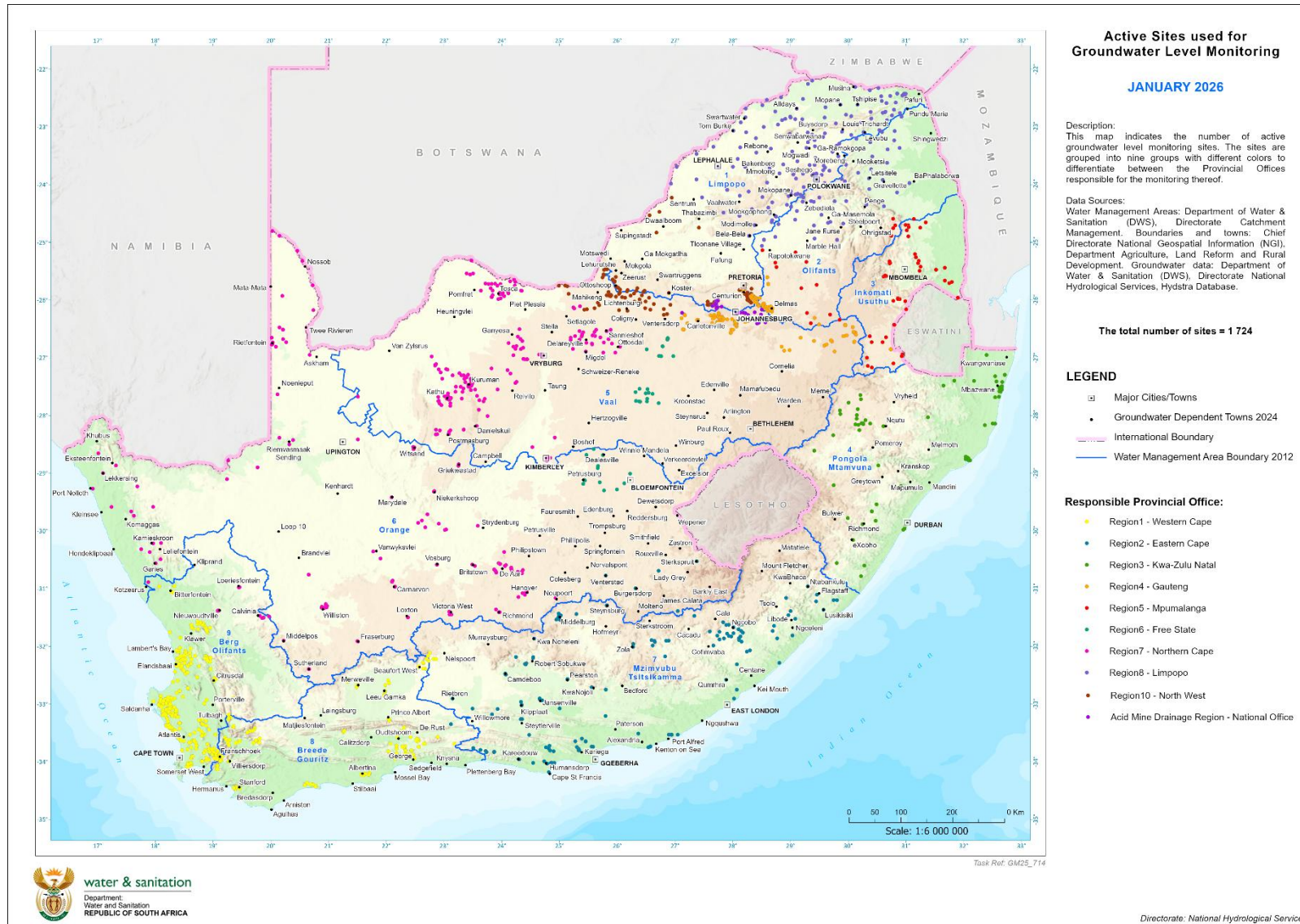


Figure 4. 2: Distribution of the National Groundwater Quality Monitoring Geosites (January 2026)

## 4.2. Groundwater Quality monitoring programme

The national Groundwater Quality monitoring programme was established in 1994, currently the monitoring network consists of 424 stations of boreholes and springs. The monitoring stations are distributed in various locations Schools, Clinics, Farms, Hospitals, Community Supply (Rural). Groundwater quality monitoring is done twice a year before and after rain season, and groundwater samples are analyzed by **RQIS**. The water quality monitoring programme also has special monitoring programme such as the Cradle of Humankind (COH) and Kruger National Park (KNP). Groundwater Quality at the Cradle of Humankind WHS is monitored on a Quarterly basis in Support of CSIR/GP Provincial office where both groundwater levels and quality are monitored. During the 2024/25 hydrological year reporting period, 10 years average of all groundwater quality available on WMS were used to determine the long-term status of groundwater quality in South Africa. Over 1500 (including 424) geosites from the national groundwater quality monitoring programme were used to determine the status of groundwater quality. The distribution of groundwater quality geosites as of December 2025 is displayed in (Figure 4.3). A total of 363 geosites were sampled and only 47 could not be samples therefore, no data is available for the reporting period for those stations.

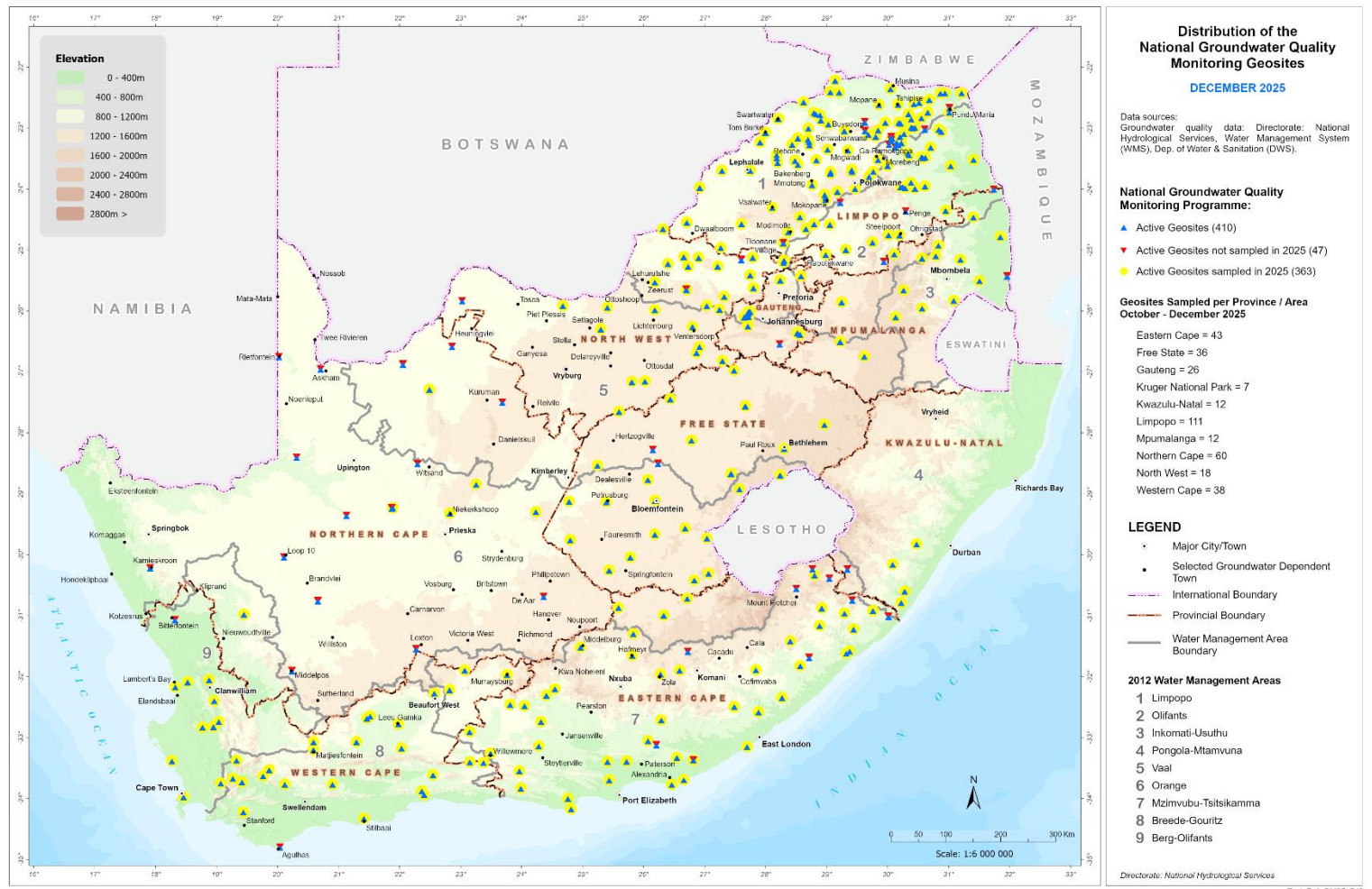


Figure 4. 3: Distribution of the National Groundwater Quality Monitoring Geosites (December 2025)

### 4.3. National Groundwater Rainfall/Recharge Monitoring Network

In addition to the groundwater monitoring programme there are other programmes such as the National groundwater rainfall monitoring network. This rainfall monitoring network has a total of 141 rain gauges across the country (Figure 4.4).

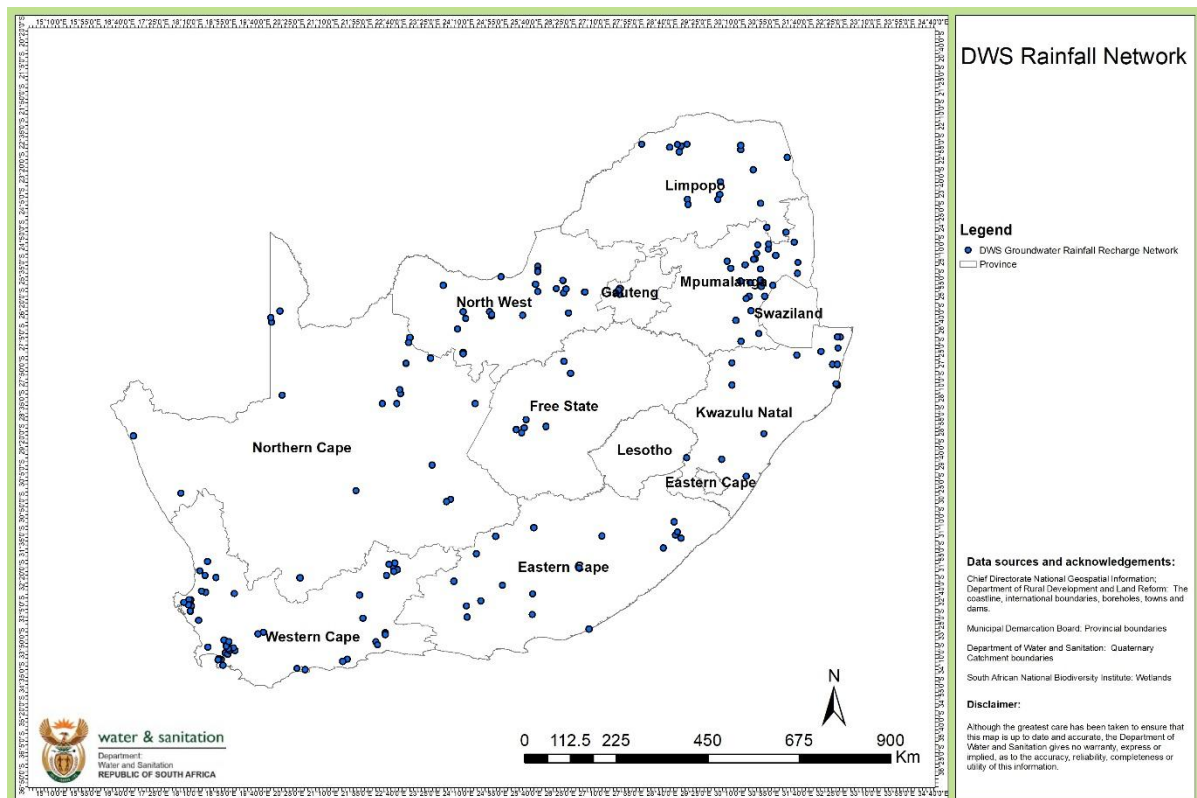


Figure 4. 4: Distribution of DWS Rainfall station across the country

### 4.4. Data acquisition and management

The Department of Water and Sanitation (DWS) is responsible for ensuring accurate, timely and reliable water resources data is available for various water management institutions, water users and the public. Section 137 of NWA outlines the mandate of the DWS which links to the proper collection of appropriate data and information for the assessment of quantity and quality of water resources. DWS is involved in the acquiring, capturing, processing, and disseminating water resources information. It is also responsible for managing and improving the quality of water resources data through data auditing and cleaning processes (detecting, correcting, modifying or removal of anomalies, errors, or inaccurate records), and advanced analysis such as data modelling and simulation. The data acquisition and capture take place in the Regional Offices, after which data is submitted to Head office for processing and quality analysis before uploading into the national database.

#### 4.5. Groundwater level Fluctuation

Water levels in aquifers reflect a dynamic balance between ground-water recharge, storage, and discharge. If recharge surpasses discharge, the volume of water in storage will increase and water levels will rise; if discharge surpasses recharge, the volume of water in storage will decrease and water levels will fall. Because recharge and discharge are not distributed uniformly in space and time, ground-water levels are continuously rising or falling to adjust to the resulting imbalances. Water levels in wells reflect these changes and provide the principal means of tracking changes in ground-water storage over time. Water-level measurements also provide insight into the physical properties that control aquifer recharge, storage, and discharge since these factors affect the timing and intensity of responses to hydrologic stresses such as precipitation or pumping.

