REPORT No:PWMA 15/000/00/0405

DEPARTMENT OF WATER AFFAIRS
AND FORESTRY

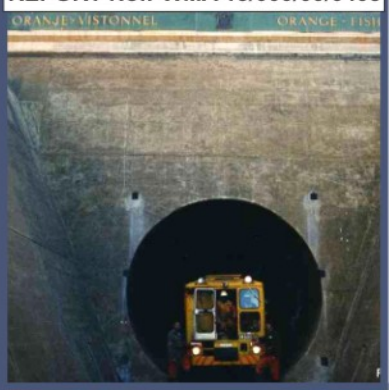
FISH TO TSITSIKAMMA WATER MANAGEMENT AREA

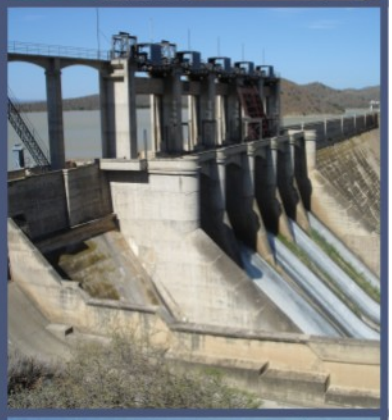
FISH TO SUNDAYS INTERNAL STRATEGIC PERSPECTIVE

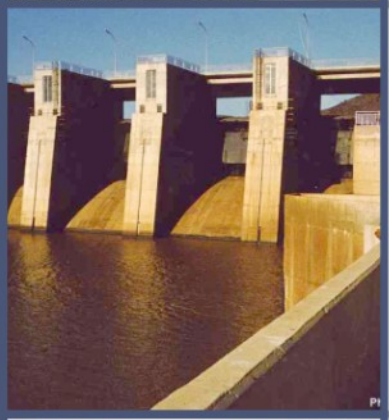
VERSION 1
February 2005

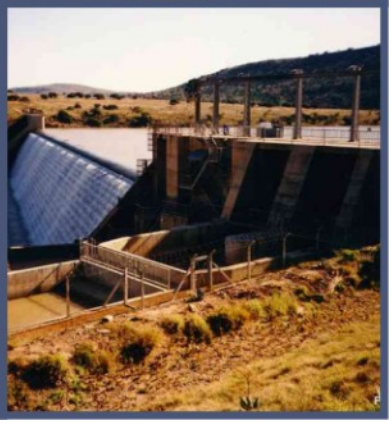
NINHAM SHAND
CONSULTING SERVICES

UMVOTO









P WMA 15/000/00/0405

Department of Water Affairs and Forestry
Directorate National Water Resource Planning

INTERNAL STRATEGIC PERSPECTIVE

for the

FISH TO SUNDAYS

portion of the

FISH TO TSITSIKAMMA WATER MANAGEMENT AREA
(WMA 15)

Version 1: February 2005

Prepared by: Ninham Shand

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

DEVELOPMENT OF INTERNAL STRATEGIC PERSPECTIVE
for the
FISH TO TSITSIKAMMA WATER MANAGEMENT AREA (WMA No 15)

Fish to Sundays Internal Strategic Perspective

APPROVAL

Title	:	**Fish to Tsitsikamma Water Management Area: Fish to Sundays Internal Strategic Perspective**
DWAF Report no.	:	P WMA 15/000/00/0405
Consultants	:	Ninham Shand in association with Umvoto Africa, Jakoet & Associates, and Tlou & Matji
Report status	:	Version 1, February 2005
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Date	:	February 2005

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INVITATION TO COMMENT

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

ELECTRONIC VERSION

This report is also available in electronic format as follows:

- DWAF website:
  - Internet: http://www.dwaf.gov.za/documents/
- On CD which can be obtained from the DWAF Map Office at:
  157 Schoeman Street, Pretoria (Emanzini Building)
  ☎ (012) 336 7813
  E-mail: apm@dwaf.gov.za

or from the Version Controller (see box overleaf)

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

- Fish to Sundays Internal Strategic Perspective (this Report)
  (Report No: P WMA 15/000/00/0405)
- National Water Resource Strategy, First Edition, 2004
- The Fish to Tsitsikamma WMA - Overview of Water Resources Availability and Utilisation
  (Report No: P WMA 15/000/00/0203)
- The Fish to Tsitsikamma WMA – Water Resources Situation Assessment
  (Report No: P WMA 15/000/00/0101)

LATEST VERSION

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

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

or by contacting the Version Controller (see box overleaf)

VERSION CONTROL

FISH TO TSITSIKAMMA WMA
FISH TO SUNDAYS INTERNAL STRATEGIC PERSPECTIVE

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(The most significant amendments included in the latest version will be indicated here).

EXECUTIVE SUMMARY

Introduction

The Fish to Sundays ISP area forms the eastern part of the Fish to Tsitsikamma Water Management Area (WMA 15), and falls almost totally within the Eastern Cape Province. It derives its name from its two largest rivers, the Great Fish and the Sundays rivers. The remainder of the WMA was separately addressed in the Tsitsikamma to Coega ISP Report.

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

After internal approval, the Department will invite comment on the ISP from local authorities, water user associations, other water-related organisations and the public. Formal updates of the document will periodically be done until the catchment management agency is technically functional and financially sustainable, and assumes its functions. The knowledge of DWAF's regional and head office water management staff about this ISP area is documented in the ISP. The knowledge and strategies in this document will *inter alia* be used as reference material and as a comprehensive background document for new entrants involved in regional water management. The ISP presents a common and consistent approach that can be adopted when addressing water management related issues, problems and queries, and when evaluating water licence applications.

The ISP has been compiled by referring to policy documentation, legislation, regional planning, departmental guidelines, and relevant water-related studies and documents, and from interviews and communications with DWAF regional managers and head office staff.

