Appendix A

Vaal River System Overarching Strategy Tables

Vaal River System Overarching Strategies

INTRODUCTION TO THE STRATEGY TABLES

The first two chapters of the document describe the ISP process, paint a broad perspective of the water situation, and provide a description of the key issues that have to be dealt with. The crux of the ISP is located in a series of strategy tables presented in **Appendix A**. Strategy tables for each strategic area present: the management objective (what we are trying to achieve); an assessment of the situation along with a motivation as to why the strategy is required; the required actions; responsibilities; priorities; and relevant supporting references. A version control is attached for future versions of this Internal Strategic Perspective (ISP).

The issues raised in the situation assessment and at the workshops were grouped into those that are knowledge gaps, specific directives, requirements or guidelines and are listed in the situation assessment section of the strategy tables. Management Actions were then developed to address issues when appropriate.

The table below provides a brief description of the elements contained in the strategy tables and was included to creating some common understanding of what is meant by these elements.

Definitions of terminology used in the Strategy Tables

Management Objective	Description of what DWAF is trying to achieve
Situation assessment	Description of the current situation and motivation to support the specific elements listed below.
Gaps (G)	Lack of knowledge, data missing or incomplete or non-existent processes that are required.
Requirement (R)	A need or specific requirement.
Directives (D)	Indicating the way, manner or direction in which something should be done.
Guidelines (U)	The standard or principle by which to determine the action. (mainly refer to an existing document)
Management action (M)	Solutions to fill Gaps, adhere to Directives and to meet Requirements.

Strategies Table of Contents

A.1 WATER BALANCE AND WATER RESOURCE RECONCILIATION STRATEGIES

A.1.1 RESOURCE AVAILABILITY

Management objective:	Ensure reliable estimates of the water resources (surface and groundwater) are available to effectively conduct Integrated Water Resources Management. The factors impacting on the water resource availability need to be clearly defined and understood.
Situation Assessment:	**Surface water resources:** The surface water resources of the Vaal River System has been the subject of various studies aimed at developing and maintaining a reliable hydrological database and Decision Support System (DSS) for the management of the water resources. The DSS consists of a series of water resource simulation models that are capable of simulating both water and salinity (Total Dissolved Solids (TDS)) balances. DWAF officials use these models as decision support tools to assess the capability (availability) of the water resource as part of the Department's responsibility to undertake development and operational planning. The predominant characteristic of the Vaal River System that plays an important role in the management of the water resources is the numerous transfers in and out of the system with links to four other Water Management Areas (WMA). Due to the interdependencies that exist, DWAF has developed an Integrated Vaal River System Water Resources Planning Model to simulate all the water resource infrastructure that affects the Vaal River System. This includes the three Vaal WMAs, significant portions of the Inkomati, Thukela and Usutu to Mhlathuze water management areas as well as the Lesotho Highlands. This complex system has to be analysed as a single network in order to simulate the interdependency that exists due to the various inter-basin transfers. The currently applied (March 2003) hydrological database and DSS were compiled as part of the *Vaal River System Analysis Update Study (VRSAU)* and the main deliverables from the study are listed below: a. Hydrological time series database for the period September 1920 to October 1995. b. TDS model that were calibrated and verified against observes data. c. Water Resource Yield Model (WRYM) network configurations that were used to determine the long term yield capability for seven sub-systems. The Integrated Vaal River System Water Resources Planning Model (WRPM) that was configured to simulate both water quantity and salinity (TDS).

Situation Assessment: (Continued)

RESOURCE AVAILABILITY

Given the level of detail of the abovementioned study, it can be stated that there is a high level of confidence in the estimates of the available surface water resources in the Vaal River System when considering the main (large) water resource components.

It was however identified that the resolution of the network models will have to be increased to realistically simulate the water resource availability at tributary catchment level. In the current system configurations certain components (demands, tributary catchments and small dams) were "lumped" together as single elements to simplify the networks. Although the simplification is suitable for analysis of the large system, an increase in detail is needed to estimate the resource availability at tributary catchment level. This issue is dealt with in more detail in the WMA specific ISPs. **[G1]**

The impact which the implementation of Water Conservation and Demand Management could have on the return flows is not well understood and has not been estimated at a satisfactory level of confidence. **[G2]**

Updating or extension of the hydrological database should be considered under the following circumstances: **[D1]**

- When a significant drought event, comparable or more severe to events experienced in the past, occurs.
- If it is observed that the status of one or more of the factors listed above, as having a large impact on water resources availability, change significantly.
- Updating the hydrological data for the purpose of re-calibrating the TDS model. (See **Directive 2** below.)

The re-calibration of the TDS (salinity) model should be considered when it is found that the land use activities assumed in the VRSAU study have changed significantly and there is evidence that the reliability of the results produced by the models is questionable due to changed circumstances. **[D2]**

As part of the international review of the Vaal River System Analysis Update Study **(review of report [Ref. 1])** it was recommended that sensitivity analysis be undertaken of selected input parameters such as the growth in the salinity recharge rates of the developed catchments. **[R1]**

Factors that were identified as having significant impacts on the available surface water resources of the Vaal River System are listed below:

1. The combined effect of small farm dams.
2. Coupled with item 1, the users abstracting water from the tributary catchments has a significant impact on the water resources of the larger dams in the system.
3. The extension of the hydrological record by 11 years, and the associated extension of the critical period, had a major impact by reducing estimates of the yield of the Vaal River System by about 13%. **[Ref. 1]**
4. Runoff from impervious urban areas contributes to the available resources.
5. Return flows from sewage treatment plants contribute significantly to the available resources. This resource will also increase due to the growth in the urban areas.

Situation Assessment: (Continued) **RESOURCE AVAILABILITY**	**Groundwater resources:** Groundwater resources will have a small impact on issues of an Overarching nature and are dealt with in more detail in each of the WMA ISPs. As a general comment it is the view of the Department that groundwater is an important resource to supply geographically dispersed water users located in the catchments of tributary rivers to the Vaal River. This resource can be a cost effective water supply option for small towns and communities if properly managed and maintained. It is very important that the planning for extensions to existing or new water schemes always include an assessment of groundwater as a resource. A concern was raised regarding the management of groundwater resources that cross into water management areas outside of the Vaal River System. A committee has been established to investigate the possibility of changing the WMA boundaries to coincide with the boundaries of the groundwater resource or to establish management protocols in cases where the boundaries are not changed. This issue will be dealt with at a **National Level**. It was further identified that the interaction between ground and surface water resources are not well defined and that the impact abstractions from the one resource type may have on the other resource's availability is not well understood. It was also recognised that the current surface water resource models and analysis techniques have limited and insufficient capability to simulate the groundwater surface water interdependencies and needs further development. This issue affects various WMAs in the country and will therefore be addressed at **National Level**.

MANAGEMENT ACTIONS (RESOURCE AVAILABILITY)		
Required actions, responsibilities and priorities:	**M1.** Improve the knowledge base by developing a Return Flow Analysis Model (similar to that which is currently being developed in the Crocodile (West) River Return Flow Analysis Study **[Ref. 2]**) for the Vaal River System. Apply the model to assess the impact of Water Conservation and Demand Management measures on the demand and return flows. (Refer to **Management Action M3** of the "**WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGYA.4**") **{G2}**	Dir: NWRP (Priority 2)
	M2. Develop higher resolution hydrological data and system models for targeted local resources for which there are indications that the water resources are under stress, allocations among users have to be resolved or where new abstraction licences need to be evaluated. Consideration should be given to how this refined data will link to the existing, larger scale, database and models. **{G1}**	Dir: NWRP (Priority 1)
	M3. Assess the need to update or extend the hydrological database on a continuous basis and commission studies accordingly. **{D1}**	Dir: NWRP (Priority 4)
	M4. Establish the need to update the TDS model by assessing the main variables that impacts on the salinity loads in the system on a continuous basis and commission studies accordingly. **{D2}**	Dir: NWRP (Priority 4)
	M5. Undertake sensitivity analysis of selected input variables and assess the impact thereof on the need for augmentation. **{R1}**	Dir: NWRP (Priority 2)
Interfaces:	**References:** **1.** DWAF report no: PC 000/00/18496, "*Vaal River System Analysis Update: Integrated Vaal River System Analysis*", Chapter 8.1. **2.** DWAF report no: PB A200/00/3802, "*Crocodile (West) River Return Flow Analysis Study: Inception Report*", 2003.	

Strategy Version control:	**Version no:**	1
	Date:	March 2004
	Author:	ISP Study

A.1.2 WATER REQUIREMENTS

Management objective:

Ensure the knowledge base on the water requirement in the three Vaal WMAs is realistic and updated on a regular basis. Furthermore, maintain and update water requirement scenarios for planning and management purposed.

Situation Assessment:

Water use data:

The actual water use data (see user composition in table below) are collated from the different DWAF offices and bulk users on an annual basis and currently captured in a spreadsheet database. This information is compared with the water requirement scenarios in order to assess the applicability of the scenarios and make adjustments to them (over the short-term) where needed. These scenarios are uses for the annual operating analysis of the system to determine the most appropriate operating rules.

Due to the detailed level of the investigation that were carried out as part of the Vaal River Irrigation Study **[Ref. 2]** the estimates on water use for irrigation is considered to be of acceptable reliability for planning purposes.

It should be noted that the actual water use for irrigation is only partially captured due to the data not being readily available and that in some cases no measurements take place. There is room for improving the collection and collation of the actual water use data in the irrigation sector.

The table below gives a breakdown of the water requirements between the indicated sectors and components for the year 2000. The total gross water use for the Vaal River System for the year 2000 was estimated at 3560 million m^3/annum.

