



**water & sanitation**

Department:  
Water and Sanitation  
REPUBLIC OF SOUTH AFRICA



# **REVIEW, EVALUATION AND OPTIMISATION OF THE SOUTH AFRICAN WATER RESOURCES MONITORING NETWORK**

## **Network Inventory**

## **VOLUME 2: MAP BOOK**

## **DRAFT**

**MARCH 2015**





Obtainable from

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Department: Water and Sanitation

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## PREFACE

*The Department of Water and Sanitation (DWS) is the custodian of ten national monitoring programmes. The overall aim of this project is to undertake an evaluation of each monitoring network, in its present condition, and to redesign and realign the network based on scientific analysis and the strategic and management objectives of DWS and of the country as a whole. The water resources monitoring network will be optimised to ensure sustainable, relevant and up-to-date data of an acceptable quality*

*This Network Inventory Task focussed on the production of maps to illustrate the spatial distribution of the existing monitoring stations for these ten monitoring programmes. The deliverable from this Network Inventory task, together the User Requirements Task will be used to identify shortcomings in the current networks.*

*The metadata from each of the ten monitoring networks was analysed and descriptive labels were developed for each station to describe the temporal information (record period), open/closed, completeness, etc.*

*This task was undertaken by a team of specialists, one for each of the following categories of data:*

- Surface water quantity.*
- Surface water quality.*
- Groundwater levels and quality.*
- Biophysical Data*
- Hydro-meteorology*

*This was followed by the development of five thematic maps with information on the spatial distribution of these ten monitoring points per new Water Management Area (WMA) have been compiled. Even though other institutions in South Africa are also collecting surface water, groundwater, Hydro-meteorological, water quality, eco-health, mostly for their own interests and applications, only the Hydro-meteorological networks of ARC and SAWS data were included on these maps since these data are used daily by DWS. Due to an abundance of groundwater stations in a number of WMA's, station numbers, rather than the detailed developed labels, were adopted for labelling the groundwater maps. The detailed groundwater labels are included as Appendix A.*

*The thematic Maps produced per nine WMA's are as follows:*

*A2-size maps were developed for the nine new WMAs per data category, as follows:*

- 1) Limpopo WMA*
- 2) Olifants WMA*
- 3) Inkomati-Usuthu WMA*
- 4) Pongola-Mtamvuna WMA*
- 5) Vaal WMA*
- 6) Orange WMA*
- 7) Mzimvubu-Tsitskamma WMA*
- 8) Breede-Gouritz WMA*
- 9) Berg-Olifants WMA.*

*Other products developed as part of this Task are data catalogues and Google Earth KMZ-coverages which are very useful to the DWS, external users and to the project team during the new network design.*

*Subsequent to the completion of the Network Inventory and User Requirements tasks, the Data integrity assessment task will continue to determine the quality of the available data.*

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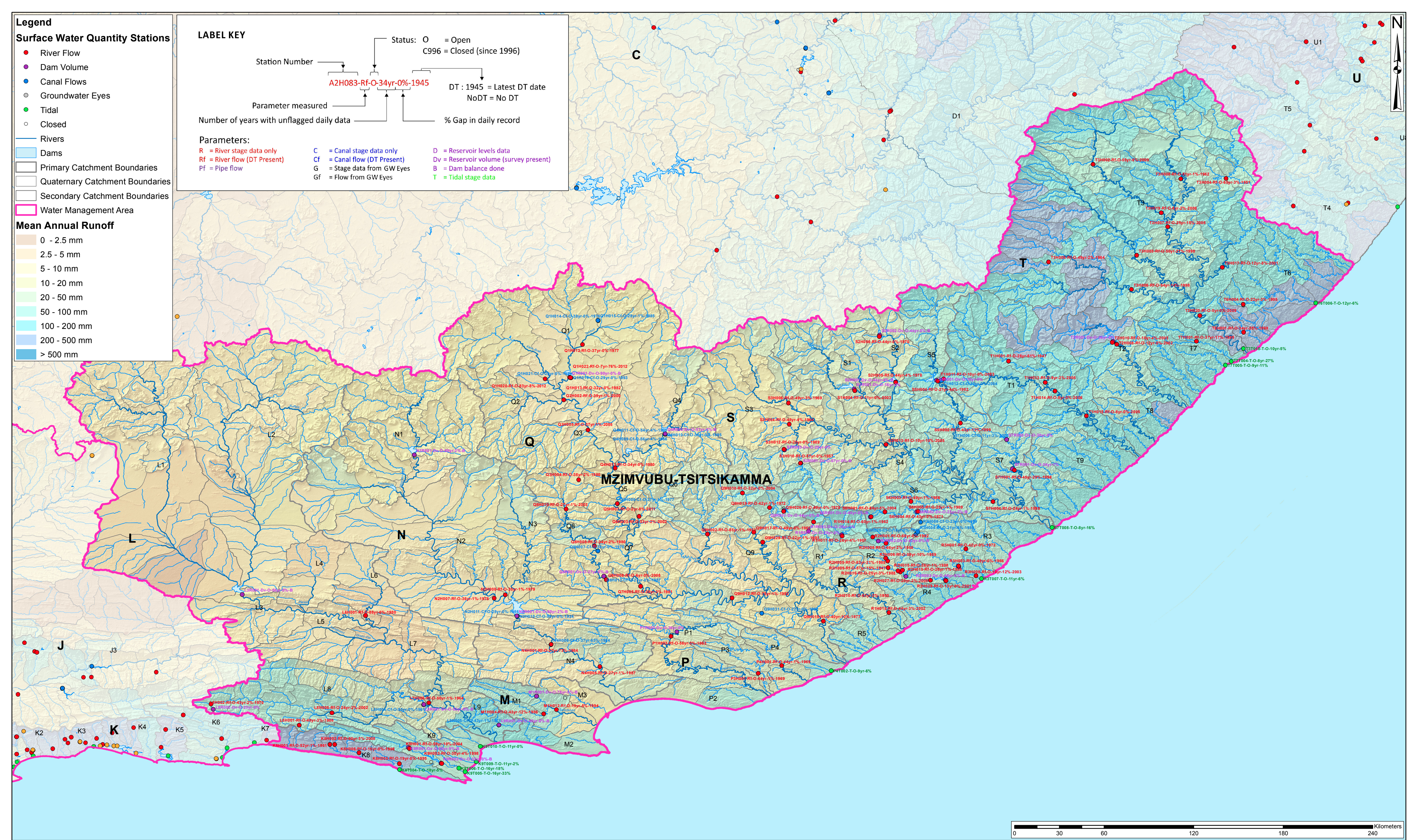
## **Appendix A**