The key driver of the ISP area

The Orange-Fish-Sundays Water Supply System (OFSWSS), which primarily supports irrigation in the Fish and Sundays catchments, but with water going as far as Port Elizabeth, is the major economic driver in the ISP area. Ensuring a continuous sustainable water supply for economic activity associated with the system is essential for community well-being and the socio-economic prosperity of the area. The rest of the ISP area has very little water of its own and the underlying geology also results in this local water being of very poor quality. The economy of this ISP area is therefore totally dominated by water transferred from the Orange River.

Water law and water management

The National Water Act (NWA) [40] is the principal legal instrument governing water resource management in South Africa, and is being incrementally implemented. The NWA is supported by other legislation such as the National Environmental Management Act and other Acts. The NWA does away with some far-reaching concepts but introduces others, which have both economic and social features.

The National Water Resource Strategy (NWRS) [25] is the implementation strategy for the NWA and provides the framework within which the water resources of South Africa will be managed in the future. All authorities and institutions exercising powers or performing duties under the NWA must give effect to the National Water Resource Strategy. This strategy sets out policies, strategies, objectives, plans, guidelines, procedures and institutional arrangements for the protection, use, development, conservation, management and control of the country's water resources.

The country has been divided into nineteen water management areas. The delegation of water resource management from central government to catchment level will be achieved by establishing catchment management agencies at water management area level. Each catchment management agency will progressively develop a catchment management strategy. Until such time as the catchment management agencies are established and are fully operational, the regional offices of DWAF will continue managing the water resources in their areas of jurisdiction.

As part of the implementation of integrated water resource management, in line with the requirements of the NWA, DWAF is following a process that includes:

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

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

Physical features

The ISP area was divided into three sub-areas, namely the Fish, Sundays and Albany Coast sub-areas. The map following this executive summary shows the demarcation of the ISP area. Main rivers are the Great Fish, Sundays, Bushmans, Kowie and Kariega rivers.

The topography is relatively flat, bounded by mountain ranges to the north. The climate over the ISP area is strongly influenced by warm coastal currents and the topography. Most of the inland has typical dry Karoo climate. Rainfall generally occurs throughout the year in the coastal region and very late in summer in the inland areas. Rainfall varies from 300 mm/a to small areas of up to 900 mm/a. Evaporation is considerably greater than rainfall, ranging from 1 450 mm/a in the south-east to as high as 2 050 mm/a in the north-west.

The Addo Elephant National Park, Mountain Zebra National Park and the Alexandria Dune Field are important conservation areas. Several other game parks and conservation areas are located in the ISP area. The permanently open estuary of the Great Fish River is ecologically important.

Demography

Approximately half a million people live in the ISP area, with more than half of these living in the Great Fish River basin. Approximately 70% of the population lives within urban areas. The population of the Fish and Sundays sub-areas is expected to decline after 2005 [(19)]. This is attributable to the lack of economic stimulus, together with the impacts of HIV/AIDS. A small growth in the urban population is forecast in the Albany Coast sub-area.

Land use

Most cultivated land in the interior is irrigated, because the rainfall is too low and erratic to be relied upon. Significant irrigation takes place in the catchments of the Great Fish and Sundays rivers using Orange River water, with lucerne, vegetables and citrus being the main crops. Irrigation from local sources is also practised along the Kat and Tarka rivers. Farming with sheep, mohair and cattle is common in the ISP area. Natural and stocked wildlife are found in this area and seems to be increasing in popularity. Pineapples and chicory are grown in the Albany Coast area. Some indigenous forests are found in the Kat River catchment.

International links and links with other WMAs

The ISP area does not border on any neighbouring country and is not directly linked to any other country through the transfer of water. Large quantities of water are transferred into the ISP area from the Orange River catchment, which is an international river shared by four countries. Some Orange River water is transferred further to the Tsitsikamma to Coega ISP area, for urban use by the Nelson Mandela Metropolitan Municipality (NMMM). An amount of 38 million m^3/a has been reserved for future transfers from the Orange River to this ISP area, for new resource-poor farmer irrigation [(26)]. Allowance has also been made for a future additional transfer of 10 million m^3/a to NMMM, in accordance with the recommendations made in the Algoa Pre-Feasibility study. Additional transfers could be made in future, but this would require further infrastructure development in the Orange River catchment. The transfer is a national issue which also forms part of South Africa's normal and ongoing liaison with basin states.

Economic development

Agriculture and supporting industries dominate the economy of the ISP area, which is heavily dependent on irrigation. About 51 000 ha of irrigated lands in the Fish and Sundays catchments rely largely on water transferred from the Orange River. A total of 4 000 ha of identified future Orange River allocations have been reserved for new irrigation by resource-poor farmers in this ISP area, for uses where it will provide the most benefit and be most effective in eradicating poverty. Agriculture has linkages to several other economic sectors. Citrus, vegetables as well as cash and fodder crops are grown under irrigation, while the area is also known for its production of pineapples, chicory and dairy

products near the coast. Dryland crop farming is a significant contributor to the agricultural sector. Almost 60% of the world's mohair and much of the country's wool is produced in the water management area and surrounding areas.

The larger regional industries of the WMA consist of manufacturing, construction, trade, transport and finance. These sectors account for the employment of about a quarter of the workforce. Manufacturing in the ISP area is centred on agro-processing. Food and dairy processing are present in the larger towns. There are no significant mining activities and mining operations are limited to quarrying for building materials. Commercial forestry is practised mainly in the Kat River catchment. Tourism is well established, with a network of tourism routes, and is on the increase, with large potential for growth.

