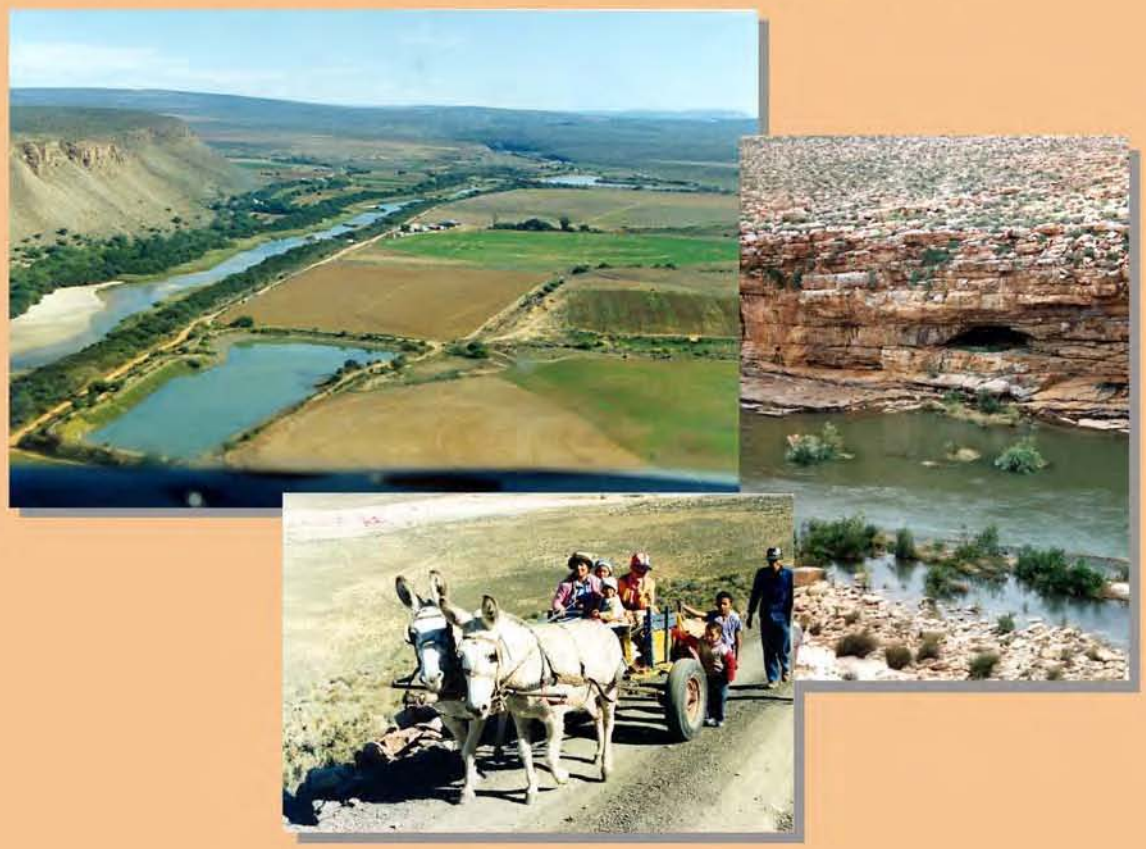
REPORT No : PWMA 17/000/00/0305

DEPARTMENT OF WATER AFFAIRS
AND FORESTRY

OLIFANTS/DOORN WATER MANAGEMENT AREA

OLIFANTS/DOORN INTERNAL STRATEGIC PERSPECTIVE



VERSION 1

FEBRUARY 2005

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NINHAM SHAND CONSULTING SERVICES

P WMA 17/000/00/0305

DEPARTMENT OF
WATER AFFAIRS
& FORESTRY

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INTERNAL STRATEGIC PERSPECTIVE

Version 1

February 2005

Prepared by: Ninham Shand Consulting Services

In association with: Jakoet and Associates
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Department of Water Affairs and Forestry
Directorate National Water Resource Planning

DEVELOPMENT OF INTERNAL STRATEGIC PERSPECTIVE
FOR THE
OLIFANTS/DOORN WATER MANAGEMENT AREA (WMA No 17)

APPROVAL

Title	:	Olifants/Doorn Water Management Area: Internal Strategic Perspective
DWAF Report No	:	P WMA 17/000/00/0305
Consultants	:	Ninham Shand in association with Umvoto Africa, Jakoet & Associates, FST and Tlou & Matji
Report Status	:	Version 1, February 2005
Version Controller	:	Mr A. Parker (Catchment Manager Olifants/Doorn WMA)
Date	:	February 2005

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INVITATION TO COMMENT

This report will be updated on a regular basis until it is eventually superseded by the Catchment Management Strategy. Water users and other stakeholders in the Olifants/Doorn WMA and other areas are encouraged to study this report and to submit any comments they may have to the Version Controller (see box overleaf).

ELECTRONIC VERSION

This report is also available in electronic format as follows:

- DWAF website:
  - Intranet: http://dwaf-www.pwv.gov.za/documents/
  - Internet: http://www.dwaf.gov.za/documents/
- On CD which can be obtained from DWAF Map Office at:
  157 Schoeman Street, Pretoria (Emanzini Building)
  +27 12 336 7813
  mailto:apm@dwaf.gov.za

  or from the Version Controller (see box overleaf).

The CD contains the following reports (all available on the DWAF website)

- Olifants/Doorn WMA Internal Strategic Perspective (*This Report*) (Report No: P WMA 17/000/00/0305)
- The National Water Resource Strategy, First Edition 2004
- The Olifants/Doorn WMA - Overview of Water Resources Availability and Utilisation (Report No: P WMA 17/000/00/0203)
- The Olifants/Doorn WMA – Water Resources Situation Assessment (Report No: P WMA 17/000/00/0101).

LATEST VERSION

This report is a living document and will be updated on a regular basis. If the version of this report is older than 12 months, please check whether a later version is not available.

This can be done on the DWAF website: http://www.dwaf.gov.za/documents/

or by contacting the Version Controller (see box overleaf).

VERSION CONTROL

OLIFANTS/DOORN WMA
INTERNAL STRATEGIC PERSPECTIVE

Version 1	February 2005
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The most significant amendments included in the latest version will be indicated here.

EXECUTIVE SUMMARY

Introduction

The Olifants/Doorn Water Management Area (WMA) is located on the west coast of South Africa, extending from about 100 km to 450 km north of Cape Town. The south-western portion mainly falls within the Western Cape Province, and the north-eastern section falls within the Northern Cape Province. The Olifants/Doorn WMA, one of nineteen WMAs in the country, derives its name from the main river draining it, namely the Olifants River. The word "Doorn", an archaic form of Doring, was added to the WMA name to distinguish it from the many other "Olifants" rivers in the country, and because the Olifants River's main tributary is the Doring River.

This document presents the Department of Water Affairs and Forestry's (DWAF's) internal strategic perspective (ISP), or view, on how it intends managing the water resources within the WMA, during the period leading up to the establishment of a fully operational Catchment Management Agency (CMA), and the development of a Catchment Management Strategy (CMS) by the CMA. One of the major goals of the ISP is to obtain a common understanding within DWAF about management objectives and strategies.

After internal approval, the Department will invite comment on the ISP from local authorities, water user associations and stakeholders. Formal updates of the ISP will be undertaken periodically. The collective knowledge of DWAF's regional and head office water management staff about this WMA is documented in the ISP. The ISP presents a common and consistent approach that can be adopted when addressing water management related issues, problems and queries, and when evaluating water license applications.

The information required to compile the ISP has been obtained from policy documentation, legislation, planning study reports, departmental guidelines, and from interviews and communications with DWAF regional managers and head office staff.