##### 4.5.1. Calculation of annual groundwater levels fluctuation

The annual changes in groundwater level can be calculated as the difference between the average groundwater level of each borehole from the current hydrological year and the previous hydrological year. A positive difference ( $\Delta$ ) indicates a rise in groundwater level and negative indicate the opposite. Changes in groundwater levels ( $\Delta GW$ ) were determined by comparing average groundwater level (each borehole) of current ( $AVG_C$ ) hydrological year with average groundwater level of the previous ( $AVG_P$ ) hydrological year based on equation 1.

$$\Delta GW = AVG_C - AVG_P \dots\dots\dots (1)$$

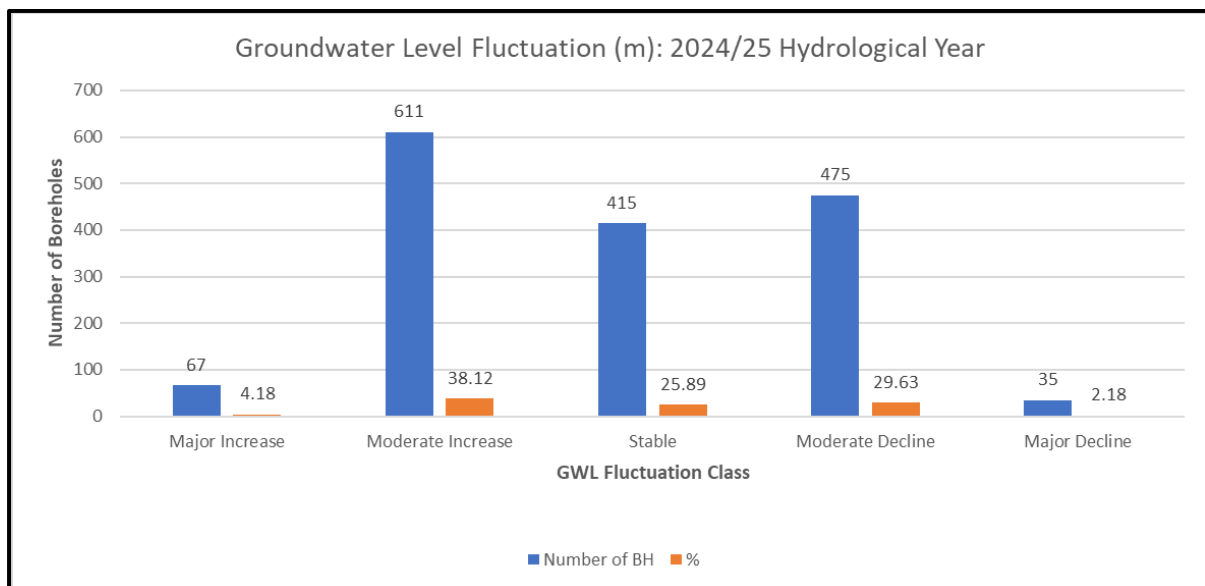


Figure 4. 5: Groundwater level fluctuations between 2023/24 and 2024/25 hydrological years.

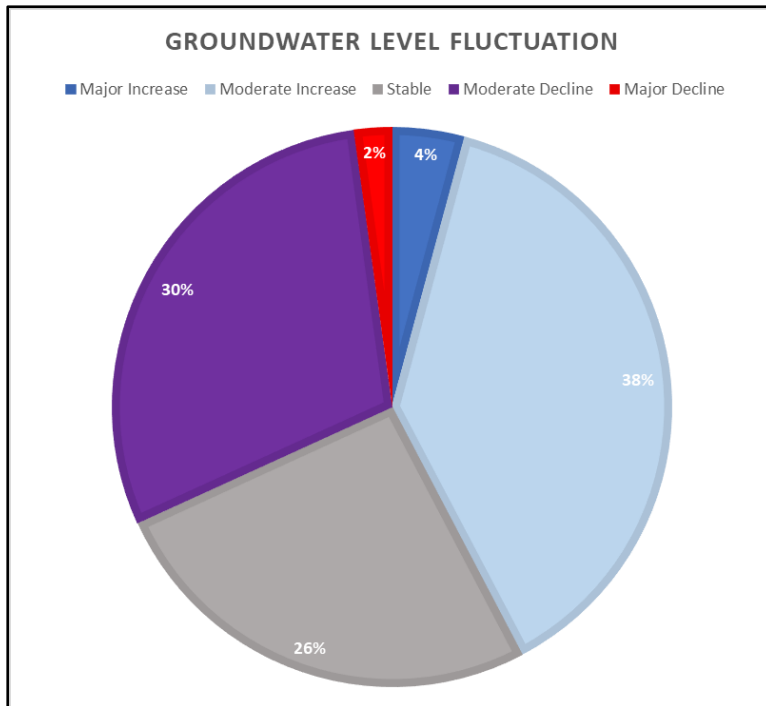


Figure 4. 6: Number of boreholes increased and declined during 2024/25 hydrological year

The change in groundwater level in this report is classified into three classes, major, moderate and stable. If groundwater level increase or decrease five (5) meters from the previous level it is then considered as major change and if it lies between (0.2 – 5 m) it is considered moderate and anything below (0.2 m) is considered stable. The change in groundwater level for 2024/25 hydrological year is presented in Figures 4.5 and 4.6. Overall, groundwater level generally increased in 2024/25, as 918 (58%) recorded an increase in groundwater levels during the current hydrological year as presented in Figure 4.5, as compared to 674 (42%) that recorded a decrease in GWL. The general outlook of groundwater level status across the country indicates declining trends (Figures 4.6).

When it comes to groundwater level fluctuations per classification (Figure 4.5), only 35 (2.18%) of the monitoring boreholes declined by more than 5m (major decline). This includes boreholes such as A6N0044 (7.026m), D5N0602 (26.462m), E3N0089 (11.908m) and G1N0473 (46.4m). About 475 (29.63%) of the boreholes recorded a moderate decline (0.2-5 m) during the 2024/25 hydrological year in comparison to the 2023/24 hydrological year. Stable groundwater fluctuation refers to boreholes with minimal change in groundwater level (<0.2 m) and 415 (25.89%) of the boreholes recorded a stable change in groundwater levels. When it comes to positive groundwater level fluctuation, 611 (38.12%) of the boreholes recorded a moderate increase groundwater level of between 0.2 and 5 m (Figure 4.6). Only 67 (4.18%) of the boreholes were classified as major increase, indicating an increase in groundwater level of > 5 m between the current and previous hydrological years. The major increase was observed in boreholes such as A2N0778 (23.2 m), D4N2524 (26.2 m), D4N2528

(27.6 m), D4N2529 (30.2 m), D4N2563 (35.6 m), D4N2565 (40.0 m), D4N2567 (32.7 m), D4N2635 (26.0 m), D4N2558 (22.1 m), G1N0555 (25.6 m), G4N0004 (50.3 m).

The spatial distribution of change in groundwater level fluctuations in the current 2024/25 hydrological year is presented in Figure 4.7. Majority of boreholes with moderate decline in groundwater levels are located in Limpopo, North-West, Mpumalanga, KwaZulu Natal, Northern Cape, Western Cape and Eastern Cape Provinces. The moderate decline in groundwater levels can be attributed to both climatic factors (groundwater / climatic drought) and groundwater abstraction. Majority of boreholes in Limpopo recorded a moderate increase and stable groundwater levels, with some boreholes being classified as major increase in Northern Cape and the Western Cape.

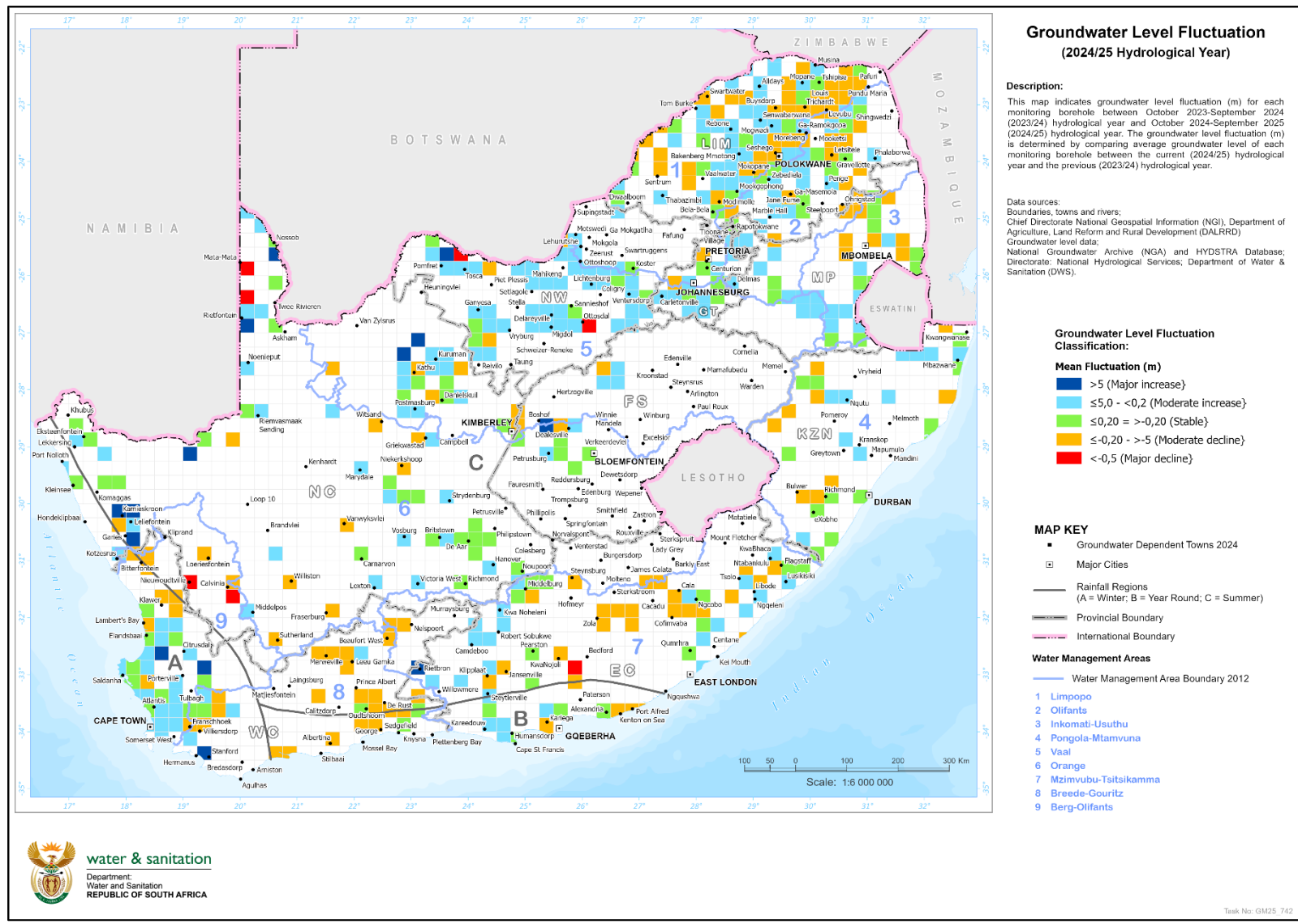


Figure 4. 7: Spatial distribution of Groundwater level fluctuation 2024/25 hydrological year

#### 4.5.2. Long term trend analysis

South Africa is subdivided into sixty-four (64) hydrogeological regions, which define the groundwater units based on unique hydrogeological characteristics. These have been utilized to interpret the groundwater datasets. They crosscut the catchment and provincial boundaries, as geology or groundwater knows no catchment or provincial boundaries. These hydrogeological units, however, give a better understanding of the groundwater performance for those regions.

Long term data was analysed to outline both the historic and the latest groundwater trends, give status quo of national groundwater resources and zoom-in into areas where impacts are observed. The primary focus is to alert the management to imminent impacts that might affect groundwater resources

##### 4.5.2.1. Methodology

The existing datasets from the groundwater database (the National Groundwater Archive) were extracted with the purpose of analyzing water level trends of the monitoring boreholes from the various hydrogeological regions alluded to earlier. The processing of datasets was primarily done on MS Excel. The initial plan was to utilize data dating back to 2015. However, this was not possible with other hydrogeological regions. Some of the shortcomings included a delayed comprehensive monitoring programme which commenced recently. In some instances, the gaps were too big to close them using both the forward and backward data patching method that MS Excel offers. A summary of step by step into ensuring completeness and accuracy of datasets involved:

- Assessing the data gaps and how best they could be closed.
- Gap closure/ data patching utilizing the forecasting method to obtain consistent trends. This was limited to small gaps using linear regression to project future data points along a line that best fits the historical data.
- Data smoothing, utilizing the exponential method to define clearly the trends. This forecasting technique for time-series data assigns exponentially decreasing weights to past observations, placing more importance on recent data than older datasets. The utilized statistical formula is as follows:

$$s(t) = \alpha x(t) + (1-\alpha)s_{t-1}$$

Where:

$s(t)$  is the smoothed value (or forecast) for the current period.

$\alpha$  is the smoothing factor.

$x(t)$  is the actual observed value for the current period.

$s_{t-1}$  is the smoothed value (or forecast) from the previous period.

Subsequently, hydrographs could be generated. The water level elevations were chosen as these have a better-defined reference point i.e. the mean sea level. These hydrographs were coupled with zoom-in analysis of level fluctuations, setting the initial water level where dataset starts (as the reference point) to determine the gains or losses, indicated as a declining or a rising trend, over the assessment period.

Because the emphasis was on hydrogeological regions, the individual borehole trends were aggregated and an average water level trend for the hydrogeological region was determined using the formula:

$$\text{Average } GWL = \sum (\text{GWL of individual wells}) / \text{Number of wells}$$

This allowed for determination of the groundwater level trends with reference to the selected background point, determining whether there is a general water level decline or a rise and how steep or gradual it is.

### **4.5.3. Case studies**

#### **4.5.3.1. The Eastern Cape and KwaZulu-Natal hydrogeological Regions**

With the methodology set out, the first areas tackled included the hydrogeological regions covering the Eastern Cape and KwaZulu Natal Provinces. These are geographically indicated in Figure 4.8, with provincial boundaries.