Sector	Components	Percentage of Total Requirement	
Urban	Rand Water	36	45
	MidVaal Water Company	2	
	Sedibeng Water	2	
	Other towns and small industries	5	
Large Industries	Eskom	8	14
	Sasol I	2	
	Sasol II and III	3	
	Iscor	1	
Irrigation	Vaalharts/Lower Vaal	17	30
	Other	13	
Losses	Wetland and river losses	11	11

Situation Assessment: (Continued)

WATER REQUIREMENTS

Water requirement scenarios:

The water requirement scenarios currently used for planning originate from the National Water Resources Strategy. For the Urban Sector, the most probable scenario is based on the so-called "**Ratio Method**". In short this method uses the same ratio between the domestic portion and the remaining portion (commercial, industrial and other) as observed in 1995 to project the urban water requirement into the future (see **[Ref. 1]** for a summarised description of the scenario generation method).

The water requirement scenario generation method adopted for the NWRS took into consideration socio-economic factors and fertility rates as driver variables for population growth and migration patterns among more than 700 Consumption Centres in the country. By nature this scenario generation method allows for factors beyond water management area boundaries which implies that water requirement scenarios have to be made from a national perspective. The determination of water requirement scenarios should be founded on actual water use data and the correlation thereof with the driver variables such as population and economic parameters. Water requirement scenarios to be used for water resource planning should therefore be carried out at the **National Level**. **[R1]**

The water requirement scenarios for the large industrial users (see table above) were obtained from the users themselves.

It was further assumed that the irrigation water requirement would remain constant from what was determined from the Vaal River Irrigation Study **[Ref. 2].**

Indications are that the registered water use is substantially more than that used in the model. It is therefore essential to compare the data in the model with verified use once the verification process is completed. **[R2]**

The water requirements for the wetlands and river losses are calculated in the water resource models and, among other variables, depend on the volume of flow through the systems and climatic conditions.

The main bulk users, Rand Water, MidVaal Water, Sedibeng Water, Eskom and Sasol provide water requirement scenarios on an annual basis. These scenarios are compared with previous scenarios to determine the level of deviation as well as possible changes in trends. Comparisons of these scenarios are made with the NWRS scenarios and adjustments are made where appropriate, mainly over the short term. The general approach is to maintain the long term future water requirement scenarios as was defined in the NWRS and only make adjustments over the short term. The intention is that the NWRS scenarios will be updated at about five year intervals.

Indications (in the year 2003) are that Eskom is experiencing elevated water use, higher than previous water requirement scenarios, and that Sasol is expecting higher growth in demand in excess of what was projected. The consequences of higher future water requirement scenarios for these two users are that the date when the Eastern Sub-system has to be augmented will be earlier than scheduled in the the Vaal River Eastern Sub-system Study (VRESS) **[Ref. 3]** **[R3]**

Situation Assessment: (Continued) **WATER REQUIREMENTS**	The responsibility for any water requirement scenario, that will be used in a decision making purposes (i.e. for deciding when to implement an augmentation scheme) is on the user themselves since it will represent a commitment of the user with respect to the cost of the proposed scheme. In all cases the user's scenarios will be checked against the planning scenarios referred to in **R1** above. **[R4]** **Return flows scenarios:** Actual return flow (urban wastewater) data are not captured continuously on an annual basis. In the past this data were only collated as part of the hydrological studies for calibration purposes. Currently the return flows are simulated as a direct proportion of the use and it is assumed that the proportion stays constant for the future scenarios. Due to the importance of this source of water and the possible impacts changes in user behaviour could have on the return flows it is proposed that, in future, the data be collected and analysed annually. Comparisons of the recorded data with the estimates will show where deviations occur and will ensure appropriate management actions can be taken accordingly. (See also the strategy on "**RESOURCE AVAILABILITY A.1.1**" for the importance of this resource and thus the need to have reliable planning information) **Registration of water use:** This process has been largely completed and indications are that the registered use is much higher than the previous estimated water use. The process of verification of actual (existing) water use and the lawfulness of that is in progress.

MANAGEMENT ACTIONS (WATER REQUIREMENTS)		
Required actions, responsibilities and priorities:	**M1.** The process of verification of existing lawful use must be completed as soon as possible. Comparisons should be made between the lawful use and the water use data applied in the water resource system models. In this process the water use database can be supplemented by using satellite images of areas under irrigated and crop water use calculations, particularly for irrigation outside of the main schemes, to estimate irrigation water use. (Refer to **Management Action M1** of the strategy on "**MONITORING NETWORKS AND DATA CAPTURING A.7.1**" **{R2}**	Regional Office (Priority 1)
	M2. Update the water requirement scenarios of the Eastern Sub-system as a priority activity. These scenarios are urgently required for the feasibility study and implementation of a scheme to augment this subsystem. **{R3}**	Dir: OA (Priority 1)
	M3. The water requirement scenarios of the Vaal WMAs and other related supply areas must be updated at regular intervals by the users themselves with co-ordination by DWAF. This must be co-ordinated with overall scenarios of population and economic growth for the whole country. **{R1,R4}**	Dir: NWRP (Priority 1)
Interfaces:	**References:** **1.** DWAF report no: PC 000/00/22502, "*Vaal River: Continuous Investigations (Phase 2), Revision of the augmentation requirements for the Integrated Vaal River System (2001)*". **2.** DWAF report no: PC000/00/21599, "*Report for the Vaal River Irrigation Study", September 1999.* **3.** DWAF report no: PC110/00/0800, "*Vaal River System: Pre-feasibility study to determine the need for Augmentation of the Eastern Sub-system: Main Report*", 2001. **4.** DWAF reports describing the Water Resources Situation Assessment Study of the Upper, Middel and Lower Vaal Water Management Areas.	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.1.3 WATER BALANCE RECONCILIATION

Management objective:	Maintain a balance between the water requirements and water availability (now and in the future) while applying the allocation priorities defined in the National Water Act, ensure equitable sharing of the water as well as making allocations for poverty eradication initiatives.
Situation Assessment:	**Overall water balance situation (Integrated Vaal River System):** *Current Knowledge:* The Vaal River System is a component of the extended Vaal River System for which the latest estimate of the water balance **[Ref. 1]** indicated the following balance results: ● A slight surplus of 19 million m^3 is estimated for the year 2000, excluding the contribution of Phase 1B (Mohale Dam and transfer tunnel) of the Lesotho Highlands Water Project (LHWP) to be commissioned in 2003. ● With Phase 1B of the LHWP in place, it was projected that excess supply conditions will exist until the year 2025 when further augmentation would be required. It is important to note that the indicated excess or surplus is only available under the condition that pumping occurs from the Thukela-Vaal Scheme. The available excess in supply is therefore qualified as a **conditional surplus** and estimated at about 300 million m^3/annum. This represents less than 9% of the year 2000 gross demand imposed on the Vaal River System. In practice the volume of water conveyed through the Thukela-Vaal Transfer scheme will be reduced, to save pumping costs, effectively operating the system such that the water demands are in balance with the supply. ● Although the above holds true of the system as a whole, additional augmentation is required by about 2010 for the Eastern Sub-systems consisting of Grootdraai Dam and supporting systems. The pre-feasibility study determined that a dam on the Klip River (Free State) with transfers into Grootdraai Dam is the best contender followed by the Merikloof Dam (Usutu) and the Vaderlands Dam (Pongola) options. This was based on economic considerations only. Subsequent to the pre-feasibility study Eskom indicated that in order to minimise the total risk of water supply the pipeline option to transfer water from Vaal Dam would be preferred. The Vaal pipeline option has the advantage that water can be accessed from both the Thukela River and Lesotho Highlands rivers, which decreases the vulnerability with respect to localised droughts in the catchments of the Eastern Sub-system. *Important qualification with respect to the indicated conditional supply surplus:* a. The estimated excess supply indicated above only exists if the inter-basin transfers are operated at maximum capacity.

Situation Assessment (Continued)

WATER BALANCE RECONCILIATION

b. During the period of excess supply, the operating rules of the inter-basin transfers will be adjusted to reduce the transfer volumes to achieve pumping cost savings. This will only be allowed when it is proven that the long-term reliability of supply are not jeopardised due to the loss of water from the supporting systems.

c. From the water balance situation it can be deduced that the indicated conditional surplus will be taken up by the growth in the water requirements over the next twenty years. It is therefore considered appropriate for new users to share in the conditional surplus by allowing further abstraction licences.

d. In all cases new users will have to pay the full Vaal River Tariff with respect to the impact they have on the reduction of the positive water balance.

Reconciliation options and perspective:

Although it is projected that the water resources will be sufficient to supply the water requirements until the year 2025, it is important to present the possible reconciliation measures that are available in the Vaal River System, should it be required over the medium term or beyond the year 2025.

- Water Conservation and Demand Management could have a significant impact on postponing the date intervention (augmentation) is required. This is due to the relative low growth rate of the projected future water requirements and preliminary indications that indicated significant savings can be achieved through WCDM. (See the "**WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY A.4**" for further details regarding the proposed planning requirements and management actions relating to WCDM.)
- In line with current planning methodology applied by DWAF, intervention by means of infrastructure development should only be considered once it has been proven that improved efficiency of water use through water conservation and demand management cannot satisfy the needs for augmentation. In all cases all potential augmentation options should be compared on the basis of economic, social, environmental and more specific ecological criteria in order to find the most feasible solution.
- Planning investigations were undertaken on several augmentation options in the past as part of the Vaal Augmentation Planning Study and several studies on further phases of the Lesotho Highlands Water Project (LHWP). According to the current knowledge the next augmentation scheme to be implemented will either be the Thukela Water Project or a further phase of the LHWP.
- After completion of the Comprehensive Reserve Determination Study for the Thukela River Catchment, consolidate all planning information so as to allow further planning phases to proceed efficiently.
- The projected future water balance is based on estimates of what the water requirements will be in future are by nature uncertain. To make appropriate adjustment to the reconciliation plans it is required to undertake continuous assessments of the water balance as new improved information become available. **Management Action M3** below related to this requirement.

