Department of Water Affairs and Forestry

Directorate: National Water Resource Planning

INTERNAL STRATEGIC PERSPECTIVE:

CROCODILE WEST MARICO

WATER MANAGEMENT AREA

CROCODILE RIVER (WEST) CATCHMENT

Version 1: February 2004

Department of Water Affairs and Forestry
Directorate National Water Resource Planning

DEVELOPMENT OF INTERNAL STRATEGIC PERSPECTIVES FOR THE CROCODILE RIVER (WEST) CATCHMENT*

APPROVAL

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INVITATION TO COMMENT

This report will be updated on a regular basis until it is eventually superceded by the Catchment Management Strategy. Water users and other stakeholders in the Crocodile River (West) catchment 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 DWAF website)

- Crocodile River (West) Internal Strategic Perspective *(This Report)* (Report No: P WMA 03/000/00/0303
- The National Water Resource Strategy
- The Crocodile (West) and Marico WMA – Overview of Water Resources Availability and Utilisation (Report No: P WMA 03/000/00/0203
- The Crocodile (West) and Marico WMA – Water Resources Situation Assessment (Report No: P WMA 03/000/00/0301)

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.

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VERSION CONTROL

CROCODILE (WEST) CATCHMENT INTERNAL STRATEGIC PERSPECTIVE

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EXECUTIVE SUMMARY

1. INTRODUCTION

The Department of Water Affairs and Forestry (DWAF), as the custodian of 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 Crocodile (West) River catchment 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. The Crocodile River (West) Catchment, which spans portions of the Gauteng, North West and Limpopo Provinces forms part of the Crocodile West and Marico Water Management Area (WMA). The ISP for the rest of the WMA is described in a separate report (Report No. 03/000/00/0404.

The objective of the ISP is to provide a framework for DWAF's management of the water resources in each Water Management Area, thus ensuring consistency when responding to new water use licences, and informing existing water users (including authorities) on how the Department will manage the water resource within the area of concern. This document will be made available to stakeholders in the catchment through existing forums in order to promote discussion and to illicit comments. Comments received will be considered and used to improve the ISP, which will serve as input into the process of establishing a Catchment Management Strategy (CMS) after the CMA has become operational.

2. WATER LEGISLATION AND MANAGEMENT

This strategic planning initiative falls within the framework of the National Water Act (Act 36 of 1998) and the National Water Resources Strategy. The NWA of 1998 is the principal legal instrument relating to water resource management in South Africa. The Act is now being implemented incrementally. The 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. Current government objectives for managing water resources in South Africa are set out in the National Water Resources Strategy (NWRS) as follows:

- To achieve equitable access to water.

- To achieve sustainable use of water.
- To achieve efficient and effective water use

DWAF are striving for an integrated planning and management approach, referred to as Integrated Water Resources Management (IWRM). The ultimate aim of this IWRM process is to arrive at:

- an allocation schedule that meets the requirements of the National Water Act (NWA) (Act 36 of 1998);
- water resources yield and other models that are representative of the flow regime of the river systems in the area;
- management class scenarios for the river (ie Reserve and Resource Quality Objectives set);
- a Catchment Management Strategy.

These deliverables can only be finalised once the CMA assumes responsibility for managing the water resources of their WMA. In the interim, DWAF's Regional Offices will continue to manage the water resources in their area of jurisdiction until such time as they can hand over these management functions to established and fully operational CMAs. In accordance with the NWA, DWAF (the Minister) will still remain ultimately responsible for the management of the water resources.

It must be borne in mind that this document forms the initial ISP for the Crocodile River (West) Catchment and was based largely on readily available information. As new information becomes available through actions initiated as a result of this ISP, the document will be updated so as to provide a relevant and up-to-date policy statement as to how the water resource of the Crocodile River (West) Catchment should be managed.

3. OVERVIEW OF THE CROCODILE RIVER (WEST) CATCHMENT

The Crocodile River is a major tributary of the Limpopo River (Drainage Region A) which discharges into the Indian Ocean in Mozambique (see **Figure 2.1**). The Pienaars, Apies, Moretele, Hennops, Jukskei, Magalies and Elands rivers are the major tributaries of the Crocodile River, which together make up the A20 tertiary hydrological catchment with its 39 quaternary catchments. The Crocodile River itself does not form any international boundaries but contributes to the flow of the Limpopo which is an international river basin shared with Botswana, Zimbabwe and Mozambique.

The upper portion of the catchment, south east of Hartbeespoort Dam, is located in the Gauteng Province. The north and north-east corners lie in the Limpopo Province whereas the central or western sections fall within the North West Province. The district and local municipal boundaries are shown in **Figures 2.1** and **2.2**. The total area of the Crocodile River Catchment is 29 400 km^2.

There are 9 major storage dams in the catchment with very limited scope for additional dams. Large quantities of water are transferred into the Crocodile River

(West) Catchment to augment the local water resources, constituting close to 46% of the total water use in the catchment. The most significant transfers of water are the supply of potable water via the Rand Water bulk distribution system from the Upper Vaal WMA to northern Johannesburg, Tshwane, Rustenburg and surrounds. A quantity of almost 520 million m^3 was transferred during the year 2000.