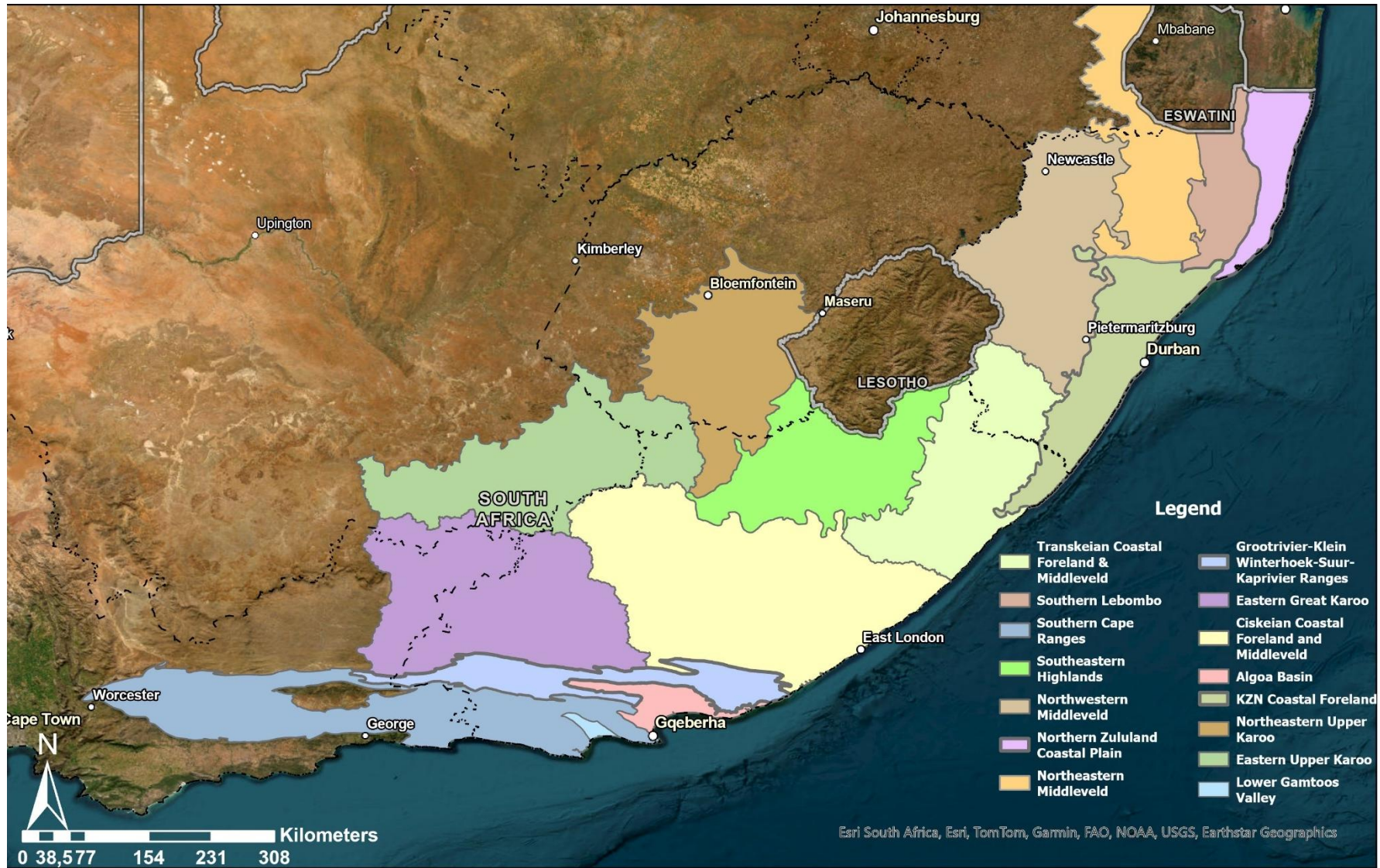


Figure 4. 8: Hydrogeological regions covering the Eastern Cape and KwaZulu Natal Provinces.

The groundwater levels for each of the regions were graphed to indicate the overall picture for the 2 provinces. Figure 4.8 indicates the performance of groundwater for the hydrogeological regions in the KwaZulu-Natal and the Eastern Cape over a 10-year observation period. What is evident from the graph is that the groundwater resources for the two provinces experienced deficit between November 2016 and April 2022 in response to environmental stressors/ low rainfall the two provinces experienced. The impacts varied from region to region as Figure 4.9 shows that water level decline was prominent in some regions while others experienced a slight decline. The Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges, the Ciskeian Coastal Foreland and Middleveld, the Algoa Bay, the Eastern Great Karoo, the Southern Cape Ranges and to a lesser degree the Transkeian Coastal Foreland and Middleveld were largely impacted over the period but have since recovered. The water level assessment for Algoa Bay and the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges hydrogeological regions indicated more than just environmental stressors on their groundwater levels. The resources barely replenished even when good rains were prevalent in the area.

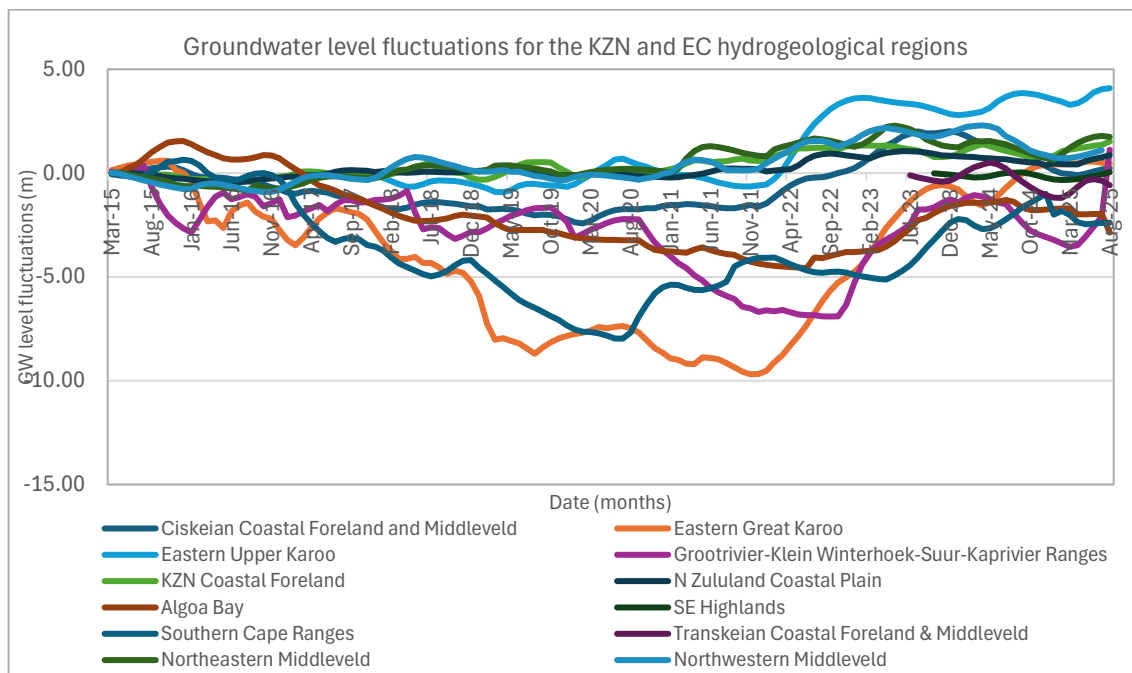


Figure 4. 9: Groundwater level status for the hydrogeological regions in Eastern Cape and KwaZulu-Natal Provinces

The second batch of analysis was for the Western cape, The Northern Cape and Free State Provinces as shown in Figure 4.10. The results outline the outcomes of the water level assessments conducted for the hydrogeological regions in the provinces of the Western Cape, The Northern Cape and the Free State. Thirty-eight hydrogeological

regions make up the three provinces mentioned above. The extent and coverage of these hydrogeological regions is shown in Figure 4.11.

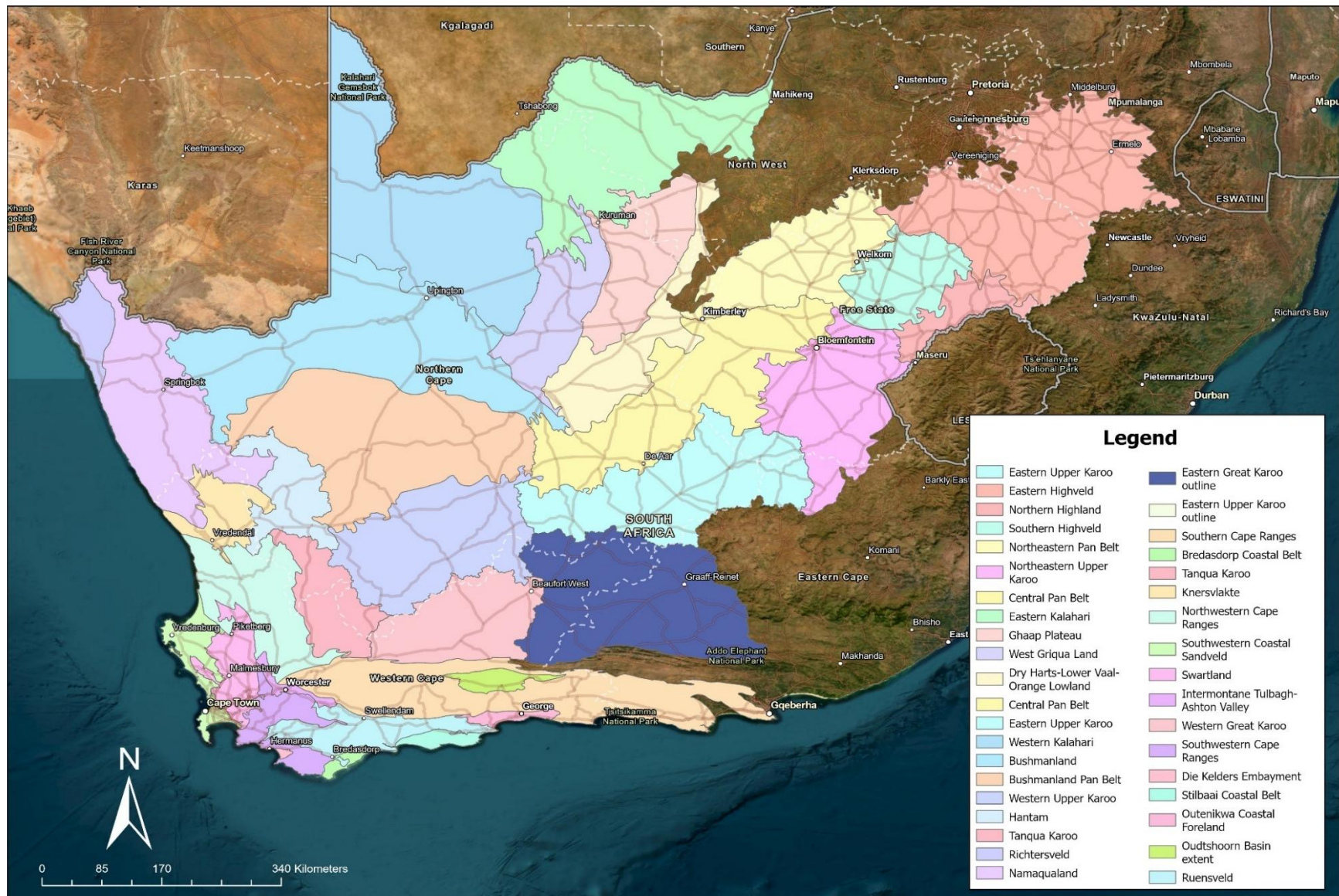


Figure 4. 10: Hydrogeological region for the Western Cape, Northern Cape and Free State Provinces

#### **4.5.3.2. The Western Cape, Northern Cape and the Free State hydrogeological Regions**

The mean groundwater levels for the Western Cape regions are presented in Figure 4.11. Water level declines were recorded over the observation period, marking a period of low rainfall. Few regions such as Oudtshoorn Basin and the Southern Cape Ranges were not as impacted as others. These two maintained positive trends for the most part of the observation period while other regions reported downward trends of up to 8m decline. It was until late 2021 that groundwater levels for all these regions had a fluctuating upward trend in response to rainfall recharge. This is the prevailing trend to date. The water level rebound in the Knersvlakte region has been slow compared to other regions, but its latest information shows that it is gradually improving, catching up with other regions. Although the latest rains for the regions have shown a reduction in intensity, the groundwater levels still reflect an upward trend indicating a delayed response to rainfall recharge.

For the Northern Cape and Free State Provinces (Figure 4.12) the hydrogeological regions that were most affected by historic groundwater level declines are Hantam and the Bushmanland Pan Belt (both in the Northern Cape). Other regions maintained horizontal, slightly upward trends until late 2021 where a prominent rise was observed (including the groundwater levels for the two regions Hantam and the Bushmanland Pan Belt, which were impacted severely previously), lasting until early 2024. Thereafter, a gradual decline lasted until March 2025. The latest water levels are marked by upward trends for most regions save for Bushmanland and Bushmanland Pan Belt. A closer observation is needed for these two regions.