Detailed Groundwater Level and Quality Monitoring Station Labels

**WMA 7:**

**Mzimvubu-Tsitsikamma**





Project Title: **Review, Evaluation and Optimisation of the South African Water Resources Monitoring Network**

Map Title: **WMA 7 - Mzimvubu-Tsitsikamma: Surface Water Quantity Monitoring Stations**

Scale 1:1 600 000  
(When page size is: A2 landscape)

Projection: Geographic  
Datum: Hartebeesthoek 1994

Sources:  
DWS: Water Information Management  
Water Resources of South Africa 2005 (WRC)

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**Legend**

**Surface Water Quality Stations**

- River Flow
- Dam Volume
- Canal Flows
- Groundwater Eyes
- Tidal
- Closed
- Rivers
- Dams
- Primary Catchment Boundaries
- Secondary Catchment Boundaries
- Quaternary Catchment Boundaries
- Water Management Area

**Mean Annual Runoff**

- 0 - 2.5 mm
- 2.5 - 5 mm
- 5 - 10 mm
- 10 - 20 mm
- 20 - 50 mm
- 50 - 100 mm
- 100 - 200 mm
- 200 - 500 mm
- > 500 mm

**LABEL KEY**

Station Number (HYDSTRA or WMS) | CPO-V15-F4W|EuC|MO-V4-FW

Maximum number of samples

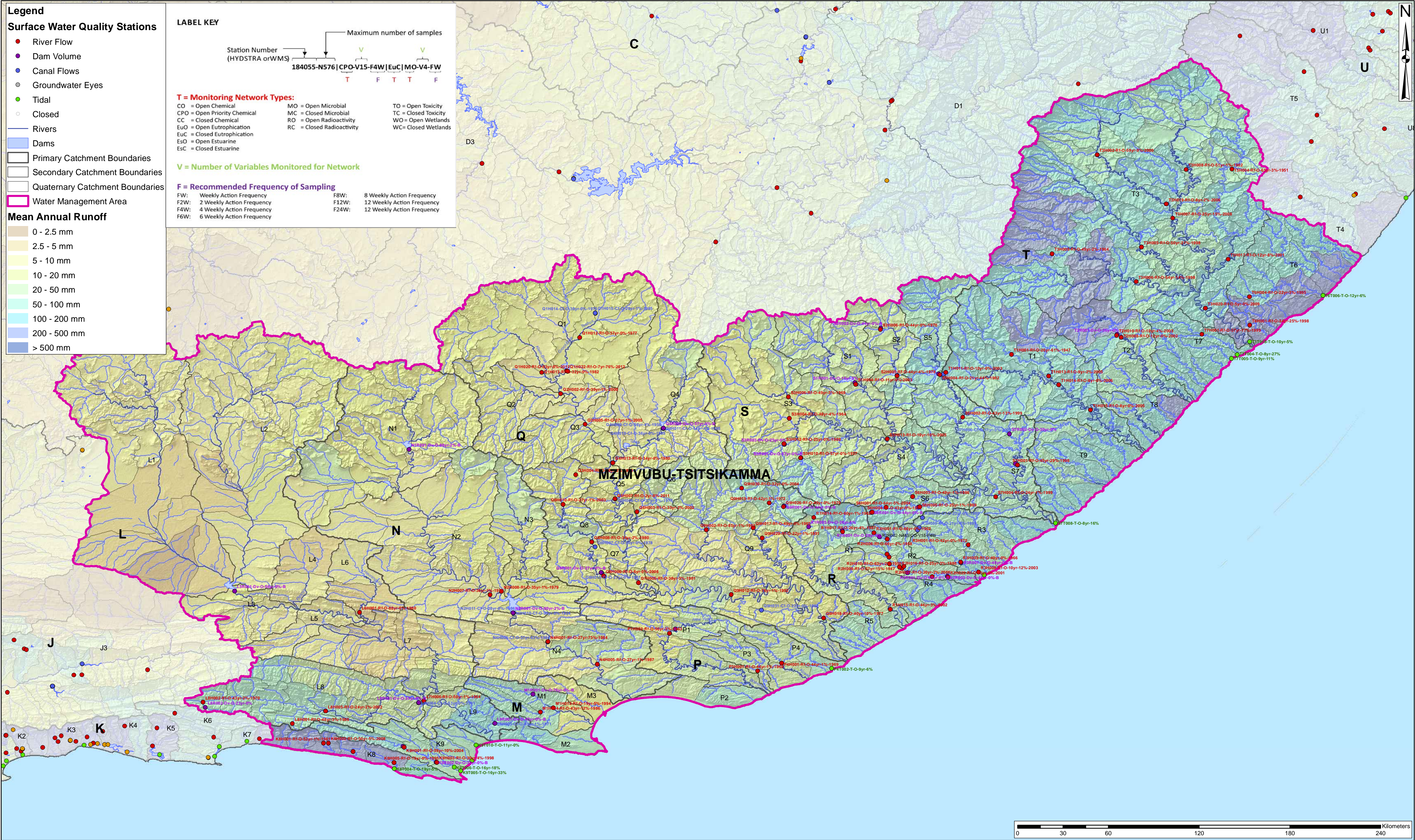
**T = Monitoring Network Types:**

CO = Open Chemical	MO = Open Microbial	TO = Open Toxicity
CPO = Open Priority Chemical	MC = Closed Microbial	TC = Closed Toxicity
CC = Closed Chemical	RO = Open Radioactivity	WO = Open Wetlands
EuC = Open Eutrophication	RC = Closed Radioactivity	WC = Closed Wetlands
ES = Closed Eutrophication		