Situation Assessment (Continued)

WATER BALANCE RECONCILIATION

*Other **g**aps in the knowledge base not identified above:*

There are two variables (one on each side of the balance scale) that could change the projected balance situation as described below:

G1. Water Conservation and Demand Management (WCDM) was not taken into consideration in the balance presented above. This is mainly due the lack of information with respect to data indicating how the various measures that are being implemented by the different authorities will impact on the long-term water requirement as well as the return flows.

G2. The water balance makes allowances for the Ecological Reserve using low confidence Desk Top estimates for the purpose of developing the National Water Resources Strategy (NWRS). Subsequent to the publication of the NWRS, a cursory assessment indicated that the positive water balance could decrease by as much as 300 million m^3/annum when using the flow requirements derived as part of the Vaal River System Analysis Update Study, also referred to as a Flow Management Plan for the Vaal River. No urgent Reserve issues were identified during the Overarching Workshops, however, the above factors point to the need for careful planning and implementation of the Ecological Reserve to balance, among other things, the economic consequences and ecological benefits. Due to the interdependencies of the triturates with the main stem of the Vaal River, it will be required to undertake the determination in an integrated way, balancing tributary contributions with the flow requirements of the main stem.

A further complication with respect to the Ecological Reserve is that the water resources of the Integrated Vaal River System straddle, apart from the three Vaal WMAs, three other WMAs for which the Ecological Reserve needs to be determined. (A strategy for the determination and implementation of the Ecological Reserve is discussed in Management Action **M1** of the strategy on "**RESERVE AND RESOURCE QUALITY OBJECTIVES A.2.1**")

The view on the above two variables (WCDM and Ecological Reserve is that, since they are at opposite ends of the water balance scale, they could be managed in such a way that the supply to the Ecological Reserve could be made by savings through WCDM measures. **[R1]**

*Other **d**irectives, g**u**idelines or **r**equirements identified from available information:*

R2. At this stage only a pre-feasibility study has been undertaken with respect to the planning of a proposed scheme to augment the Eastern Sub-systems. The planning process needs to be taken further through a feasibility study to be succeeded by detailed design, financing, tendering, construction and implementation of the selected option.

D1. The conditional surplus, indicated above, is available to supply the growth in the requirements in the system. Users can apply for licences for new requirements, as well as, growth in existing requirements. In all cases the normal criteria will be used to evaluate the licences according to departmental policies. All new uses will have to be pay the full system tariff for the water. (See the strategy on "**LICENSING A.3.2**" for the conditions according to which the surplus should be allocated.)

MANAGEMENT ACTIONS (WATER BALANCE RECONCILIATION)		
Required actions, responsibilities and priorities:	**M1.** The impact WCDM measures could have on the projected supply situation must be determined. The products of the proposed Return Flow Analysis Study, described under **Management Action M1** of the strategy on **"RESOURCE AVAILABILITY A.1.1",** and the study described in **Management Action M3** of the "**WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY A.4**" should proof to be useful sources in re-determine the projected water balance. **{G1}**	(See referenced strategy)
	M2. A Feasibility Study should commence to determine what options should be taken further in the planning process to augment the Eastern Sub-systems. Further activities are discussed under the "**INFRASTRUCTURE DEVELOPMENT AND SUPPORT A.6.1**" **strategy**, **Management Action M2**. **{R2}**	Dir: OA (Priority 1)
	M3. With reference to components shown in **Figure 1.4** of **Section 1.4** and the reconciliation perspective given in the Situation Assessment above, their remains many uncertainties regarding the future projected water balance. It is therefore required to assess and update the reconciliation scenarios regularly and inform and involve all users in the selection of the appropriate intervention measures.	Dir: NWRP (Priority 2)
Interfaces:	**References:** **1.** Comments on the water balance presented in the first draft of the NWRS for the Upper, Middle and Lower Vaal WMAs, 2003. **2.** DWAF report no: PC000/00/22502, "*Vaal River: Continuous Investigations (Phase 2), Revision of the augmentation requirements for the Integrated Vaal River System (2001)*". **3.** DWAF report number PBC110/00/1200, "*Vaal River System: Pre-feasibility Study to determine the need for augmentation of the Eastern Sub-system*", 2002.	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.1.4 TRANSFERS AND RESERVATION OF WATER

Management objective:	Secure sufficient transfers into the Vaal River System to augment the local water resources and reserve adequate water resources to support the transfers out of the WMAs.
Situation Assessment:	**Overview:** **Figure 2.1, Figure** 2.2 and **Figure** 2.3 in **Chapter 2** give geographical representations of the transfer into and out of the three Vaal WMAs. According to the NWRS all inter-WMA transfers are under control of the Minister. **Existing transfers into the Vaal River System:** There are six inter basin transfers into the three Vaal WMAs as listed below: 1. Transfer from Heyshope Dam, located in the Usutu - Mhlathuze WMA, to augment Grootdraai Dam. 2. Transfer from Zaaihoek Dam in the Thukela WMA to supply Majuba Power Station and augment Grootdraai Dam. 3. Thukela-Vaal Transfer Scheme supplying water from the Upper Thukela into Sterkfontein Dam. 4. Transfers from Lesotho (LHWP) into the Liebenbergsvlei River augmenting the water resources of Vaal Dam. 5. The fifth transfer scheme is into the Lower Vaal WMA conveying water from the Upper Orange WMA in support of the irrigation water requirements supplied from Douglas Weir. 6. Water that is transferred from the Usutu - Mhlathuze WMA to support the power stations in the Olifants WMA, crosses the Upper Vaal WMA and also supplements the water supply to the town of Ermelo. **Existing transfers out of the Vaal River System:** The two main transfers conveying water out of the system are listed below: 1. Water is transferred to support the thermal power stations in the Olifants WMA from Grootdraai Dam. 2. Transfers to the Crocodile West & Marico WMA supporting the bulk of the urban water requirements in the Tshwane and northern portion of the Greater Johannesburg Metropolitan areas. **Release obligation between the Vaal Water Management Areas:** The cascading orientation of the three WMAs in the Vaal River System and the disproportionate distribution of the water resources, dictated by the decreasing annual average rainfall in the direction of the river flow, necessitate that significant obligatory releases (considered to be in national interest) have to take place from the Upper to the Middle and from the Middle to the Lower Vaal WMAs. In accordance with the NWRS, these inter-WMA transfers (releases) are under the control of Minister.

Situation Assessment: (Continued)

TRANSFERS AND RESERVATION OF WATER

Upper Vaal to Middle Vaal release obligations:

In the NWRS an average annual release is specified based on the yield balance in the Middle Vaal WMA using a 1:50 year return period basis. In practice however the flow from the Upper to Middle Vaal WMA is made up of several components as listed below:

- Spills and incremental runoff during high flow conditions.
- Outflow from the Vaal Barrage as a result of releases from Vaal Dam for the blending rule to maintain the TDS concentration water in the Vaal Barrage at 600 mg/l.
- Releases to support the water requirements of Midvaal Water and Sedibeng Water.
- During prolonged drought events when Bloemhof Dam is depleted; large volumes have to be released to support the water requirements of both the Middle and the Lower Vaal WMAs.

Middle Vaal to Lower Vaal release obligations:

Bloemhof Dam is the most downstream control structure in the Middle Vaal WMA and most of the water requirements in the Lower Vaal have to be released and controlled from the dam. The flow between the two WMAs is therefore driven by the requirements in the Lower Vaal WMA with occasional uncontrolled spills from the dam.

Future transfers into the Vaal River System:

1. The transfer from the LHWP will be increased with the commissioning of Mohale Dam and transfer tunnel in 2003.
2. Based on the reconciliation status given in the strategy on "**WATER BALANCE RECONCILIATION A.1.3"** it is shown that augmentation will be required by 2025. Current planning information indicates this augmentation could be either the Thukela Water Project or further phases of the LHWP.

Future transfers out of the Vaal River System:

The transfers to the Olifants, Crocodile West and Marico WMAs are expected to increase over time to support the growing urban water requirements. (This is part of the projected water requirements used in the 2025 water balance.)

Future release obligations between the Vaal WMAs:

The release obligations between the WMAs will only experience minor increases in future. This is due to the relatively low increase that is expected in growth of the water demands in the Middle and Lower Vaal WMAs.

Situation Assessment: (Continued) **TRANSFERS AND RESERVATION OF WATER**	***D**irectives, g**u**idelines or **r**equirements identified from available information:* **D1.** The management of all the transfers and release obligations should be undertaken using the Integrated Vaal River System model. This model encompasses the entire Vaal River and supporting systems and simulates all the interdependencies that are crucial for proper operation of the system. (See **Management Action M1** of the strategy on "**SYSTEM MANAGEMENT A.6.2**".) **D2.** Cost saving operating rules (i.e. reduction of pumping from the Thukela) should be implemented for the transfers during periods of high runoff and high dam levels. The decision to implement such rules should be taken only if it can be shown that the long term assurance of supply is not jeopardised. See also the strategy on "**SYSTEM MANAGEMENT A.6.2**".