Water institutions

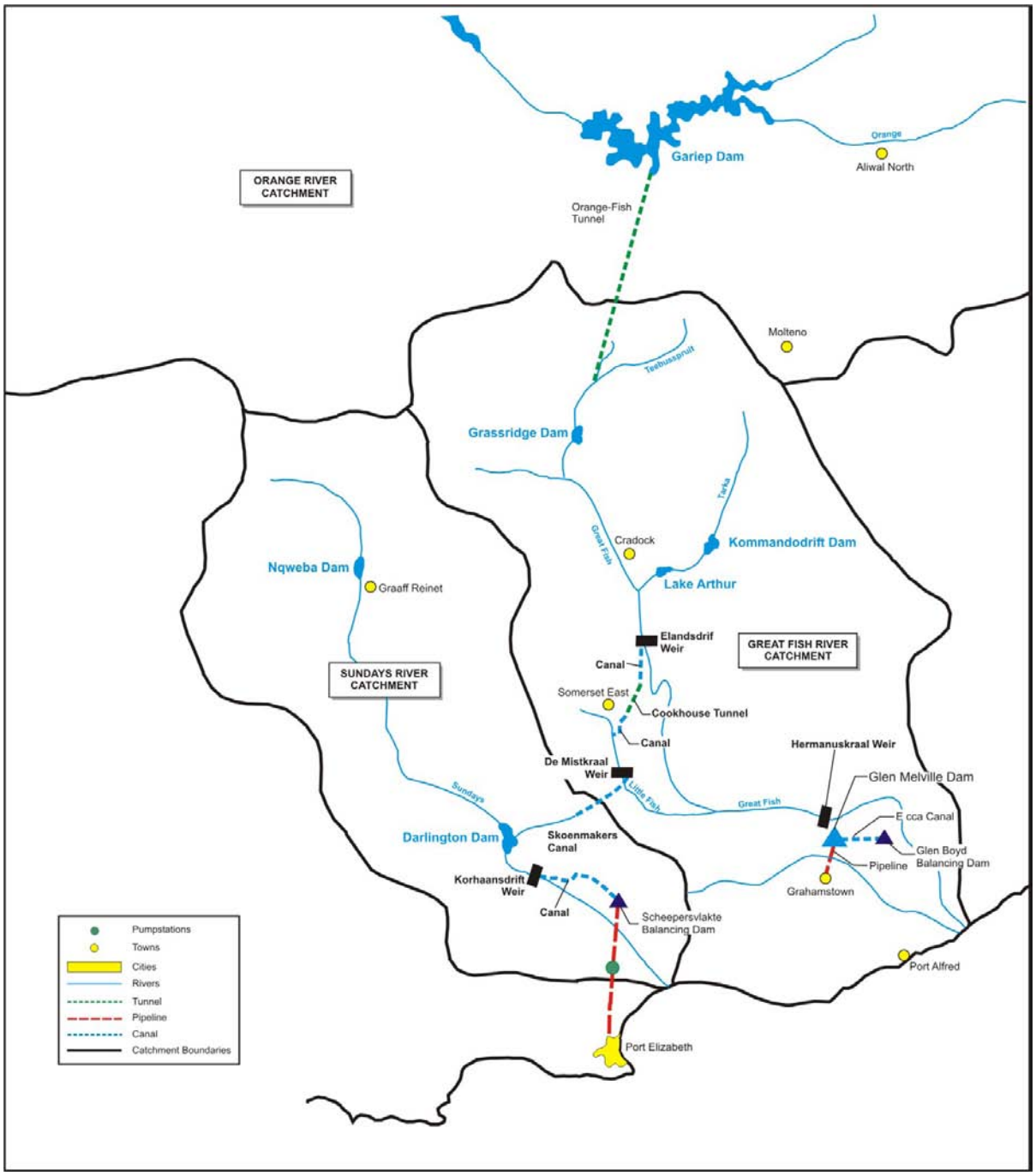
Water Services Authorities, which are all the local municipalities in the Cacadu, Chris Hani and Amatole district municipalities, are responsible for ensuring access to water services. The district municipalities of Cacadu, Chris Hani and Amatole manage most of the ISP area, whilst the Ukhahlamba District Municipalities manages a much smaller area. A water services authority is any municipality responsible for ensuring access to water services, while a water services provider provides water services to consumers or to another water services institution. The water services authorities are responsible for drafting water services development plans. The five local municipalities within the Cacadu District Municipality are all water services authorities/water services providers. For the remainder of the ISP area, the district municipalities act as the water service authorities and the local authorities as the water service providers.

The Albany Coast Water Board is the only water board in the ISP area. The Great Fish River Water User Association, including its Sub-Areas, Kat River Water User Association and the Sundays River Water User Association have been established. The Kat River Catchment Forum is the only catchment forum to have been established in the ISP area [(23)].

Waterworks

The Orange-Fish-Sundays water transfer scheme transfers Orange River water from Gariep Dam to the Great Fish River valley and thence to the Sundays River valley, to supplement local water supply for irrigation and some urban use by local towns. Some water is also transferred to the Nelson Mandela Metropolitan Municipality via this system. A schematic diagram of the system is shown on the following page. The scheme consists of Grassridge and Darlington dams and various balancing dams, weirs, canals and tunnels. The Lower Fish River Scheme transfers Orange River water to Grahamstown and to irrigators along the lower Great Fish River. Separate irrigation schemes exist on the Tarka and Kat Rivers, with irrigation taking place from the Commandodrift Dam, Lake Arthur and the Kat River Dam. Nqweba Dam supplies water to Graaff Reinet.

Potential future schemes have been identified in the Kat and the Koonap rivers. The proposed Foxwood Dam in the Koonap River has a potential yield of 25 million m^3/a, although this water would be expensive. The water source for the proposed Tamboekiesvlei Scheme will likely be from the proposed Baddaford Dam in a small tributary in the Kat River catchment, and from fountains [(27)].



Schematic diagram of the Orange-Fish-Sundays Transfer Scheme

Groundwater is widely used to supply towns and for rural water supply, with localised over-exploitation occurring. The urban and rural domestic water supplies are generally adequate, with some localised shortfalls occurring, mainly because of inadequate management of supply systems. Groundwater holds significant potential.

Water resources availability

The total available yield of the ISP area is estimated to be 757 million m^3/a.

Surface water availability

The water resources are not evenly distributed across the catchment. The natural mean annual runoff of 972 million m^3/a has been reduced by abstractions and other consumptive usages, but has been substantially augmented through transfers from the Orange River for irrigation, urban use and freshening releases. The available yield of local surface water resources is estimated to be 160 million m^3/a. The impact of water transferred into the ISP area from the Upper Orange WMA is 575 million m^3/a [(26)]. There are no natural lakes or large wetlands in the ISP area, although there are many small wetlands. There is uncertainty about the estimates of the Reserve and how these may change in future. The available yield in the ISP area is a combination of surface water, groundwater, usable return flows and transfers into the ISP area. Very limited potential for development of new dams and other water resources remain.