ES = Open Estuarine		
ESC = Closed Estuarine		

**V = Number of Variables Monitored for Network**

**F = Recommended Frequency of Sampling**

FW: Weekly Action Frequency	F8W: 8 Weekly Action Frequency
F2W: 2 Weekly Action Frequency	F12W: 12 Weekly Action Frequency
F4W: 4 Weekly Action Frequency	F24W: 12 Weekly Action Frequency
F6W: 6 Weekly Action Frequency	



Project Title: **Review, Evaluation and Optimisation of the South African Water Resources Monitoring Network**

Scale 1:1 600 000  
(When page size is: A2 landscape)

**Figure 7.2**

Map Title: **WMA 7 - Mzimvubu-Tsitsikamma: Surface Water Quality Monitoring Stations**

Projection: Geographic	Sources: DWS: Water Information Management Water Resources of South Africa 2005 (WRC)
Datum: Hartbeesthoek 1994	
Compiled By: LC Gallagher	
GIS QC By: M Storie - PGP 0124	
Approved By: E Van Niekerk	
Date Saved: 2015/03/16	
Project Number: 60326707	
Map Ref: SW_Quality_Mzim_Tsitsi_A2L.mxd	
Revision: 01	

Whilst every care has been taken in compiling the information on this map, AECOM cannot accept responsibility for any inaccuracies.

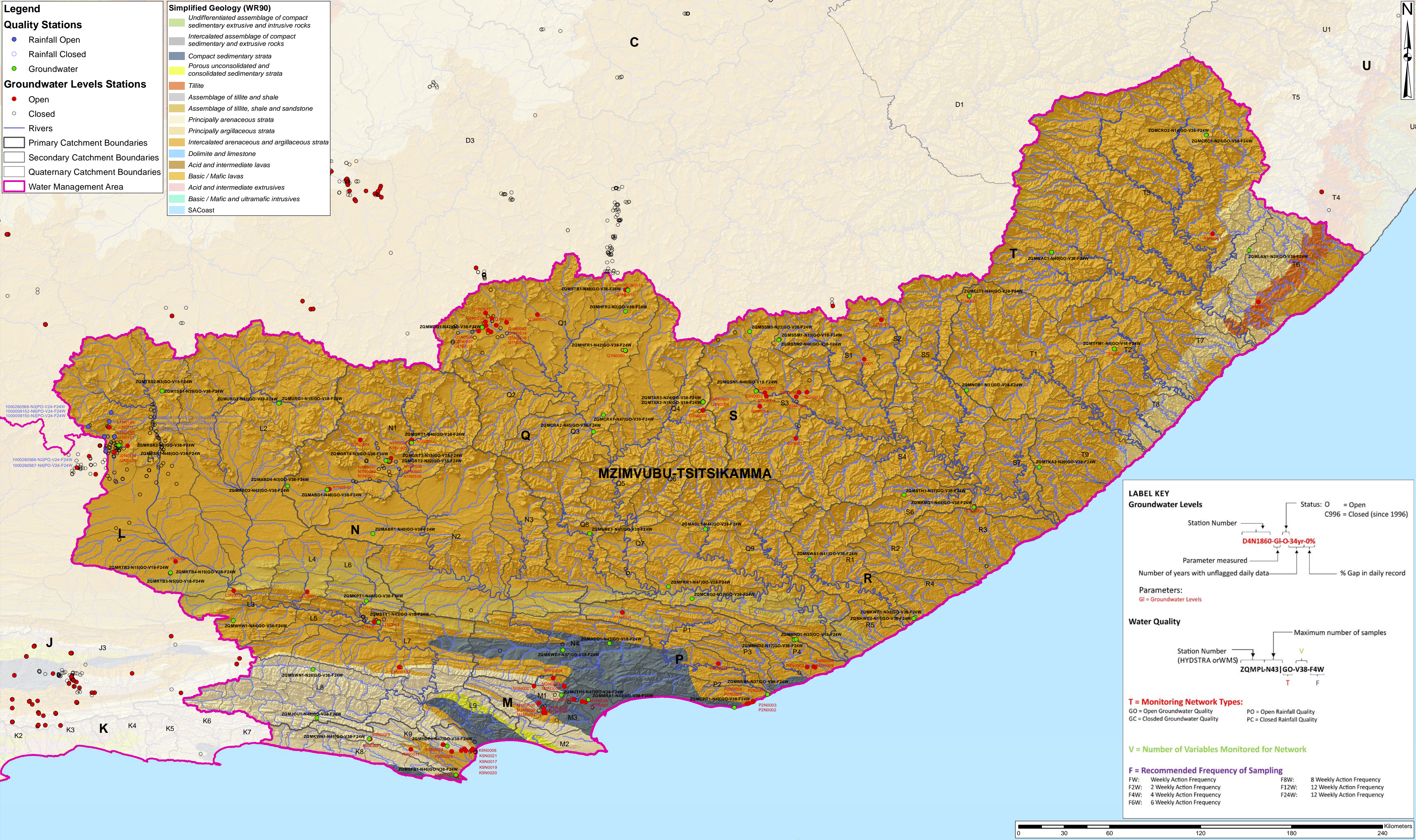
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- Legend**
- Quality Stations**
- Rainfall Open
  - Rainfall Closed
  - Groundwater
- Groundwater Levels Stations**
- Open
  - Closed
- Rivers
- Primary Catchment Boundaries
  - Secondary Catchment Boundaries
  - Quaternary Catchment Boundaries
  - Water Management Area