Water law and water management

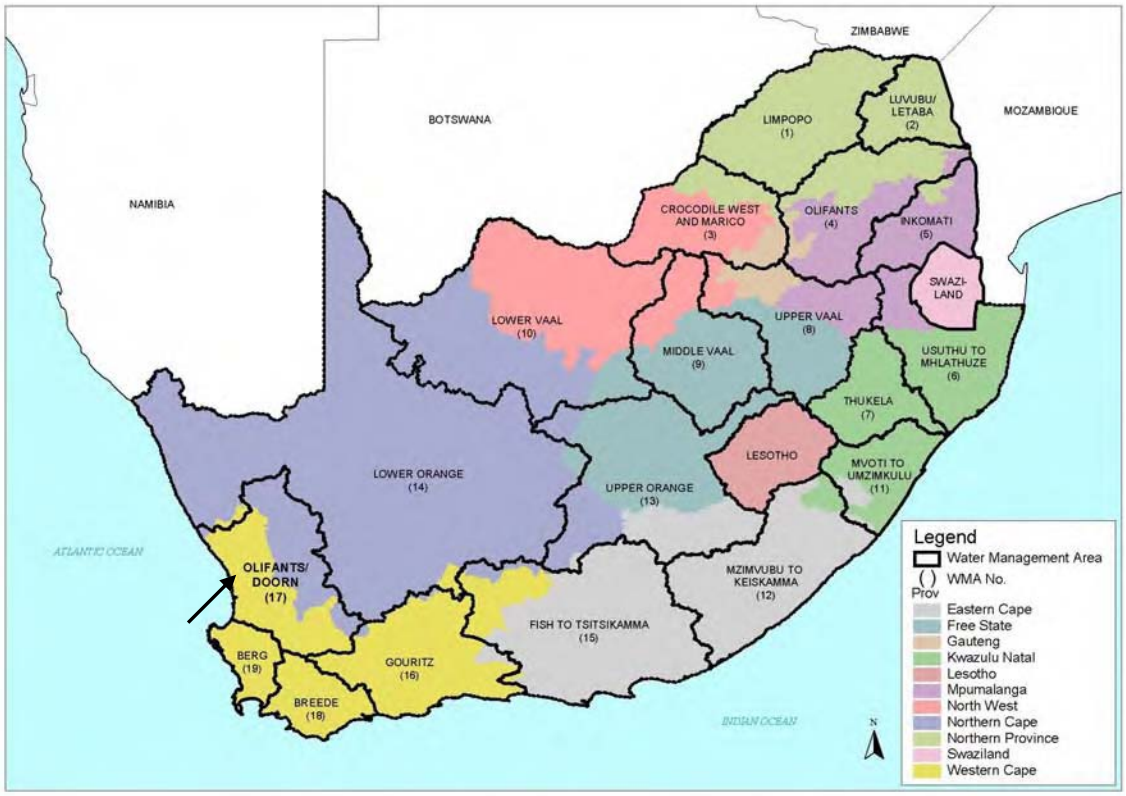
The National Water Act (NWA), is the principal legal instrument governing water resource management in South Africa, and is being incrementally implemented. The NWA is supported by other legislation such as the National Environmental Management Act and other Acts. The NWA does away with some far-reaching concepts but introduces others, which have both economic and social features.

The National Water Resource Strategy (NWRS) is the implementation strategy for the NWA and provides the framework within which the water resources of South Africa will be managed in the future. All authorities and institutions exercising powers or performing duties under the NWA must give effect to the NWRS which sets out policies, strategies, objectives, plans, guidelines, procedures and institutional arrangements for the protection, use, development, conservation, management and control of the country's water resources.

As part of the implementation of Integrated Water Resource Management (IWRM), in line with the requirements of the NWA, DWAF is following a process that includes:

- Determination of existing lawful use;
- Determination of water availability at acceptable confidence levels;
- Determination of ecological water requirements at high confidence levels and
- Development of the regional management strategies, the ISPs.

An iterative and interactive process will then follow where public participation (preferably through the CMAs) will play a role in determining water resource and water-use reconciliation options.



Map showing the WMAs of South Africa (Olifants/Doorn -WMA 17)

Locality and physical features

Refer to the ISP sub-areas map on page xii.

The major river in the WMA is the Olifants River, of which the Doring River (draining the Koue Bokkeveld and Doring areas) and the Sout River (draining the Knersvlakte) are the main tributaries. The WMA incorporates the E primary drainage region and components of the F and G drainage regions along the coastal plain, respectively north and south of the Olifants River estuary, covering a total area of 56 446 km^2.

The Olifants River rises in the mountains in the south-east of the WMA and flows north-west. Its deep narrow valley widens and flattens downstream of Clanwilliam until the river flows through a wide floodplain downstream of Klawer. The Doring River is a fan shaped catchment. The main river rises in the south and flows in a northerly direction. It is first joined by the Groot River and then by the Tra-Tra River flowing from the west and the Tankwa River from the east, before flowing in a westerly direction to its confluence with the Olifants River just upstream of Klawer.

The north of the WMA is flatter and much of the basin lies between 500 and 900 m above sea level. In the east there are significant mountain ranges, the Hantam near Calvinia and the Roggeveld to the south, which rise to about 1 500 m above sea level. West of Nieuwoudtville lies the Bokkeveld Mountains escarpment, where the plateau elevation of about 700 m drops to about 300 m. The rolling hills and plains of the 30 to 40 km wide strip along the coast from the southern boundary of the WMA to the estuary of the Olifants River are known as the Sandveld. The deep sandy deposits overlaying the bedrock in this area are "primary" aquifers which provide a significant groundwater resource.

Climatic conditions vary considerably as a result of the variation in topography. Minimum temperatures in July range from –3 ºC to 3 ºC and maximum temperatures in January range from 39 ºC to 44 ºC. The area lies within the winter rainfall region, with the majority of rain occurring between May and September each year. The mean annual precipitation is up to 1 500 mm in the Cederberg mountains in the south-west, but decreases sharply to about 200 mm to the north, east and west thereof, and to less than 100 mm in the far north of the WMA. Average gross mean annual evaporation (as measured by Symons pan), ranges from 1 500 mm in the south-west to more than 2 200 mm in the dry northern parts. Due to the diverse soil types and variance in rainfall distribution, vegetation is varied and includes at least six veld types and several thousand plant species. Karoo and Karroid Types, False Karoo Types, Temperate and Transitional Forest Types, Scrub Types, and Sclerophyllous Bush Types occur in the Olifants/Doorn WMA.

Important conservation areas include the Tankwa-Karoo National Park, the Verlorevlei wetland in the Sandveld (which enjoys Ramsar status), the Cederberg Wilderness Area, and the northern section of the Groot Winterhoek Wilderness Area. The Olifants River and its tributary, the Doring River are important from a conservation perspective because they contain a number of species of indigenous and endemic fish that occur in no other river systems, and that are endangered. In addition, reaches of some of the tributaries are virtually unspoiled by human manipulation and are of high to very high ecological importance. The Olifants estuary is one of only three permanently open estuaries on the west coast of South Africa. It therefore represents a critical habitat to many estuarine-associated fish species. The estuary also supports at least 86 species of estuarine waterbirds and has a wide range of habitats. It plays an important role in bird migration and is considered to be in the top ten South African locations of importance for conservation of waterbirds. The coastal wetlands of Verlorevlei, Die Vlei (Wamakervlei), Wadriftsoutpan and Lambert's Bay in the Sandveld are vulnerable due to the pressure placed on the groundwater resource by over-utilisation and pollution.