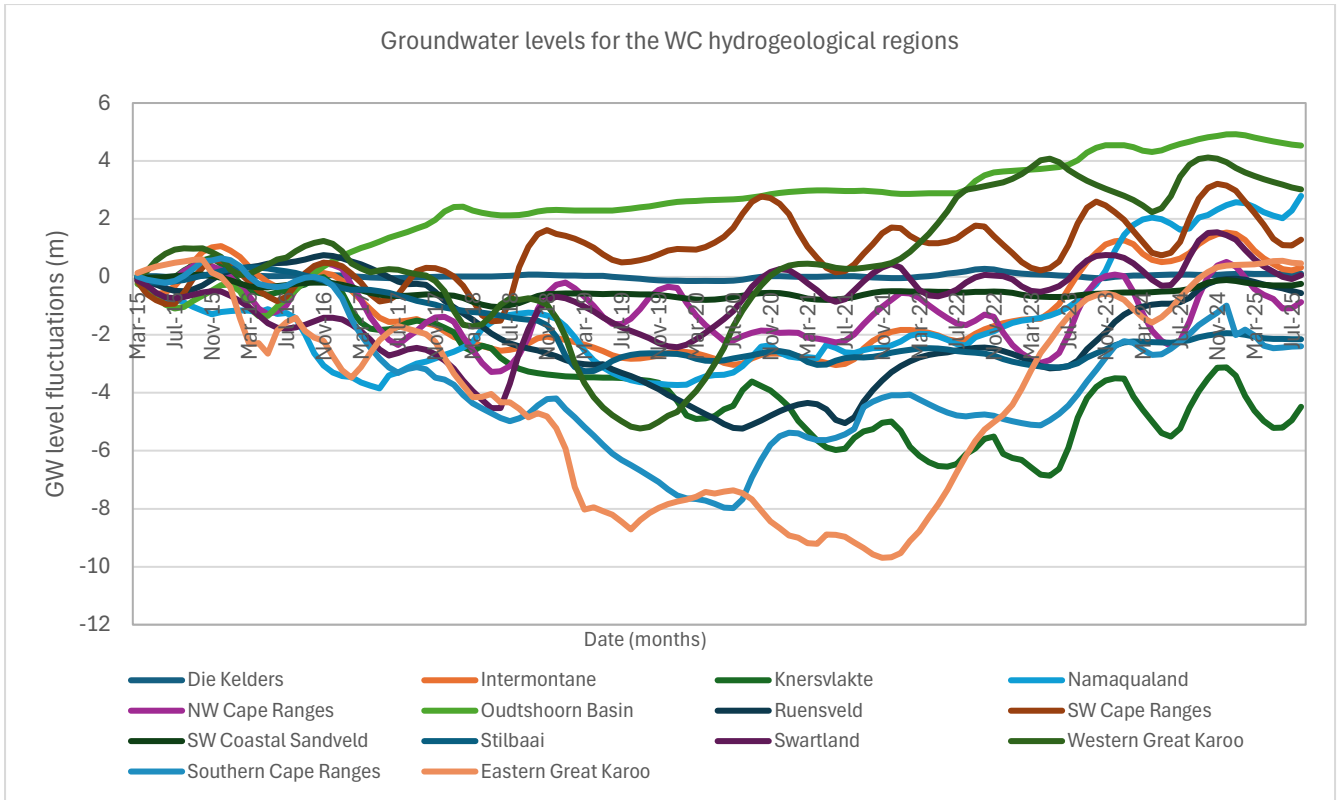


Figure 4. 11: Groundwater levels for the hydrogeological regions in the Western Cape

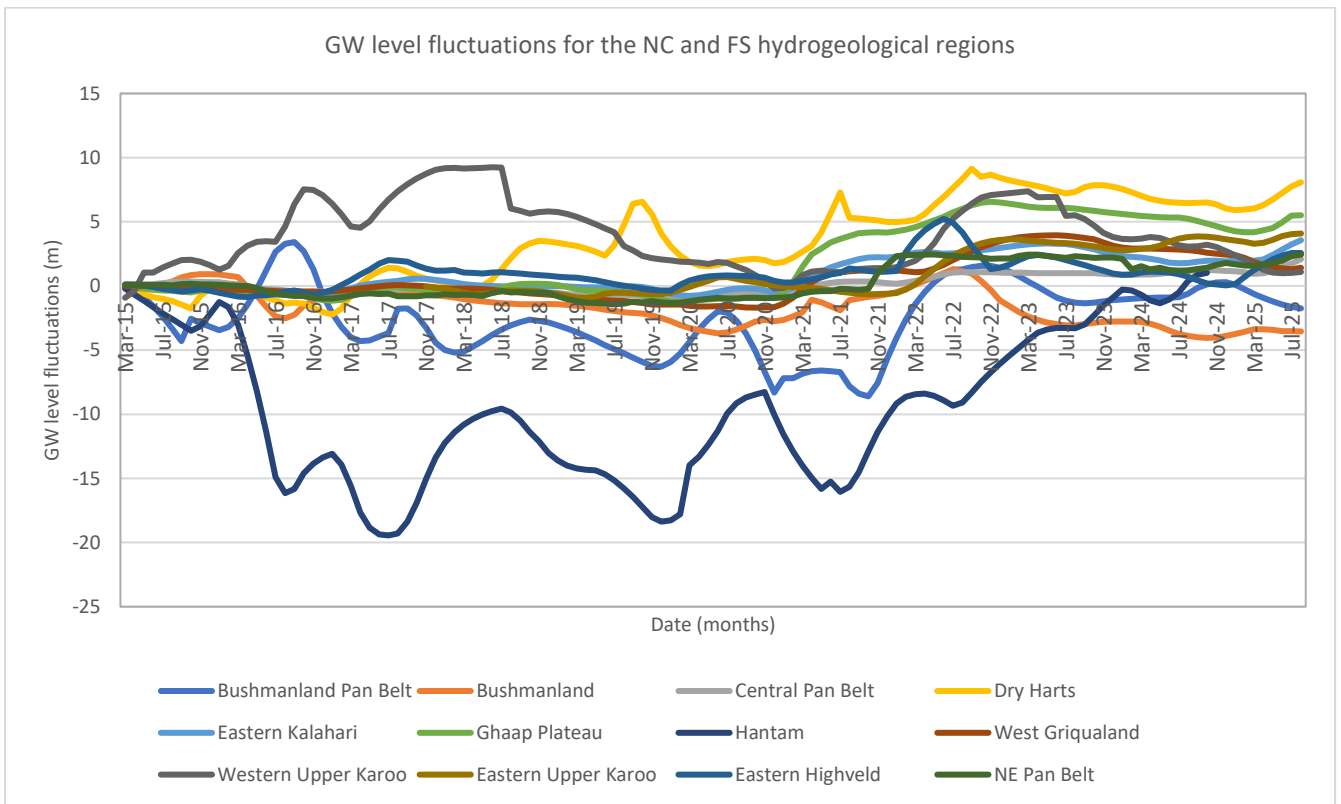


Figure 4. 12: Groundwater levels for the hydrogeological regions in the Northern Cape and Free State Provinces

#### **4.5.3.3. The Gauteng, Northwest, Limpopo and Mpumalanga hydrogeological Regions**

The last batch of hydrogeological regions tackled included the Gauteng, Northwest, Mpumalanga and Limpopo as shown in Figure 4.13.

The graphs for these provinces were split so that they could be legible. The Gauteng and Northwest Provinces hydrogeological regions are shown in Figure 4.14. Generally, the groundwater levels for these hydrogeological regions have maintained positive trends with rising water levels with time. The latest is indicating the healthy status of groundwater with climbing groundwater levels after a slight decline in 2024- possibly responding to rainfall recharge.

The Limpopo and Mpumalanga hydrogeological regions generally maintained horizontal trends with latest data indicating rising water levels (Figure 4.15). An exception holds for the Springbok Flats hydrogeological region were, for the longest period, its water levels declined by about 12m. Nevertheless, the latest status for this region indicates rising water levels, albeit still below the initial water levels. The latest trends Soutpansberg hydrogeological region showed a downward leaning since 2023. This is the only region that registered a decline from all the observed regions. A closer observation/ monitoring needs to be implemented for this region.

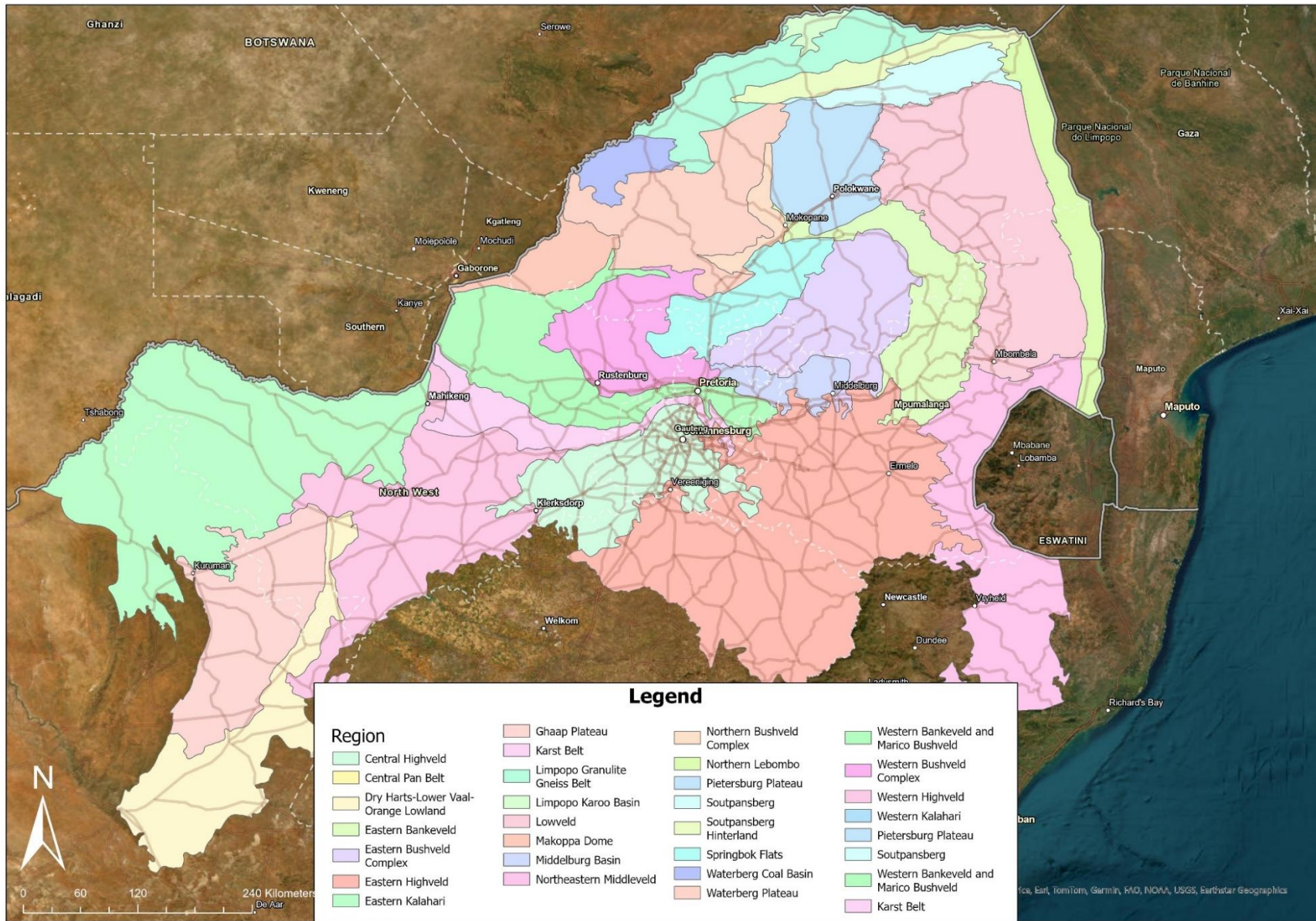


Figure 4. 13: Hydrogeological region for the Gauteng, Northwest, Mpumalanga and the Limpopo Provinces

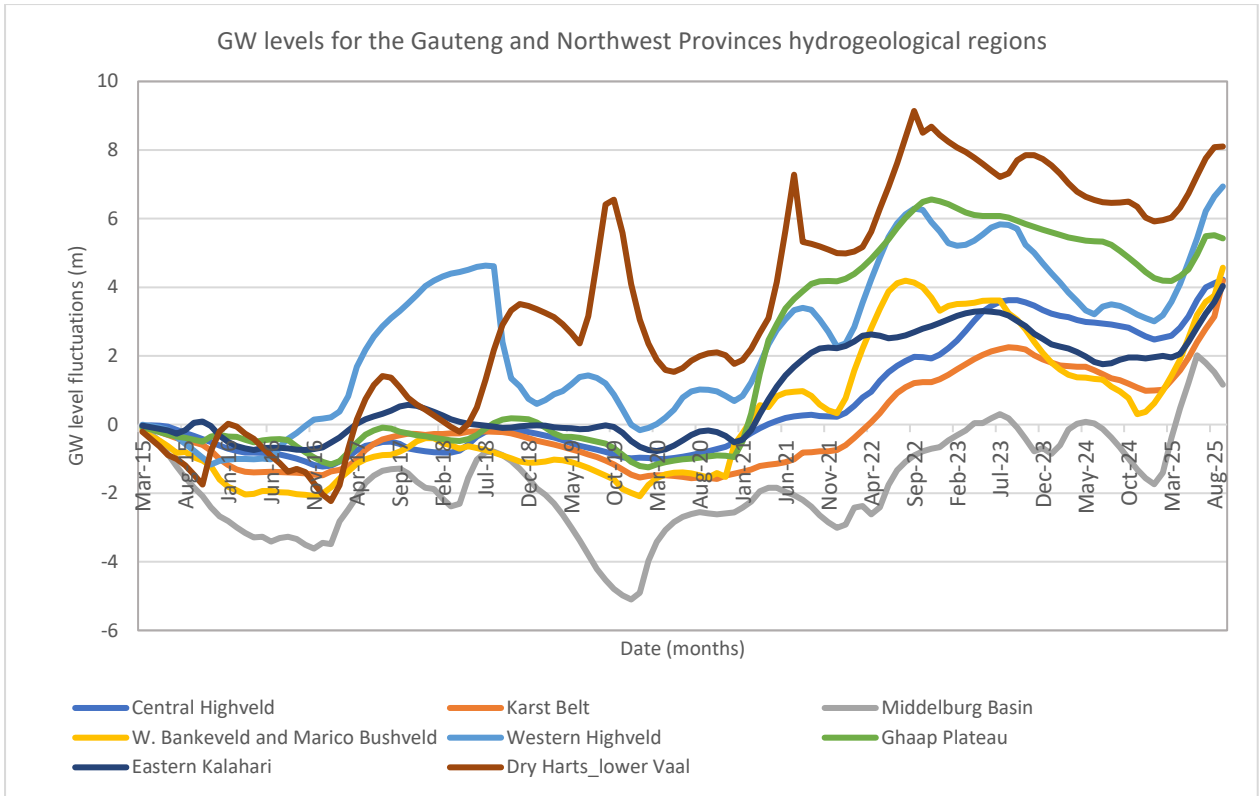


Figure 4. 14: Groundwater level fluctuations for the hydrogeological regions in the Gauteng, and Northwest Provinces