- Simplified Geology (WR90)**
- Undifferentiated assemblage of compact sedimentary extrusive and intrusive rocks
  - Intercalated assemblage of compact sedimentary and extrusive rocks
  - Compact sedimentary strata
  - Porous unconsolidated and consolidated sedimentary strata
  - Tillite
  - Assemblage of tillite and shale
  - Assemblage of tillite, shale and sandstone
  - Principally arenaceous strata
  - Principally argillaceous strata
  - Intercalated arenaceous and argillaceous strata
  - Dolomite and limestone
  - Acid and intermediate lavas
  - Basic / Mafic lavas
  - Acid and intermediate extrusives
  - Basic / Mafic and ultramafic intrusives
  - SACoast



**LABEL KEY**

**Groundwater Levels**

Station Number: **D4N1860-GI-O-34yr-0%**

Parameter measured: GI = Groundwater Levels

Number of years with unflagged daily data: 34

% Gap in daily record: 0%

Status: O = Open, C996 = Closed (since 1996)

**Water Quality**

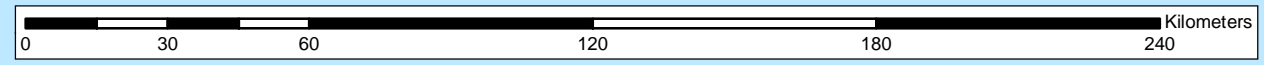
Station Number (HYDSTRA or WMS): **ZQMPL-N43|GO-V38-F4W**

Maximum number of samples: 4

T = Monitoring Network Types: GO = Open Groundwater Quality, GC = Closed Groundwater Quality, PO = Open Rainfall Quality, PC = Closed Rainfall Quality

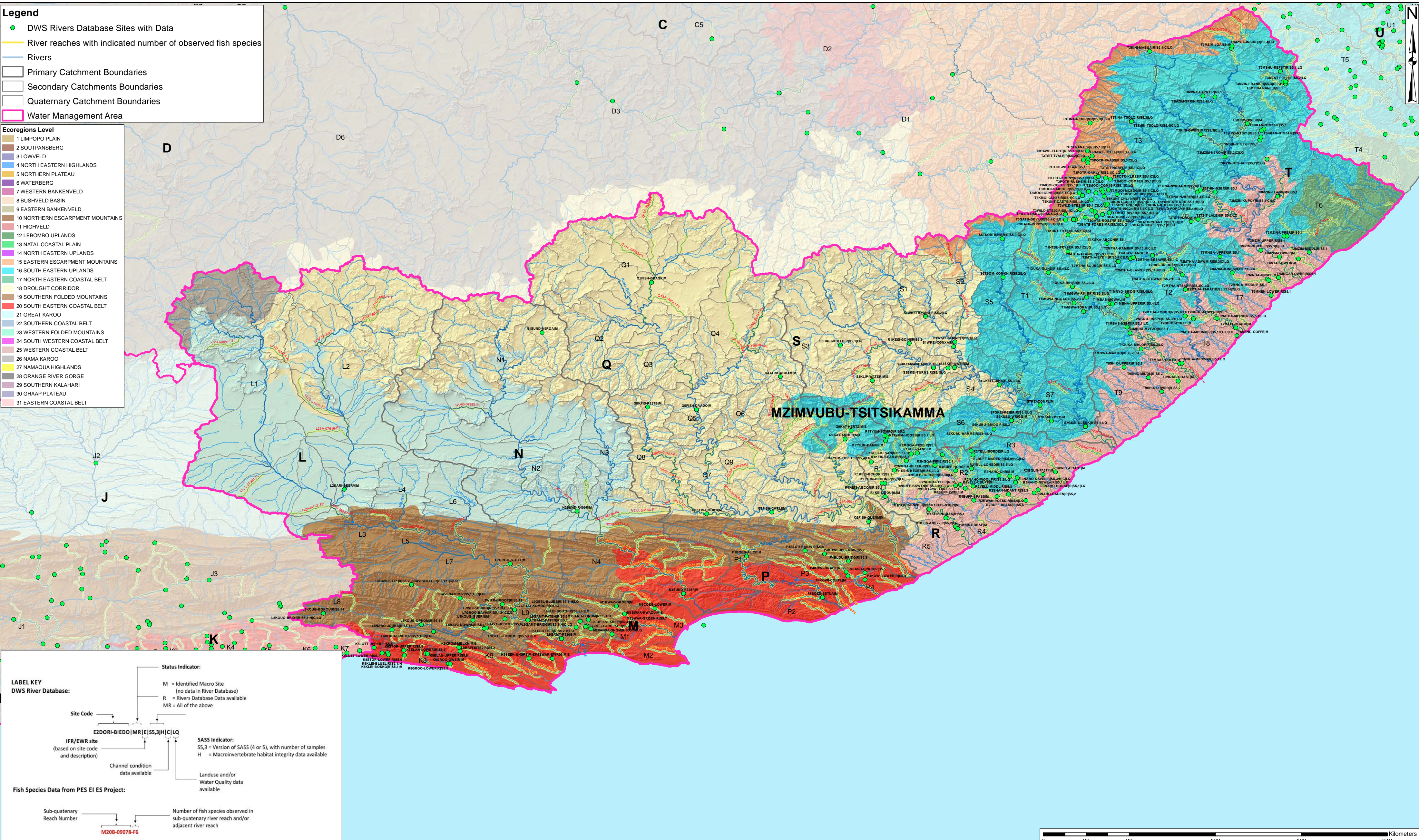
V = Number of Variables Monitored for Network: 3