The DWAF Directorate: Resource Directed Measures (RDM) commissioned a Comprehensive Reserve Determination Study (2003-2005) for the WMA. A separate Groundwater Reserve Study was undertaken in the Sandveld (Conrad, 2003). The formal public process to decide the Management Class and Reserve will be undertaken at a later stage.

The WMA was divided into six sub-areas[1] or "management units", corresponding to the current divisions used in surface water resource management by the Regional Office of the DWAF.

ISP sub-areas

ISP Sub-area	Catchments
Upper Olifants	E10A to E10G
Koue Bokkeveld	E21A to E21L
Doring	E22, E23, E24A-M, E40A-D
Knersvlakte	E31A-H, E32, E33A-F, F60
Lower Olifants	E10H-K, E33F-E33H
Sandveld	G30A (part) to G30H

Demography

The Olifants/Doorn WMA is the least populated WMA in the country with approximately 0.25% of the national population residing in the area. Approximately 113 000 people live in the WMA. More than half of the population live in urban or peri-urban areas, and the rest in rural areas. About 65% of the population is concentrated in the south-western portion of the WMA in the Koue Bokkeveld, Upper and Lower Olifants and Sandveld sub-areas. The population growth expected for the area appears to follow the general trend of decreasing rural populations which can be attributed to the lack of strong economic stimulants, migration of young people and the impacts of HIV/ AIDS (NWRS, 2004). There is strong in-migration of seasonal workers during the harvest and planting seasons.

International links and links with other WMAs

The WMA borders on the Lower Orange WMA to the north and east, the Gouritz, Breede and Berg WMAs in the south, and the Atlantic Ocean in the west. The only inter-water management area transfer is a transfer of 2.5 million m^3/a from the Breede WMA (quaternary H20C) via the Inverdoorn canal for irrigation purposes. No water transfer from this WMA to other WMAs is taking place nor is any planned.

Economic development

The contribution from the Olifants/Doorn WMA to the national Gross Domestic Product (GDP) is the lowest of any WMA in the country, however the WMA agriculture sector does contribute about 5% to the GDP. In this WMA, the agricultural sector contributes far more to the local economy (43%) than any other sector. Whilst emphasising the importance of agriculture in the regional economy of the WMA, this also highlights the relatively low level of activity in other sectors.

[1] The Olifants Doorn WMA was divided into only five sub-areas in the National Water Resource Strategy (NWRS). The Olifants River sub-area as defined in NWRS has been spilt into two for the purpose of this ISP (Upper Olifants and Lower Olifants). It was recognised that the two sections of the river have distinctly different water resource management characteristics.

The significance of the agricultural sector can be attributed to the variety of products cultivated in the area, mostly under irrigation. Two of the other more important economic sectors, namely trade and manufacturing, are strongly linked to the agricultural sector, with a large proportion of their activities involving the sale or processing of agricultural products. The agricultural sector showed a growth of 3.7% per annum between 1988 and 1997, indicating that this sector has an important role in the future of this WMA.

Of the total labour force of 58 600 people, 8% is unemployed, which is much better than the national average of 29%. Approximately 75% of the labour force is active in the formal economy. A total of 50% of the formally employed labour force worked in the agricultural sector, 20% in the government sector and only 9% in trade. The agriculture-dominated economy of the WMA is marked by inequality in income distribution along racial, gender and urban/rural divides. A skewed age and skills profile exists with decreasing numbers of young educated people remaining in the area. Security of tenure, adequate housing and access to productive land are the key development needs amongst the disadvantaged majority. The northern and eastern parts of the WMA are characterised by high unemployment, are sparsely populated, have poor infrastructure and high poverty levels.

The only major mine in the area is the Namakwa Sands heavy minerals mine which is situated on the coast in the north-west of the WMA. There are also several granite-quarrying operations in the vicinities of Vredendal and Vanrhynsdorp. Dredging for marine diamonds occurs offshore. Industries in the WMA are small and the majority of them are concerned with the processing and packaging of agricultural products. Approximately only 4 million m^3/a of water is currently required by the mining and industrial sectors. Small commercial timber plantations, totalling 10 km^2, are established in the mountainous high rainfall areas in the south-west of the WMA, with very little impact on the water resource (total use is 1 million m^3/a).

Tourism is an important and growing component of the WMA economy. The coastal towns, Clanwilliam Dam and the Cederberg Wilderness Area support numerous tourism-based businesses. The coastal towns suffer from water shortages over the summer tourist season due to peak demand.

Land use and ownership

The mean annual precipitation over much of the WMA is less than 200 mm, with the result that, except in the wetter south-west, the climate is not suitable for dryland farming on a large scale. Consequently, more than 90% of the land in the Olifants/Doorn WMA is used as grazing for livestock, predominantly for sheep and goats. An estimated 2 190 km^2, or some 4% of the land area is cultivated for dryland farming.

Approximately 497 km^2 is under irrigation, of which almost 50% lies within the Upper and Lower Olifants sub-areas. Irrigated citrus, deciduous fruits, grapes and potatoes are grown on a large scale in the WMA and provide the mainstay of this WMA's economy (NWRS, 2004). In addition to the intensive irrigation practised along the Olifants River, significant irrigation also takes place in the Koue Bokkeveld, along the rivers and from groundwater in the Sandveld sub-area.

Urban areas are small, covering a total land area estimated at only 31 km^2. There are a few small rural settlements, but they occupy an insignificant area of land. Commercial farmers dominate the

ownership of land. Resource-poor farmers have limited access to good quality agricultural land and have been historically sidelined in terms of access to water. This WMA is water stressed and there is no surplus available from existing sources. Additional water resource developments will be required for any further irrigation development. Although the local authorities and the provincial departments of land and agriculture have programmes in place to actively transform the land ownership pattern, progress has been slow.

Waterworks

Olifants River (Vanrhynsdorp) Government Water Scheme

The Olifants River (Vanrhynsdorp) Government Water Scheme includes the Clanwilliam Dam, Bulshoek Weir and a canal system to irrigate land extending along the Olifants River. Clanwilliam Dam and Bulshoek Weir are state-owned. Bulshoek Weir and the canal is operated and maintained by the Lower Olifants River Water User Association (LORWUA). A dam safety inspection found that the Clanwilliam Dam wall requires strengthening by 2010 to meet the national safety requirements. A study is being undertaken at present to investigate the feasibility of raising the dam at the same time.

Water is released from Clanwilliam Dam (live storage 122 million m^3) into the river to flow to Bulshoek Weir (live storage 5.7 million m^3), some 30 km downstream. Downstream of the weir water is distributed by a canal system consisting of main and distribution canals totalling 186 km in length. The combined 1:50 year yield of Clanwilliam Dam and Bulshoek Weir is 154 million m^3/a. It is estimated that canal conveyance losses are of the order of 28%. The scheduled area under the canal system is 11 500 ha, with an irrigation quota of 12 400 m^3/ha/a. The canal system is used for irrigation, domestic and industrial supplies for towns, and to the Namakwa Sands Mine, as well as a number of small mining activities. Recently, irrigation supplies have frequently been curtailed. Other than Clanwilliam Dam and the Bulshoek Weir, there are no other large state-owned dams in the WMA. There are numerous farm dams throughout the upper Olifants and Doring catchments.

