



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

Chief Directorate: Water Information Management

Department: Water and Sanitation

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PRETORIA

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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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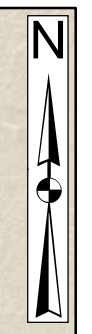
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Appendix A

Detailed Groundwater Level and Quality Monitoring Station Labels

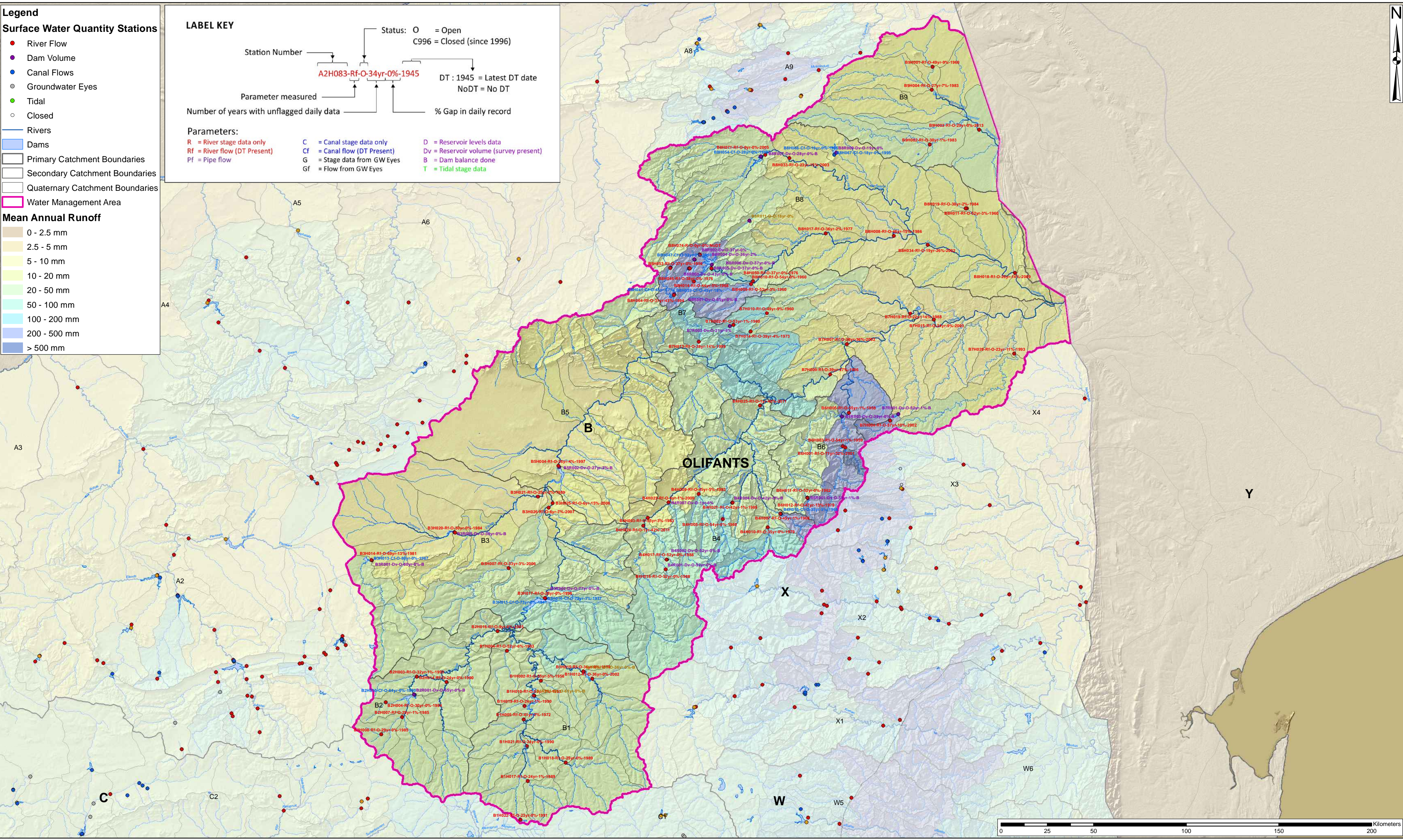
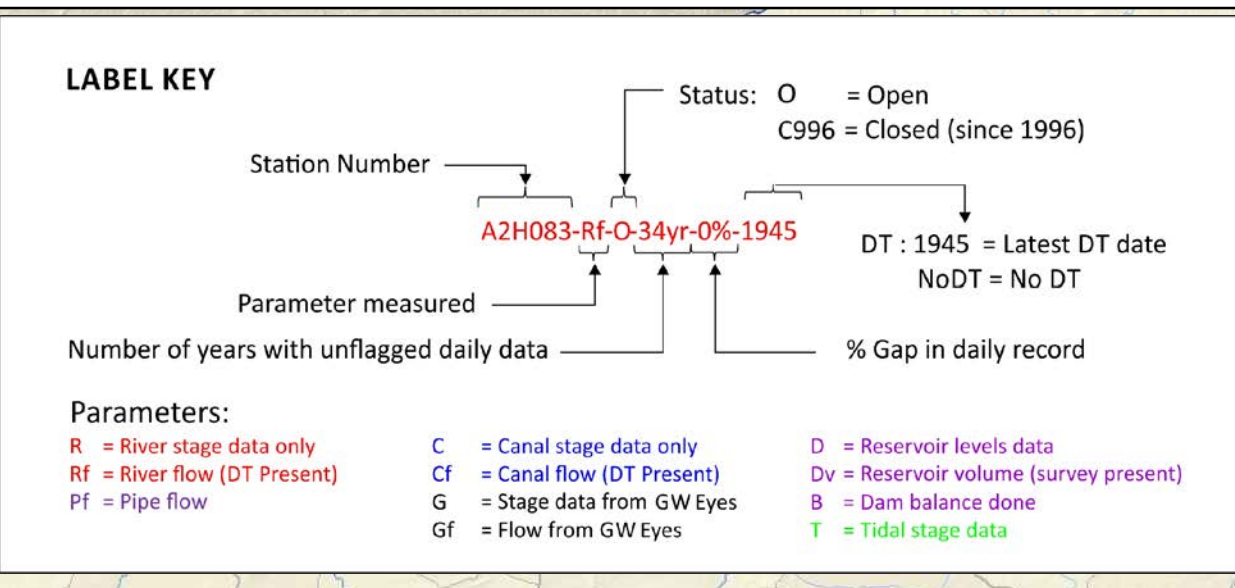
WMA 2:

Olifants



- Legend**
- Surface Water Quantity 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



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

Map Title: **WMA 2 - Olifants: Surface Water Quantity Monitoring Stations**

Scale 1:1 300 000
(When page size is: A2 landscape)

Figure 2.1

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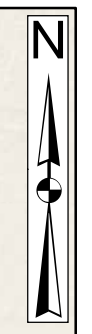
Sources:

Projection: Geographic
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_Quantity_Olifants_A2L.mxd
Revision: 01

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





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

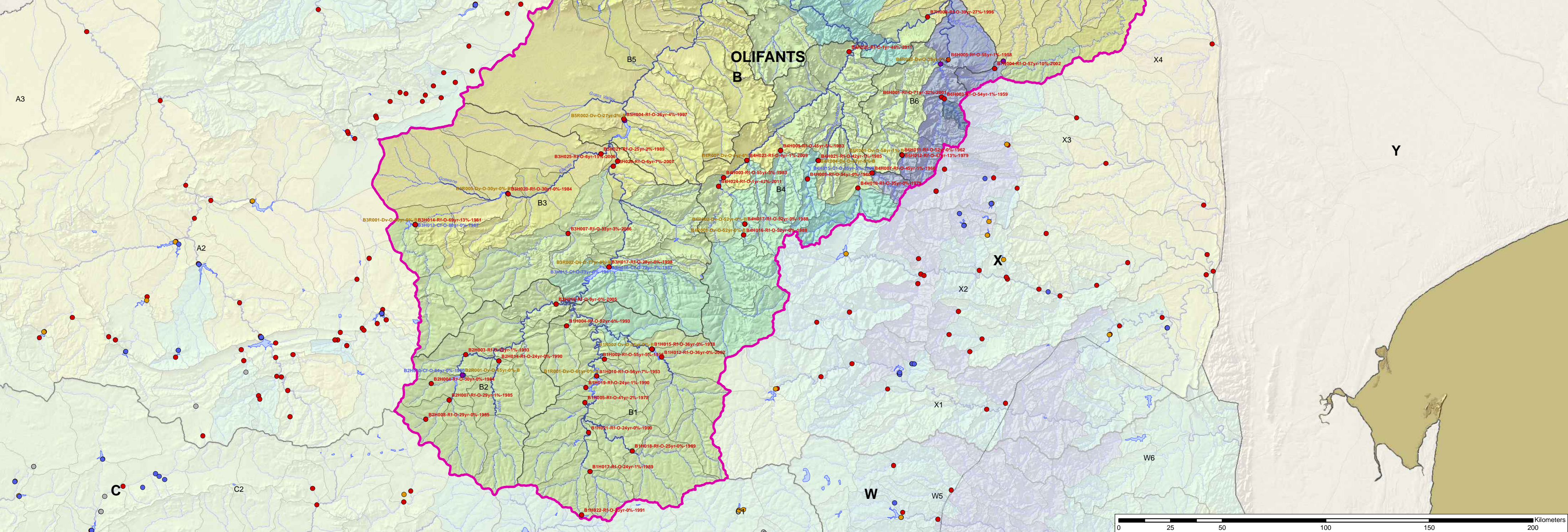
T = Monitoring Network Types:

CO = Open Chemical	MO = Open Microbial	TO = Open Toxicity
CC = Closed Chemical	MC = Closed Microbial	TC = Closed Toxicity
EuO = Open Eutrophication	RO = Open Radioactivity	WO = Open Wetlands
EuC = Closed Eutrophication	RC = Closed Radioactivity	WC = Closed Wetlands
EsO = 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**

Map Title: **WMA 2 - Olifants: Surface Water Quality Monitoring Stations**

Scale 1:1 300 000
(When page size is: A2 landscape)

Projection: Geographic
Datum: Hartbeesthoek 1994

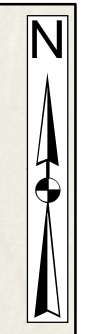
Sources:
DWS: Water Information Management
Water Resources of South Africa 2005 (WRC)

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Map Ref: SW_Quality_Olifants_A2L.mxd
Revision: 01





Legend

Quality Stations

- Open (Blue circle)
- Closed (White circle)
- Groundwater (Green circle)

Groundwater Levels Stations

- Open (Red circle)
- Closed (White circle)

Rivers (Blue line)

Primary Catchment Boundaries (Black outline)

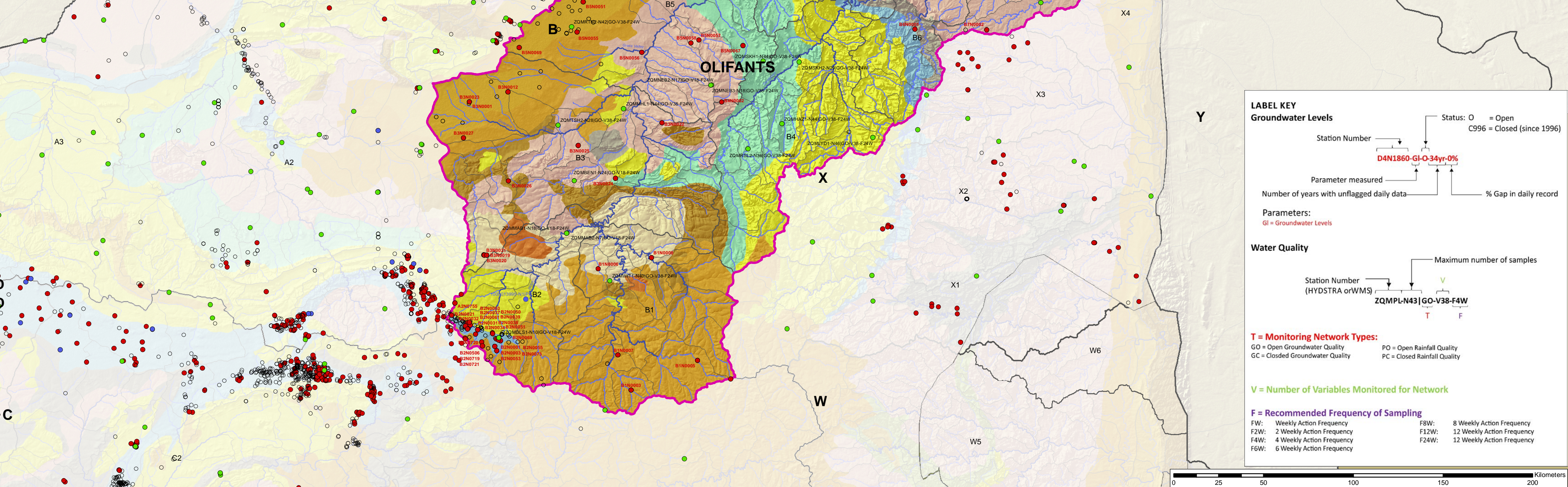
Secondary Catchment Boundaries (Grey outline)

Quaternary Catchment Boundaries (Light grey outline)

Water Management Area (Pink outline)

Simplified Geology (WR90)

- Undifferentiated assemblage of compact sedimentary extrusive and intrusive rocks (Light green)
- Intercalated assemblage of compact sedimentary and extrusive rocks (Light blue)
- Compact sedimentary strata (Light yellow)
- Porous unconsolidated and consolidated sedimentary strata (Light orange)
- Tillite (Light brown)
- Assemblage of tillite and shale (Light grey)
- Assemblage of tillite, shale and sandstone (Light tan)
- Principally arenaceous strata (Light yellow)
- Principally argillaceous strata (Light orange)
- Intercalated arenaceous and argillaceous strata (Light brown)
- Dolomite and limestone (Light blue)
- Acid and intermediate lavas (Light orange)
- Basic / Mafic lavas (Light brown)
- Acid and intermediate extrusives (Light orange)
- Basic / Mafic and ultramafic intrusives (Light green)