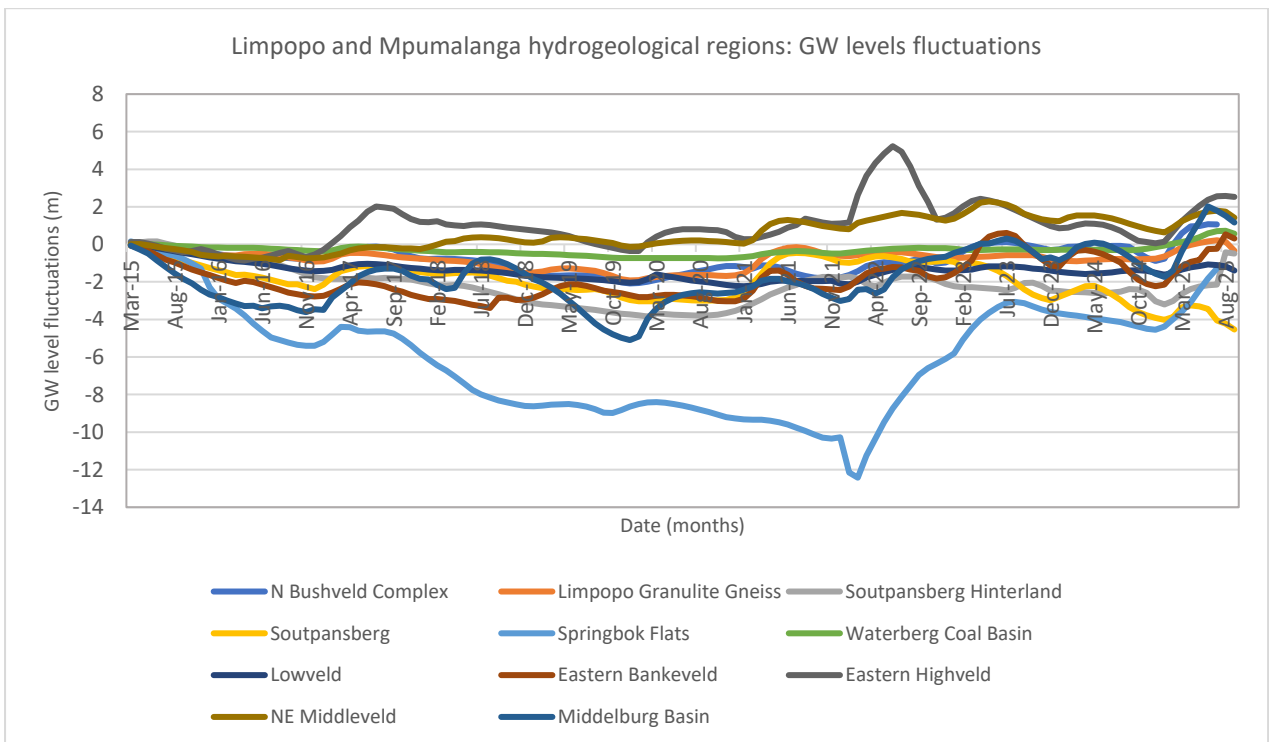


Figure 4. 15: Groundwater level fluctuations for the hydrogeological regions in the Limpopo and Mpumalanga Province

## **4.6. Groundwater Quality Status**

### **4.6.1. Background and Introduction**

Groundwater quality can be influenced by local geology, residence time in the aquifer, groundwater chemistry and groundwater-rock interactions. Groundwater can have naturally elevated salinity concentrations, dissolved nutrients, and metals. The natural (background) geochemical composition of the groundwater is directly related to the aquifer mineralogy and the rate of dissolution of the aquifer minerals into the groundwater. Most of these reactions are slow and only subtle changes in inorganic concentrations occur over time within a hydrogeological unit / hydrogeological region. Faster reactions and changes can occur locally where there are changes in aquifer mineralogy such as a sandy stream channel within a limestone unit or an influx of groundwater with a different composition than the pore water of the aquifer such as from a losing stream. National Department of Water and Sanitation (DWS) is responsible for monitoring groundwater resource in South Africa. National Groundwater Quality monitoring programme is consisted of 424 active geosites (boreholes and springs) as presented in Figure 4.3. Groundwater quality monitoring is being conducted twice year during wet and dry season. The aim of the monitoring programme is to ascertain the influence of rainfall on the groundwater quality and to determine the time series and spatial trends in the groundwater quality on the national scale.

### **4.6.2. Data availability**

Groundwater samples were collected in October 2025, April-May and September 2025. In October 2024-April-May 2025 sampling run, 249 (64%) geosites were monitored and 142 (36%) from the 391 active geosites were not monitored as indicated in Table 4.2. In September 2025 sampling run, 312 (74%) geosites were monitored and 112 (26%) from the 424 active geosites were not monitored as indicated in Table 4.3 and presented in Figure 4.3. Analysis or assessment on this report was based on the long terms data from 2021 to 2025 (5 years data).

Table 4. 1: Total Number of Sampled Geosites: September 2024-April-May 2025

Province / Area	Total number of Sites to be sampled per Province/Area	Total Number of Sites not sampled	Total Number of Sites not sampled %	Total Number of Sites sampled	Total Number of Sites sampled %
Eastern Cape	36	36	100%	0	0%
Free State	39	0	0%	39	100%
KwaZulu Natal	10	10	100%	0	0%
Kruger National Park	9	0	0%	9	100%
Limpopo	121	8	7%	113	93%
North West	13	3	23%	10	77%
Northern Cape	79	39	49%	40	51%
Western Cape	40	40	100%	0	0%
The groundwater sampling in Mpumalanga, North West & Gauteng Provinces conducted by National Office	44	6	14%	38	86%
<b>TOTAL:</b>	<b>391</b>	<b>142</b>	<b>36%</b>	<b>249</b>	<b>64%</b>

Table 4. 2: Total Number of Sampled Geosites: September 2025

Province / Area	Total number of Sites to be sampled per Province/Area	Total Number of Sites not sampled	Total Number of Sites not sampled %	Total Number of Sites sampled	Total Number of Sites sampled %
Eastern Cape	52	38	73%	14	27%
Free State	39	6	15%	33	85%
KwaZulu Natal	13	6	46%	7	54%
Kruger National Park	9	0	0%	9	100%
Limpopo	121	9	7%	112	93%
North West	13	2	15%	11	85%
Northern Cape	92	49	53%	43	47%
Western Cape	40	0	0%	40	100%
The groundwater sampling in Mpumalanga, North West & Gauteng Provinces conducted by National Office	45	2	4%	43	96%
<b>TOTAL:</b>	<b>424</b>	<b>112</b>	<b>26%</b>	<b>312</b>	<b>74%</b>

### **4.6.3. Results and analysis: 2020-2025**

In this section, the spatial distribution of parameters such as Nitrate ( $\text{NO}_3^-$ ), salinity as Electrical Conductivity (EC), Fluoride ( $\text{F}^-$ ) and Sulphates ( $\text{SO}_4^{2-}$ ) which are highly concentrated in groundwater will be mapped and discussed. Spatial distribution and trends of various parameters from sampled geosites from 2021 to 2025 is presented from Figure 4.16-19.

#### **4.6.3.1. Nitrate ( $\text{NO}_3^-$ )**

The spatial distribution of  $\text{NO}_3^-$  in South Africa based on data collected between 2021 to 2025 is presented in Figure 4.16 where it indicates that  $\text{NO}_3^-$  is a big problem in Limpopo, North-West, Free State and Northern Cape Provinces. High concentration of  $\text{NO}_3^-$  can be associated with anthropogenic activities such as input from irrigation or sanitation issues. The Limpopo, North West and Northern Cape Provinces have notable agricultural activity which could be associated with their elevated  $\text{NO}_3^-$  concentrations. In Limpopo, there are geosites (H30-0095) that have significantly high nitrate concentrations (103.3 mg/L).

There is a need to investigate and determine the processes influencing the hydro-geochemistry in areas where  $\text{NO}_3^-$  concentration in groundwater is high. It is important to alert groundwater users about the status of high concentrations of nitrate ( $\text{NO}_3^-$ ) in affected areas as it can cause severe health issues especially in toddlers if they consume groundwater without treatment. Monitoring of high concentration levels of  $\text{NO}_3^-$  in these boreholes should be prioritised to assess and determine the source of high concentration of  $\text{NO}_3^-$  in groundwater.

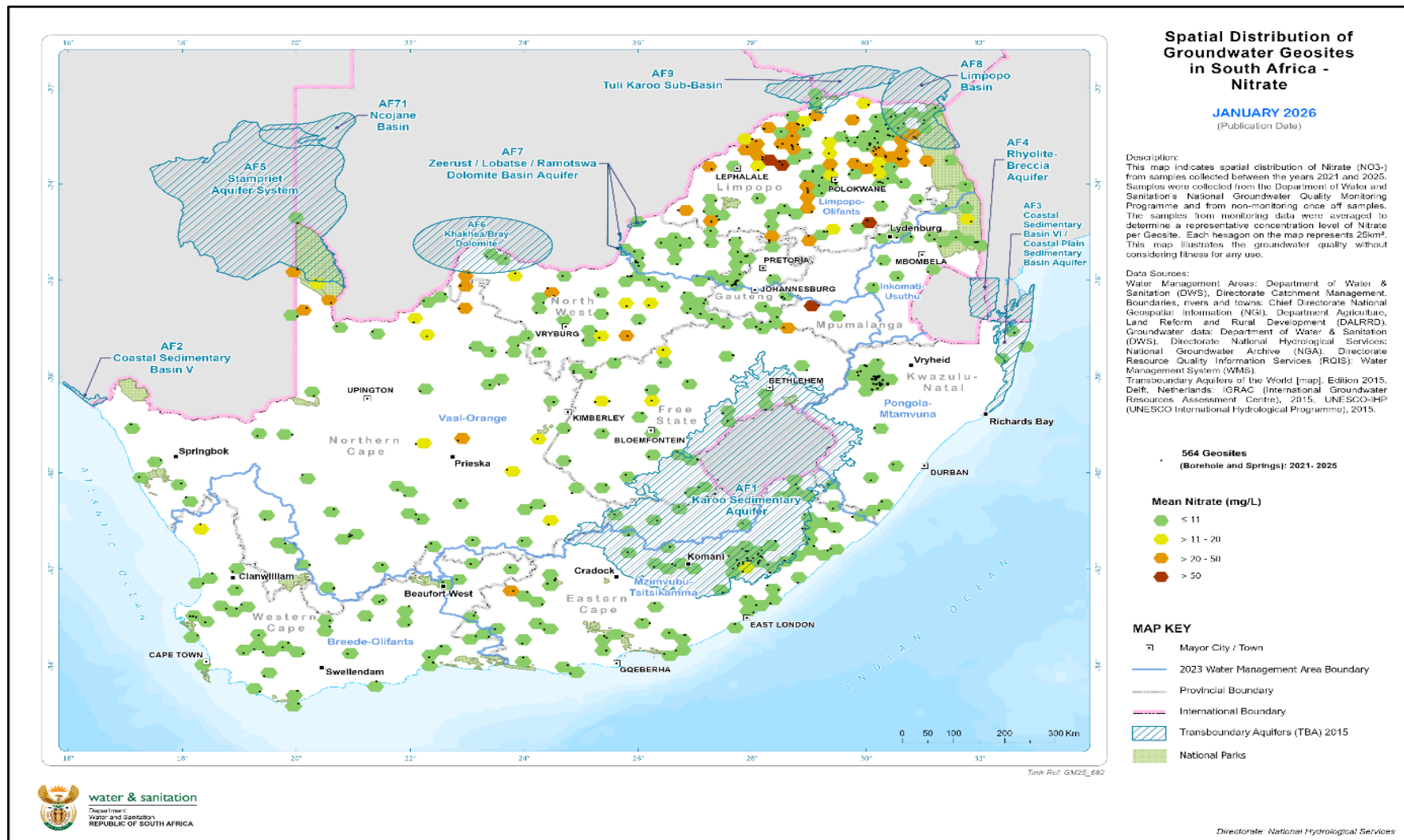


Figure 4. 16: Spatial distribution of Nitrate: 2025

Table 4. 3: List of geosites with high Nitrate concentration (Greater than 35 mg/L) (2022/23-2023/24)

Geosite ID	Latitude	Longitude	Nitrate (Mg/L)
<b>Limpopo</b>			
2330ac00220 Roerfontein Ptn. Ga- Phooko - H10-0601	-23.38	30.16861	61
H30-0095 Smashblock	-24.9197	27.76402	103.3
ZQMABL1 Abel H07-0998	-23.4778	30.61807	55.9
ZQMALL2 2229ac00129 Alldays	-22.6789	29.10056	36.3
ZQMBGG1 Otherworld Ptn Bangalong H21-0354	-23.491	28.18172	53.4
ZQMBLT3 2328ba00198 Kopbeenpan - Baltimore	-23.1625	28.535	50.6
ZQMBWR1 Blinkwater H10-0006	-23.4097	30.33576	59.7
ZQMELN1 Ramagoep Ptn. Eisleben H16-0385	-23.5178	29.84239	39.5
ZQMGIY1 2330bc00027 Giyani	-23.3136	30.70583	39.7
ZQMGM1 Ga Musi H03-2434	-23.5307	28.48112	91.2
ZQMGNA1 Genua - H26-0254	-22.9997	28.69974	46.3
ZQMGS1 Beaty H21-0216	-23.2276	27.90756	45.2
ZQMJMA1 Bellevue Ptn Jamela H07-0103	-23.4371	30.3488	39.1
ZQMKHK2 2229ca00357 Kromhoek(Kliniek)	-22.5556	29.01417	70.6
ZQMLBD1 Lombaard - H15-0077	-23.0543	30.87965	36.9
ZQMMDA1 Macalacaskop Ptn Madiba H03-1719	-24.1325	28.98248	50.6
ZQMMDR1 Mariniersdrift Ptn Madazi H17-0292	-23.3113	30.12341	46.5
ZQMMGE1 Gorkum Ptn. My Darling/Tickelyne H11-2489	-23.2225	28.71139	63.3
ZQMMUA1 Stateland H14-0160	-23.6185	31.03303	37
Zqmpga1 Schutte Ptn. Penninghotsa H15-0192	-23.0192	30.83867	36.9
ZQMPP11 Papegaai Ptn. Papegaai H11-0126	-23.2201	28.71308	50.6
ZQMRMO1 Staatsgrond Ptn Ra-Modumo H07-0204	-23.4668	30.55697	35.4
ZQMSKH1 2430cc00062 Swea (Schoonoord)	-24.7514	30.01417	94.5
ZQMSMA1 Semanya H04-0741	-23.6822	29.41116	42.4
ZQMSWW1 2228cc00283 Dassenberg	-22.8556	28.20278	43
<b>Mpumalanga</b>			
Villiers Borehole Villiers Windmill	-26.9837	28.55901	38.3
ZQMSEC1 2629ca00408 Secunda - Kwekery	-26.52	29.18	59.9
ZQMTSH2 2528bb00106 Tsamahansi	-25.0719	28.98556	39.1
<b>North West</b>			
ZQMGYA2 2623dd00011 Summerfield (Vergenoeg) - Sd10	-26.8575	23.94028	86.8
ZQMKLH1 2622ba00025 Radnor - Rr4	-26.1117	22.88417	35.8
<b>Northern Cape</b>			
ZQMKNP2 Niekerkshoop Allotment	-29.3271	22.83792	38

#### 4.6.3.2. Salinity as EC

Salinity parameters (EC and TDS) results for data collected between 2021 and 2025 is presented in Figure 4.17, where EC ranged from 1 to 5097 mg/L. Western Cape, Free State and Eastern Cape Provinces stood out as the most problematic areas regarding electrical conductivity as salinity. The northern part of Limpopo also displayed an issue with salinity. High concentration of salinity in inland regions is usually associated with natural hydrogeochemical processes such as water-rock interaction, however some anthropogenic activities such as agriculture (fertilisers) can influence salinity in groundwater. In coastal areas, the elevated salinity is associated with seawater intrusion/saltwater ingress. Localised studies should be conducted to determine the source of high salinity to determine suitable measures in protecting groundwater resource.