Surface water quality

The relatively flat topography, low mean annual runoff, high evaporation and underlying mudstones generally give rise to saline groundwater and resulting saline base flows in the Fish and Sundays rivers, irrespective of water transferred in from the Orange or irrigation return flows. Water quality in the Fish River deteriorates significantly in a downstream direction from good to very poor and from poor to very poor in the Sundays River. These rivers are significantly impacted on by saline irrigation return flows. High salinity is also the main concern in the Bushmans, Kariega and Kowie River catchments. The Bushmans River water quality is mostly unacceptable. Water quality in the Kowie River is poor and in the Kariega River the water quality is completely unacceptable.

Groundwater availability

Groundwater is often the only source of water for rural domestic use and stock watering, whilst several towns also obtain a large proportion or all of their water from underground sources. Groundwater is also used for urban supply by coastal towns, but cannot always support growing demands and peak seasonal uses. Exploited aquifers are not necessarily well managed. Actual groundwater use, especially for irrigation, is likely to be significantly higher than has been reflected in the National Water Resource Strategy and these numbers require verification. The potential for groundwater use is under-developed. It is suggested that improved borehole siting and wellfield management would significantly increase both the yield and the reliability of the groundwater resource.

Groundwater quality

In the Albany Coastal Range groundwater of poor quality is associated with outcrops of the Bokkeveld Group and the Dwyka-basal Ecca formations. Areas of low slope in the Ecca Group and lower Beaufort Group (Adelaide Sub-group) between the coastal ranges and the Middle Veld escarpment also have a higher salinity. In the south, the best quality groundwater is associated with the limited areas of the Witpoort aquifer in the Albany Coastal Range. In the north, good quality groundwater is generally associated with the Katberg sandstone aquifer in the Winterberg Range between Seymour and Cradock, and along the Great Fish and Sundays headwater divides near Nieu Bethesda, Middelburg and Steynsburg.

Available yield

Calculations of the available water per river sections, rivers and the ISP area were carefully studied, revisited and, where necessary, refined for this ISP, following the publication of the NWRS. This required limited changes to the NWRS yields. The major difference is in the presentation of results and in the way river losses have been included. Significant river losses due to the large volumes of transferred water have been taken into account in the calculations of total available yields. These river losses have not been included as part of the surface water resource as in the NWRS, because it can almost entirely be ascribed to losses from transferred Orange River water. This change however has no impact on the final calculated values of available yield. Transferred water from the Orange River accounts for the majority of all available yield in the ISP area. The following table shows the yields per ISP sub-area as revisited during the ISP process.

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

ISP Sub-area	Natural resource		Usable return flow			Total local yield (1)	Transfers in (2)	River losses (3)	Grand Total (1)+(2)+(3)
	Surface water	Ground-water	Irriga-tion	Urban	Mining and bulk				
Fish	91	6	77	5	0	179	575	-94	660
Albany Coast	15	2	0	4	0	21	1	0	22
Sundays	54	16	22	2	0	94	123	-18	199
Total for ISP area	**160**	**24**	**99**	**11**	**0**	**294**	**575**	**-112**	**757**

1) After allowance for the impacts on the yield of the ecological component of the Reserve, river losses, invasive alien plants, dry land agriculture and urban runoff.
2) Transfers into and out of hydrological sub-divisions or sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of the transfers therefore does not necessarily correspond to the total transfers into and out of the WMA.
3) River losses as calculated for the Orange River Replanning Study (ORRS) and used in the NWRS.

The *major* differences between the available yields as determined in the ISP and the NWRS yields are the following:

- Available yield in the ISP area was determined as 757 million m^3/a compared to 786 million m^3/a in the NWRS;
- Sub-area available yields (according to the NWRS sub-areas) were determined as:
  - 660 million m^3/a in the Fish sub-area which is virtually the same as the 659 million m^3/a of the NWRS;
  - 22 million m^3/a in the Albany Coast sub-area which is the same as the 22 million m^3/a of the NWRS;
  - 199 million m^3/a in the Sundays sub-area compared to the 217 million m^3/a of the NWRS;
- The yields of Grassridge and Darlington dams, which is reflected in the surface water yields, have been adjusted, because under 1:50 year drought conditions, these dams operate purely as balancing dams for transferred water, and their yields become negligible. The reduction in yield

due to the Reserve, for the hydrological sub-divisions in which these dams fall, were consequently also adjusted;

- The impact on yield of the transfer from the Fish to the Sundays sub-area was increased from the 116 million m^3/a in the NWRS to 123 million m^3/a, to reflect a situation where just enough water is transferred to ensure a balanced situation.

Water use

Total water use of the ISP area is estimated at 759 million m^3/a. At 94%, irrigation currently constitutes by far the largest user of water in the ISP area. The water is mainly used to grow vegetables, deciduous fruit, citrus, lucerne and maize, and for the irrigation of pastures [17]. There is believed to be significant scope for more efficient use. Other uses are small in comparison.

Calculations of the water requirements of the ISP area were refined for this ISP, following the publication of the NWRS. The later calculations and updates of requirements show that there is significant uncertainty associated with irrigation water use. There is enough confidence in these revisited values that they have been shown in tables in this report. It is, however, essential that the apparent discrepancies be addressed as a matter of priority.

The following table shows the water requirements per ISP sub-area as revisited during the ISP process.