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**

Maximum number of samples: **V**

Monitoring Network Types: **T** (Open Groundwater Quality), **F** (Open Rainfall Quality), **GC** (Closed Groundwater Quality), **PC** (Closed Rainfall Quality)

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 1:1 500 000 (When page size is: A2 landscape)	Figure 2.3
Map Title:	WMA 2 - Olifants: Groundwater Quality and Water Level Monitoring Stations	Projection: Geographic Datum: Hartbeesthoek 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_Olifants_A2L.mxd Revision: 01		© Copyright	
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- Legend**
- DWS Rivers Database Sites with Data
 - River reaches with indicated number of observed fish species
 - Rivers
 - Primary Catchment Boundaries
 - Secondary Catchment Boundaries
 - Quaternary Catchment Boundaries
 - Water Management Area

- Ecoregions Level**
- LIMPOPO PLAIN
 - SOUTPANSBERG
 - LOWVELD
 - NORTH EASTERN HIGHLANDS
 - NORTHERN PLATEAU
 - WATERBERG
 - WESTERN BANKENVELD
 - BUSHVELD BASIN
 - EASTERN BANKENVELD
 - NORTHERN ESCARPMENT MOUNTAINS
 - HIGHVELD
 - LEBOMBO UPLANDS
 - NATAL COASTAL PLAIN
 - NORTH EASTERN UPLANDS
 - EASTERN ESCARPMENT MOUNTAINS
 - SOUTH EASTERN UPLANDS
 - NORTH EASTERN COASTAL BELT
 - DROUGHT CORRIDOR
 - SOUTHERN FOLDED MOUNTAINS
 - SOUTH EASTERN COASTAL BELT
 - GREAT KAROO
 - SOUTHERN COASTAL BELT
 - WESTERN FOLDED MOUNTAINS
 - SOUTH WESTERN COASTAL BELT
 - WESTERN COASTAL BELT
 - NAMA KAROO
 - NAMAQUA HIGHLANDS
 - ORANGE RIVER GORGE
 - SOUTHERN KALAHARI
 - GHAAP PLATEAU
 - EASTERN COASTAL BELT

LABEL KEY

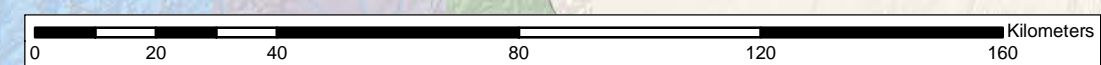
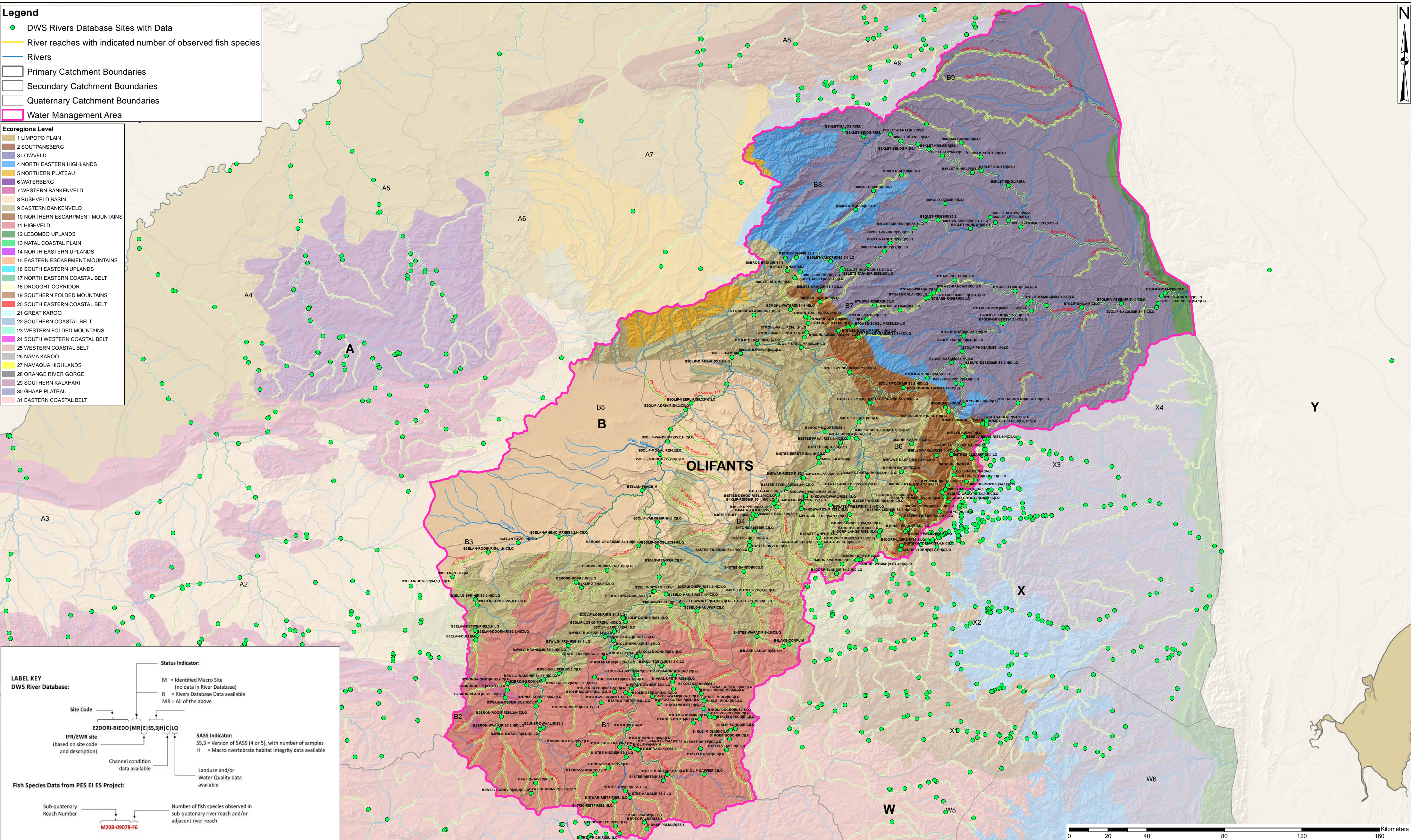
DWS River Database:

Site Code: IFR/EWR site (based on site code and description) | Channel condition data available | SASS Indicator: S5,3 = Version of SASS (4 or 5), with number of samples | H = Macroinvertebrate habitat integrity data available | Landuse and/or Water Quality data available

Status Indicator: M = Identified Macro Site (no data in River Database) | R = Rivers Database Data available | MR = All of the above

Fish Species Data from PES EI ES Project: Sub-quaternary Reach Number | Number of fish species observed in sub-quaternary river reach and/or adjacent river reach

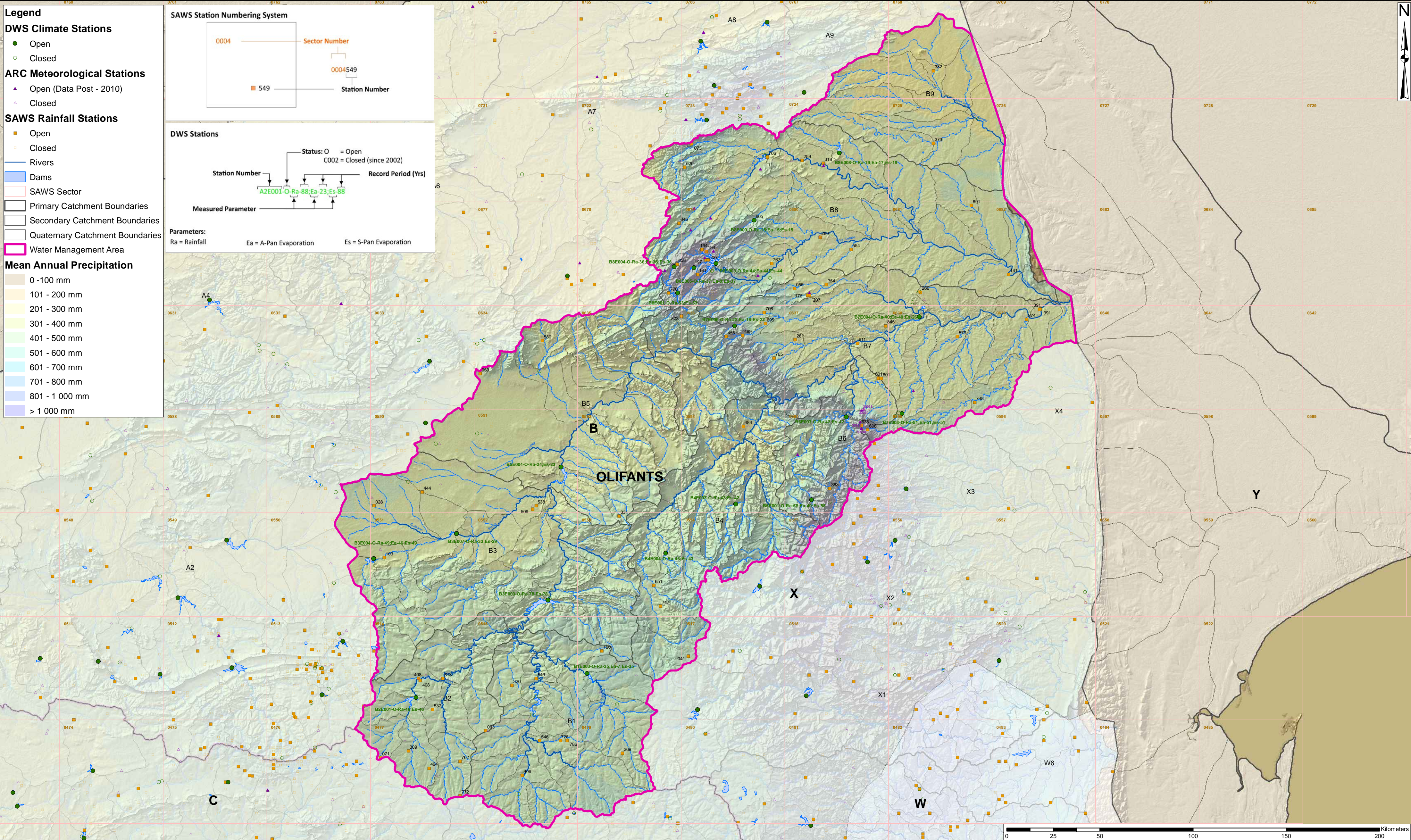
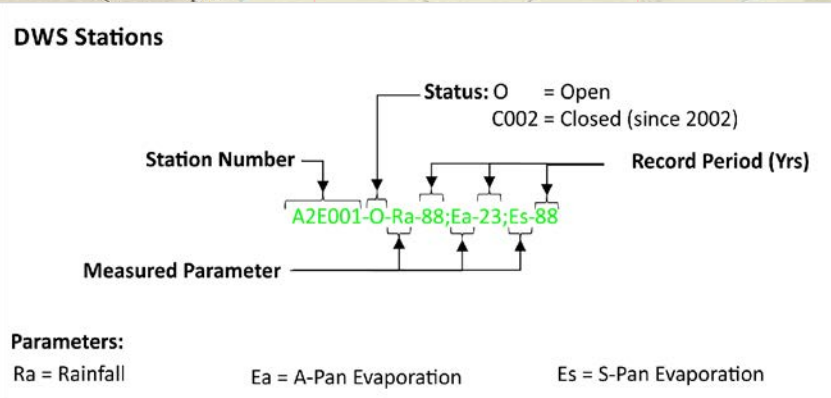
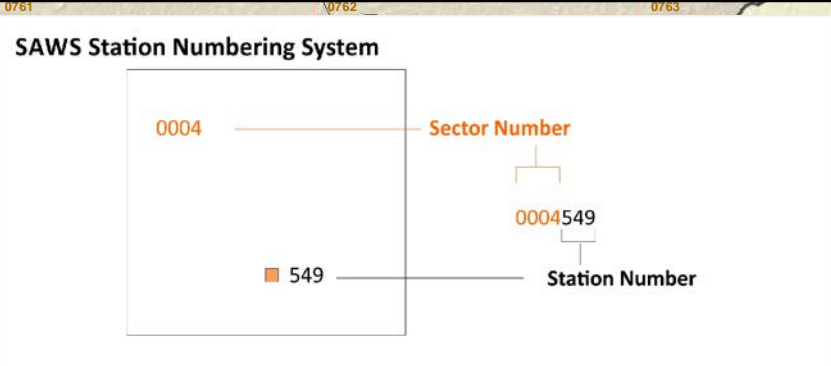
Example: M208-09078-F6



Project Title:	Review, Evaluation and Optimisation of the South African Water Resources Monitoring Network		Scale 1:1 250 000 (When page size is: A2 landscape)	Figure 2.4
Map Title:	WMA 2 - Olifants: Biophysical Monitoring Stations		Projection: Geographic Datum: Hartebeesthoek 1994	Sources: DWS: Water Information Management Water Resources of South Africa 2005 (WRC) Desktop PES, EI + ES (DWS, 2014)
			Compiled By: LC Gallagher GIS QC By: M Storie - PGP 0124 Approved By: E van Niekerk Date Saved: 2015/03/17 Project Number: 60326707 Map Ref: Biophysical_Olifants_A2L.mxd Revision: 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 2 - Olifants: Hydro-meteorological Monitoring Stations**

Scale 1:1 300 000
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Figure 2.5

Projection: Geographic
Datum: Hartbeesthoek 1994

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Project Number: 60326707
Map Ref: CMN_Olifants_A2L.mxd
Revision: 01

Sources:

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

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APPENDIX A:
Detailed Groundwater Level and Quality
Monitoring Station Labels