A small quantity of water is transferred from the Olifants WMA to the Cullinan Mine. Transfers out of the Crocodile River (West) Catchment are from the Pienaars River to the towns of Bela Bela and Modimolle in the Limpopo WMA and from the Vaalkop Dam into the Marico River Catchment to the Deelkraal cement factory. The total quantity transferred out of the Crocodile River (West) Catchment is approximately 3 million m^3/annum. Main transfers within the Crocodile River (West) Catchment are from the Roodekopjes Dam to Vaalkop Dam as well as via the Magalies bulk water distribution system. Water is also released from the Roodekopjes Dam for irrigation in the Lower Crocodile sub-area.

Groundwater forms an important feature with regard to water resources in the Crocodile River (West) Catchment. A large dolomitic aquifer stretches along the southern parts of the catchment. Significant volumes of water are drawn for irrigation and other purposes from this aquifer, including a significant portion of the water supply to the City of Tshwane. This aquifer extends across the boundaries of the various WMAs in this area. Sandy aquifers occur along the Lower Crocodile River, from which large quantities of water are abstracted for irrigation. These aquifers are recharged from rainfall as well as river flow. The remainder of the catchment is mostly underlain by fractured rock aquifers, which are well utilised for rural community water supplies.

The Crocodile River (West) Catchment was divided into four sub-areas to facilitate more detailed strategies. These sub-areas are the same as those used in the National Water Resources Strategy (NWRS) and are shown on **Figure 2.3.**

4. RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES

The NWRS total water balance for the year 2000 figures are as follows:

Table 1: Reconciliation of Water Requirements and Available Water for the Year 2000 (million m^3/annum)

Component/Sub-area	Local Yield	Transfers In (2)	Local Requirements	Transfers Out (2)	Balance (1)
Upper Crocodile	336	279	556	17	42
Apies/Pienaars	186	182	280	87	1
Elands	86	71	113	24	20
Lower Crocodile	59	112	171	0	0
Total for Catchment	**667**	**519**	**1120**	**3**	**63**

Note (1): Surpluses are shown in the most upstream sub-area where they first become available.
(2): Transfers into and out of sub-areas 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..

Taking future growth in water requirements and return flows into account, the reconciliation of water requirements and water availability for the year 2025 is shown **Table 2.**

Table 2: Reconciliation of Water Requirements and Available Water for the Year 2025 Base Scenario (million m³/annum)

Component/Sub-area	Local Yield (1)	Transfers In	Local Requirements (2)	Transfers Out	Balance (3)
Upper Crocodile	399	382	673	13	95
Apies/Pienaars	244	287	399	92	40
Elands	90	71	124	24	13
Lower Crocodile	59	113	173	0	(1)
Total for Catchment	**792**	**727**	**1369**	**3**	**147**

Source: NWRS

Note (1): Based on existing infrastructure and infrastructure under construction in the year 2000. Also includes return flows resulting from growth in requirements. Assumed that water will be transferred into the Apies/Pienaars and Upper Crocodile sub-areas from the Upper-Vaal WMA, to meet growth in these requirements.
(2): Based on growth in water requirements as a result of population growth and general economic development. Assumed no general increase in irrigation.
(3) Brackets around numbers indicate negative balance.

It is clear from **Table 1** and **Table 2** that current surplus in the Crocodile is expected to increase substantially over time. This is due to increased return flows and is based on the assumption that transfers will continue into the catchment to support continued economic growth. This is not necessarily the case and many of the strategies for this catchment relate to dealing with this situation of apparent surplus in the catchment.

5. MANAGEMENT STRATEGIES

5.1 *Upper Crocodile River Sub-catchment Area*

The southern portion of this sub-catchment is highly developed with the large industrial, urban and semi-urban sprawls of northern Johannesburg, Mid-Rand and southern Tshwane. The economic activity in this area generates a large portion of South Africa's Gross Domestic Product. Local water resources are insufficient to meet the water requirements in this area and therefore large volumes of water are transferred from the Vaal River System, via the Rand Water supply system, into this area. Large treated wastewater return flows are generated from these transfers which further supply other users downstream. The

rest of this area, mainly north of the Magaliesberg Mountain Range, includes significant irrigation (270 km ^{2}) and mining activities.

The main issue relating to this sub-area is the high projected growth in water requirements and the source of supply for these requirements. The first option, water demand management, will only have a limited impact, after which additional transfers into the area will need to be considered. However, the substantial return flows in the area will increase with increasing transfers resulting in a large surplus. It is important to develop a strategy that will optimise the use of this surplus, taking into account that the Vaal system is being supplied from other basins through Inter Basin Transfers. Very expensive projects will be required in future to increase the supply to the Vaal River system and the reuse of return flows in the Crocodile River (West) catchment must be considered as an option to delay costly additional transfer schemes. This reuse of return flows will result in an increase in the salinity of the Crocodile systems and the costs associated with this will need to be carefully considered. A cascading re-use is a feasible and preferable option, whereby the salts are always passed downstream and could conceivably be stored in slimes dams if mines are the end user in the system.