Other Irrigation Schemes

There are a large number of privately owned irrigation schemes, namely:

- In the Koue Bokkeveld and in the Agter Witzenberg area (upper reaches of the Olifants River) numerous farm dams have been constructed for the irrigation of deciduous fruit and vegetables. The total irrigated area is approximately 8 600 ha;
- At the confluence of the Tankwa and Doring Rivers water is abstracted from the Doring River for the irrigation of 350 ha of land from the water works of the Elandskaroo Irrigation Board;
- Oudebaaskraal Dam on the Tankwa River (quaternary E23F) is the largest privately owned farm dam in South Africa, with live storage of 34 million m^3. It seldom fills completely and supplies water irregularly to approximately 320 ha of land, irrigated by the farmer on a semi-opportunistic basis;
- Along the Olifants River upstream of Clanwilliam Dam there are numerous small individual private schemes with various abstraction systems, including pump stations, small diversion weirs, canals and off-channel dams mainly to irrigate citrus. The total irrigated area is approximately 10 700 ha.

Local water supply schemes

Surface Water Supplies

The towns in the Olifants/Doorn WMA are all relatively small and most are supplied from local surface and groundwater sources via infrastructure owned and operated by local authorities. There are a few exceptions, such as Klawer, Vredendal, Vanrhynsdorp, Lutzville, Ebenhaezer, Strandfontein and Doringbaai which are supplied from the Lower Olifants Government Water Scheme. The towns of Citrusdal and Clanwilliam obtain water directly from the Olifants River. Clanwilliam also abstracts from the Jan Dissels River, upstream of its confluence with the Olifants River.

Groundwater Urban and Rural supplies

Towns that are dependent or partially dependent on groundwater supplies are Loeriesfontein, Calvinia, Nieuwoudtville, Vanrhynsdorp, Bitterfontein-Nuwerus, Doringbaai, Lamberts Bay, Graafwater, Leipoldtville and Elandsbaai. Citrusdal supplements its summer water supplies with groundwater.

Southern Namakwaland Government Water Scheme

The Southern Namakwaland Government Water Scheme supplies desalinated groundwater from boreholes to the small towns of Bitterfontein and Nuwerus. This was implemented because of the severe shortage of suitable sources of surface water in those areas and groundwater of unfit quality. This scheme has recently been extended to supply the Rietpoort and Molsvlei communities.

Water resources availability

The table on the following page shows water availability in the WMA.

The water resources are not evenly distributed over the WMA. The highest runoff is from the relatively small southern central mountainous area of the WMA, notably the Upper Olifants, Doring and Koue Bokkeveld sub-areas, with limited runoff emanating from the arid remainder. The total natural mean annual runoff (MAR) of 1 068 million m^3 has been significantly reduced by abstractions, mainly for irrigation.

The fractured-rock aquifer systems in this WMA include the TMG Aquifers in the *Cederberg sub-province*, and parts of the Witteberg Group in the *Tankwa Karoo sub-province*. Another fractured-rock system is represented by Karoo dolerites in the *Hantam sub-province* on the eastern side of the WMA. Primary intergranular (porous sandy) aquifers occur most extensively in the western coastal (*Knersvlakte sub-province* and western Cederberg) and northern parts of the WMA. In the northern parts of the WMA (Knersvlakte and Hantam), these primary aquifers are related to alluvial deposits. Borehole distribution, in all except in the alluvial and TMG aquifers, does not reflect good groundwater sources. The spread of boreholes indicates a relatively high level of summer-season groundwater dependence. The groundwater resource has not been systematically explored and developed, and its monitoring is uneven.

The recharge to the TMG aquifers is highest in the high mountains along the southern catchment boundary divide, around the Koue Bokkeveld and southern Cederberg ranges. In contrast to this, the estimated recharge in the northern part of the WMA, and over a wide area of the Tankwa Karoo in the rain shadow east of the Cederberg ranges, is less than 10 mm/a. The yields obtained to date and the

recharge distribution together indicate that the TMG fractured-rock aquifers should be the main groundwater exploration targets in this region.

Available yield for the year 2000 at 1:50 year assurance (million m^3/a)

Sub-area	Natural resource		Usable return flow		Total local yield (1)	Transfers in (2)	Total available
	Surface water	Ground-water	Irrigation	Urban			
Upper Olifants	169	20	8	0	197	0	**197**
Koue Bokkeveld	59	5	3	0	67	0	**67**
Doring	8	3	0	0	11	3	**14**
Knersvlakte	1	3	0	0	4	4	**8**
Lower Olifants	18	1	4	2	25	94 (3)	**119**
Sandveld	2	30	0	0	32	0	**32**
Total for WMA	**257**	**62**	**15**	**2**	**336**	**3**	**339**

1) After allowance for the impacts on yield of: ecological component of the preliminary Reserve, river losses, invasive alien plants, dry land agriculture and urban runoff.
2) Transfers into sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of the transfers therefore does not necessarily correspond to the total transfers into the WMA.
3) Transfers into the Lower Olifants sub-area of 94 million m^3/a for irrigation, mainly via the Lower Olifants River canal.

The water availability is influenced by the following:

- The Reserve requirement has yet to be comprehensively determined and the yield balance is currently based on Rapid Reserve estimates only;
- The preliminary Reserve estimates do not include the estuarine or wetlands Reserve requirements, as these have yet to be determined;
- The possible effect of climate change has not been allowed for in the ISP. There have been predictions that the effects of global warming could cause a possible 10-15% reduction in streamflow in the Western Cape by 2015.

Water requirements and use

The agricultural sector is by far the largest water-use sector with estimated requirements of about 95% (356 million m^3/a) of the total requirements. The table on the following page shows water requirements in the WMA.

Water requirements for the year 2000 at 1:50 year assurance (million m³/a)

Sub-area	Irrigation	Urban (1)	Rural (1)	Mining and bulk industrial (2)	Afforestation (3)	Total local requirements	Transfers out	Grand Total
Upper Olifants	**100**	1	1	0	1	**103**	94 (4)	**197**
Koue Bokkeveld	**65**	0	1	0	0	**66**	0	**66**
Doring	**13**	1	1	0	0	**15**	0	**15**
Knersvlakte	**3**	0	1	3	0	**7**	0	**7**
Lower Olifants	**140**	3	1	0	0	**144**	4 (5)	**148**
Sandveld	**35**	2	1	0	0	**38**	0	**38**
Total for WMA	**356**	**7**	**6**	**3**	**1**	**373**	**0**	**373**

1) Includes component of the Reserve for basic human needs at 25 l/c/d.
2) Mining and bulk industrial water uses, which are not part of urban systems.
3) Quantities given refer to impact on yield only.
4) Transfers out of the Upper Olifants of 94 million m^3/a for downstream irrigation, mainly via the Lower Olifants River canal.
5) Transfers out of the Lower Olifants of 4 million m^3/a consists of a transfer of 2.5 million m^3/a to meet the Namakwa Sands mining requirement and 0.4 million m^3/a to the northern Sandveld for urban use. The rest is transportation losses.

Water requirements are influenced by the following:

- There is uncertainty regarding the accuracy of run-of-river yields and yields from farm dams, especially above Clanwilliam Dam;
- The extent of actual water use by irrigators, particularly those outside of WUAs;
- The extent of over-abstraction in the Olifants River sub-area, with resulting variable assurances of supply.

Future requirements

Little growth is anticipated for towns, industry and mining. In the Upper Olifants, Koue Bokkeveld and the Sandveld sub-areas there is a demand for ongoing expansion of existing irrigation. There is potential for further irrigation. Development in the Lower Olifants is constrained by water availability and in peak demand periods through existing infrastructure.

The *Olifants Doring Basin Study Phase 1 (1998)* recommended that restrictions be placed on the issuing of further licences in identified catchments, until more information becomes available regarding the feasibility of identified development options and the implications of the Reserve. Further allocations were in response restricted to allow the issuing of licenses only to the following maximums:

Koue Bokkeveld/Witzenberg	950 ha
Citrusdal/Clanwilliam	475 ha
Middle Doring	150 ha
Ceres Karoo	1 500 ha
Coastal Zone	2 000 ha

The restrictions are currently being adhered to by DWAF. The restrictions were to apply for a period of seven years (1998-2005) after which it was anticipated that there would be finality on the extent of development on the major irrigation schemes identified in the *Olifants Doring Basin Study Phase 1 (1998)*. A review of these restrictions is to take place in 2005.

