# PART 2 – THE STRATEGIES

## SECTION 1: YIELD BALANCE AND RECONCILIATION STRATEGIES

The Broad Overview described in Chapter 2 of this report, concludes that the Berg WMA is in deficit in terms of its overall yield balance. Greater Cape Town and the developing West Coast regions are of particular concern. Anticipated economic growth coupled with the need for urban expansion will place further stress on the water resources of the Berg WMA.

### a) The Resource

Hydrology

The natural MAR from all the catchments in the Berg WMA is at present estimated at about 1 430 million $m^3$. This figure is based on available hydrological information, which for some of the catchments, dates back to 1988. Estimates of yields for the Berg WMA are therefore based on a mix of hydrology. This is one of the uncertainties relating to the yield balances.

Yield (1:50 year level of assurance)

The yield within the WMA (as reported in the NWRS) at the Year 2000 level of development is summarised as follows (Refer to Chapter 2, Table 2.6.2 for details):

| Area | Local Surface Yield ($10^6m^3/a$) | Groundwater Yield ($10^6m^3/a$) | Total Local Yield ($10^6m^3/a$) | Transfers In ($10^6m^3/a$) | Total Available Yield ($10^6m^3/a$) |
|---|---|---|---|---|---|
| **BERG WMA** | **425** | **57** | **482** | **194** | **676** |

River losses (10 million $m^3/a$), the impact of invasive alien plants (0,1 million $m^3/a$ according to the NWRS) and the impact of the provisional Reserve (23 million $m^3/a$), have been accounted for in the above figures. It is a recommendation of this ISP that the NWRS figure for impact on yield of invasive alien plants is too low and that the actual impact should be determined. In the mean time a figure of 2 million $m^3/a$ can be adopted in the next revision of the Strategy. Also the impact of the Reserve on yield is greater than 23 million $m^3/a$ and should be revised, as this does not reflect the most recent Reserve determination approach. The effect of afforestation on yield should be about 6 million $m^3/a$ and not zero as shown in the detailed figures. Efforts should be made to confirm the 6 million $m^3/a$ estimate.

The Reserve

The impact that the Reserve has on the yield of the WMA is currently estimated at 23 million $m^3/a$, but this is based on provisional Reserve determinations only. As discussed in Paragraph 2.8 of Part 1, the eventual Reserve requirements may exceed those of the provisional estimates and as such, may further impact on the available yield within the WMA.

**b) The Requirements**

The requirements (as reported in the NWRS) at the Year 2000 level of development in the Berg WMA are as summarised below (Refer to Chapter 2, Table 2.6.2 for detail):

| Area | Irrigation ($10^6m^3/a$) | Urban ($10^6m^3/a$) | Rural ($10^6m^3/a$) | Afforestation (Impact on Yield) ($10^6m^3/a$) | Total Requirement ($10^6m^3/a$) |
|---|---|---|---|---|---|
| **BERG WMA** | **301** | **389** | **14** | **0,2** | **704** |

A comparison of the requirements and available yield shows a shortfall in the Berg WMA of some 28 million $m^3/a$, at the Year 2000 level of development. It is a recommendation of this ISP that the impact on yield of afforestation is too low and that a figure of 6 million $m^3/a$ be adopted until such time that the figure can be confirmed. The actual figure should be adopted in the next revision of the NWRS.

Urban Growth

Two future scenarios for the Year 2025 are presented in Paragraph 2.7 of Part 1. Actual growth must be carefully monitored so that resource planning can be adapted to meet realistic needs. What does seem certain is that there will be significant growth in urban water requirements through economic growth and industrial expansion in the Saldanha (West Coast) area. There can be no doubt that resource management interventions will be required if future needs are to be met.

Irrigation Requirements

DWAF is currently implementing the registration process and all users are required to register their use. A verification process will follow to determine the "correctness" of the registration, where after the lawfulness of the use will be verified. This will give a much more reliable determination of the extent of current irrigation water use, which is quite uncertain outside of the Government Schemes. Irrigation from farmers' own sources and from run of river constitutes more than 50% of the total irrigation requirement in the Berg WMA, emphasising the importance of this process.

Capping limits on further allocations of water to irrigation out of the Western Cape Water Supply System (WCWSS) have been introduced into the Western Cape System Planning Model (refer to Paragraph 2.2.3 of Part 1). There is insufficient water available to support any substantial growth in the agricultural sector.