MANAGEMENT ACTIONS (TRANSFERS AND RESERVATION OF WATER)		
Required actions, responsibilities and priorities:	**M1.** Implement cost saving operating rules for the transfers. In all cases the cost saving transfer rules should not jeopardise the long-term supply reliability in any of the effected water resource systems. **{D2}**	Regional Office (Priority 1)
Interfaces:	**References:**	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.1.5 COMPULSORY LICENSING

Management objective:	Ensure the equitable sharing of the available water resources for both the Reserve and to reduce past inequities whilst maintaining the economic and social structures that rely on the water resources of the Vaal River System.
Situation Assessment:	*Status Quo:* Considering the three variables (Reserve, water for equity and a negative water balance) that could drive the need for Compulsory licencing, the status is as follows: ● Due to the excess supply situation as indicated in the Reconciliation Strategy, there is no need to implement compulsory licensing on the grounds of water supply constraints. ● Currently the Comprehensive Ecological Reserve has not been determined for the WMA and no urgent Reserve issues were identified during the Overarching Workshops that pointed to the need for Compulsory Licensing on the basis of pressures brought upon by the Reserve. ● The economic activities supported by the water resources in the Vaal River System is recognised as the economic engine of South Africa. The key purpose in allocating water must be to keep this economy to prosper to the benefit of all. The specific need to move water into the hands of the historically disadvantaged is not seen as the focus in the Vaal River System. Indirectly, by supporting the economic activities, secondary opportunities are created in the form of revenue for the government that can be allocated for worthy causes such as land restitution. ● Although the above status indicates that Compulsory Licensing is not a priority in the whole Vaal River System, it may be required in selected sub-catchments. ● The above presented view, as well as, the principle that all new water use will pay the full cost for water (see the strategy on "**LICENSING A.3.2**") effectively rules out any increases in irrigation from surface water resources. Redistribution of equity irrigation water can take place through land redistribution, however, it could also be done through Compulsory Licensing. This need will be determined in the WMA ISP workshops and reflected in the ISPs for the individual WMAs. ***D**irectives, g**u**idelines or **r**equirements identified from situation assessment:* **D1.** Based on the situation assessment it is evident that Compulsory Licensing is not a priority for the Vaal River System as a whole. There may be specific catchments in the system where the priority is higher. These priority areas are identified as part of the WMA specific ISPs. **(No specific Management Actions are required)**

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.2 WATER RESOURCES PROTECTION STRATEGY

A.2.1 RESERVE AND RESOURCE QUALITY OBJECTIVES

Management objective:	The Vaal River catchment and its various tributaries and reaches needs to be classified in terms of the new classification system to ensure a balance between environmental health and the optimal use of the resource. Ultimately a Comprehensive Reserve determination needs to be undertaken for the Vaal River catchment, with the Reserve being implemented and enforced.
Situation Assessment:	The Vaal River Catchment has sub-catchments whose natural flow and water quality regimes are significantly changed from natural conditions, whilst others are close to natural. The impacted river systems in the Vaal River catchment are highly regulated by major and small dams. The natural flow patterns in many of these river reaches have been substantially modified by return flows from wastewater treatment plants, mine dewatering, agricultural return flows and releases of water from transfer schemes into the river systems. It is believed that the ecosystems have largely adapted to the changed flow and water quality regimes. There are also substantial areas of the Vaal River catchment where land use development is low and the flow patterns are therefore largely unimpacted (e.g. Klip River (Free State), tributaries of the Wilge River and selected catchment upstream of Grootdraai Dam in the Upper Vaal WMA). A Comprehensive determination of the Reserve has not been done for the Vaal River Catchment **[G1]**. However, as part of the VRSAU study an Environmental Flow Management Plan was developed for the main stem of the Vaal River **[Ref. 1]**. The products from the study were basic definitions of flow requirements and preferred operating regimes. The scope of the study did not include the development of flow duration curves, which is the current applied method of simulating In-stream Flow Requirements (IFR) in the water resource models. Currently applied reservoir release and transfer operating rules do not explicitly contain the flow requirements and patterns defined in the abovementioned study. **[G2]** The RDM directorate has also determined low confidence desktop estimates of the IFR and in some cases the water quality Reserve for critical catchments where the Reserve is needed for the issuing of licences. The water resources of the Vaal River System are augmented by transfers into the catchment from adjacent WMAs. The ecological Reserve still needs to be determined for many of the catchments supplying the Vaal River System. The implementation of these Reserves and the Vaal River Catchment Reserve will affect the water availability in the Vaal River System. The impact of the implementation of the Reserves for the various augmentation schemes and the Vaal River System will have to be derived and an implementation schedule determined.

Situation Assessment (Continued) **RESERVE AND RESOURCE QUALITY OBJECTIVES**	Other identified **gaps** in the knowledge base: **G3**. The timing for the determination of the comprehensive Reserve needs to be planned. *Additional **D**irectives, g**u**idelines or **r**equirements identified from available information:* **R1.** Continue to determine the Ecological Reserve, using the Desktop, Rapid and Intermediate determination methods in support of the Licensing of water use. **R2.** Implementing the Ecological Reserve in the Vaal River System will most likely have the indirect cause that further and more expedient augmentation options will be needed. The merits of improving the ecological status in the Vaal River at the cost of degrading the Ecology in a source catchment should be assessed when the Comprehensive Reserve is determined. **D1.** The Department has the view that the Vaal River is a "workhorse' river and that the Ecology thereof should be managed to prevent further degradation and improve areas where unacceptable ecological conditions exists without causing a significant reduction in the water availability. (*This directive was included after comments were received from DWAF officials and is in reaction to a need that was expressed requesting a statement on DWAF's view regarding the implementation of the Reserve. This directive was therefore not tested by all Directorates*.) **D2.** With respect to contributions of the Vaal River to support the Reserve in the Lower Orange WMA the situation and perspective is as follows: a. The current system configuration is such that the Vaal River System already relies on large quantities of water transferred from the Orange River through the LHWP. b. Any release obligation from the Vaal River to the Orange River for the Reserve will result in additional transfers from the Thukela WMA (over the period leading to the year 2025) as well as expediting the date when augmentation to the Vaal River System is required (bringing the 2025 balance date forward in time). This will in effect imply that a further augmentation scheme will be implemented to supply the reserve in the Lower Orange WMA, in essence exchanging one environmental impact for another. c. It is therefore the perspective that the Reserve requirements in the Lower Orange WMA have to be supplied from the Upper Orange WMA and not the Lower Vaal WMA.

MANAGEMENT ACTIONS (RESERVE AND RESOURCE QUALITY OBJECTIVES)		
Required actions, responsibilities and priorities:	**M1.** The RDM Directorate should investigate what the status of the Environmental Flow Management Plan is with respect to current Reserve Determination methodologies. Furthermore the implementation of the conditions and flow requirements into the operating rules of the system should be investigated and the impacts determined. The intention is to establish if the Environmental Flow Management Plan can be implemented as an interim measure prior to the determination and implementation of the Comprehensive Reserve for the Vaal WMAs. **{G1}**	Dir: RDM (Priority 1)
	M2. The time schedule for determining the Comprehensive Reserve is needed for the Vaal River. A committee needs to be established to assess if the Reserve for the entire catchment and or system needs to be determined or only sections of the catchment and when should this determination take place. This determination should be co-ordinated with catchments augmenting the Vaal River System and the determination of the Orange River Reserve. (See **Management Action M1** of the strategy on "**COMPULSORY LICENSING A.1.5**") **{G1 and G3}**	Dir: NWRP (Priority 1)
	M3. The status of the Vaal River as a "working" system need to be assessed by the RDM Directorate. **{D1}**	Dir: RDM (Priority 2)
Interfaces:	**References:** **1.** DWAF report no: PC000/00/18596, "Vaal River System Analysis Update: Environmental considerations in the Vaal River System Analysis Study", 1999.	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.2.2 WATER QUALITY MANAGEMENT

Management objective:	The Department has a mandate to manage water resources in a sustainable manner and to pursuit activities that stimulate development and socio-economic growth which unfortunately are associated with negative water quality impact. The main objective is therefore to ensure a sound and reasonable balance between development and the protection of the resource. Fitness for use by all users (especially downstream users) and protection of the natural ecosystems must form the basis for strategy development.
Situation Assessment:	The water quality in the Vaal River catchment varies from poor in the highly developed areas to good in the less developed areas. The land use in the catchment includes agriculture, extensive gold and coal mining, power generation, industrial activities and urban developments. The industrial activities include mineral processing plants, steel industry, petrochemical industries, fertiliser manufacture, pulp and paper and light industry located in and around the urban centres. The urban developments consist of cities, towns and dense settlements. There are also dolomitic compartments in the Wonderfonteinspruit and Blesbokspruit catchments, which have been dewatered by mining activities. All these activities impact on the surface water and groundwater quality in the catchment. The water quality in many of the catchments is determined by the point source discharges from wastewater treatment plants, industrial effluent discharges and mine dewatering. The water resources of the Vaal WMAs are supported by transfers from adjacent catchments. These transfers are generally released into the rivers in the catchment and also impact on the water quality of the catchment. There are a number of coal fired power stations in the Olifants River catchment to the north of the Vaal River catchment as well as in the Vaal River catchment. The power stations as well as the steel industries and Sasol all contribute to the mass of pollutants emitted to the atmosphere. The deposition of pollutants from the atmosphere has been cited as a cause of the deterioration of the water quality in the Vaal River catchment. **[Ref. 1]** The flow in the main stem of the Vaal River, downstream of Vaal Dam and upstream of Bloemhof Dam, is largely influenced by the blending and/or dilution options that are implemented to maintain the TDS concentration at acceptable levels for users receiving water from the Vaal Barrage. These measures were required due to the high salinity content of the mine dewatering as well as the diffuse sources originating from the highly urbanised areas, all discharging into the catchment of the Vaal Barrage. In addition, large volumes of treated effluent also discharge into the Vaal Barrage of which the re-use has to be maximised to enhance the benefit obtainable from the resource. Several studies investigated what blending and or dilution rules should be implemented and the current practice is to apply one of the following rules:

Situation Assessment: (Continued)

WATER QUALITY MANAGEMENT

a. *Best quality, worst re-use option*: Supply Rand Water only from Vaal Dam and release water from Vaal Dam for dilution to maintain the TDS concentration in the Vaal Barrage at 600mg/l.

b. The second rule attempts to maximise reuse by supplying Rand Water users with a blend of water from Vaal Barage and Vaal Dam with the objective to maintain the TDS concentration at a maximum of 300 mg/l.

c. A third rule is a combination of the first two where both rule (a) and (b) are applied simultaneously to achieve some level of reuse and improve the water quality of the users downstream of Vaal Barrage. This third rule can however not be implemented fully due to the long water body of the Vaal Barage and the location of existing off-takes which hinders proper blending to be achieved in the Vaal Barrage.