As an immediate strategy, all new use north of the Magaliesberg should be supplied from return flows, while a strategy needs to developed to supply users in the more upstream (southern) parts of the catchment as well. Some of the return flows could also be used for irrigation and establishing of emerging farmers should be considered.

5.2 *Elands River Sub-catchment Area*

This area forms the western drier portion of the Crocodile River Catchment. Rustenburg is the main urban centre in this sub-area and has grown rapidly in recent years due to the expansion of platinum mining activities here. There is potential for new mines to develop in this area.

Local water resources are under-utilised, while significant volumes of water are transferred to this area from the Vaal River System.

There is a significant amount of irrigation in this area (50 km^2), mostly situated along the northern foothills of the Magaliesberg.

The State/Tribal Authorities own a large portion of this area. Due to the vibrant economic activity in this area, people here (both urban and rural), and in the Upper Crocodile area, tend to be better off socio-economically than people in other parts of the country.

The rapid economic growth in this sub-area will certainly lead to increased water requirements. These increased requirements should be supplied from local sources, such as Bospoort Dam which is underutilised or increasing return flows in the Crocodile River.

5.3 *Apies-Pienaars River Sub-catchment Area*

A major part of this area is densely populated with the City of Tshwane (Pretoria) situated in the higher lying southern portion of the sub-catchment. The bulk of the water requirements of this area are supplied by Rand Water, sourced from the

Vaal River System, although significant quantities are also supplied from groundwater and from local sources. Water infrastructure in the existing urban areas of Mabopane, Hammanskraal and Temba, to the north of Pretoria is being upgraded which will have an impact on water usage in this area.

Irrigation in this sub-area is significant, with an estimated 67 km^2 of irrigated crops.

The same situation exists in the Apies/Pienaars sub-area as in the upper Crocodile, with increasing return flows resulting in projected surpluses in future. The difference here though is that the return flows become available in the Apies and Pienaars Rivers as opposed to the Crocodile which receives the return flows from the Upper Crocodile sub-area. Also, in the case of the Apies/Pienaars system, some of the surplus has already been allocated for improvement and expansion of the water supply to the areas north of Pretoria referred to above. The possibility of transferring the surpluses derived from return flows to the Western Highveld area in the Olifants WMA is also an option which is currently being investigated. It is important to ensure that increasing river flows due to return flows are not taken up by riparian irrigators, without first carefully considering alternative uses of this water.

5.4 Lower Crocodile River Sub-catchment Area

The area is characterised by large-scale irrigation activity along the mainstem of the Crocodile River (134 km^2) while in the rest of the sub-area the main activity is cattle and game farming. There are also a few mines in the area. Thabazimbi is the main town in this area. The water requirements of the Lower Crocodile sub-area can be met by return flows for the foreseeable future. It must be born in mind, however, that the NWRS reserves 45 million m^3/annum for the possible development of a new power station in the neighbouring Limpopo WMA. The allocation of surplus return flows in the Lower Crocodile must therefore be carefully considered.

6. WATER RESOURCES MANAGEMENT STRATEGIES

Twenty-two strategies have been grouped together under nine main strategic areas that are associated with the structures of the National Water Act and the National Water Resources Strategy. These are:

- Water Balance and Reconciliation
- Water Resources Protection
- Water Use Management
- Water Conservation and Water Demand Management
- Institutional Development and Support
- Integrated Environmental Management
- Waterworks Development and Management
- Monitoring and Information Management
- Implementation

Each sub-strategy under the above headings is focussed on recording the way in which the DWAF Regional Office, with the support of Head Office

Directorates, wishes to manage the water resources of the Crocodile (West) River Catchment in the interim, until such time as a Catchment Management Agency takes over various functions. These sub-strategies are presented in the following format:

- A situation assessment to provide the background
- A broad management objective
- An overall strategic approach that will be implemented
- Specific management actions that will be followed, along with the assigned responsibilities and priorities. These assignments will, outside of this ISP, be programmed and budgeted for by the Regional Office and other Directorates in DWAF.

INTERNAL STRATEGIC PERSPECTIVE:

CROCODILE WEST MARICO

WATER MANAGEMENT AREA

CROCODILE RIVER (WEST) CATCHMENT

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LIST OF ABBREVIATIONS

CEIMP	Consolidated Environmental Implementation Management Plan
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
DWAF	Department of Water Affairs and Forestry
IDP	Integrated Development Plan
ISP	Internal Strategic Perspective
IWRM	Integrated Water Resources Management
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MASL	Meters Above mean Sea Level
NEMA	National Environmental Management Act
NWA	National Water Act
NWRS	National Water Resource Strategy
RDM	Resource Directed Measures
RQO	Resource Quality Objectives
WMA	Water Management Area
WRSA	Water Resources Situation Assessment
WSDP	Water Services Development Plan
WSP	Water Sector Plan
WUA	Water User Association