Water requirements for the year 2000 (million m^3/a)

ISP Sub-area	Average	1:50 year assurance								
	Average irrigation use [1]	Irrigation [2]	Urban [3]	Rural [3]	Mining and bulk industrial [4]	Power generation [5]	Afforestation [5]	Total local requirements	Transfers out	Grand Total
Fish	513	447	12	6	0	0	2	467	193 [6]	660
Albany Coast	13	11	9	2	0	0	0	22	0	22
Sundays	217	174	5	3	0	0	0	182	18 [6]	200
Total for ISP area	**743**	**632**	**26**	**11**	**0**	**0**	**2**	**671**	**88** [6]	**759**

1) Actual average irrigation use has only been included here to show the comparison with the 1:50 year requirement, and has not been included in the total requirement.
2) Irrigation requirements allows for canal losses.
3) Includes component of Reserve for basic human needs at 25 l/c/d.
4) Mining and bulk industrial water uses, which are not part of urban systems.
5) Quantities given refer to impact on yield only.
6) 70 Million m^3/a water flows to sea from the Fish River and 7 million m^3/a from the Sundays River, while 11 million m^3/a is transferred on to NMMM from the Sundays sub-area.

The *major* differences between the water requirements as determined in the ISP from the NWRS water requirements are the following:

- The irrigation requirement in the Fish sub-area was corrected to 447 million m^3/a, compared to 453 million m^3/a for the NWRS. This as a result of:

  - the Kat River use that was changed to 17 million m^3/a, in line with allocations, compared to 14 million m^3/a shown in the NWRS;
  - a reduction in the irrigation water requirement from the Commando Drift Dam, which should not include the irrigation below Lake Arthur in the Tarka River catchment (as it does in the NWRS), as this (except for 180 ha) receives transferred Orange River water via the Fish River;
- The transfer into the Tsitsikamma to Coega ISP area from this ISP area, for use by the NMMM, was corrected to 11 million m^3/a, compared to the 31 million m^3/a of the NWRS.
- A major difference between the ISP and NWRS is the presentation of flows to sea, which have been included in the ISP as downstream transfers out of the lowest sub-divisions, sub-areas and the ISP area. This was done to be able to show more realistic water balances, as this water is not used because of its very poor water quality. These changes then lead to the following differences:
  - Total requirements in the Fish sub-area is 660 million m^3/a, compared to 590 million m^3/a of the NWRS;
  - Water requirements in the Sundays sub-area is 200 million m^3/a, compared to 213 million m^3/a of the NWRS;
  - Local requirements of the ISP area were determined as 671 million m^3/a, compared to 677 million m^3/a for the NWRS;
  - Total requirements in the ISP area, is 759 million m^3/a, which includes transfers out of the area of 88 million m^3/a (most of which is due to freshening releases that flows to the sea), compared to 825 million m^3/a of the NWRS.

Potential maximum water use

A calculation of the potential maximum use of Orange River water requirements of the ISP area, according to current water allocations, indicates a maximum allocated quantity of 658 million m^3/a, compared to the annual 1:50 year transfer of 575 million m^3/a. The implications of this difference of 83 million m^3/a at 1:50 year assurance of supply, is that farmers could potentially use more water than have been allocated for transfer from the Upper Orange WMA. It is necessary to urgently address this difference.

Current yield balance

The following table shows the yield balance per ISP sub-area as revisited during the ISP process. The *yield balance* is: the *total available water* (the sum of the available local resources and the transfers into the area) compared or reconciled with *the total requirements* (the sum of the various water requirements and losses and the transfers out of the area).

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

ISP sub-area	Available yield				Water requirements			Balance
	Local yield	Transfers in (1)	River Losses (2)	Total	Local require-ments	Transfers out (1)	Total	
Fish	179	575	-94	660	467	193 (3)	660	0
Albany Coast	21	1	0	22	22	0	22	0
Sundays	94	123	-18	199	182	18 (3)	200	-1
Total for ISP area	**294**	**575**	**-112**	**757**	**671**	**88 (3)**	**759**	**-2**

1) Transfers into and out of sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of the transfers per sub-area therefore does not necessarily correspond to the total transfers into and out of the WMA.
2) The river losses resulting from evaporation and seepage for the transferred volumes have been included here. This was a best estimate from the ORRS modelling.
3) 70 Million m^3/a flows to sea from the Fish River and 7 million m^3/a from the Sundays River and 11 million m^3/a is transferred on from the Sundays sub-area to NMMM.

The reconciliation of available water and requirements for the year 2000, including transfers of Orange River water, indicates that the ISP area is approximately in balance, mainly because transfers are sufficient to satisfy the demand. The Tarka River catchment (Great Fish River tributary) is stressed. There are unused and under-utilised water allocations in the Kat River catchment (Great Fish River tributary). These unused allocations must be addressed, as well as the unlawful use of these current unused allocations.

The NWRS shows a balance of 38 million m³/a, which is substantially more than the balance determined in the ISP. The major difference is in the NWRS Fish sub-area, where the NWRS shows a balance of 37 million m³/a, compared to the ISP balance of zero million m³/a.

The surplus flows at the bottom end of the Fish and Sundays rivers include freshening releases made, unused irrigation releases, and return flows downstream of the last point of abstraction. The salinity of such flows may be too high for direct beneficial use without blending or treatment. This water is therefore generally not available for use.

Meeting future water requirements

Water for significant new envisaged resource-poor farmer developments (4 000 ha), involving a total estimated water requirement of about 38 million m^3/a of Orange River water to alleviate poverty, have been reserved for future transfers to this ISP area from the Upper Orange WMA. About two-thirds is expected to be used in the lower Sundays River catchment (27). Significant growth in urban water use is expected in the Albany Coast sub-area, due to the large projected growth of especially coastal towns. Some growth is also expected in urban use of towns in the Fish and Sundays rivers catchments.

In addition to the 38 million m^3/a reserved for future use by resource-poor farmers, 2 million m^3/a could be transferred to meet urban growth in small towns using Orange River water, totalling 40 million m^3/a that has been reserved for future transfer of Orange River water to this ISP area. Provision has also been made for a limited additional transfer of 10 million m^3/a to NMMM to meet the growth in urban demand. Local resources, mostly through an increase in the use of groundwater, will need to be developed to meet the urban water needs of growing towns. In a 1:50 year drought situation in the ISP area, additional transfers for freshening of the Orange-Fish-Sundays Water Supply System will depend on the availability of "surplus" water in the Upper Orange WMA, which is only available when Gariep and Van der Kloof dams are spilling.