Table 4. 4: List of Geosites with EC greater than 370 mS/m

Geosite ID	Latitude	Longitude	Electrical conductivity (mS/m)
<b>Eastern Cape</b>			
N1H013Q01 Mackies Puts Eye At Graaff-Reinet/Vanryneveldspas	-32.2414	24.53222	371
ZQMBRM1 3326DA00169 Kwaihoek	-33.6931	26.65861	1251
ZQMCBG1 3326AA00066 WENTZEL KOESTER	-33.1256	26.20944	556
<b>Free State</b>			
ZQMFBD1 2826CC00026 Florisbad Warm Bath	-28.7678	26.07	431
<b>Western Cape</b>			
225/14 Modderfontein 3218BA00425	-32.226	18.53005	377
261_4 Aties Extention 3118DA00306	-31.63	18.62474	597
3018CC00048 Rietpoort	-30.9619	18.06833	416
3118DA00099 Duinen Ptn Bbp Gypsum Maskam Mine - OD00253	-31.5669	18.73513	1246
3118DB00072 Annex Ronderug Ag2	-31.6894	18.88278	535
3218ab00071 Brandwacht - Bt10	-32.1703	18.43389	1978
3218AB00075 BRANDWACHT - BT9	-32.2	18.4	986

3218AB00326 KOOKFONTEIN GED LANGDAM - G047866	-32.0956	18.38862	3977
3218AD00132 Graawe Duynen - G033948	-32.2998	18.3625	1256
3218BA00273 Rietfontein - G047820	-32.1525	18.50635	460
3218BA00274 MODDERFONTEIN - G047826	-32.2104	18.54295	1317
3218BA00414 Rietfontein - G047843	-32.1374	18.5303	1076
3318AA00001 Waschklip 183 - BG00062	-33.0453	18.1125	730
3318DA00115 Draaihoek G46066	-33.6578	18.615	601
3318DA00117 Philadelphia G46068	-33.6578	18.58806	475
BG00165 KOPERFONTEIN ZQMKFT1	-33.1043	18.3997	372
BITTERFONTEIN G37361	-31.055	18.31372	586
DN5 DUINEN OD00311	-31.5669	18.73513	851
G31276 KOKERBOOM NURSERY 3118DA00060	-31.6133	18.74497	374
G31277 VANRHYNSDORP 3118DA00061	-31.6134	18.7309	468
G33248 3218CD00004	-32.805	18.3742	5423
G33249 3218CD00054	-32.7699	18.42307	820
G33490 3318AB00175	-33.2201	18.36692	1641
G37382 BITTERFONTEIN 3118AB00070	-31.0536	18.27285	3176
G37520 KOUVLEI 3018CD00089	-30.955	18.33025	484
G39116 BITTERFONTEIN ZQM	-31.0706	18.31734	530
G40156 SPORTSFIELD OUDTSHOORN 3322CA00376	-33.5793	22.19078	1678
G44061A ELANDSBAAI 3218AD00053	-32.3128	18.36118	5093
G46041 ARMOED ESTATE 3322CA00381	-33.6842	22.07167	624
G47827 BRANDENBURG 3218BC00120	-32.2898	18.61114	595
G47844 BRANDENBURG 3218BA00415	-32.2239	18.62676	1125
G47862 VERLORENVLEI 3218AD00125	-32.3402	18.37137	1038
GZ00031 WELBEDAG PTN ONVERWAG	-33.7521	22.2979	783
JAN ZWARTS VALLEY PTN COLENSO- BG00071	-33.335	18.41556	3243
KA2 DIEPVLEI OD00390	-31.6775	18.94628	384
KERSEFONTEIN G33246 3218CD00006	-32.901	18.33653	429

KRANSDUINEN 3318AD00524	-33.4618	18.35067	384
MD2A MALANSDAM	-33.285	18.77325	467
OD00502 CLANWILLIAM 3218BB00223	-32.1713	18.88153	392
OD01055 RONDEGAT PTN DRIEHOEK E1N0055	-32.2372	18.90188	532
OSPLAATS PORTION DOORNLAAGTE BE00187	-33.4661	19.68551	479
OSPLAATS_HEXVALLEY H2N0507	-33.4465	19.70496	521
RL13 RASKRAAL OD00288	-31.6279	18.81911	862
RONDERUG (DUP NAME 19582)	-31.6667	18.86667	596
RWS 02A BRAKKE FONTEIN PTN ATLANTIS PROPOSED LANDFILL SITE	-33.6411	18.49278	800
UITVLUG BG00225 UV003	-33.2002	18.86819	2185
VLAKKERUG PTN KALOS FARMING BG00355	-33.2937	18.87805	747
WELGEGUND BG00163	-33.7537	18.62284	503
ZQCNI1 3118AB00076 NIEUWOUDTS NAAUWTE - G37355	-31.0631	18.35056	380
ZQMCLAN6 3218CC00294 BRAK FONTEIN - G33324	-32.9181	18.18389	493
<b>Limpopo</b>			
ZQMGPE1 2328BA00252 GLENALPINE PTN. UITZICHT / DWAF CAMP H03-2872	-23.1893	28.69401	408
ZQMPDF1 2229AA00024 PONTDRIF BORDER POST	-22.2164	29.14	475

### 4.6.3.3. Fluoride (F<sup>-</sup>)

Spatial distribution of F<sup>-</sup> in South Africa based on data collected from 2021 till 2025 is presented in Figure 4.18, where F<sup>-</sup> is highly concentrated in some part of the Limpopo, Mpumalanga, Free State and Eastern Cape Provinces however all 9 provinces display a slight issue in fluoride concentration. The province with the most alarming F<sup>-</sup> concentrations is Limpopo, where there are geosites recording significantly high concentrations up to 18.9 mg/L (ZQMSKG1) and 9.6 mg/l (H30-0102). Fluoride (F<sup>-</sup>) in groundwater is often associated with dissolution of the Fluorite (CaF<sub>2</sub>) mineral from the host aquifer materials, and the fluctuation may be resulting from the water-rock interaction rate and natural chemical reaction processes in the aquifer. Overextraction of groundwater may also result in elevated concentrations due to deeper water being abstracted. High concentration (>1.5 mg/L) of F<sup>-</sup> in groundwater can cause health risk such as dental fluorosis to people drinking such groundwater without treatment. There is a need of conducting detailed studies on the processes influencing groundwater quality and raise awareness to improve the health and livelihood of communities.

Table 4. 5: List of geosites with Fluoride concentration in groundwater (2023/24 – 2024/25)

Site ID	Latitude	Longitude	Fluoride Concentration (mg/L)
<b>KwaZulu Natal</b>			
KZN100034 - NNC 3 Defunctional Mine Borehole	-28.03887	30.16815	3.3
KZN100277 - Old Bulwer Defunctional Mine Downstream Borehole	-27.99489	30.20644	3.1
KZN100282 - NNC 2 Defunctional Mine Borehole	-28.06716	30.16245	2.8
KZN140060 DUNDEE	-28.16011	30.18387	1.8
<b>Western Cape</b>			
3218AB00133 Klein Klipheuvel	-32.2328	18.42	1.9
BG00413 Bont Vlei Ptn Bontevlei	-33.9931	18.81712	3
G37526 Kouvillei 3018cd00147	-30.9535	18.32813	1.7
Jan Zwarts Valley Ptn Colenso- BG00071	-33.335	18.41556	3.8
Soverby Bg00411	-33.9919	18.80492	3.4

ZQMLEU1 3221DD00017 Bitterwater - LG1	-32.7747	21.98	2
<b>Northern Cape</b>			
G01317nc Brakgat	-31.476	22.36539	2
G01322nc Pofadder	-29.2128	19.93116	2.4
Zqmgrn2 3020dc00034 Brandvlei - Ed1	-30.7558	20.65972	2.7
Zqmgar2 3018ca00079 Wilgehout Fontein	-30.5161	18.06556	2.1
Zqmkam2 Clyven Fontein Ged Kamieskroon	-30.2167	17.98333	1.7
Zqmmmer1 2620ca00283 Mier Area Farm 92 - G42490	-26.5797	20.18139	2.7
Zqmmta1 2520ac00002 Mata Mata - Kgnp50	-25.7675	20.01806	2.2
Zqmpof2 Namies North Town Pofadder	-29.2365	19.31756	2.4
Zqmrvm1 2820ad00015 Riemvasmaak - G38354	-28.4042	20.3125	3.2
Zqmsut1 3220bc00015 Suterland Allotment Area - N92	-32.3944	20.65694	1.9
Zqmtrn1 2620ad00129 Twee Rivieren - Kgnp1c	-26.4728	20.61528	3
Zqmund1 Unions End	-24.8033	20.02634	1.8
Zqmvwv2 3021bd00101 Spitskop Ptn Smouskolk - G039953	-30.4788	21.89867	1.8
<b>North West</b>			
ZQMEDE3 DAWKINSVILLE	-26.6822	26.86642	2.6
Zqmkvd1 2527bb00037 Klipvoor Barakalalo Game Reserve	-25.1206	27.78611	2.7
Zqmpil2 2527ac00177 Zuiverfontein	-25.2639	27.2125	4.6
Zqmsgs1 2526da00177 Brakfontein-Ngk Swartruggens	-25.6667	26.68306	4.5
<b>Mpumalanga</b>			
Zqmbps1 2530dc00171 Badplaas Aventura	-25.9569	30.56056	56
Zqmmcd1 2530cb00001 Machadodorp/Hidro Baths Hotel	-25.6569	30.26111	38
<b>Limpopo</b>			
H30-0102 Wachtbeenbietjesdraai	-24.6669	27.3797	9.6
Zqmall1 2229ca00352 Alldays	-22.6789	29.10056	3.2
ZQMBSG1 MATALAS PTN. BAKONE/SETOMONG H04- 0976	-23.7412	29.06088	1.7

Zqmeva1 Evangelina (Game Ranch)	2229ac00122	-22.4156	29.20944	3.2
Zqmgto1 - H03-2463	Bavaria/Ga-Mathapo	-23.5207	28.83122	1.8
Zqm nab2 Welgevonden Ged. Libertas	2428bc00494	-24.4556	28.56889	4
Zqmpnr1 Vaalboschbult	2528ab00075	-25.2111	28.29639	1.7
Zqm skg1 Macalacaskop Sekgakgapeng	2428bb00287 Ptn.	-24.1766	28.9789	18.9
Zqmsou1 Soutpansberg	2230cc00116	-22.9058	30.18056	2.6
Zqm ssn1 Lappidood - H26-0128		-22.745	28.79069	2.3
Zqm tha3 Thabazimbi / Buffelshoek	2427ad00162	-24.3411	27.36167	4.3
Zqmt ps1 Honnet - Aventura	2230ca00190	-22.6075	30.17472	5
Zqmtug2 Tugela Bad	2228da00518	-22.5692	28.62194	4.5
Zqmtug4 Tugela Bad	2228da00520	-22.5703	28.62222	3.2
Zqmvna1 Nora(Vlakpan)	2328ca00001 Villa	-23.7083	28.11306	2.3
Zqm wbd1 Warmbad(Ou Oord)	2428cd00293	-24.8847	28.28944	7.3
Zqm wbd2 Aventura Oord Warmbad	2428cd00012	-24.8858	28.29167	8.5
<b>Gauteng</b>				
Vaal Marina Vaal Marian Production Borehole		-26.8596	28.31483	47
<b>Free State</b>				
ZQMFB D1 Florisbad Warm Bath	2826CC00026	-28.7678	26.07	431
<b>Eastern Cape</b>				
ZQM ALI1 Aliwal North	3026DA00035	-30.7156	26.71472	4.2
ZQM CBG1 Wentzel Koester	3326AA00066	-33.1256	26.20944	1.6
ZQM RHK1 Ramohlakoana		-30.238	28.76723	4.1

#### 4.6.3.4. Sulphate (SO<sub>4</sub><sup>2-</sup>)

Spatial distribution of SO<sub>4</sub><sup>2-</sup> presented in Figure 4.19 indicates that the most problematic areas are Gauteng (1815 mg/L GP00306), Northern Cape (2140 mg/L: G01317NC) and Western Cape (1817 mg/L: 3118DA00099) having concentrations ranging from 500 mg/L to over 800 mg/L. The Western Cape, Limpopo, North West, Eastern Cape and Gauteng Provinces display sulphate concentrations between 200 mg/L to 500 mg/L which are concerning concentrations as they above the acceptable limit (>200 mg/L) however not as problematic as

over 500 mg/L. A high concentration of sulphate (SO<sub>4</sub><sup>2-</sup>) is often associated with mining activities. The areas identified as most problematic all have mining activity which may account for their elevated concentrations.

Based on long term data, areas such as Gauteng and KwaZulu Natal (Dundee) were identified as hotspots for high concentration of sulphate in groundwater however, based on the 2021-2025 data, the geosites in Dundee (KwaZulu Natal) fall within acceptable limits (<200 mg/L). in Gauteng, there are closed gold mines which have been identified as problematic areas due to elevated sulphate concentrations. This is a result of the oxidation of pyrite from Acid Mine Drainage in the closed gold mines and their tailings The boreholes (GP00300, GP00301, GP00302, GP00305, GP300306, GP00307, GP00309, GP00312, GP00313, GP00314) form part of the Department's Acid Mine Drainage (AMD) Monitoring Network. The sulphate concentrations in the tailings in Gauteng range from 222 mg/L to 1815 mg/L which is very alarming and further motivates the need for continuous monitoring. There is a need to manage and protect groundwater resources in the identified problematic areas as these elevated sulphate concentrations can have severe health and environmental impacts such as the contamination of groundwater systems and the disruption of aquatic ecosystems.