The NWRS discussion of high scenario water requirements for 2025 assumes limited population growth, but more equitable distribution of wealth leading to higher average levels of water services. No adjustments were made reflecting the impacts of increased water efficiency. Tourism was considered to be the sector in the WMA undergoing the most growth between 2000 and 2025. The NWRS high scenario predicted that requirements would reduce by 1 million m^3/a in the Koue Bokkeveld sub-area, and by 4 million m^3/a each in the Olifants (combination of the two ISP sub-areas) and Knersvlakte sub-areas by 2025. The NWRS 2025 base scenario predicted that requirements would reduce in the Koue Bokkeveld, Olifants (combination of the Upper and Lower Olifants ISP sub-areas) and Knersvlakte sub-areas by 2025, by 1 million m^3/a each. The NWRS concluded that water requirements would remain stable, perhaps decreasing slightly with the trend of depopulation of the rural areas.

Yield balance

The table on the following page shows water requirements in the WMA.

The reconciliation of available water and requirements for the year 2000, indicates that there was an overall deficit of 34 million m^3/a in the WMA. A deficit of 29 million m^3/a is experienced in the Lower Olifants sub-area. This deficit reflects a shortage at a 1: 50 assurance of supply, however, in practice a lower level of assurance is accepted by irrigators. The 6 million m^3/a deficit in the Sandveld sub-area is attributable to urban and irrigation water requirements, in excess of what can sustainably be supplied from the available resources, with the resultant over-exploitation of groundwater to make up the shortfalls. The Upper Olifants, Doring, Koue Bokkeveld and Knersvlakte sub-areas are all approximately in balance. It is anticipated that implementation of the Reserve will influence the use of farm dams, mainly on small tributaries, where water will have to be released to meet the needs of the Reserve. Little change in water requirements is foreseen unless new large-scale irrigation development occurs. The raising of Clanwilliam Dam (which could provide additional yield of up to 40 million m^3/a) and development of the deep Table Mountain Group aquifer, are currently seen as the most promising possible large-scale developments in the WMA.

Reconciliation of water requirements and availability for the year 2000 at 1:50 year assurance (million m³/a)

Sub-area	Available yield			Water requirements			Balance (1)
	Local yield	Transfers in (2)	Total	Local require-ments	Transfers out (2)	Total	
Upper Olifants	197	0	**197**	**103**	94 (3)	**197**	**0**
Koue Bokkeveld	67	0	**67**	**66**	0	**66**	**1**
Doring	11	3	**14**	**15**	0	**15**	**(1)**
Knersvlakte	4	4	**8**	**7**	0	**7**	**1**
Lower Olifants	25	94 (3)	**119**	**144**	4 (4)	**148**	**(29)**
Sandveld	32	0	**32**	**38**	0	**38**	**(6)**
Total for WMA	**336**	**3**	**339**	**373**	**0**	**373**	**(34)**

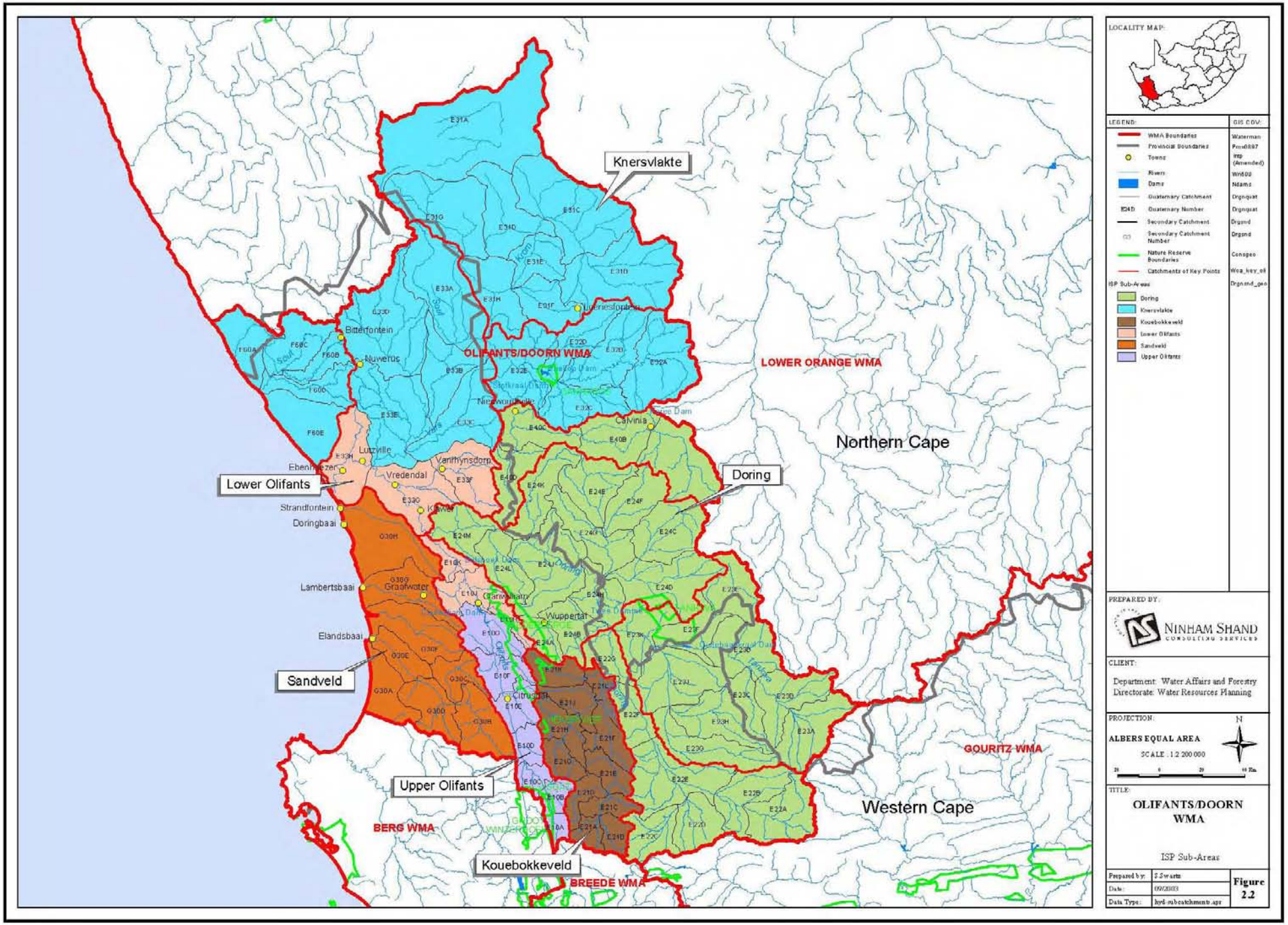
1) Surpluses are shown in the most upstream sub-area where they first become available.
2) Transfers into and out of sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of the transfers per sub-area therefore does not necessarily correspond to the total transfers into and out of the WMA.
3) Transfers from the Upper to the Lower Olifants sub-area of 94 million m^3/a for downstream irrigation, mainly via the Lower Olifants.
4) Transfers out of the Lower Olifants of 4 million m^3/a consists of a transfer of 2.5 million m^3/a to meet the Namakwa Sands mining requirement (and an additional 1 million m^3/a transportation losses), and 0.4 million m^3/a to the northern Sandveld for urban use.