WMA 2: Olifants

WMA 2 - Olifants: Groundwater Level and Quality Monitoring Stations

Station	Name	Catchment	Province	Label
A9N0009	Hoyandou ptn. Tshidzivhe	A92A	LP	A9N0009-GI-O-8yrs-4%
B5N0011	Portugal	B51G	LP	B5N0011-GI-O-46yrs-2%
B5N0013	Modderfontein	B51G	LP	B5N0013-GI-O-46yrs-2%
C3N0666	Grootkop ptn. Seswikaneng	C33C	NC	C3N0666-GI-O-1yrs-0%
B7N0002	Okkernootboom	B73E	MP	B7N0002-GI-O-11yrs-0%
B6N0001	Clermont ptn Matibidi ptn. Mamorapama	B60D	MP	B6N0001-GI-O-2yrs-0%
B3N0027	Klippan ptn. Mmamethlake	B31E	MP	B3N0027-GI-O-2yrs-0%
B3N0001	Knapp	B31E	LP	B3N0001-GI-O-47yrs-1%
B3N0012	Tuinplaats	B31E	LP	B3N0012-GI-O-38yrs-1%
B3N0023	Knapp ptn. Settlers	B31E	LP	B3N0023-GI-O-3yrs-0%
B3N0022	De Kuil	B31E	LP	B3N0022-GI-O-7yrs-10%
B4N0002	RIETFontein	B41E	LP	B4N0002-GI-O-2yrs-0%
B3N0025	Walkraal ptn. Siyabuswa	B31H	MP	B3N0025-GI-O-2yrs-0%
B3N0024	Kwarrielaagte ptn. Ntwane	B32H	MP	B3N0024-GI-O-2yrs-0%
B3N0026	Kameelpoortnet ptn. Klipkopfontein	B31D	MP	B3N0026-GI-O-2yrs-0%
B3N0019	Hartebeestfontein Ptn. Rayton 092044 Plot 11	B31A	GP	B3N0019-GI-O-10yrs-0%
B3N0020	Hartebeestfontein Ptn. Rayton 092044 Plot 9	B31A	GP	B3N0020-GI-O-10yrs-0%
B3N0021	Zonkolol Ptn. Rayton Nkululeko Bricks	B31A	GP	B3N0021-GI-O-10yrs-0%
B1N0006	Leeuwpoot	B11K	MP	B1N0006-GI-O-0yrs-0%
B1N0008	Middelburgtown and Townlands	B12D	MP	B1N0008-GI-O-0yrs-0%
A2N0755	Onbekend ptn. Welbekend	A21	GP	A2N0755-GI-O-20yrs-0%
B2N0021	Rietfontein	B20	GP	B2N0021-GI-O-29yrs-0%
B2N0031	Rietvalei	B20	GP	B2N0031-GI-O-27yrs-0%
B2N0032	Rietvalei	B20	GP	B2N0032-GI-O-27yrs-0%
B2N0034	Rietvalei	B20	GP	B2N0034-GI-O-27yrs-0%
B2N0037	Rietvalei	B20	GP	B2N0037-GI-O-27yrs-0%
B2N0038	Rietvalei	B20	GP	B2N0038-GI-O-27yrs-0%
B2N0039	Rietvalei	B20	GP	B2N0039-GI-O-27yrs-0%
B2N0050	Olifantsfontein	B20	GP	B2N0050-GI-O-29yrs-0%
B2N0051	Rietkol	B20	GP	B2N0051-GI-O-30yrs-0%
B2N0061	Rietvalei	B20	GP	B2N0061-GI-O-29yrs-0%
B2N0063	Rietvalei	B20	GP	B2N0063-GI-O-27yrs-0%
B2N0001	Dorpsgebied (Delmas)	B20	GP	B2N0001-GI-O-47yrs-0%
B2N0003	Delmas Dorpsgebied	B20	GP	B2N0003-GI-O-37yrs-0%
B2N0053	Rietkol	B20	GP	B2N0053-GI-O-28yrs-0%
B2N0055	Leeuwpoot	B20	GP	B2N0055-GI-O-29yrs-0%
B2N0069	Witklip	B20	GP	B2N0069-GI-O-29yrs-0%
B2N0073	Wolvenfontein	B20	GP	B2N0073-GI-O-28yrs-0%
B2N0506	Delmas Dorpsgebied	B20	GP	B2N0506-GI-O-29yrs-0%
B2N0719	Middelbult	B20A	GP	B2N0719-GI-O-9yrs-0%
B2N0720	Middelbult Ptn. E10h	B20A	GP	B2N0720-GI-O-8yrs-0%
B2N0721	Leeuwpoot	B20A	GP	B2N0721-GI-O-9yrs-0%
B1N0005	Graspan	B11A	MP	B1N0005-GI-O-0yrs-0%
B1N0007	Rietkuil	B11B	MP	B1N0007-GI-O-0yrs-0%
B1N0003	Vaalkop	B11C	MP	B1N0003-GI-O-0yrs-0%
B9N0004	Mhingas Location Extension	B90B	LP	B9N0004-GI-O-9yrs-21%
B9N0001	Lith Ptn. Greenfam	B90C	LP	B9N0001-GI-O-9yrs-20%
B9N0002	Locatie Van De Knopneuzen Ptn. Mukhomi	B90F	LP	B9N0002-GI-O-9yrs-9%
B9N0003	Jorrison ptn. Halahala	B90F	LP	B9N0003-GI-O-9yrs-3%
B8N0503	Stateland Ptn. Vuheli	B82H	LP	B8N0503-GI-O-9yrs-8%
B8N0521	Midelfontein ptn. Chavani	B82F	LP	B8N0521-GI-O-9yrs-5%
B8N0504	Stateland Ptn. Ka-Sikhunyane	B82G	LP	B8N0504-GI-O-8yrs-3%
B8N0507	Stateland Ptn. Ka-Nghalalume	B82G	LP	B8N0507-GI-O-6yrs-4%
B8N0524	Doornhoek ptn. Mmumoni	B82E	LP	B8N0524-GI-O-0yrs-0%
B8N0509	Caledon Ptn. Ndengeza	B82D	LP	B8N0509-GI-O-9yrs-4%
B8N0510	Paardedood	B82D	LP	B8N0510-GI-O-8yrs-10%
B8N0515	Worcester Ptn. Femane	B81G	LP	B8N0515-GI-O-8yrs-19%
B8N0520	Segops Location Ptn. Sekgopo	B82A	LP	B8N0520-GI-O-9yrs-20%
B8N0523	SILWANAS PTN. NYAKALANE	B81J	LP	B8N0523-GI-O-4yrs-21%
B8N0518	State Land	B81F	LP	B8N0518-GI-O-9yrs-12%
B8N0514	Doornhoek Ptn. Tzaneen	B81B	LP	B8N0514-GI-O-8yrs-10%
B8N0502	Haenertsburg Town And Townlands Ptn. Haenertsburg	B81A	LP	B8N0502-GI-O-6yrs-9%
B7N0006	Schalk Ptn. Namakgale	B72K	LP	B7N0006-GI-O-9yrs-6%
B7N0007	Rubbervale Ptn. Rubbervale Station	B72J	LP	B7N0007-GI-O-8yrs-28%