F = Recommended Frequency of Sampling: FW = Weekly Action Frequency, F2W = 2 Weekly Action Frequency, F4W = 4 Weekly Action Frequency, F6W = 6 Weekly Action Frequency, F8W = 8 Weekly Action Frequency, F12W = 12 Weekly Action Frequency, F24W = 12 Weekly Action Frequency



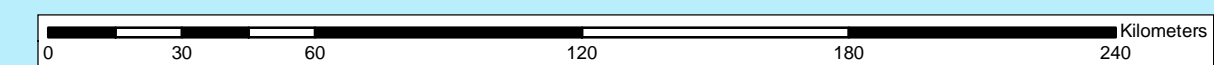
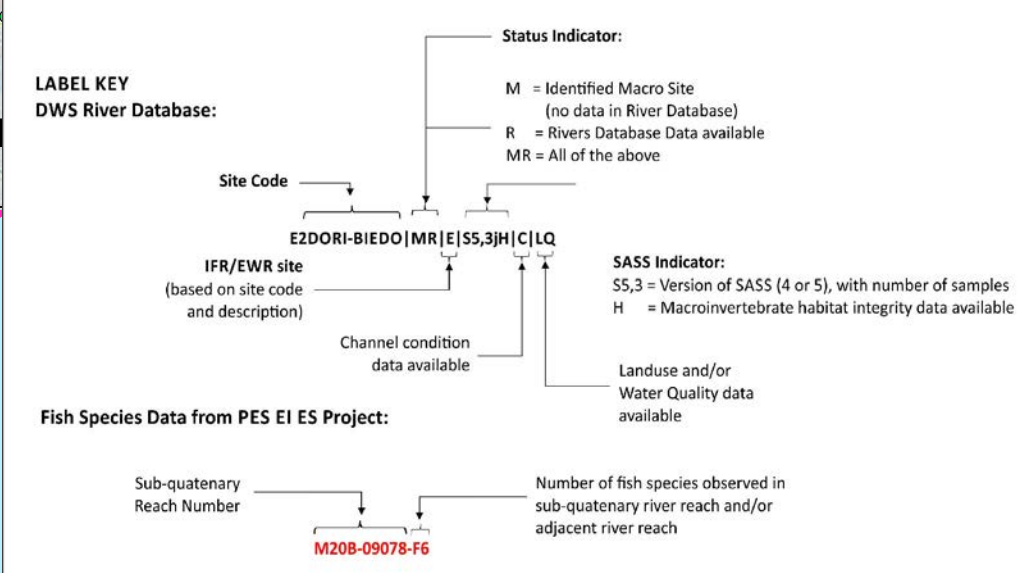
Project Title:	<b>Review, Evaluation and Optimisation of the South African Water Resources Monitoring Network</b>		Scale 1:1 600 000 (When page size is: A2 landscape)	<b>Figure 7.3</b>
Map Title:	<b>WMA 7 - Mzimvubu-Tsitsikamma: Groundwater Quality and Water Level Monitoring Stations</b>		Projection: Geographic Datum: Hartebeesthoek 1994	Sources: DWS: Water Information Management Water Resources of South Africa 2005 (WRC)
Compiled By: LC Gallagher GIS QC By: M Storie - PGP 0124 Approved By: E Van Niekerk Date Saved: 2015/03/16 Project Number: 60326707 Map Ref: GWQuality_Mzim_Tsitsi_A2L.mxd Revision: 01			Whilst every care has been taken in compiling the information on this map, AECOM cannot accept responsibility for any inaccuracies. © Copyright	





- Legend**
- DWS Rivers Database Sites with Data
  - River reaches with indicated number of observed fish species
  - Rivers
  - Primary Catchment Boundaries
  - Secondary Catchments Boundaries
  - Quaternary Catchment Boundaries
  - Water Management Area