The need for more stringent blending targets has been expressed by users downstream of the Vaal Barrage and changing conditions with respect to the mine dewatering highlights the need to revisit these rules as a matter of priority. **[R1]**

During 1997 the Amanzi Study investigated the possibility of desalinating the mine water, as an option to manage the high saline source for the remaining lifetime of the mines and after decommissioning. The study concluded that it will be technically feasible to desalinate, however, the economic viability was not favourable for a private initiative at that point in time.

The Department is currently developing a Waste Discharge Charge System under which dischargers will have to pay for the pollution caused. It is expected that this system will have a significant, mainly positive, impact on water quality management of the Vaal River System.

The approach adopted by the Department of Water Affairs and Forestry in managing the water quality in the Vaal River catchment is to set water quality objectives (WQO) for the sub-catchments. The WQO are based on the water user requirements in the catchments. The WQO include ideal, tolerable and unacceptable objectives for the water quality variables. A phased approach has been adopted for the development of strategies to manage the water quality in the sub-catchments of the Vaal River Catchment. The first phase is a situation assessment and setting WQOs, which is followed by further phases to develop catchment management strategies.

The currents status is that WQOs have been set for the whole of the Upper Vaal WMA, some in the Middel Vaal and none in Lower Vaal. Studies that are under way are on the Schoonspriut River and Vals River catchments.

What has not been assessed up to now is the cumulative effect on the main stem of the Vaal of the WQO's set for the various sub-catchments.

Furthermore, the Vaal River catchment is a cascade of three WMAs. The water quality of the main stem of the Vaal River in the downstream WMAs is therefore impacted on, not only by the activities in the WMA itself, but also by the water received from upstream. The water quality in Vaal River will also impact on the water quality of the Orange River in the Lower Orange WMA. A water quality management strategy can therefore not be developed in isolation for individual WMAs but the entire Orange River System will have to be considered in an integrated manner.

Situation Assessment: (Continued)

WATER QUALITY MANAGEMENT

The above situation description point to an urgent need for an integrated study to develop an overarching WQM strategy for the whole of the Vaal River System and possibly the Orange River System as well. Such an overarching strategy will have to feed back into the strategies of the various sub-catchments in order to make adjustments in an iterative process. **[G1]**

Possible components of the proposed study and an integrated water quality management strategy is listed below:

- The TDS dilution limit applied in the Vaal Barage (currently set at 600 mg/l) needs to be re-evaluated and possibly lowered. This will benefit the water users in the Middle Vaal.
- What is needed is an integrated modelling approach that will assist in evaluating the benefits that can be expected from, for example, mitigation efforts carried out in sub-catchments and the effects on the rest of the system.
- A study of the Vaal and Orange rivers should be formulated to develop an integrated water quality management strategy for the two river systems. The plan should be developed as two linked studies rather than a single large study of the two systems.
- The proposed study should devise methods of integrating quantity and quality management more closely.
- The study should identify and quantify sources of pollution.
- Salinity is the primary variable of concern but nutrients should also be considered.
- The setting of attainable Water Quality Objectives (WQO) and allocations of waste load should be made.
- The principles of the national waste discharge charge system strategy must be applied.
- Develop (or advise) water quality modelling systems that can be used for integrated water resource management. Consideration should be given to the integration of small scale catchment models with the larger system models.
- The study should focus on using available data and modelling systems as far a possible to develop management plans. The study should preferably not undertake time consuming intensive re-calibration of models.
- The need has been identified that some of the funds generated by the waste discharge charges in the Upper Vaal WMA should be allocated for the treatment of the water that is supplied to the users in the Middle and Lower Vaal WMAs. Such mechanisms should possibly be addressed as part of the proposed study.

MANAGEMENT ACTIONS (WATER QUALITY MANAGEMENT)		
Required actions, responsibilities and priorities:	**M1**. An integrated water quality management strategy needs to be developed for the Vaal and Orange River Systems. **{G1}**	Dir: NWRP (Priority 1)
Interfaces:	**References:** 1. Vaal Dam Salinity Assessment with particular reference to atmospheric deposition. By CE Herold and A Gorgens for HRI and DWAF, February 1991	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.3 WATER USE MANAGEMENT STRATEGY

A.3.1 GENERAL AUTHORISATION

Management objective:	To optimise the use of General Authorisation limits and rules with a view to cutting down on unnecessary administrative efforts of water use activities that can be allowed without individual water use licences. Both the DWAF and the users falling in the General Authorisation category would save resources (time and money) by not having to apply for and process licenses for the specified low impact water use activities. Details regarding what general authorisation is required in the catchments are discussed in the WMA specific ISPs and the only requirement from an overarching perspective is to ensure that relevant General Authorisation should be coordinated among the WMAs where appropriate.

A.3.2 LICENSING

Management objective:	To manage the "conditional" surplus and ensure that the water resources are used efficiently to best benefit of the country. The reserves are intended to support growth but must also be conserved for the future benefits.
Situation Assessment:	**Considerations for water abstraction licences:** Due to the "conditional" excess water available in the Vaal River System (see the strategy on "**WATER BALANCE RECONCILIATION A.1.3**") the issuing of licences for water abstraction could be considered under specific conditions as listed below. This opportunity for new licences is made possible only as a result of the transfer of water into the system, which implies that the full cost of the water will have to be charged for the intended user. Because water is transferred into the system and is available not only to users in the Vaal WMAs, but also to users in other WMA's, the allocation of the surplus will remain under DWAF's national control. *Directives and guidelines to apply when evaluating new licences to be allocated from the conditional surplus:* 1. Apply the fundamental allocation priorities defined in the Water Act. 2. The full surplus will be held by the national government. 3. No new licence application will be considered unless water conservation and demand management is satisfactorily practiced and proved. 4. As indicated in the "**WATER BALANCE RECONCILIATION A.1.3**" strategy, the Eastern Sub- system of the Vaal River System will require augmentation by about 2010. Due to this situation all available resources in the Eastern Sub-system are allocated to support the growth in the water requirements of existing users and no new license applications will therefore be considered upstream of Grootdraai Dam until new water supply infrastructure is in place. 5. An applicant with direct access to water from a transfer scheme will be able to receive a license for water abstraction at the full cost. Direct access referrers to all users abstracting water directly from the main stem of the Nuwejaarspruit / Wilge rivers downstream of Sterkfontain Dam, Ash/Liebenbergsvlei rivers, Vaal Dam and the main stem of the Vaal River downstream of Vaal Dam. 6. If a licence applicant from surface water is not in the Grootdraai Dam catchment and does not have direct access to transferred water because of the geographical location, then the conditions listed below applies. These are typically users from the other tributaries of the system i.e. Vals, Suikerbos, Klip, Renoster, Sand, Vet and Harts, to list some examples.

Situation Assessment: **(Continued)** **LICENSING**	a. Determine if the water is available from the local resource. b. If water is available, the full cost of the impact of the allocation on the yield of the system will be charged. The impact on the yield of the system will not be more than the total allocation. c. Water rights can also be obtained by means of trading as defined in the National Trading Policy. The need for the recipient, of a traded water use entitlement, to apply for a licence, depends on the particular conditions surrounding the donor and the recipient. If for example the trade is between irrigators receiving water from the same canal system, not new licence will be required. However, if the recipient is located on a river where other parties could be affected, a license is required. *Other general conditions are:* 1. Water quality impacts of any new license must be considered. 2. When the trading of water rights is considered, the net impact of the water users involved needs to be taken into consideration. The existing trading policy on in- sectoral trading should be applied. 3. New licences for abstractions from groundwater have to be evaluated can be allowed if it is found that the conditions pertaining to the specific water resource can support the demand.

MANAGEMENT ACTIONS (LICENSING)		
Required actions, responsibilities and priorities:	**M1**. Apply the guidelines and directive indicated above in the evaluation of new licences.	Regional Office (Priority 4)
Interfaces:	**References:**	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.3.3 PRICING

Management objective and motivation:	Apply the existing DWAF water pricing policy for water use in order to: (a) Maintain existing and develop new water supply infrastructure where necessary. (b) Sustain institutional capacity for effective management of the water resources of the Vaal River System. Furthermore, develop and implement waste discharge charges as a means of protecting the water resource quality by applying the polluter pays principle.
Situation Assessment:	DWAF has established a "Pricing Strategy for Raw Water User Charges" **[Ref. 1]** which sets out procedures for determining and implementing charges for water resource management, development of water infrastructure and charges for economic incentives and/or disincentives in order to promote the equitable and efficient allocation of water. The NWA provides an enforcement mechanism. With reference to the directives given in the "**LICENSINGA.3.2**" strategy, the pricing of water supply is an important mechanism to enhance the beneficial use of water and would help to contain the growth in water requirements in the Vaal River System. DWAF is currently developing a National Waste Discharge Charge System **[Ref. 2]** that will deals with return flows, tariffs, rebates, etc. and will be an economic mechanism to manage water discharges. Once the national system has been developed, tariffs will be determined for all the WMA catchments in the country. It is the intention to first develop and implement these waste discharge tariffs in pilot catchment areas before the scheme is applied in all WMAs. ***D**irectives, g**u**idelines or **r**equirements:* **R1.** New abstraction licences should be allowed at full cost in line with the appropriate tariff structures that are applicable in the specific supply system. **R2.** The need has been identified that some of the funds generated by the waste discharge charges in the Upper Vaal WMA should be allocated for the treatment of the water that is supplied to the users in the Middle and Lower Vaal WMAs. The pilot studies, referred to above, should be used to investigate such mechanisms. (*This requirement was identified after the document was circulated to all the DWAF officials*.)