**c) Reconciliation Interventions**

The implementation of the Berg Water Project is in progress and will provide an additional yield of 81 million $m^3/a$ to the Berg WMA, through the WCWSS. It is anticipated that this water will become available by 2007 and that by 2010 the system will once again be in deficit. Additional water will then be required to sustain further growth. Possible interventions are listed below (refer to Paragraph 2.9 of Part 1 for details):

- *Re-allocation through Compulsory Licensing*
  The re-allocation of water will need to be progressively implemented to make allowance for the Reserve. This would be through the Compulsory Licensing process. Re-allocation through Compulsory Licensing will also allow for a more equitable distribution of water, correcting

imbalances in past allocations. The details of this strategy have yet to developed in the Berg ISP (See Part 2, Section 11 – Additional Strategies to be Developed).

- *Water Trading*
  The re-allocation of water via the trading of existing authorisations allows for a change of ownership without having to find additional water and issue new authorisations. Refer to the Licensing Strategy (No 3.4).

- *Water Conservation and Demand Management*
  Encouraging results have been achieved through the CCT's Water Conservation and Demand Management strategy. The implementation of water services water conservation and demand management needs to be entrenched in all local authorities, with DWAF providing technical assistance to those local authorities where adequate technical resources are not available. Refer to the Water Conservation and Demand Management: Water Services Strategy (No 4.1).

  Both the pricing of water and the installation of more efficient irrigation systems are measures that can be used to reduce the demands in the Agricultural sector. Refer to the Agricultural Water Conservation and Demand Management Strategy (No 4.2).

- *Strategy for System Management and Reconciliation*
  The current management approach to the operation of the WCWSS is focused on minimising spills from dams. Spills at Misverstand Dam can be better managed through the installation of telemetry, allowing releases from Voëlvlei Dam into Misverstand Dam to be more appropriately timed, so as to minimise wasteful spillage. Refer to the Strategy for the Lower Berg (No 8.4).

- *Clearing of Invasive Alien plants*
  Clearing of invasive alien plants is currently focused in the uppermost regions of the Berg River catchment. This will bring increased surface water runoff although monitoring is required to improve quantification. What is most important is the prevention of increased losses by containing the spread of invasive alien plants. Refer to the Changing Land Use - Clearing of Invasive Alien plants Strategy (No 3.7).

- *Effluent Re-use*
  The volume of treated effluent currently re-used can be significantly increased. This includes industrial use and local commercial irrigation use. Artificial aquifer recharge using treated effluent is a further possibility. Refer to the Effluent Re-use Strategy (No 4.3).

- *Aquifer Storage Recovery (ASR)*
  This essentially allows for available storage within aquifers to be used for storing surplus water. There are various ways in which this water can be fed into these aquifers. The potential exists for increased re-use of treated effluent via ASR techniques. ASR is addressed under the Aquifer Storage Recovery and Artificial Aquifer Recharge Strategy (No 1.4).

- *Development of New Surface and Groundwater Supply Schemes*
  The choice of interventions and order of implementation needs careful consideration. It must be recognised that the above interventions may not alone be sufficient to meet requirements into the longer term. In addition to the implementation of the Berg Water Project (yield = 81 million $m^3/a$), further water projects must be part of the picture. The planning of such schemes is a lengthy procedure and studies should be implemented sooner rather than later. This is further addressed under the Reconciling Water Supply and Demand Strategy (No 1.2).

  Paragraph 2.9.8 of Part 1, and Appendix 10 provide details of the following schemes that have been identified as potentially viable.

  - Voëlvlei Augmentation Scheme
  - Lourens River Diversion Scheme
  - Table Mountain Group Aquifer
  - Cape Flats Well Field
  - Eerste River Diversion
  - Breede WMA to Berg WMA transfers
  - Desalination

In addition to the implementation of water conservation and demand management, the potential for effluent re-use, and the proposed development of new schemes, there are a number of uncertainties regarding the resource availability, the quantities of actual water use and the requirements of the ecological component of the Reserve. These are discussed in Paragraph 2.8 of Part 1. Local authorities must be encouraged to implement water conservation and demand management. They must also be given assistance in the planning of the development of local water resources, rather than being reliant on the provision of additional water through major schemes (Strategy No 6.1).

While a greater reliance must be placed on groundwater within the Berg WMA, there remains too little understanding of the potential impacts of utilisation of this resource. This calls for increased monitoring. See Strategies No 1.3 (Groundwater) and No 9.2 (Monitoring Networks and Data Capture).