Water quality

The surface water quality of the Olifants/Doorn WMA is quite variable. Physical and chemical characteristics of the WMA geology have a strong influence on the water quality. Water quality in the Upper Olifants and Koue Bokkeveld is good and suitable for all uses, although seasonal differences are noted. The quality of water in the upper Doring River (E22), when flowing, is suitable for agriculture and domestic water supplies, however, at the end of summer the quality deteriorates. Highly saline flows from the Tankwa Karoo tributaries have a sporadic influence. In the upper portions of the Sandveld sub-area water quality is poor, resulting from agricultural activities on the Malmesbury shales which are high in salts. Agricultural activities influence the water quality significantly throughout the WMA, especially during the summer months.

Groundwater quality is generally controlled by aquifer lithology and geochemistry. Accordingly groundwater quality in the Olifants/Doorn WMA varies significantly between the fractured-rock aquifers that overlie generally impermeable shale- or granite-dominated pre-Cape formations. The most vulnerable aquifer is the primary coastal aquifer in the vicinity of Elands Bay and Lamberts Bay, reflecting the potential risk of seawater intrusion from exploitation of groundwater in this area. The

heavy reliance on groundwater for town supplies also highlights the need for aquifer protection, monitoring and wellfield management.



ISP Sub-areas

Perspective of the sub-areas

Upper Olifants

The Olifants River (E10A-G) rises in the Cederberg Mountains at the southern edge of the WMA and provides the most significant contribution to the available water in the WMA. The Upper Olifants sub-area extends to the Clanwilliam Dam wall. The area is currently in balance. In the upper reaches of the Olifants River numerous small farm dams have been constructed for the irrigation of fruit and vegetables. A large proportion of irrigated land is under citrus, with a small proportion under deciduous fruit, which is the economic mainstay in the valley. There is also limited commercial forestry. Invasive alien plants occur mainly in the riparian zone which reduce yield by 5 million m^3/a and therefore should be systematically eradicated.

The area is dominated by the Table Mountain Group (TMG) which forms the high ridges of the Cederberg. The TMG fractured-rock aquifers provide an important base flow contribution to surface water drainage. There is evidence that groundwater in the coastal plain of the WMA is linked to the high mountain recharge water found in this sub-area. Groundwater yield estimates are considered to be higher than previously estimated at 20 million m^3/a. Groundwater is being increasingly used to supplement summer shortfalls in irrigation water supplied from the river, particularly in the river reach upstream of the Clanwilliam Dam (E10D-F). There is a transfer of 94 million m^3/a from the dam to the Lower Olifants sub-area.

There is demand for growth in agriculture in the Upper Olifants, including pressure from resource-poor farmers to be given land and water allocations. Water trading should be encouraged to accommodate this need or further resource development should be undertaken. There is insufficient storage to provide for agricultural use during the dry summer and the low flows are pressurised by ongoing peak demand. A higher percentage of existing use should be stored during winter high flows in off-channel storage. No further licences for additional use are being encouraged until the EWR have been established.

Koue Bokkeveld

The Koue Bokkeveld sub-area forms part of the southern boundary of the WMA. It lies between the Koue Bokkeveld and southern Cederberg mountain ranges on the west (E10 boundary), and the Swartruggens mountain range on the east (E22 boundary). The Koue Bokkeveld has several rivers that feed into the Doring River. The most notable of these are the **Groot River** (E21F), **Matjies River** (E21L) and the **Riet River** (E21). There is only the small town of Op-die Berg in this sub-area. The area overlies fractured rock aquifers and Karoo aquifers and there is considerable potential for expansion of groundwater use. The sub-area therefore has a small surplus of 1 million m^3/a and can be regarded as essentially in balance. It has been extensively developed for the cultivation of deciduous fruits and vegetables. Irrigation constitutes 98% of water use in the sub-area. Irrigation water is stored in a large number of farm dams. There is increasing demand for further development. An embargo was placed on development in the area (1998-2005) to ensure that *ad hoc* development did not negatively affect the viability of potential larger schemes on the Doring River. Any future development must be informed by the Reserve requirements currently being investigated in the Comprehensive Reserve Determination study.

Doring

The Doring sub-area forms part of the southern and eastern boundaries of the WMA. The Doring River rises in the E22 catchments. It meets with the Olifants River (E23F-H) below the Bulshoek Weir. This sub-area incorporates the Doring River, the Tankwa River and the Oorlogskloof River catchments. The MAP in this sub-area varies from 199 mm in the E23 catchments to 256 mm in the E40 catchments. In the E22 catchment, an inter-basin water transfer of 2.5 million m^3/a takes place from the catchment of Lakenvallei Dam in the Breede WMA, via the Inverdoorn canal, into the Upper Doring River catchment for irrigation purposes. The Doring River is the only unimpounded river in the region and it supports nine species of indigenous fish, seven of which are endemic, illustrative of the ecological diversity. Groundwater baseflow into the rivers is ecologically important to species which over-summer in pools in the river bed.

There is uncertainty regarding the groundwater usage in the area. Much of the groundwater is of very poor quality and, given the relatively low yield estimates, would be capital intensive to develop for any large-scale supply. However, for small-scale supply some parts of the sub-area are reliant on groundwater and it is believed that further exploitation potential exists. The towns of Calvinia and Nieuwoudtville are reliant on groundwater. The sub-area has a deficit of 1 million m^3/a.

There is a demand for increased agriculture aimed at poverty alleviation. Investigations of potential dams in the region (Aspoort, Melkbosrug and Melkboom) have been undertaken and it was determined that there is potential for irrigation developments on a relatively large scale. It was however indicated that considerably more work was needed to verify the assumptions used and allay environmental concerns regarding the potential dam sites and impact on the river system. A development cap was put in place to ensure that *ad hoc* development did not preclude the development of any of these schemes.

Knersvlakte

The Knersvlakte sub-area forms the northern part of the eastern boundary of the WMA. It comprises the Hantams, the Kromme and the Goerap catchments, as well as the Sout River tributary of the Lower Olifants River. The sub-area extends from the escarpment range (Lower Orange WMA boundary) to the coastline. Rainfall is low and there is limited surface water and groundwater recharge. The sub-area is dependent on groundwater mainly from primary aquifers, fractured rock aquifers, and dolerite dykes. The key uses are stock watering and domestic use. Limited irrigation is undertaken; it does however comprise 43% of the total water use. Namakwa Sands Mine is on the coast and water is transferred from the Lower Olifants to supply the mine. The towns of Bitterfontein, Nuwerus and Loeriesfontein rely on groundwater supply. The sub-area has a surplus of 1 million m^3/a. Water requirements are not anticipated to expand significantly.

Lower Olifants

The Lower Olifants is the area of the Olifants River below Clanwilliam Dam and includes the Bulshoek Weir, the confluence with the Doring River (E33F-H) and estuary. The estuary is important and freshwater requirements for the estuarine Reserve are being determined in a Comprehensive Reserve Determination Study, currently underway. At 144 mm, this catchment has the lowest average MAP in this WMA. The catchment receives a large transfer from the Upper Olifants but a deficit of 29 million m^3/a still exists. Irrigated agriculture is the largest water user with estimated requirements of about 140 million m^3/a (i.e. about 95% of the total requirements in the catchment). The groundwater

usage is predominantly in the primary aquifer along the coast, with some further use from the deeper aquifers. Irrigation occurs mainly from the water conveyed from Bulshoek Weir, by means of a 186 km canal.