MANAGEMENT ACTIONS (PRICING)		
Required actions, responsibilities and priorities:	**M1.** Develop and implement a Waste Discharge Charge System, first through application in pilot catchments followed by implementation in all WMAs. **{R2}**	Dir: WDD (Priority 2)

Interfaces:	**References:** **1.** DWAF report, "*A Pricing Strategy for Raw Water Use Charges*", November 1999. **2.** DWAF report, "*The Development of a Charge System for Discharging Waste into Water Resources*", Second Edition, May 2000. **3.** DWAF report, "*Water trading policy*", February 2001.

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.4 WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY

Management objective:	To make more effective and efficient use of the existing available water resources in all water user sectors. The objective is to conserve water with the aim to avoid or delay the construction of further augmentation schemes. Furthermore, all water conservation and demand management programmes should implement measures that maintain the economic sustainability of all the institutions that are involved in water supply, especially the authorities at the different tiers of government.
Situation Assessment:	*Status Quo* **National Perspective:** The principles of Water Conservation and Demand Management (WCDM) are well entrenched in the National Water Act and DWAF is currently in the process of developing a national water conservation strategy. This initiative also includes the development of sectoral strategies that in some cases are backed by knowledge gained through pilot studies carried out in selected sectors. **Vaal River System Perspective:** The potential benefits of Water Conservation and Demand Management (WCDM) in the Vaal River System were illustrated in an assessment carried out during 1994 as part of the Vaal River Augmentation Planning Study (VAPS) **[Ref. 1]**. The results show that a reduction of about 10% in the projected water requirements would delay the proposed augmentation schemes and have an economic benefit of R4 billion (1994 prices) due to the delay in capital expenditure. This estimate excludes the savings that can be realised by postponing additional infrastructure to increase the capacities of bulk water treatment and distribution systems, which can easily be double the indicated benefit. It is important to note that this assessment was undertaken with the impact on return flows taken into consideration. There are currently various WCDM initiatives being implemented by water service providers and local authorities in the supply area of the Vaal River System. Furthermore WCDM is also being practised through the licencing and EMPR processes on mines and industrial complexes. In these sectors the reuse of effluent and polluted stormwater through recycling and treatment is being encouraged and has been implemented in a number of cases. Although these positive actions are taking place, what is lacking is reliable information on the combined effect these measures will have on the water requirements (current and projected) to be supplied from the Vaal River System. **[G1]** Due to this uncertainty, the water requirement scenarios produced by the NWRS did not consider the impact of WCDM measures and the water balance presented in the "**WATER BALANCE RECONCILIATION A.1.3**" strategy did not include the effect of WCDM.

Situation Assessment:

(Continued)

WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY

The following two WCDM planning initiatives were undertaken for the Vaal River System:

1. Gauteng Water Cycle Initiative led by representatives of Rand Water with the purpose of co-ordinating activities that have an impact on the water cycle. Activities of this initiative have declined due to resource limitations and the indication of surpluses in supply as described under the "**WATER BALANCE RECONCILIATION A.1.3**" strategy.
2. A study was commissioned by the then Directorate Water Conservation to assess Water Demand Management in the Vaal River System and Phase 1 (Development of a Study Framework) was completed during 2002. **[Ref. 2]**

Some factors to consider in planning for Water Conservation and Demand Management in the Vaal River System:

1. Cognisance should be taken of the impact of WCDM on the quantity of return flows with respect to the assessment of the net impact on the water resources. **[G2]**
2. The impact of WCDM on return flow volumes will alter the composition (blend of return flow sources) with the result that the water quality could be changed.
3. WCDM could, through reductions in return flows, impact on the river ecology and wetlands and these aspects should be assessed in all cases.

***D**irectives, g**u**idelines or **r**equirements:*

D1. This National and Sectoral strategies currently under development by the Directorate Water Use Efficiency must be applied in the Vaal River System.

D2. Notwithstanding the indicated conditional surplus in supply of Vaal River System, WCDM has other benefits and it is important that the awareness thereof should continue through initiatives such as the Water Cycle Management Initiative.

R1. Careful planning is required to ensure that cost recovery of water supply remains at levels that are viable, both to service providers and local authorities when implementing WCDM measures.

<table>
<tr><th colspan="3">MANAGEMENT ACTIONS
(WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY)</th></tr>
<tr><td rowspan="3">Required actions, responsibilities and priorities:</td><td>M1. Commission a WCDM Planning Study with the following objectives:
a. Assess the current and planned WCDM measures with the purpose of developing reliable estimates of the savings that can be expected.
b. Design and Implement a verification system to compare actual water use with projected water requirements to monitor the true effects of WC&WDM measures.
c. Undertake water resource modelling to determine the impact of WCDM on availability, quality as well as the flow requirements for the ecology.
d. Devise plans for the realisation of the National and Sectoral WCDM strategies in the Vaal River System.
e. Assess the impacts of WCDM on cost recovery with respect to the economic impacts on Local Authorities and Service Providers. {G2, D1}</td><td>Dir: WUE
Dir: NWRP
(Priority 2)</td></tr>
<tr><td>M2. Reactivate the Water Cycle Management initiative by:
a. Compiling a document motivating why WCDM still has significant benefits even if a potential surplus exists in the Vaal River System.
b. Creating awareness of the benefits of WCDM measures among Local Authorities as well as at the various Forums that are active in the Vaal River System. {D2}</td><td>Dir: WUE
(Priority 2)</td></tr>
<tr><td>M3. Develop a water demand and return flow model that can be used for scenario planning. The generic model developed from the Crocodile (West) River Return Flow Study [Ref. 3] should be used in this study. A large part of the study will involve collecting and collating the land use data to characterise the urban, irrigation and bulk users in the Vaal River System {G1}</td><td>Dir: NWRP
(Priority 2)</td></tr>
<tr><td>Interfaces:</td><td colspan="2">References:
1. DWAF report no: PC 000/00/15495, “Vaal Augmentation Planning Study: Water Demand Management in the Vaal River System Supply Area”. Compiled by BKS (Pty) Ltd, 1995.
2. DWAF report on the “Development of a Framework for Water Conservation and Demand Management in the Vaal River System”, 2001.
3. DWAF report no: PB A200/00/3802, “Crocodile (West) River Return Flow Analysis Study: Inception Report”, 2003.</td></tr>
</table>

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.5 INSTITUTIONAL DEVELOPMENT SUPPORT STRATEGY

A.5.1 INTERNATIONAL LEVEL

Management Perspective:	The **National Department** is responsible to draft and implement strategies and policies regarding international shared river basins. These strategies are guided by international protocols that define the basic framework for water management across international boarders. From a Vaal River System perspective, it will be required to communicate all issues relating to the international transfers through the appropriate National Department. The most important international connection that affects the Vaal River System is the Lesotho Highlands Water Project (LHWP), which transfers water from Lesotho.

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.5.2 CO-OPERATIVE GOVERNANCE

Management objective:	Co-operative governance (i.e. liaison and integration of planning between government departments, district and local authorities) needs to be factored into the overall integrated water resources management arena to ensure a compounded benefit to all users in the catchment. Proper management capacity at all levels of water resources management needs to be put in place in order to ensure that the water resource management process is adequately implemented.
Situation Assessment:	Certain water resource management functions remain with the Minister. Co-ordination at a national level will always remain necessary, especially at policy and regulation level. The Vaal River catchment is unique in that the Upper Vaal WMA receives water from other catchments such as the Thukela River and the Senqu River in Lesotho, while at the same time offering water to other catchments such as the Crocodile and Middle Vaal. The control and ownership of the water resource infrastructure in the Vaal River System also reside with different institutions and therefore requires a high degree of coordination of planning and operational activities. One of the most important planning variables is the future water requirements of users that will be supplied from the system. This is a subject that requires a high level of understanding among users, operators and the different authorities. The Department has the view that users must take responsibility for their own water demand scenarios, however, it is essential to have checks and balances, which is clearly a function of an Overarching nature. The Department has various co-operating management structures in place of which a few are listed below: ● Co-ordination with Eskom and Sasol with respect to the planning and operation of the Eastern Subsystem of the Vaal River System. ● Liaison with organised agriculture. ● Regular co-ordination activities with Rand Water. A Memorandum of Understanding is being prepared to guide the interactions and define the respective responsibilities of DWAF and Rand Water. ● Provincial Liaison Committees to co-ordinate, among other things, development planning that have an impact on the water resource in both the donor and recipient catchments. (As an example, it is essential to communicate with the Kwazulu Natal Provincial Government regarding the future planning and implementation of the proposed Thukela Water Project). ● Liaison between the DWAF National Directorates and the Regional Offices that are acting currently as the CMA for the three Vaal WMAs.

Situation Assessment: (Continued) **CO-OPERATIVE GOVERNANCE**	• Liaison with various Forums on regular intervals. This activity intensifies during drought periods when water restrictions are implemented. ***D**irectives, g**u**idelines or **r**equirements:* **R1**. There is a strong need to co-ordinate and encourage communications between the various government departments, regional and local authorities as well as the users receiving water from the Vaal River System. **R2.** Due to the national importance and the various transfers in and out of the Vaal River System, it is perceived that the National Department will continue to play a prominent role in the management of the Vaal River System.