Table 4. 6: List of Geosites with Sulphate greater than 200 mg/L

Geosite ID	Latitude	Longitude	Sulphate (mg/L)
<b>Eastern Cape</b>			
N1H013Q01 Mackies Puts Eye At Graaff-Reinet/Vanryneveldspas	-32.2414	24.53222	365
ZQMBRM1 3326DA00169 Kwaaihoek	-33.6931	26.65861	381
ZQMCBG1 3326AA00066 Wentzel Koester	-33.1256	26.20944	327
ZQMGR1 3224BA00098 Graaff-Reinet Allotment Area - Gr4	-32.2011	24.54917	349
ZQMKPT1 3324AB00011 Camferspoort - Qmkpt1	-33.1381	24.28083	283
ZQMRTB4 3223CC00045 Kareekuul	-32.9712	23.11731	347
ZQMSFB1 3424BB00085 Goed Geloof	-34.1728	24.80833	249
ZQMSTY1 3324AD00068 KILWARDEN - KW4	-33.2617	24.35083	242
ZQMWHW1 3323AD00102 Van Der Westhuizenskraal Ged 1 - 96/1	-33.2556	23.48972	213
<b>Gauteng</b>			

2528CD00015 Rietvlei	-25.9047	28.315	207
2627BA00021 ZWAartkrants(A2N0600)- G037794	-26.0174	27.71136	853
2627BA00084 Sterkfontein (A2N0586) - G036331	-26.0471	27.70942	535
2627BA00087 Sterkfontein (A2N0584) - G036334	-26.0579	27.70002	447
GP00300 Sterkfontein	-26.0477	27.70914	783
GP00301 Sterkfontein Sterkfontein 0173	-26.047	27.7017	555
GP00302 Sterkfontein	-26.0585	27.69975	1610
GP00305 Krugersdorp Game Reserve	-26.0934	27.7194	222
GP00306 Krugersdorp Game Reserve	-26.0924	27.7124	1815
GP00307 Krugersdorp Game Reserve	-26.081	27.70507	1433
GP00309 Sterkfontein	-26.036	27.71517	1296
GP00312 Sterkfontein	-26.0452	27.71504	940
GP00313 Zwartkrans	-26.0123	27.72678	803
GP00314 Danielsrust	-26.0075	27.7383	742
Maryvale5 Vlakfontein	-26.3379	28.52661	1284
ZWSP1 Zwartkrans	-26.0082	27.745	583
<b>Limpopo</b>			
2328bb00347 Normandy H111130	-23.18111	28.80622	229
Zqmdn1 2329ad00500 Duitschland (Dendron)	-23.361111	29.342778	229
Zqmeva1 2229ac00122 Evangelina (Game Ranch)	-22.415556	29.209444	217
Zqmmpe1 Erasmus Ptn. Mopane H18-0798	-22.61565	29.85435	231
Zqmpdf1 2229aa00024 Pontdrif Border Post	-22.216389	29.14	429
Zqmrtn2 2429ca00983 Roedtan (Hardekraal)	-24.579444	29.053611	209
Zqmtug2 2228da00518 Tugela Bad	-22.569167	28.621944	345
Zqmtug4 2228da00520 Tugela Bad	-22.570278	28.622222	460
<b>Mpumalanga</b>			
Villiers Borehole Villiers Windmill	-26.9837	28.55901	129
Zqmmhl1 2429cd00178 Marble Hall - Loskop Nursery	-24.9897	29.31444	129
<b>North West</b>			
Zqmbts1 2527db00420 Brits High School	-25.6208	27.79972	283
Zqmjkp1 2724dd00163 Jan Kempdorp - 3ay	-27.9258	24.86472	548

Zqmkh1 Radnor - Rr4	2622ba00025	-26.1117	22.88417	253
Zqmvor1 Vorstershoop	2523cc00174	-25.8378	23.02472	311
<b>Northern Cape</b>				
G01317nc Brakgat		-31.476	22.36539	2140
Zqmdps1 Middelpos - Zn1	3120cc00043	-31.9081	20.235	431
Zqmhpr1 Pads Rivier - Lus10	3020aa00009	-30.0403	20.10444	1067
Zqmjkd1 Vaalharts Nedersetting A Blok A Jankempd	2724dd00183	-27.8864	24.86472	605
Zqmkam2 Clyven Fontein Ged Kamieskroon		-30.2167	17.98333	214
Zqmlox1 Loxton - Lx1	3122cb00012	-31.5444	22.26667	576
Zqmlox2 Loxton		-31.4757	22.36448	277
Zqmmta1 Mata Mata - Kgnp50	2520ac00002	-25.7675	20.01806	288
Zqmsut1 Suterland Allotment Area - N92	3220bc00015	-32.3944	20.65694	236
Zqmszs1 Scholzfontein-Wes	2924ac00053	-29.2925	24.23444	205
Zqmtrn1 Twee Rivieren - Kgnp1c	2620ad00129	-26.4728	20.61528	268
Zqmvwt1 Victoria West Allotment Area - Vw7	3123ac00018	-31.3986	23.09083	321
Zqmvwv1 Van Wyksvlei - Vm2	3021bd00066	-30.3553	21.77333	361
<b>Western Cape</b>				
033551 Speelmans Kuil - 3222ba00002		-32.2497	22.73306	263
261_4 Aties Extention 3118da00306		-31.63	18.62474	644
3018cc00048 Rietpoort		-30.9619	18.06833	365
309_5 Widouw Od00294		-31.6995	18.74495	208
3118da00056 Van Rhynsdorp Allotment Ptn Erven 698 - G31006		-31.6134	18.7451	669
3118da00099 Duinen Ptn Bbp Gypsum Maskam Mine - Od00253		-31.5669	18.73513	1817
3118db00072 Annex Ronderug Ag2		-31.6894	18.88278	280
3218ab00071 Brandwacht - Bt10		-32.1703	18.43389	839
3218ab00075 Brandwacht - Bt9		-32.2	18.4	268
3218ab00326 Kookfontein Ged Langdam - G047866		-32.0956	18.38862	1597

3218ad00132 Graawe Duynen - G033948	-32.2998	18.3625	556
3218ba00414 Rietfontein - G047843	-32.1374	18.5303	321
3318ad00286 Darling Allotment Ptn Darling Meat Market	-33.3749	18.37873	237
3318da00115 Draaihoek G46066	-33.6578	18.615	252
Be00186 Buchuland_Ceres	-33.3787	19.35539	307
Bon1 Bitterwater Outspan 3221dd00048	-32.7733	21.97449	388
Dn5 Duinen Od00311	-31.5669	18.73513	1835
G29877le Platdoorns 3222bd00073	-32.2562	22.7848	393
G29902fe Rhenosterkop 3222bb00252	-32.219	22.8624	213
G29935a Hans Rivier	-32.3877	22.67367	582
G30855 Uitkyk_Hexvalley	-33.4897	19.59491	255
G31276 Kokerboom Nursery 3118da00060	-31.6133	18.74497	1379
G31277 Vanrhynsdorp 3118da00061	-31.6134	18.7309	501
G33248 3218cd00004	-32.805	18.3742	1045
G33249 3218cd00054	-32.7699	18.42307	216
G33490 3318ab00175	-33.2201	18.36692	667
G37382 Bitterfontein 3118ab00070	-31.0536	18.27285	2064
G40156 Sportsfield Oudtshoorn 3322ca00376	-33.5793	22.19078	492
G44061a Elandsbaai 3218ad00053	-32.3128	18.36118	1902
G46041 Armoed Estate 3322ca00381	-33.6842	22.07167	244
G47827 Brandenburg 3218bc00120	-32.2898	18.61114	328
G47862 Verlorenvlei 3218ad00125	-32.3402	18.37137	510
Gkn52 Groot Kruid Fontein 3221dd00150	-32.8405	21.96327	414
Gz00031 Welbedag Ptn Onverwag	-33.7521	22.2979	1452
H2n0500 Goedehoop_Hexvalley	-33.4174	19.72139	259
Hb921/32 Droë Rivier 3222bc00176	-32.3863	22.53385	442
Jan Swarts Valley Ptn Colenso- Bg00071	-33.335	18.41556	1889
Klipfontein-Geoss-A5	-32.5967	18.3875	625
Lpm01 Leipoldville 3218ab00317	-32.2177	18.49115	202
Md2a Malansdam	-33.285	18.77325	298

Mel3c Van Der Byls Kraal 3221da00064	-32.6667	21.50228	436
Mel5 Mooileegte 3221cb00120	-32.7079	21.48748	227
Od00502 Clanwilliam 3218bb00223	-32.1713	18.88153	392
Od00506 Clanwilliam 3218bb00227	-32.1818	18.89017	234
Od01055 Rondegat Ptn Driehoek E1n0055	-32.2372	18.90188	296
Oosterzee Ptn Setlaars High School	-33.8906	18.61028	207
Osplaats Portion Doornlaagte Be00187	-33.4661	19.68551	460
Osplaats_Hexvalley H2n0507	-33.4465	19.70496	467
Pd01 Plaatdoorns 3221cb00087	-32.6109	21.33095	313
Rg71 Ronderug Od00291	-31.6857	18.8769	248
RI13 Raskraal Od00288	-31.6279	18.81911	1251
Ronderug (Dup Name 19582)	-31.6667	18.86667	379
Rws 02a Brakke Fontein Ptn Atlantis Proposed Landfill Site	-33.6411	18.49278	213
Stn10 Stinkfontein Ptn Oslaagte 3221db00068	-32.6735	21.98361	437
Troe Troe (Dup Name 19061)	-31.6042	18.76528	870
Uitvlug Bg00225 Uv003	-33.2002	18.86819	483
Vlakkerug Ptn Kalos Farming Bg00355	-33.2937	18.87805	340
Welgegund Bg00163	-33.7537	18.62284	372
Zqmclan6 3218cc00294 Brakfontein - G33324	-32.9181	18.18389	201
Zqmleu1 3221dd00017 Bitterwater - Lg1	-32.7747	21.98	642
Zqmmat1 3320ba00056 Wilgehoutfontein - 87/1	-33.07	20.58861	423
Zqmrsk1 3222bb00313 Rhenosterkop - G29858ka	-32.2144	22.81889	236
Zqmtbg1 3319db00031 Ezeljagt - 171/1	-33.5303	19.86167	374
Zqmurg2 3123dd00003 Murraysburg Primere Skoolkoshuis	-31.9669	23.75917	338
<b>KwaZulu Natal</b>			
Kzn070035 - Gladstone 2 Defunctional Mine Downstream Borehole	-28.0785	30.28808	202
Kzn1000278 - Nonsana 3 Defunctional Mine Downstream Borehole	-27.9968	30.22232	385
Kzn100272 - Nnc 4 Defunctional Mine Borehole	-28.0028	30.18843	218

Kzn110001 Northfield Farm# 2272 1	-28.1533	30.12297	1526
Kzn110009 - Malungisa Defunctional Mine Borehole 2	-28.2751	30.10578	312
Kzn140061 Drooge Ref	-28.0636	30.15455	230