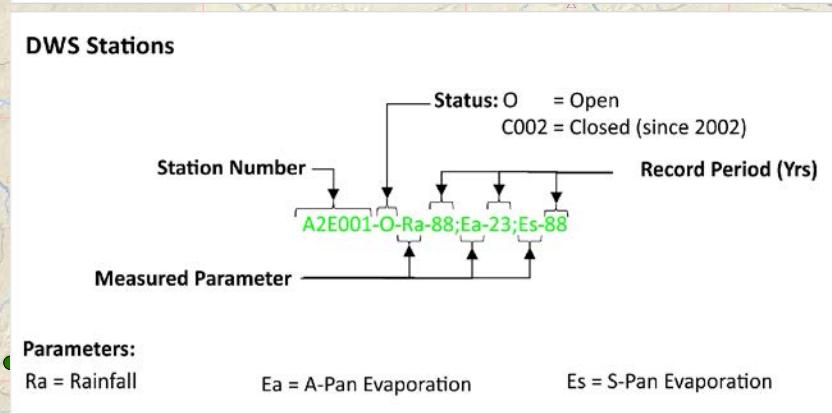
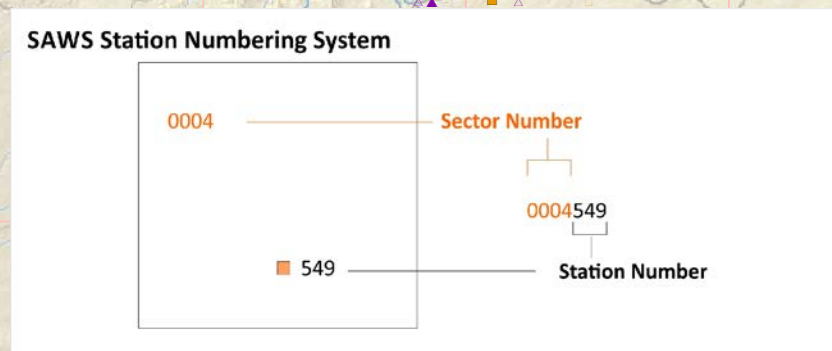
- Ecoregions Level**
- 1 LIMPOPO PLAIN
  - 2 SOUTPANSBERG
  - 3 LOWVELD
  - 4 NORTH EASTERN HIGHLANDS
  - 5 NORTHERN PLATEAU
  - 6 WATERBERG
  - 7 WESTERN BANKENVELD
  - 8 BUSHVELD BASIN
  - 9 EASTERN BANKENVELD
  - 10 NORTHERN ESCARPMENT MOUNTAINS
  - 11 HIGHLAND
  - 12 LEBOMBO UPLANDS
  - 13 NATAL COASTAL PLAIN
  - 14 NORTH EASTERN UPLANDS
  - 15 EASTERN ESCARPMENT MOUNTAINS
  - 16 SOUTH EASTERN UPLANDS
  - 17 NORTH EASTERN COASTAL BELT
  - 18 DROUGHT CORRIDOR
  - 19 SOUTHERN FOLDED MOUNTAINS
  - 20 SOUTH EASTERN COASTAL BELT
  - 21 GREAT KAROO
  - 22 SOUTHERN COASTAL BELT
  - 23 WESTERN FOLDED MOUNTAINS
  - 24 SOUTH WESTERN COASTAL BELT
  - 25 WESTERN COASTAL BELT
  - 26 NAMA KAROO
  - 27 NAMAQUA HIGHLANDS
  - 28 ORANGE RIVER GORGE
  - 29 SOUTHERN KALAHARI
  - 30 GHAAP PLATEAU
  - 31 EASTERN COASTAL BELT



<b>Project Title:</b>	<b>Review, Evaluation and Optimisation of the South African Water Resources Monitoring Network</b>	<b>Scale 1:1 700 000</b> (When page size is: A2 landscape)	<b>Figure 7.4</b>
<b>Map Title:</b>	<b>WMA 7 - Mzimvubu-Tsitsikamma: Biophysical Monitoring Stations</b>	<b>Projection:</b> Geographic <b>Datum:</b> Hartebeesthoek 1994	<b>Sources:</b> DWS: Water Information Management Water Resources of South Africa 2005 (WRC) Desktop PES, EI + ES (DWS, 2014)
Whilst every care has been taken in compiling the information on this map, AECOM cannot accept responsibility for any inaccuracies.		<b>Compiled By:</b> LC Gallagher <b>GIS QC By:</b> M Storie - PGP 0124 <b>Approved By:</b> E van Niekerk <b>Date Saved:</b> 2015/03/17 <b>Project Number:</b> 60326707 <b>Map Ref:</b> Biophysical_Mzimvubu_Tsitsi_A2L.mxd <b>Revision:</b> 01	
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**Legend**

**DWS Climate Stations**

- Open
- Closed

**ARC Meteorological Stations**

- ▲ Open (Data Post - 2010)
- Closed

**SAWS Rainfall Stations**

- Open
- Closed

— Rivers

— Dams

— SAWS Sector

— Primary Catchment Boundaries

— Secondary Catchment Boundaries

— Quaternary Catchment Boundaries

— Water Management Area

**Mean Annual Precipitation**

- 0 - 100 mm
- 101 - 200 mm
- 201 - 300 mm
- 301 - 400 mm
- 401 - 500 mm
- 501 - 600 mm
- 601 - 700 mm
- 701 - 800 mm
- 801 - 1 000 mm
- > 1 000 mm

Project Title: **Review, Evaluation and Optimisation of the South African Water Resources Monitoring Network**

Map Title: **WMA 7 - Mzimvubu-Tsitsikamma: Hydro-meteorological Monitoring Stations**