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.6 WATER INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT STRATEGY

A.6.1 INFRASTRUCTURE DEVELOPMENT AND SUPPORT

Management objective:	Provision of adequate water resource development infrastructure (storage) and bulk water supply infrastructure to sustain a social and economic growth while protecting the environment.
Situation Assessment:	**General:** The local water resources in the Vaal River System were fully utilised many years ago through the development of a number of large dams to support the heavily industrialised and urbanised areas. Continuous economic and population growth in the supply area required additional augmentation, which was achieved through the construction of various transfer schemes (see the strategy on "**TRANSFERS AND RESERVATION OF WATER A.1.4** for details), mainly importing water directly into the Upper Vaal WMA. **Infrastructure development needs:** Based on the situation assessment presented in the "**WATER BALANCE RECONCILIATION A.1.3**" strategy, augmentation to the Vaal River System as a whole will only be required by 2025. The Eastern Sub-system of the Vaal River System, however, requires additional water resources by about the year 2010. **Existing knowledge on possible augmentation options:** 1. A pre-feasibility study to determine the need for augmentation of the Eastern Sub-system of the Vaal River System has been completed. This recommended that three options should be taken to the feasibility phase **[Ref. 1]**. 2. Current knowledge indicates that either Phase 2 of the Lesotho Highlands Water Project (LHWP) or the Thukela Water Project (TWP) would be the next augmentation option for the Vaal River System as a whole. 3. Planning status of the Thukela Water Project (TWP): A feasibility study on the TWP has been completed where it was identified that the Ecological Reserve is likely to have a significant impact on the size of the required infrastructure. This has led to the commissioning of the study to determine the Ecological Reserve of the Thukela River Catchment at a Comprehensive Level of detail. This latter study is almost completed and the intention is to undertake preliminary system analysis to show the impact of the proposed Reserve scenario on the supply capability of the proposed Jana and Mielietuin dams.

Situation Assessment: (Continued) **INFRASTRUCTURE DEVELOPMENT AND SUPPORT**	4. Planning status of Phase 2 of the LHWP: a. A pre-feasibility study has been completed as part of the Vaal Augmentation Planning Study. Further optimisation needs to take place before detail design can commence. ***D**irectives, g**u**idelines or **r**equirements:* **D1.** The interdependency of the WMAs of the Vaal River System, as well as other WMAs that are connected through the various transfers, make it essential that development planning be approached in a holistic manner. All planning effort will be required to identify the optimum bulk water storage and supply infrastructure that will make optimal use of the local and imported water resources. **D2.** In line with current planning methodology applied by DWAF, intervention by means of infrastructure development should only be considered once it has been proven that improved efficiency of water use through water conservation and demand management cannot satisfy the needs for augmentation. In all cases all potential augmentation options should be compared on the basis of economic, social, environmental and more specific ecological criteria in order to find the most feasible solution. **R1**. After completion of the Comprehensive Reserve Determination Study for the Thukela River Catchment, consolidate all planning information so as to allow further planning phases to proceed efficiently. **R2**. The programming of planning activities related to augmentation should constantly be adjusted based on the water reconciliation information to be produced by studies such as the Annual Operating Analysis. Continuous review of augmentation dates has to take place due to long lead times required for implementation of large water supply schemes.

MANAGEMENT ACTIONS (INFRASTRUCTURE DEVELOPMENT AND SUPPORT)		
Required actions, responsibilities and priorities:	**M1. Short-term actions:** a. Undertake a feasibility study and further planning activities to implement the augmentation of the Eastern Sub-systems of the Vaal River System. More details are provided in the **Upper Vaal ISP**. b. Complete the current Thukela Water Project Decision Support Phase with the aim of consolidating all planning information for later reference. **{R1}**	Dir: OA (Priority 1)
	M2. Continuous actions: Annual review of the required augmentation date should take place as part of the Annual Operating Analysis and the programme for augmentation planning need to be adjusted accordingly. **{R2}**	Dir: NWRP Continuous
	M3. Long-term actions: Based on the situation reflected by **Management Action M2,** activate the necessary planning actions to ensure timely implementation of the next augmentation scheme.	Dir: NWRP (Priority 4)
Interfaces:	**References:** **1.** DWAF report number PBC110/00/1200, "*Vaal River System: Pre-feasibility Study to determine the need for augmentation of the Eastern Sub-system*", 2002.	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.6.2 SYSTEM MANAGEMENT

Management objective:	Implement system management measures to optimally utilise the available water resources by reducing pumping costs during high runoff periods and implement beneficial water quality blending rules whilst maintaining the reliability of supply over the long-term.
Situation Assessment:	*Status Quo:* The Vaal River System is complex consisting of various water resource infrastructure components as presented schematically in **Figure B-2** of **Appendix B**. The system is intensely managed, particularly with respect to the main stem on the Vaal River as well as the operation of the Eastern Sub-system. The co-ordination of the system management activities is essential among the various institutions that are responsible for the operation of different components of the system (see also the "**CO-OPERATIVE GOVERNANCE A.5.2**"strategy**)**. Operations planning are undertaken on an annual basis where the following are considered: 1. Drought Management which include determining when and how intense restrictions should be implemented during drought events. This activity also entails communication with stakeholders and compliance monitoring to determine if the target reductions in demands are being achieved by the users. 2. Which blending or dilution operating rule should be applied with respect to the supply options to Rand Water and the release of water to maintain the TDS concentration to the desirable level to downstream users. 3. The reduction of pumping from the inter-basin transfer schemes as a means of reducing operating costs. 4. Communication of rules to operators and discuss operating options with main stakeholders. ***D**irectives, g**u**idelines or **r**equirements:* **R1.** Although drought management has been implemented in the past in the Vaal River System, the need has been identified for the formulation of a Drought Management Plan that defines all the actions and events that has to be considered in the period leading to and during a drought.

MANAGEMENT ACTIONS (SYSTEM MANAGEMENT)		
Required actions, responsibilities and priorities:	**M1**. Undertake annual operational planning to determine the operating rules to apply, as defined in the Situation Assessment Above.	Dir: NWRP Continuous
	M2. Develop and implement a Drought Management Plan. **{R1}**	Dir: NWRP (Priority 1)
Interfaces:	**References**	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.6.3 PUBLIC HEALTH AND SAFETY

Management objective:	At the overarching level the main management focus is on maintaining high levels of coordination among the Vaal WMAs with respect to flood and drought management. (Drought management has been addressed in the previous strategy.) The objectives with the strategy are therefore to co-ordinate and confirm the responsibilities for the management of the existing flood warning and management system.
Situation Assessment:	The Vaal River system has been subject to large floods and intense droughts in the past. The floods are a threat to human life and property. The existing warning and management system has proved itself in the past. The Department's current commitments are to manage floods by direct intervention on the ground. A sophisticated flood routing and dam optimisation/operation system has been developed for the Vaal River catchment. The system has been developed over a period of time and the operating rules are documented in a set of internal notes and operating manuals. Head Office staff at the Dir: Hydrological Information monitor the river system on a 24 hour basis and determine dam operation procedures (mainly Vaal Dam and Bloemhof Dam) when a potential flood hazard has been identified. Under these circumstances the Directorate of Hydrological Information directs the operation of the system for flood management. DWAFs (and the CMAs in some cases) future commitments under National Disaster Management Act which is to be promulgated in 2003 will be: • DWAF/CMA will be required to support and enforce disaster management planning by all relevant authorities. • Drafting a National Flood Management Policy and Dam safety policy is the responsibility of the Department. • Co-operating with the Department of Agriculture on drought relief strategies and policy formulation. • Managing the pollution of water resources (ie limiting health hazards such as cholera). Other relevant public health and safety strategies (i.e. pollution, dam safety) are described in the WMA specific ISP documents. ***D**irectives, g**u**idelines, **r**equirements or **g**aps:* **G1.** The operating rules and communication protocols for flood control are documented in a set of internal notes and operating manuals. These need to be assessed to determine if the current operating practice is adequately reflected in the manuals and notes and how well the protocols are understood by the staff based at the Vaal Dam. There is a need to ensure that the documentation is compiled in such a way to easily facilitate the transfer of the knowledge.

MANAGEMENT ACTIONS (PUBLIC HEALTH AND SAFETY)		
Required actions, responsibilities and priorities:	**M1.** The extent to which the roles and responsibilities of the staff involved in the flood management system are defined needs to be determined. The handing over of the operation from the regional person at the dam to the flood section in head office and the level of documentation, are particularly issues needing attention. Furthermore it is required to assess the current documentation with respect to its ability of facilitate knowledge transfer, with the aim to identify shortcomings and update where appropriate **{G1}**	Regional Offices (Priority 1)
Interfaces:	**References:**	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.7 MONITORING AND INFORMATION MANAGEMENT STRATEGY

A.7.1 MONITORING NETWORKS AND DATA CAPTURING

Management objective:	To design and implement effective monitoring networks and repository databases to ensure adequate quantification of the balance between sustainable water use and protection for surface freshwater bodies and groundwater.
Situation Assessment:	**Monitoring, for the purposes of this strategy, applies to all aspects of the water resource, particularly:** • Hydrology - rainfall, climate, and streamflow • Geohydrology – groundwater • Inflows and outflows (transfers) • Abstraction (water users, dam levels, operational releases, losses etc) • Water Quality (surface water, groundwater) • Waste water outflows • River Health (function and impact of the ecological Reserve) • Sedimentation **Supporting information includes:** • Small farm dams (numbers, capacity, use) – this will also require monitoring. • Land use change (agricultural cropping, forestry, alien invasives) – data available from other sources, but this needs monitoring. • Return flows *Key elements of the strategy*: To motivate **nationally** regarding the importance of monitoring and the essential need for better networks at national, WMA, and catchment level. The strategy is to ensure that those responsible for the allocation of funding fully understand that to allocate, manage and sell the water resource means that local managers need to know what and how much they have to allocate, manage and sell. • Coordination and cooperation across agencies at a regional level. • Organisational cooperation and efficiency. As an organisation the Department can only operate at optimum efficiency through close cooperation and sharing of relevant data capture and information management with its partners.