Management of the Orange-Fish-Sundays Water Supply System

An integrated management approach to the OFSWSS is required, to address overall system management, development planning, monitoring, releases and other operational aspects, freshening releases and other water quality aspects, control of black fly and routine maintenance. Improved system operation and the cutting of losses or spillages from the system should be addressed as key priorities.

In the longer term, the water supply system is to be kept operational and the condition of its ageing infrastructure needs to be improved, through continued revitalisation of components in disrepair, fixing of infratructural damage, addressing erosion problems caused by transfers as well as some expansion of irrigation (4 000 ha). A long-term plan should be put in place, with the necessary financing. Areas of potential irrigation, or problem irrigation areas which should be closed down, should be identified and included in the plan.

At the moment there is still temporary operational latitude with the water supply system due to allocations not being fully utilised. Eventually, when all allocations have been taken up, the Orange System will be in balance and the Eastern Cape will have to make do with its allocation for long periods of time. Actual irrigation water use will need to be more accurately determined, to prepare an updated water balance that provides a more reliable picture of actual use versus scheduled water use.

A more user-friendly and understandable planning and operational model needs to be developed. The model will *inter alia* be used to operate the system more efficiently to limit operational losses. A Water Quality Operational Plan component, which will form part of the overall OFSWSS Management Plan, will be drafted. Management of salinity in the OFSWSS will determine when and how freshening releases should be made and could influence where new development would be allowed. The focus of the model will be to show what transfers are necessary, when and of what quality, and distinction will be made between releases for use and freshening releases. In addition, control of black fly will be addressed in co-operation with catchment forums. Improved real-time monitoring of the system is required. Resolving the infrastructural and operational problems with Grassridge and Darlington Dam must receive attention, along with other operational and management scenarios, once the new operational model is available.

The future focus on water use in the ISP area will be to ensure optimal utilisation of the irrigation water allocation, improving efficiency of urban water use, and ensuring that water is made available to uplift the poor.

Management of areas outside the OFSWSS

Due to the dryness of the area, irrigation outside the OFSWSS is limited. Information on irrigation use outside government water schemes are not readily available and needs to be improved. Information sources from allocations registered on the WARMS database will need to be verified and additional water use surveys may be required. Improved estimates of actual irrigation water requirements should be obtained so that allocations can be better matched to requirements. Reconciliation of urban, rural and irrigation water requirements will be addressed through co-operative governance. Groundwater development will be promoted, along with the implementation of other intervention measures to meet requirements. The need to implement Management Plans, for especially coastal aquifers, will be promoted.

Intervention measures

With the entire ISP area as well as all the sub-areas approximately in balance, any further demands for commercial water use should preferably be addressed either through the trading of unused or under-utilised water use authorisations, water conservation and demand management, more effective use of existing infrastructure and further groundwater development, to alleviate water shortages and meet future needs. Sustainable management must be implemented for stressed aquifers.

Unused or underdeveloped allocations, notably in the Kat River catchment, which is close to fully allocated, but where there is a big demand from irrigators without allocations, needs to be resolved through trading, delisting or possibly reallocation, or implementation of a pricing system.

Water saved through water conservation and demand management measures (especially in towns and irrigation schemes), such as e.g. the lining of earth canals, could make water available for development, although it would also mean that there would be less return flows. Many existing irrigators may also be in a position to use such “freed” water. The large conveyance losses experienced at some schemes must be tackled through demand management studies and the implementation of identified conservation measures.

Water for the use of resource-poor farmers will be given a very high priority.

Development options

Opportunities for new surface water developments are extremely limited and will generally be very costly. Sustainable development of groundwater holds the best potential. New irrigation development would be too expensive in most cases. Water for expansion of irrigation, where land is still available, should preferably be acquired through increased water use efficiency and water trading.

The proposed Foxwood Dam in the Koonap River will be costly. The proposed Baddaford off-channel dam in a Kat River tributary is being evaluated to supply a potential resource-poor farmer scheme. The

potential Wapadsberg Scheme for Graaff-Reinet would be very costly and would likely be unaffordable for local irrigation use, even if additional Orange River water were available, which it is not.

Introduction to the ISP strategies

The many issues and concerns identified in the ISP area will be addressed through the implementation of appropriate regional water management strategies (of which many are existing). DWAF staff has identified the essential management strategies to manage the Fish to Sundays ISP area. Additional strategies may be developed in future.

Ten broad strategy groups, called main strategies, which cover all necessary current and required future water management activities, were identified from current DWAF Regional Office activities, and the requirements of the NWA and the NWRS. These main strategies are the following:

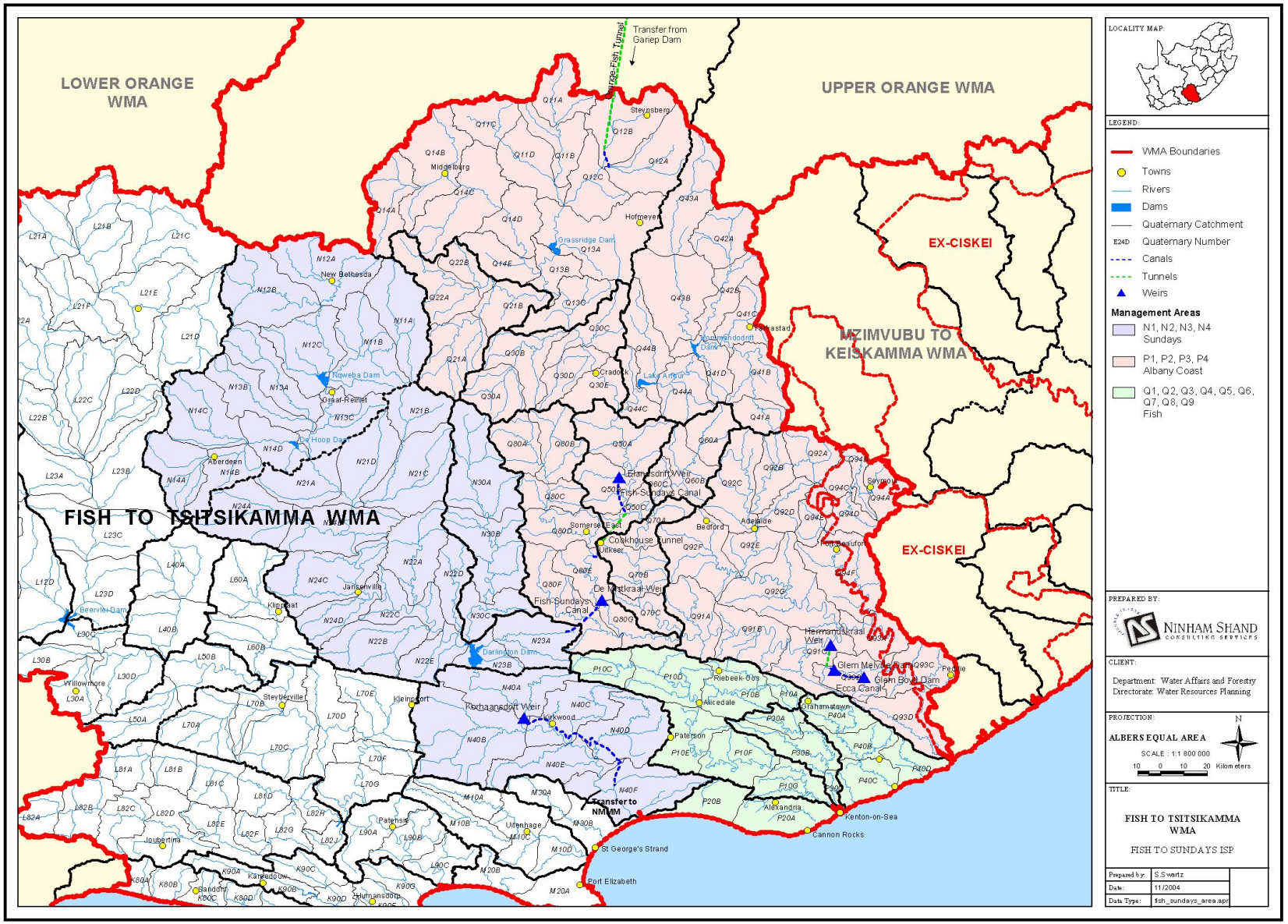
- ⇨ Yield balance and reconciliation;
- ⇨ Water resources protection;
- ⇨ Water use management;
- ⇨ Water conservation and demand management;
- ⇨ Institutional development and support;
- ⇨ Social and environmental considerations;
- ⇨ Integration and co-operative governance;
- ⇨ Waterworks development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

Under each of these main strategy groups, specific strategies particular to the Fish to Sundays ISP area were developed.

For each strategy, the following aspects are addressed:

- ***Management objectives*** in terms of the envisaged outcomes for the strategy;
- ***Situation assessment;*** providing a synopsis of the current situation with a focus on the issues;
- ***Strategic approach;*** stating the approach or plan that DWAF will follow to reach its objectives for the strategy;
- ***Management actions;*** states the required actions to implement the strategy;
- ***Responsibility;*** the responsible offices or Directorates are named;
- ***Priority*** in terms of the ISP rating system (1 – 5, where 1 indicates the highest priority);

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



Locality Map of the Fish to Sundays ISP area

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
Directorate National Water Resource Planning

FISH TO SUNDAYS INTERNAL STRATEGIC PERSPECTIVE
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ABBREVIATIONS AND ACRONYMS

AWSS	Algoa Water Supply System
AIDS	Acquired immunity deficiency syndrome
CEIMP	Consolidated Environmental Implementation and Management Plan
CMA	Catchment management agency
CMS	Catchment management strategy
CCAW	Co-ordinating Committee for Agricultural Water
DLA	Department of Land Affairs
DEAET	Eastern Cape Department of Economic Affairs, Environment and Tourism
DEAT	National Department of Environmental Affairs and Tourism
DM	District Municipality
DWAF	National Department of Water Affairs and Forestry
ECA	Environmental Conservation Act (Act 73 of 1989)
EFR	Ecological flow requirement
EIA	Environmental impact assessment
EMF	Environmental management framework
EPP	Emergency preparedness plans
EWR	Ecological water requirements
GA	General authorization
GFRWUA	Great Fish River Water User Association
GIS	Geographical information system
GIWRM	Groundwater integrated water resources management
GRP	Gross regional product
GWS	Government water scheme
IAP	Invasive alien plants
IDP	Integrated development plan
ISP	Internal strategic perspective
IWRM	Integrated water resource management
IWRP	Integrated water resource planning
GRIP	Groundwater Resources Information Project
MAR	Mean annual runoff
NEMA	National Environmental Management Act (Act 107 of 1998)
NGDB	National Groundwater Database
NMMM	Nelson Mandela Metropolitan Municipality
NWA	National Water Act (Act 36 of 1998)
NWRS	National Water Resource Strategy
OFSWSS	Orange-Fish-Sundays Water Supply System
ORP	Orange River Project
ORRS	Orange River Replanning Study
PDI	Previously disadvantaged individual
RAMSAR	The Convention on Wetlands of International Importance, signed in Ramsar, Iran, in 1971
RO	Regional office (DWAF)
RDM	Resource directed measures
RQO	Resource quality objectives
SFRA LAAC	Licence assessment advisory committee for stream flow reduction activities
SUP	Sustainable utilisation plan
TDS	Total dissolved solids

UAW	Unaccounted for water
WARMS	Water use authorisation and registration management system
WC&DM	Water conservation and demand management
WDM	Water demand management
WfW	Working-for-Water
WfWetlands	Working-for-Wetlands
WMA	Water management area
WMI	Water Management Institutions
WQM	Water quality management
WRC	Water Research Commission
WRSA	Water resources situation assessment
WSA	Water service authorities
WSDP	Water service development plan
WSM	Water management system
WSP	Water service providers
WTW	Water treatment works
WUA	Water user association
WUE	Water use efficiency
WWTW	Wastewater treatment works