The water available for use is constrained by the physical limitations of the canal and water conservation and demand management initiatives, such as the upgrading of the canal to reduce losses, must be investigated. Water is transferred out of the sub-area to serve the Namakwa-Sands mine (2.4 million m^3/a). There is a requirement for a better assurance of supply for agriculture and for growth. There is pressure to allocate additional water to resource-poor farmers in this area. The Lower Olifants River WUA is engaged in facilitating water trading to ensure that provision is made for poverty alleviation. The sub-area is stressed and no further abstraction licences should be issued.

Sandveld

The Sandveld is bounded on the west by the Atlantic coastline, on the east by the Olifants Mountain Range, and on the south by the Berg WMA. It has several small rivers which flow towards the sea. The most notable of these are the Verlorevlei River (G30F) and the Langvlei River (G30G). Apart from fishing and eco-tourism around the coastal resort towns, potato farming primarily under centre-pivots, is the economic mainstay of the G30 coastal plain. The catchment is stressed, with an estimated deficit of 6 million m^3/a. Activities are predominantly dependent on groundwater. Rapid agricultural development has already lead to over-exploitation of the groundwater resource. Based on the yield balance estimates, no further growth in the agricultural sector can be supported from the currently developed resource. Individual users undertake groundwater usage and groundwater resources are threatened by declining water levels and seawater intrusion, due to poorly co-ordinated aquifer management. There are no major dams in the sub-area. Invasive alien plant control is an important catchment management activity as the impact is approximately 3 million m^3/a on the yield of this stressed catchment.

Introduction to the ISP Strategies

The many issues and concerns identified in the WMA will be addressed through the implementation of appropriate regional water management strategies (of which many are existing). DWAF staff has identified the essential management strategies to manage the Olifants/Doorn WMA. Additional required strategies may be developed in future.

Nine broad strategy groups, that cover all necessary current and required future water management activities - were identified from current DWAF Regional Office activities, and the requirements of the NWA and the NWRS. These are:

- ⇨ Yield balance and reconciliation;
- ⇨ Water resources protection;
- ⇨ Water use management;
- ⇨ Water conservation and demand management;
- ⇨ Institutional development and co-operative governance;
- ⇨ Social and environmental;
- ⇨ Waterworks development and management;
- ⇨ Monitoring and information management; and
- ⇨ Implementation.

Under each of these strategy groups, specific strategies particular to the Olifants/Doorn WMA were developed.

For each strategy, the following aspects are addressed:

- ***Management objective*** in terms of the envisaged solutions for the strategy;
- ***Situation analysis;*** providing a synopsis of the current situation with a focus on the issues;
- ***Strategy;*** stating the approach or plan that DWAF will follow to reach its objectives for the strategy;
- ***Management actions;*** states the required actions to implement the strategy;
- ***Responsibility;*** the responsible offices or Directorates are named;
- ***Priority;*** very high to low priority rating assigned.

Responsibilities for strategies were assigned to responsible DWAF Directorates or Sections within the Western Cape Regional Office. DWAF head office champions were identified where appropriate.

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
Directorate National Water Resource Planning

OLIFANTS/DOORN INTERNAL STRATEGIC PERSPECTIVE
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APPENDICES

ABBREVIATIONS AND ACRONYMS

AFS	Administrative Filing System
AIDS	Acquired immunity deficiency syndrome
CAGE	Citrusdal Artesian Groundwater Exploration
CAPE	Cape Action Plan for People and the Environment
CCAW	Co-ordinating Committee for Agricultural Water
CCT	City of Cape Town
CEIMP	Consolidated Environmental Implementation and Management Plan
CMA	Catchment management agency
CMS	Catchment management strategy
CSDB	Corporate Spatial Database
DEADP	Department of Environmental Affairs and Development Planning
DEAT	National Department of Environmental Affairs and Tourism
DLA	Department of Land Affairs
DOA	Department of Agriculture
DWAF	National Department of Water Affairs and Forestry
EC	Electrical conductivity
ECA	Environmental Conservation Act
EIA	Environmental impact assessment
EMF	Environmental management framework
EPP	Emergency preparedness plans
EURO CAP	European Common Agricultural Policy
EU	European Union
EWR	Ecological water requirements
GA	General authorisation
GIS	Geographical information system
GWS	Government water scheme
HDI	Historically Disadvantaged Individual
IAC	Irrigation Action Committee
IAP	Invasive alien plants
IDP	Integrated development plan
ISP	Internal strategic perspective
IRF	Irrigation return flows
IWRM	Integrated water resources management
IWRP	Integrated Water Resource Planning
MAP	Mean annual precipitation
MAR	Mean annual run-off
MIG	Municipal Infrastructure Grant
MSL	Mean sea level
PESC	Present Ecological Status Class
NEMA	National Environmental Management Act
NGO	Non-Governmental Organisation
NMC	Namaqualand Metamorphic Complex
NWA	National Water Act
NWRS	National Water Resource Strategy
ORGWS	Olifants River Government Water Scheme
POLMON	Pollution Monitoring Information System
RAMSAR	Conservation areas classified in terms in of this convention on "wetlands"
RO	Regional office (DWAF)
RDM	Resource directed measures
RPF	Resource-poor Farmers
RQO	Resource quality objectives
SAWS	South African Weather Service

SDM	Source directed measures
SFRA	Stream flow reduction activity
SKEP	Succulent Karoo Ecosystem Plan
SWDS	Solid waste disposal site
TDS	Total dissolved solids
TMG	Table Mountain Group
TSS	Total suspended solids
WARMS	Water use authorisation and registration management system
WC&DM	Water conservation and demand management
WCNCB	Western Cape Nature Conservation Board
WfW	Working-for-Water
WfWetlands	Working for Wetlands
WMA	Water Management Area
WMS	Water management system
WODRIS	Western Cape Provincial Government Olifants Doring River Irrigation Study
WQM	Water quality management
WRSA	Water resources situation assessment
WSA	Water Service Authority
WSDP	Water service development plan
WSP	Water service provider
WTW	Water treatment works
WUA	Water user association
WWTW	Wastewater treatment works

GLOSSARY OF TERMS

AQUICLUDE	An impermeable geological unit that cannot transmit water at all. Very few natural geological materials are considered to be aquicludes.
AQUIFER	A saturated permeable geological unit that can transmit significant (economically useful) quantities of water under ordinary hydraulic gradients. Specific geologic materials are not innately defined as aquifers and aquitards, but within the context of the stratigraphic sequence in the sub-surface area of interest.
AQUITARD	A saturated geological unit of relatively lower permeability within a stratigraphic sequence relative to the aquifer of interest. Its permeability is not sufficient to justify production wells being placed in it. This terminology is used much more frequently in practice than aquiclude, in recognition of the rarity of natural aquicludes.
ASSURANCE OF SUPPLY	The reliability at which a specified quantity of water can be provided, usually expressed either as a percentage or as a risk. For example "98% reliability" means that, over a long period of time, the specified quantity of water can be supplied for 98% of the time, and less for the remaining 2%. Alternatively, this situation may be described as a "1 in 50 year risk of failure" meaning that, on average, the specified quantity of water will fail to be provided in 1 year in 50 years, or 2% of the time.
BASIN	The area of land that is drained by a large river, or river system.
CONDENSED AREA	The equivalent area of alien plants with a maximum concentration/density that represents the more sparsely distributed alien plants that occur over a large area.
CATCHMENT	The area of land drained by a river. The term can be applied to a stream, a tributary of a larger river or a whole river system.
CONFINED AQUIFER	An aquifer that is physically located between two aquicludes, where the piezometric water level is above the upper boundary of the aquifer. The water level in a well tapping a confined aquifer usually rises above the level of the aquifer. If the water rises above ground level, the aquifer is called artesian.
DEFICIT	Describes the situation where the availability of water at a particular assurance of supply is less than the unrestricted water requirement.
DISCHARGE AREA	The area or zone where groundwater emerges from the aquifer. Natural outflow may be into a stream, lake, spring, wetland, etc. Artificial outflow may occur via pump wells.
ECOSYSTEM	A unit made up of all the living and non-living components of a particular area that interact and exchange materials with each other.
ENDOREIC	An area which is inwardly draining.
ENVIRONMENTALLY SENSITIVE AREA	A fragile ecosystem, which will be maintained only by conscious attempts to protect it.
GROUNDWATER	Water in the subsurface, which is beneath the water table, and thus present within the saturated zone. In contrast, to water present in the unsaturated or vadose zone which is referred to as soil moisture.