Situation Assessment: (Continued)

MONITORING NETWORKS AND DATA CAPTURING

- Assessment of information requirements (surface water, groundwater etc) at the scale of decisions (WMA and at catchment scale).
- Meetings and negotiations with cooperating partners. Assess what information is gathered, how it is processed and stored. Develop a plan for the sharing of mutually useful information.
- Together with cooperating partners develop a set of principles which outline the basis for monitoring and information capture. Typically these could cover: accuracy, completeness, time scales and time frames, information sharing)
- Prepare a set of standards for data capture and the processing of information.
- Design a monitoring system to meet needs. This design should offer phased implementation, based on priorities. Priorities should be broken down to critical monitoring points within specific fields of concern, so that the most urgent areas can be attended to first. Apply the cost: benefit principle.
- Motivate and seek funding to meet requirements
- Develop and train staff.
- At regional level the implementation of this monitoring strategy will be tasked to a small team drawn from across the traditional hydrological disciplines in the region.

Status Quo in the Vaal River WMAs:

An extensive monitoring network of flow gauges, rainfall stations and water quality sampling and analysis is in operation and has been used as the source of data for the water resource system analysis and water quality management studies. During these studies recommendations were made to upgrade the monitoring network, usually to fill a particular data deficiency that was identified for a specific analysis or application.

As part of the Vaal River System Analysis Update (VRSAU) study a report **[Ref. 1]** was compiled presenting the data that is required to undertake a system analysis study in the Vaal River System as well as recommending where the monitoring network could be improved.

What has been identified as a shortcoming is the definition of all the monitoring needs, and a co-ordinated monitoring programme in order to support the process of Integrated Water Resource Management, as defined in **Section 1.4** of this document.

Certain monitoring needs have been identified during the process of developing this ISP and are listed below for reference purposes. The purpose of providing the list is not to give an all inclusive definition of all the problems but to ensure that the identified items are recorded for use when **Management Action M1** of this strategy is implemented.

Situation Assessment: (Continued) **MONITORING NETWORKS AND DATA CAPTURING**	*Monitoring coordination and planning:* Coordination of all monitoring requirements is best undertaken by the WMA managers (currently the regional offices and in future the CMAs). All monitoring requirements for water resource management should be defined by each of the relevant agencies and feed to the WMA managers for coordination. For example, monitoring needs that are required for the overarching management and operation of the Vaal River System should be communicated to the each WMA. *List of some identified monitoring requirements for future reference:* **R1**. Uncertainty exists in the estimates of losses occurring in the bulk distribution network (conveyance losses) of the Vaal River System. Currently only rough estimates of the losses are available for use in the water resource models. It is recommended that these estimates are improved to model the actual conditions more accurately. **R2**. A general need was identified to improve and increase the flow measurement gauging stations in the system. Specific recommendations can be found in previous study reports, which will form the point of departure for the proposed study described under **Management Action M1**. **R3**. A national data management system should be maintained to capture and distribute data in support of water resource management functions. Such a management system is currently being developed by DWAF for use by all and controlled at a **National Level**.

MANAGEMENT ACTIONS (MONITORING NETWORKS AND DATA CAPTURING)		
Required actions, responsibilities and priorities:	**M1**. Undertake a study to assess, identify and recommend all monitoring requirements that are needed to support Integrated Water Resource Management. The Regional Offices will take the lead with support from other directorates and institutions. **{R1}**	Regional Offices (Priority 2)
	M2. Carry out a study to improve the estimates of conveyance losses in the bulk distribution network of the Vaal River System. It is anticipated that the emphasis of such an assessment will be where rivers are used for conduits with the losses in open canal systems as the second priority. **{R1}**	Dir: NWRP (Priority 1)
Interfaces:	**References:** **1.** Report number PC 000/00/19296 of DWAF, "Vaal River System Analysis Update: Data Inventory: Vaal Water Supply System Area", April 1999.	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.7.2 INFORMATION MANAGEMENT FOR WATER RESOURCE MODELLING

Management objective:	In order to base management decisions on reliable data and information management and decision support systems must be updated on a regular basis, be easily assessable.
Situation Assessment:	*Status Quo:* With reference to the situation assessment of the "**RESOURCE AVAILABILITYA.1.1**" strategy there are currently four main model and associated databases used in the Vaal River System as listed below: 1. Water Resources Simulation Model 2000 (WRSM2000) – This is a rainfall-runoff model with calibration features that is used to produce hydrological time series data. 2. Water Quality (TDS) Calibration model – Employed to calibrate the salinity sub-models using historical data. 3. Water Resource Yield Model (WRYM) – Water resource network simulation model used to determine operating rules and to determine the yield of the sub-systems of the Vaal River System. 3. Water Resources Planning Model (WRPM) – Integrates all the sub-system components that make up the Integrated Vaal River System and simulates both salinity and quantity operating rules. The WRPM is used to undertake development and operational planning, with distinguishing features such as a water allocation procedure, the ability to simulate dilution and blending rules and the simulation of changed system configurations and operating rules for a pre-defined planning horizon. The need for improvements to the models has been identified in previous studies. These recommended changes include among other increasing certain model dimensional constraints and the need for additional modelling functionality. **[R1]** It should be noted that the Directorate of Policy and Strategic Co-ordination has embarked on a model renewal process with the initial emphasis on improving the hydrological information management. To this end the Vaal Hydrological Information Management System (VHIMS) is currently being developed with the ultimate aim of providing a system that can manage all the data required by the models listed above.

MANAGEMENT ACTIONS (INFORMATION MANAGEMENT FOR WATER RESOURCE MODELLING)		
Required actions, responsibilities and priorities:	**M1**. Assess the need to improve the models using the identified shortcomings, and suggestions from previous studies, as a point of departure. The development of new functionality that will be required to undertake the challenges of Integrated Water Resource Management, as spelled out in **Section 1.4** of this document, should also be considered. **{R1}**	Dir: NWRP (Priority 2)
Interfaces:	**References: (none)**	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study

A.8 IMPLEMENTATION STRATEGY

Management objective:	To ensure that the approaches put forward by the Department through this ISP are tadopted and implemented in the WMA. This will require willpower, funding and capacity.
Situation Assessment:	The ISP is an internal document, developed almost exclusively by and on behalf of the Department of Water Affairs and Forestry. The ISP sets out the approaches which the Department is taking towards water management in the Vaal River System – and lists suggested actions towards achieving good management of the water resource. The wider public has had no direct input into this ISP – yet it is recognised that the approaches adopted have a significant impact on the populace of the Vaal River System. Whilst the approach to date in developing this ISP may seem non-participatory, it must be remembered that this is not a Catchment Management Strategy – but DWAF setting out how DWAF itself sees the situation, and the steps which DWAF views as most appropriate in dealing with the situation. Years of interaction with the public have had an important influence. The ISP is not a closed document but is to be made available to the wider public for comment and input. This makes the ISP an inherently transparent document – exposing the thinking and planning of the Department. Although DWAF makes no commitment to adopt every comment made, these will be taken seriously and the ISP will be updated and improved as newer and better perspectives are formed. Once the CMA has been established it will be required to develop a CMS, and this will require full public participation. It is to be hoped that the ISP will be taken as useful baseline information and, indeed, that the approaches adopted here are found to be acceptable to, and adaptable by, the new dispensation. The ISP is subject to the approach set out in the NWRS – and details this approach for the Vaal River System. It carries significant weight in expressing HOW water resource planning and management will be carried out in the WMA. It is not, however, an inflexible document, nor is it without its flaws. As such the ISP may be adjusted and adapted when new and better ideas are presented.

Situation Assessment: (Continued) **IMPLEMENTATION STRATEGY**	The Implementation of the ISP is an enormous task. Much of what is in this document describes the day-to-day functions of the Department – but there are many new tasks, functions, and actions set out in response to DWAF's visions for the future. It is recognised that it is quite impossible to immediately launch into, and achieve, all that is required by this ISP. Funds and capacity are, and will always be, blocks that must be climbed over. The approach is to take the ISP and to use it as instruction, guidance, and motivation in the development of yet clearer management and action plans. These must be built into Departmental Business Plans, and budgeted for as part of Departmental operating costs. This will necessarily be in a phased manner as dictated by available resources, but it is important that the ISP be used to leverage maximum funds, maximum capacity, and to bring optimum management to the WMA.

MANAGEMENT ACTIONS (IMPLEMENTATION STRATEGY)		
Required actions, responsibilities and priorities:	The following actions are required: a. Publish the ISP in hard-copy, on CD, and perhaps even on the Web, for public input and comment. Copies will only be presented to key stakeholders, and on request. It is not the intention to have a major drive for public input, but merely to create accessibility for input. b. There are many actions in the ISP which do require public involvement – and it is important that the thinking with regard to, for example, the use of groundwater, and the importance of WCDM, are taken out forcefully both to local authorities, other direct water users such as agriculture, and the wider public. c. Collate comment and consider this in revising and improving the ISP. d. There is a need to develop materials – suitable for the provincial cabinet, the various management committees, and major forums. Also to support the Water Services Development Plan, Organised Agriculture, Emerging Farmers, etc. This should be suited to make input to the preparation of the Provincial Growth and Development Strategy, and other regional and provincial planning activities. e. The ISP should, in any event, be open to continuous improvement, with possible updating on an annual basis. f. All Regional staff, Working for Water, (Rand Water, Eskom and Sasol), and other major stakeholders should have access to, or copies of, the ISP g. Approaches set out in the ISP need to be accepted and adopted by both national and regional staff. Where there is resistance to ideas then this needs to be resolved in an open climate of debate and understanding. Modification of the ISP is not ruled out! h. The practicalities of implementation demands must always be considered. Most actions in this ISP have been assigned to the Region. It is critically important that the tasks outlined are prioritised, budgeted for, and built into regional and national business plans and budgets.	

Strategy Version control:	**Version number:**	1
	Date:	March 2004
	Author:	ISP Study