**Scale 1:1 600 000**  
(When page size is: A2 landscape)

Projection: Geographic  
Datum: Hartebeesthoek 1994

Compiled By: LC Gallagher  
GIS QC By: M Storie - PGP 0124  
Approved By: E Van Niekerk  
Date Saved: 2015/03/16  
Project Number: 60326707  
Map Ref: CMN\_Mzimvubu\_Tsitsikamma\_A2L.mxd  
Revision: 01

**Sources:**  
DWS: Water Information Management  
Water Resources of South Africa 2005 (WRC)  
Agricultural Research Council (ARC)

**Figure 7.5**

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**APPENDIX A:**  
**Detailed Groundwater Level and Quality**  
**Monitoring Station Labels**

**WMA 7: Mzimvubu-Tsitsikamma**

**WMA 7 - Mzimvubu-Tsitsikamma: Groundwater Level and Quality Monitoring Stations**

Station	Name	Catchment	Province	Label
T3N0001	Ntabankulu	T33H	EC	T3N0001-GI-O-1yrs-11%
T6N0001	Lusikisiki	T60F	EC	T6N0001-GI-O-2yrs-9%
Q1N0518	Steynsburg	Q12B	EC	Q1N0518-GI-O-4yrs-11%
Q1N0519	Steynsburg	Q12B	EC	Q1N0519-GI-O-4yrs-8%
Q1N0042	Bultfontyn Ged. Matjieskloof - Middelburg	Q14B	EC	Q1N0042-GI-O-36yrs-3%
Q1N0050	Grootfontein - Middelburg	Q14	EC	Q1N0050-GI-O-55yrs-0%
Q1N0507	Middelburg	Q14B	EC	Q1N0507-GI-O-48yrs-0%
Q1N0508	Middelburg Munisipaliteit	Q14B	EC	Q1N0508-GI-O-27yrs-1%
Q1N0511	Middelburg	Q14B	EC	Q1N0511-GI-O-1yrs-12%
Q1N0514	Middelburg	Q14B	EC	Q1N0514-GI-O-1yrs-2%
Q1N0515	Middelburg	Q14B	EC	Q1N0515-GI-O-1yrs-2%
Q1N0516	Middelburg	Q14B	EC	Q1N0516-GI-O-1yrs-2%
Q1N0517	Middelburg	Q14B	EC	Q1N0517-GI-O-1yrs-2%
T1N0001	Elliot	T11A	EC	T1N0001-GI-O-2yrs-10%
Q1N0513	Middelburg	Q11D	EC	Q1N0513-GI-O-1yrs-2%
S2N0001	Indwe	S20A	EC	S2N0001-GI-O-2yrs-20%
Q1N0512	Middelburg	Q14C	EC	Q1N0512-GI-O-1yrs-2%
T2N0001	Yersey Farm	S20C	EC	T2N0001-GI-O-8yrs-0%
Q1N0060	Struys Vogel's Leegee Ged. Avondglooi	Q13A	EC	Q1N0060-GI-O-30yrs-1%
S1N0001	Lady Frere	S10G	EC	S1N0001-GI-O-2yrs-31%
S3N0001	Turveys Post	S31E	EC	S3N0001-GI-O-34yrs-1%
S3N0002	Lehmans Drift	S31E	EC	S3N0002-GI-O-34yrs-0%
S3N0003	Hopefield	S31E	EC	S3N0003-GI-O-34yrs-0%
S3N0010	Queenstown Commonage	S31F	EC	S3N0010-GI-O-34yrs-2%
S3N0016	Queenstown	S31F	EC	S3N0016-GI-O-1yrs-15%
Q4N0002	Tarkastad Municipality	Q41C	EC	Q4N0002-GI-O-30yrs-1%
Q4N0003	Tarkastad Golden Valley	Q41C	EC	Q4N0003-GI-O-22yrs-0%
Q4N0004	Tarkastad Municipality at Golden Valley Nr. 129	Q41C	EC	Q4N0004-GI-O-6yrs-5%
S3N0008	Galla Hill Ged. Peninsula	S31G	EC	S3N0008-GI-O-34yrs-0%
N1N0021	Graaff Reinet Allotment Area	N11B	EC	N1N0021-GI-O-31yrs-0%
N1N0022	Graaff-Reinet Allotment Area	N11B	EC	N1N0022-GI-O-30yrs-0%
S3N0014	Thornhill at Queenstown	S32C	EC	S3N0014-GI-O-8yrs-5%
N1N0025	Grasrand - Graaff Reinet	N13A	EC	N1N0025-GI-O-29yrs-0%
N1N0091	Grasrand - Graaff Reinet	N13A	EC	N1N0091-GI-O-25yrs-1%
N1N0092	Grasrand - Graaff Reinet	N13A	EC	N1N0092-GI-O-25yrs-0%
N1N0503	Grasrand - Graaff Reinet	N13A	EC	N1N0503-GI-O-21yrs-0%
N1N0505	Grasrand (Mimosadale)	N13A	EC	N1N0505-GI-O-21yrs-1%
N1N0506	Grasrand - Graaff Reinet	N13A	EC	N1N0506-GI-O-24yrs-0%
N1N0507	Grasrand - Graaff Reinet	N13A	EC	N1N0507-GI-O-24yrs-1%
J2N0109	Plaatdoorns	L11F	WC	J2N0109-GI-O-29yrs-0%
J2N0111	Rhenosterkop	L11F	WC	J2N0111-GI-O-30yrs-0%
J2N0114	Speelmans Kuil	L11F	WC	J2N0114-GI-O-10yrs-0%
L1N0146	De Hoop	L11F	WC	L1N0146-GI-O-9yrs-0%
L1N0150	De Hoop	L11F	WC	L1N0150-GI-O-9yrs-0%
L1N0151	Rhenosterkop	L11F	WC	L1N0151-GI-O-9yrs-0%
N1N0504	Grasrand - Graaff Reinet	N13B	EC	N1N0504-GI-O-21yrs-1%
S3N0017	Whittlesea	S32G	EC	S3N0017-GI-O-2yrs-25%
S7N0002	Komga Mincipality	S70A	EC	S7N0002-GI-O-29yrs-0%
N1N0510	Aberdeen	N14B	EC	N1N0510-GI-O-1yrs-10%
L1N0168	Rietbron	L12C	EC	L1N0168-GI-O-1yrs-0%
L4N0001	Miller	L40B	EC	L4N0001-GI-O-2yrs-0%
L3N0001	Beervleidam	L30C	EC	L3N0001-GI-O-4yrs-4%
P1N0504	Kuduskop	P10C	EC	P1N0504-GI-O-5yrs-13%
L7N0013	Steytlerville	L70D	EC	L7N0013-GI-O-2yrs-0%
L7N0011	Steytlerville	L70B	EC	L7N0011-GI-O-2yrs-0%
L7N0014	Steytlerville	L70B	EC	L7N0014-GI-O-2yrs-0%
P1N0502	Birchleigh Ged. Eschol	P10F	EC	P1N0502-GI-O-19yrs-1%
P4N0008	Port Alfred	P40D	EC	P4N0008-GI-O-1yrs-23%
P4N0009	Port Alfred	P40D	EC	P4N0009-GI-O-1yrs-13%
P4N0003	Grove Hill - Bathurst	P40C	EC	P4N0003-GI-O-35yrs-1%
M3N0002	Prentice Kraal PK 7	M30	EC	M3N0002-GI-O-46yrs-13%
M3N0003	Prentice Kraal PK 22	M30	EC	M3N0003-GI-O-46yrs-12%
M3N0004	Elandshoorn	M30	EC	M3N0004-GI-O-46yrs-1%
M3N0005	Rietheuvel - Uitenhage	M30	EC	M3N0005-GI-O-35yrs-6%
M1N0003	Mimosadale West Uitenhage	M10C	EC	M1N0003-GI-O-43yrs-0%
M1N0004	Wincanton Kloof Ged. Wincanton	M10C	EC	M1N0004-GI-O-37yrs-0%
M1N0034	Kruis Rivier Ged. Springfield - Uitenhage	M10C	EC	M1N0034-GI-O-31yrs-0%
M1N0036	Kruis Rivier KR 16 - Uitenhage	M10C	EC	M1N0036-GI-O-26yrs-1%
M1N0038	Kruis Rivier _ Uitenhage	M10C	EC	M1N0038-GI-O-21yrs-2%