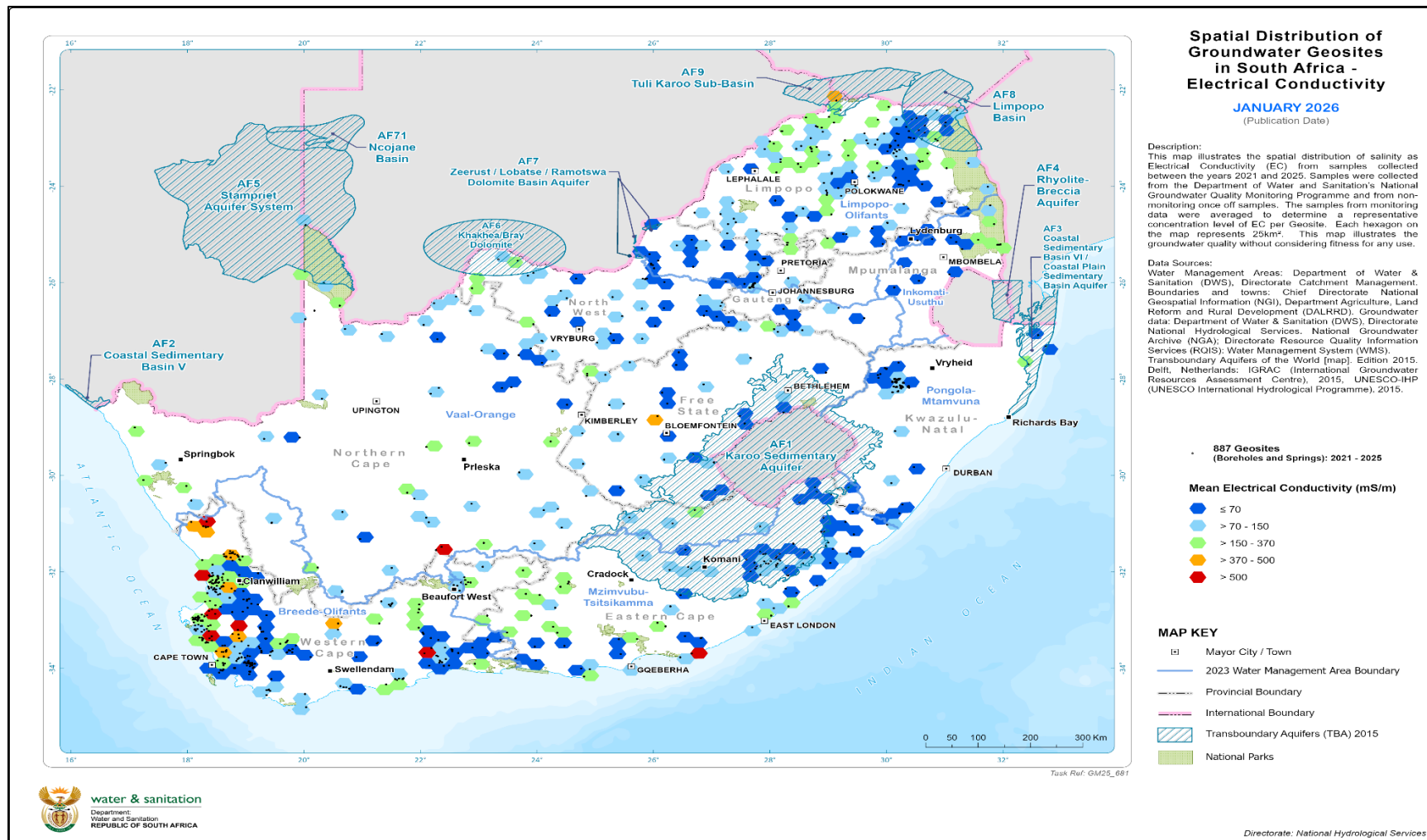


Figure 4. 17: Spatial distribution of EC: 2025

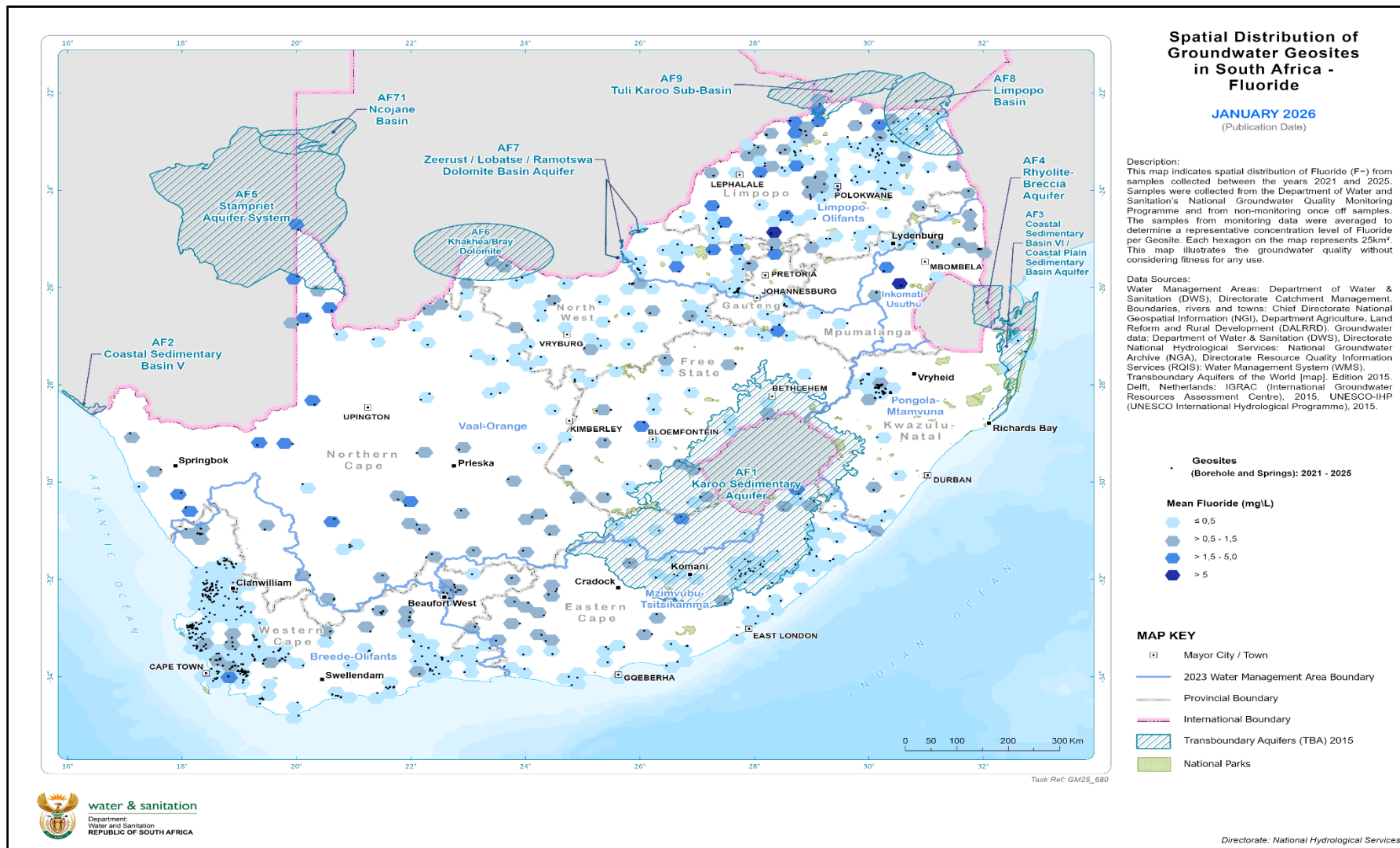


Figure 4. 18: Spatial distribution of Fluoride: 2025

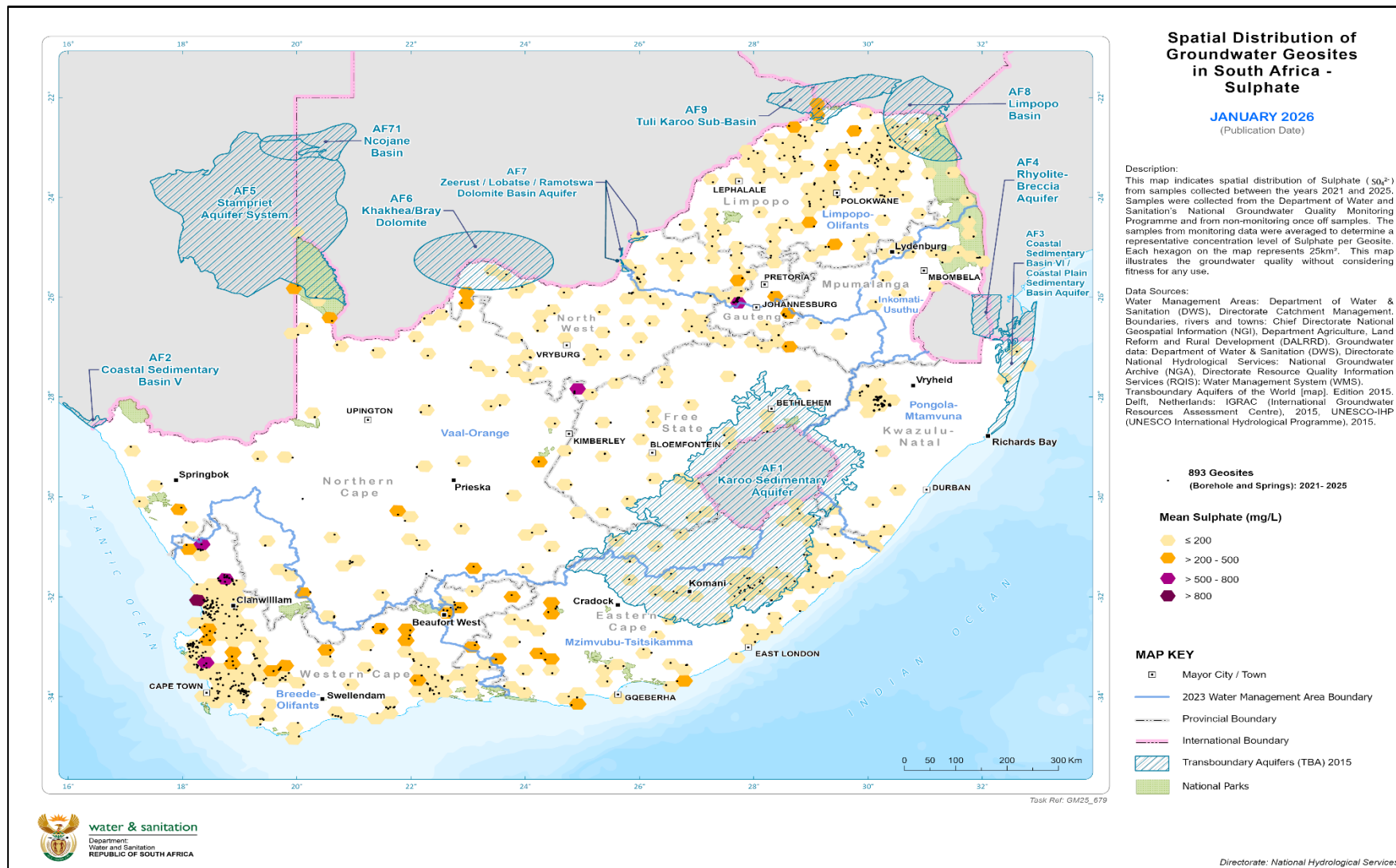


Figure 4. 19: Spatial distribution of Sulphate: 2025

## **5. Conclusion**

### **5.1. Status of Surface water monitoring programme and analysis**

The 2024/25 streamflow deviations were mostly positive for the WMAs located in the summer rainfall regions and mostly negative in the winter rainfall regions. In the summer rainfall regions, the 2024/25 flows peaked between January and December, and in the winter rainfall regions, between July and August, for WMAs. Overall, the 2024/25 flows for Limpopo, Olifants, Inkomati-Usuthu, and Pongola-Umzimkulu WMAs were well above the period mean and the previous hydrological years in most of the months. On the other hand, the Orange and Mzimvubu-Tsitsikamma, Breede-Gouritz, and the Berg-Olifants WMA recorded lower flows that were below the period mean and the previous hydrological years.

The reservoir water storage for the 2024/205 hydrological year started below the national average water storage and continued to decline until December 2024. There was then a gradual increase in the national dam levels until the national average was surpassed, recording the highest national dam levels in the last five hydrological years. The dam levels were lower in the wet season compared to the previous hydrological year, around the same time. However, the opposite was observed in the dry season, where the dam levels were higher compared to the previous hydrological year around the same time. At the end of the hydrological year 2024/25, nationally, 36 dams were overflowing (above 100%) and 11 dams were under a critical state (below 30%).

### **5.2. Groundwater Level**

In conclusion, while a greater proportion of monitoring boreholes recorded increases in groundwater levels (58%) compared to decreases (42%), the overall national outlook remains indicative of declining groundwater conditions. Most observed changes fall within the moderate range, reflecting fluctuations between 0.2 m and 5 m, with relatively few boreholes exhibiting extreme variations exceeding 5 m in either direction. Stable conditions also constitute a significant portion of observations, suggesting areas of relative equilibrium within the monitoring network.

Spatially, moderate declines are widespread across multiple provinces and are likely driven by a combination of climatic influences, and anthropogenic pressures such as groundwater abstraction. Conversely, regions exhibiting moderate to major increases in groundwater levels point to localized recharge events or reduced abstraction pressures. Overall, the findings highlight the heterogeneous nature of groundwater responses across the country,

underscoring the need for region-specific management strategies that account for both climatic variability and usage pressures in sustaining groundwater resources

For the long-term analysis, the groundwater status for all the assessed regions indicated, largely, horizontal to rising trends. The rising trends have been prevalent since 2023. Exceptions exist though where declining trends were noted. These included the regions in the Northern Cape i.e. the Bushmanland and the Bushmanland Pan Belt; and the Soutpansberg in Limpopo Province. Close monitoring is required for these regions. In the Eastern Cape, the Grootrivier-Klein Winterhoek-Suur-Kaprivier Ranges and the Algoa Bay also indicated a downward trend, surprising at the time when all other surrounding regions are responding positively to rainfall recharge. Anthropogenic impacts are suspected to be at play for these regions and further investigation is recommended.

Historically, the Western Cape hydrogeological regions have been dominated by fluctuating rising trends to the latest. A below average rainfall had a significant impact on groundwater levels for the hydrogeological regions in the Western Cape, the Eastern Cape and KwaZulu-Natal between 2017 to late 2022. These have since recovered to healthy levels.

On a national scale, the groundwater levels seem to be in a viable state with no major concerns, save for the few regions mentioned above (which are not alarming, but would require more observation).

### **5.3. Groundwater Quality**

In conclusion, data collected and analysed up to January 2026 indicated that parameters such as high concentration levels of Nitrate, Fluoride, and Sulphates continues to be the main issues in groundwater in South Africa. Provinces such as Limpopo, North-West, Free State, Northern Cape, and Mpumalanga are mostly affected. There is an increasing trend of nitrate concentration in groundwater in some of the geosites in South Africa, mostly in Limpopo, North-West and the Free State Provinces. This report recommends that there is need to conduct groundwater awareness drive in areas with high concentrations level of identified parameters, and where there is recorded groundwater use. This will assist in improving groundwater quality where anthropogenic activities were found to be the main process influencing groundwater quality. Groundwater awareness campaign can also assist in the improvement of health and livelihood as most people are not aware of the quality of groundwater they are using for drinking and domestic use. This report further recommend that localised study should be conducted to determine the hydrogeochemical process influencing groundwater quality in Limpopo, North-West, Northern Cape, Western Cape, Eastern Cape, and other provinces where there are high concentration levels of identified parameter in groundwater. The water quality needs to be continuously monitored especially in Gauteng

where acid mine drainage is prominent with elevated Sulphate concentrations. The acid mine drainage that is generally prominent in Dundee does not appear to be as concentrated in Sulphate based off the 2021-2025 data however continuous monitoring is still required.

## **6. Challenges**

The data availability keeps fluctuating simply because some monitoring stations do not have data for the reporting period. This is influenced by various reasons:

- ◆ Station being vandalised and data logger stolen in some parts.
- ◆ Monitoring stations being obstructed by bees,
- ◆ Access to monitoring sites
- ◆ Dry boreholes
- ◆ Blocked or collapsed
- ◆ Financial constrains that leads to the reduction of groundwater level monitoring frequencies in some areas
- ◆ Lack of capacity in some offices (delay in the capturing of data on the HYDSTRA system), Free State Region does not have dedicated groundwater monitoring team

## **7. Recommendations**

Regular inspection of monitoring sites is important to ensure and maintain good condition of monitoring points both groundwater and surface water stations.

Boreholes that showed constant declining may require further investigation to determine the impact factor.

Prioritising data loggers on monitoring boreholes can be valuable in ensuring continuous data availability and minimise data gaps

Localised study should be conducted to determine the hydrogeochemical process and other related factors influencing groundwater quality in Limpopo, North-West, Northern Cape, Western Cape, Eastern Cape, borehole logging may be necessary in some boreholes.

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National Weekly Status of Dams Report (January, February, March, April, June, July, and September 2025)

South African Weather Service

Media release 25 January 2025, CS-CMS-LETT-003

Media release 16 February 2025, CS-CMS-LETT-003

Media release 16 April 2025, CS-CMS-LETT-003

Media release 22 April 2025, CS-CMS-LETT-003

South African Weather Service

Historical rainfall map, October 2023

Historical rainfall map, December 2023

Historical rainfall map, January 2024

Historical rainfall map, January 2025

Historical rainfall map, April 2025

Historical rainfall map, June 2025

Historical rainfall map, July 2025

Historical rainfall map, September 2025

Annexure A: UN IGRAC methodology of groundwater level trend analysis