GLOSSARY OF TERMS

AQUIFER	A saturated permeable geological unit that can transmit significant (economically useful) quantities of water under ordinary hydraulic gradients. Specific geologic materials are not innately defined as aquifers and aquitards, but within the context of the stratigraphic sequence in the subsurface area of interest.
ASSURANCE OF SUPPLY	The reliability at which a specified quantity of water can be provided, usually expressed either as a percentage or as a risk. For example "98% reliability" means that, over a long period of time, the specified quantity of water can be supplied for 98% of the time, and less for the remaining 2%. Alternatively, this situation may be described as a "1 in 50 year risk of failure" meaning that, on average, the specified quantity of water will fail to be provided in 1 year in 50 years, or 2% of the time.
AVAILABLE YIELD	This is the amount of water that can be expected to be "available" for commercial use (for 98% of the time in this case), either from dams, directly from rivers, or from groundwater - during any one year.
CONDENSED AREA	The equivalent area of alien plants with a maximum concentration/density that represents the more sparsely distributed alien plants that occur over a large area.
CATCHMENT	The area of land drained by a river. The term can be applied to a stream, a tributary of a larger river or a whole river system.
COMMERCIAL FARMING	Large scale farming, the products of which are normally sold for profit.
COMMERCIAL FORESTS	Forests that are cultivated for the commercial production of wood or paper products.
CONFINED AQUIFER	An aquifer that is physically located between two aquicludes, where the piezometric water level is above the upper boundary of the aquifer. The water level in a well tapping a confined aquifer usually rises above the level of the aquifer. If the water rises above ground level, the aquifer is called artesian.
DEFICIT	Describes the situation where the availability of water at a particular assurance of supply is less than the unrestricted water requirement.
DISCHARGE AREA	The area or zone where ground water emerges from the aquifer naturally or artificially. Natural outflow may be into a stream, lake, spring, wetland, etc. Artificial outflow may occur via pump wells.

ECOSYSTEM	A unit made up of all the living and non-living components of a particular area that interact and exchange materials with each other.
ENVIRONMENTALLY SENSITIVE AREA	A fragile ecosystem, which will be maintained only by conscious attempts to protect it.
GROUNDWATER	Water in the subsurface, which is beneath the water table, and thus present within the saturated zone. In contrast, to water present in the unsaturated or vadose zone which is referred to as soil moisture.
IRRIGATION QUOTA	The quantity of water, usually expressed as m^3/ha/a, or mm/a, allocated to land scheduled under the scheme. This is the quantity to which the owner of the land is entitled at the point at which he or she takes delivery of the water and does not include conveyance losses to that point.
MEAN ANNUAL RUNOFF	Frequently abbreviated to MAR, this is the long-term mean annual flow calculated for a specified period of time, at a particular point along a river and for a particular catchment and catchment development condition.
OPPORTUNISTIC IRRIGATION	Irrigation from run-of-river flow, farm dams, or compensation flows released from major dams. As storage is not provided to compensate for reduced water availability in dry years, the areas irrigated generally have to be reduced in dry years.
PRIMARY AQUIFER	Aquifers in which the water moves through the spaces that were formed at the same time as when the geological formation was formed, for instance intergranular porosity in sand (for example alluvial deposits).
RECHARGE AREA	Areas of land that allow groundwater to be replenished through infiltration or seepage from precipitation or surface runoff.
RELIABILITY OF SUPPLY	Synonymous with assurance of supply.
RESERVE	The quantity and quality of water required (a) to satisfy basic human needs by securing a basic water supply, as prescribed under the Water Services Act, 1997 (Act No. 108 of 1997) for people, who are now or who will, in the reasonably near future, be (i) relying upon; (ii) taking water from; or (iii) being supplied from, the relevant water resource; and (b) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource as indicated in the National Water Act (Act No. 36 of 1998).
RESOURCE DIRECTED MEASURES	Measures that focus on the quality and overall health of water resources.

RESERVOIR	The lake formed behind a dam wall. In this report the colloquial term dam is generally used for reservoir.
RESOURCE QUALITY	The quality of all the aspects of a water resource including: (a) the quantity, pattern, timing, water level and assurance of instream flow; (b) the water quality, including the physical, chemical and biological characteristics of the water; (c) the character and condition of the instream and riparian habitat; and (d) the characteristics, condition and distribution of the aquatic biota.
RESOURCE QUALITY OBJECTIVE	Quantitative and verifiable statements about water quantity, water quality, habitat integrity and biotic integrity that specify the requirements (goals) needed to ensure a particular level of resource protection.
RIVER SYSTEM	A network of rivers ranging from streams to major rivers and, in some cases, including rivers draining naturally separate basins that have been inter-connected by man-made transfer schemes.
SALINITY	The concentration of dissolved salts in water. The most desirable drinking water contains 500 parts per million or less of dissolved minerals.
SECONDARY AQUIFER	Aquifers in which the water moves through spaces that were formed after the geological formation was formed, such as fractures in hard rock.
SOURCE-DIRECTED CONTROL	Measures primarily designed to control water use activities at the source of impact, through tools such as standards, and conditions in water use authorisations.
SUBAREA	The sub-divisions used as management regions for this document.
SUB-CATCHMENT	A sub-division of a catchment.
SURPLUS	Describes the situation where the availability of water at a particular assurance of supply is more than the unrestricted water requirement.
WATER TABLE	The top of an unconfined aquifer where water pressure is equal to atmospheric pressure. The water table depth fluctuates with climate conditions on the land surface above and is usually gently curved and follows a subdued version of the land surface topography.
WATER TRANSFERS	Water transferred from one drainage basin or secondary sub-catchment to another.

YIELD	The maximum quantity of water obtainable on a sustainable basis from a dam or river in any hydrological year, in a sequence of years, and under specified conditions of catchment development and dam operation.
WARMS	Water Use Authorisation and Registration Management System.