WMA 2 - Olifants: Groundwater Level and Quality Monitoring Stations

Station	Name	Catchment	Province	Label
B5N0054	Zamensloop Ptn. Dithlophaneng	B52H	LP	B5N0054-GI-O-8yrs-15%
B5N0068	Spitskop	B52H	LP	B5N0068-GI-O-7yrs-13%
B8N0513	Mohlabas Location Ptn. Nkoakoa	B81D	LP	B8N0513-GI-O-8yrs-18%
B7N0005	Bordeaux Ptn. Julesburg	B72E	LP	B7N0005-GI-O-7yrs-13%
B7N0013	Paardevelei	B71A	LP	B7N0013-GI-O-7yrs-16%
B7N0011	Mica	B72D	LP	B7N0011-GI-O-9yrs-13%
B5N0052	Langkrans Ptn. Ga-Chuene	B52C	LP	B5N0052-GI-O-8yrs-5%
B7N0014	Moeijelik ptn. Tshebeng	B71B	LP	B7N0014-GI-O-2yrs-17%
B7N0004	Bismark	B72A	LP	B7N0004-GI-O-8yrs-37%
B7N0015	State land ptn. Penge	B71F	LP	B7N0015-GI-O-5yrs-0%
B5N0051	Wildebeestpan	B51E	LP	B5N0051-GI-O-7yrs-10%
B5N0055	Byzonderheid Ptn. Roedtan	B51E	LP	B5N0055-GI-O-7yrs-8%
B5N0056	KROKODILKOP PTN. ELANDSKRAAL	B51E	LP	B5N0056-GI-O-4yrs-0%
B5N0069	Klippot	B51E	LP	B5N0069-GI-O-28yrs-6%
B7N0009	The Oaks Ptn. The Willows	B71H	LP	B7N0009-GI-O-8yrs-8%
B5N0067	Korenvelden geluks Location	B52B	LP	B5N0067-GI-O-4yrs-0%
B5N0057	Rustplaats ptn. Maololo	B51H	LP	B5N0057-GI-O-4yrs-0%
B5N0058	Rustplaats ptn. Mmatsekele	B51H	LP	B5N0058-GI-O-3yrs-0%