**WMA 7 - Mzimvubu-Tsitsikamma: Groundwater Level and Quality Monitoring Stations**

Station	Name	Catchment	Province	Label
M3N0001	Prentice Kraal Ged. Rondalia	M30	EC	M3N0001-GI-O-49yrs-2%
M3N0006	Welbedachtsfontein Ged. Greenhills Uitenhage	M30	EC	M3N0006-GI-O-46yrs-1%
M3N0007	Welbedachtsfontein Ged. Dalby Park - Uitenhage	M30	EC	M3N0007-GI-O-12yrs-8%
P2N0001	Boesmans River Mouth	P10	EC	P2N0001-GI-O-28yrs-2%
P2N0002	Cannon Rocks	P20A	EC	P2N0002-GI-O-1yrs-8%
P2N0003	Cannon Rocks	P20A	EC	P2N0003-GI-O-1yrs-0%
P2N0004	Cannon Rocks	P20A	EC	P2N0004-GI-O-1yrs-0%
P2N0005	Cannon Rocks	P20A	EC	P2N0005-GI-O-1yrs-10%
K9N0006	Jeffreys Bay Municipality	K90G	EC	K9N0006-GI-O-29yrs-1%
K9N0017	Jeffreys Bay Municipality	K90G	EC	K9N0017-GI-O-21yrs-0%
K9N0029	Kareedouw Municipality	K90B	EC	K9N0029-GI-O-23yrs-1%
K9N0030	Kareedouw Ptn. Kareedouw Municipality	K90B	EC	K9N0030-GI-O-23yrs-3%
K9N0019	Mentors Kraal	K90	EC	K9N0019-GI-O-21yrs-2%
K9N0020	Mentors Kraal	K90F	EC	K9N0020-GI-O-21yrs-2%
K9N0021	Farm 337 Ged. The Burns	K90F	EC	K9N0021-GI-O-21yrs-2%
K9N0024	Farm 371 Ged. Kromrivier Staatsbos(Kareedouwberg)	K90F	EC	K9N0024-GI-O-21yrs-0%
K9N0028	Erf 2 Ged. Kruisfontein	K90F	EC	K9N0028-GI-O-23yrs-0%
K9N0011	Jeffreys Bay Municipality	K90D	EC	K9N0011-GI-O-21yrs-0%
K9N0025	Ongegunde Vryheid Ged. St.Francisbay	K90E	EC	K9N0025-GI-O-24yrs-1%