GROUNDWATER YIELD POTENTIAL	The maximum amount of groundwater that can be continuously withdrawn without creating critically low water levels exceeding recharge.
HYDROTECT	More correctly known as a *'hydraulically conductive tectonic structure/s'* are regionally significant faults, master joints or fractures along which deep artesian groundwater flow is channeled.
IRRIGATION QUOTA	The quantity of water, usually expressed as m^3/ha/a, or mm/a, allocated to land scheduled under the scheme. This is the quantity to which the owner of the land is entitled at the point at which he or she takes delivery of the water and does not include conveyance losses to that point.
MEAN ANNUAL PRECIPITATION	Frequently abbreviated to MAP, this is the long-term mean annual precipitation a specified period of time, at a particular point along a river and for a particular catchment and catchment development condition.
MEAN ANNUAL RUNOFF	Frequently abbreviated to MAR, this is the long-term mean annual flow calculated for a specified period of time, at a particular point along a river and for a particular catchment and catchment development condition.
OPPORTUNISTIC IRRIGATION	Irrigation from run-of-river flow, farm dams, or compensation flows released from major dams. As storage is not provided to compensate for reduced water availability in dry years, the areas irrigated generally have to be reduced in dry years.
POROSITY	The degree to which the total volume of soil or rock is permeated with spaces or cavities through which water or air can move.
PRIMARY AQUIFER	Aquifers in which the water moves through the spaces that were formed at the same time as when the geological formation was formed, for instance intergranular porosity in sand (for example alluvial deposits).
RECHARGE AREAS	Areas of land that allow groundwater to be replenished through infiltration or seepage from precipitation or surface runoff.
RELIABILITY OF SUPPLY	Synonymous with assurance of supply.
RESERVE	The quantity and quality of water required (a) to satisfy basic human needs by securing a basic water supply, as prescribed under the Water Services Act, 1997 (Act No. 108 of 1997) for people, who are now or who will, in the reasonably near future, be (i) relying upon; (ii) taking water from; or (iii) being supplied from, the relevant water resource; and (b) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource as indicated in the National Water Act (Act No. 36 of 1998).
RESOURCE DIRECTED MEASURES	Measures that focus on the quality and overall health of water resources.
RESERVOIR	The lake formed behind a dam wall. In this report the colloquial term dam is generally used for reservoir.
RESOURCE QUALITY	The quality of all the aspects of a water resource including: (a) the quantity, pattern, timing, water level and assurance of instream flow; (b) the water quality, including the physical, chemical and biological characteristics of the water; (c) the character and condition of the instream and riparian habitat; and (d) the characteristics, condition and distribution of the aquatic biota.

RESOURCE QUALITY OBJECTIVE	Quantitative and verifiable statements about water quantity, water quality, habitat integrity and biotic integrity that specify the requirements (goals) needed to ensure a particular level of resource protection.
RIVER SYSTEM	A network of rivers ranging from streams to major rivers and, in some cases, including rivers draining naturally separate basins that have been inter-connected by man-made transfer schemes.
SALINITY	The concentration of dissolved salts in water. The most desirable drinking water contains 500 parts per million or less of dissolved minerals.
SATURATED ZONE	The subsurface zone below the water table where pores within the geologic matrix are filled with water and fluid pressure is greater than atmospheric. Aquifers are located in this zone.
SECONDARY AQUIFER	Aquifers in which the water moves through spaces that were formed after the geological formation was formed, such as fractures in hard rock.
SOURCE DIRECTED CONTROL	Measures primarily designed to control water use activities at the source of impact, through tools such as standards, and conditions in water use authorisations.
SUB-AREA	The sub-divisions used as management regions for this document.
SUBPROVINCE	A geological term defining an area which has common geological characteristics
SURPLUS	Describes the situation where the availability of water at a particular assurance of supply is more than the unrestricted water requirement.
UNCONFINED AQUIFER	An aquifer, which is not restricted by any confining layer above it. Its upper boundary is the water table, which is free to rise and fall. The water level in a well tapping an unconfined aquifer is at atmospheric pressure and does not rise above the level of the water table within the aquifer. An unconfined aquifer is often near to the earth's surface and not protected by low permeable layers, causing it to be easily recharged as well as contaminated.
UNSATURATED ZONE	An area, usually between the land surface and the water table, where the openings or pores in the soil contain both air and water.
WATER TABLE	The top of an unconfined aquifer where water pressure is equal to atmospheric pressure. The water table depth fluctuates with climate conditions on the land surface above and is usually gently curved and follows a subdued version of the land surface topography.
WATER TRANSFERS	Water transferred from one drainage basin or secondary sub-catchment to another.
YIELD	The maximum quantity of water obtainable on a sustainable basis from a dam, river or aquifer in any hydrological year, in a sequence of years, and under specified conditions of catchment development and dam operation.

PREFACE

The Department of Water Affairs and Forestry (DWAF), as the custodian of the South Africa's water resources, wishes to make optimal use of these resources in promoting economic growth and wealth for all its citizens. On the other hand, armed with the National Water Act (NWA) and other legislation, it has the difficult responsibility of ensuring that such water utilisation is sustainable, and especially ensuring the sustainability of our natural environment. The following document presents DWAF's strategic perspective on how it wishes to protect, allocate use, develop, conserve, manage and control the water resources within the Olifants/Doorn Water Management Area (WMA) until the regional responsible authority (to be known as the Catchment Management Agency or CMA) has been established and is in a position to take over most or all of these functions.

In keeping with sound business practice, the Regional Office of the Department, assisted by the Directorate: National Water Resource Planning together with the other relevant DWAF Head Office Directorates, has focused on the following in preparing this document:

- Understanding what their core business is in conducting their interim water resource management functions (these must be in line with DWAF's Vision, Mission, Policy Objectives, the NWA, the recently drafted National Water Resource Strategy, and all NWA implementation processes);

- Clear management objectives and the setting of desired deliverables;

- Obtaining a thorough understanding of the natural, social, economic, political and other environments in the Berg WMA in which they have to perform their strategically important responsibilities. This is crucial to ensuring that the service they deliver optimises benefits for all water users by integrating all planning, implementation and management activities;

- A clear understanding of the water resources availability and how it is intended that this water be used. Reconciliation of water requirements and availability, as well as optimisation of river and water system operations, in the best interest of the country and the regional economy, is fundamental to the success of this management role.

- Providing a concise overview of the way in which DWAF will manage the business at hand. This includes strategies and actions regarding all aspects of water resources management in the WMA. Where no clear policy or approach exists, a strategy to obtain better decision support information is proposed.

- Business infrastructure and human resources that need to be assigned to each task or function. Prioritisation of these tasks and functions, including work scheduling.

The structure of this Internal (to DWAF) Strategic Perspective (ISP), or interim management strategy, has been prepared in such a way that the reader is provided with the necessary background along with the management approach to be adopted by the Department. This includes motivations as to how these approaches are intended to benefit all by ensuring equity of access to water, sustainability in maintaining the balance of utilisation by natural ecosystems and water users, and efficient and effective water use.