Four Yield balance and Reconciliation strategies have been identified for development, namely:

1.1 Reliability of the Yield Balance
1.2 Reconciling Water Supply and Demand
1.3 Groundwater
1.4 Aquifer Storage Recovery and Artificial Aquifer Recharge

| 1.1 | RELIABILITY OF THE YIELD BALANCE |
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| **Management objective:** | This strategy addresses the uncertainties, assumptions and unknowns of the two components that impact on the reliability of the yield balance determination, namely the availability of water (yield) and the water requirements. The objective is to improve on our knowledge and understanding of both components, which in turn improves the reliability of the yield balance. |
| **Background information:** | Yield Balance = Availability of Water - Water Requirements<br><br>**Availability of Water (Yield)**<br>The accuracy of estimates of water availability (or yield) is dependant on the reliability of the available hydrological information used as input to the water resource models. Land use changes may also have a significant impact on the yield.<br><br>*Reliability of Hydrological Information Base Data*<br>Rain gauge data (reliability, record length and spatial distribution) and flow gauge data form an integral part of the determination of yield. In the Berg WMA, the yield of the Western Cape Water Supply System (WCWSS) and the yield of catchments lying outside of that system (the Diep River catchment for example) is based on hydrology dating back as far as 1988.<br><br>More recently, hydrological modelling has been updated in those catchments forming part of proposed schemes for which feasibility studies have been conducted. These include the Berg Water Project and the Voëlvlei Augmentation Scheme. However, the yield of the entire WCWSS, taking the revised hydrologies into account, has not been re-determined. Another factor influencing the reliability of availability estimates is the question of the Reserve. The following specific issues and concerns relating to the reliability of the hydrology have been identified:<br><br>• The rainfall gauging network is inadequate for accurate modelling purposes and yield analysis, particularly in the high rainfall areas of the Berg River catchment. A number of long term rain gauges have been closed.<br>• The interaction between surface water and groundwater resources in the WMA is not well understood.<br>• The impact of climate change on surface water runoff and groundwater recharge, has not been taken into account in the analysis of yield determinations.<br><br>*Land Use Changes*<br>In the Berg WMA land use changes such as the removal of forestry and the removal of invasive alien plants may also impact on the availability of water (Refer to Strategies No 3.6 and 3.7).<br><br>**Water Requirements**<br>Currently in the Berg WMA, urban water use is predominantly supplied from the WCWSS, as is approximately 50% of the total irrigation requirement in the WMA. As such, supply to these users is well monitored through the system. However the remaining irrigation requirement is supplied from farmers' own sources, run of river and from groundwater. It is this component of current water use that is most uncertain throughout the Berg WMA. The Diep River catchment is identified as one of particular concern in this regard. Clarity regarding agricultural use will eventually be provided through registration and verification and the licensing of additional usage (if any). Refer to the Verification of Existing Lawful Use Strategy (No 3.3).<br><br>Methodologies used to estimate future water requirements produce demand figures that are only as accurate as the input information used. Future urban use will depend on population numbers, on the actual economic growth of the various urban and industrial sectors, and also on the efficiency of future water use (WC/DM). These factors will all impact on the reliability of future requirement estimates. As such there is uncertainty as to the exact water requirement scenario that will ultimately unfold. This is reflected in the significant difference between the base and high requirement scenarios (Year 2025) for the Berg WMA as contained in the NWRS. Ongoing monitoring of actual water use will allow for estimates of future water use to be continually improved. |

| 1.1 | RELIABILITY OF THE YIELD BALANCE (cntd) |
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| **Background information (cntd):** | It is nevertheless important to note that the projected demands used for the WCWSS operation and planning are within the envelope of the projected future water requirement scenarios contained in the NWRS. The City of Cape Town (CCT) will soon embark on a new requirements study in collaboration with DWAF. This study will probably use revised methodology for future estimates. |
| **Strategic approach:** | Until better information becomes available regarding the availability of water in the WCWSS, the NWRS figures, as tabled in Section 2.6 (Part 1) of this ISP will be used in supporting management decisions in this WMA. The approach is however to improve our knowledge of availability and of requirements and to make use of improved information as and when it becomes available, so as to continually improve our estimates of the yield balance.<br><br>Revised hydrological studies and water yield modelling need to be implemented to obtain a more reliable understanding of the availability of water. The Western Cape System Analysis model should be extended to include the full extent of the Berg River downstream of Misverstand Weir. The model should be rerun on a regular basis, as more reliable hydrological information becomes available from which to improve the yield estimate.<br><br>On the requirements side, improved estimates of current irrigation water requirements will be possible through the verification process. Future water requirement scenarios will largely be influenced by population change, economic development, the Reserve requirement and efficiency of water use. Estimates of future scenarios of water requirements will be possible through improved methodologies, supported by ongoing monitoring of actual water requirements.<br><br>It is likely that once the Reserves for the rivers and Berg River Estuary have been determined and implementation begins, the Berg WMA will be even more stressed than is currently the case. An accurate measure for the Reserve will improve the level of confidence for all our estimates of water availability. As such more informed planning and management of the system will be possible.<br><br>The impacts of climate change need to be considered in future water resource planning. |
| | MANAGEMENT ACTIONS |
| **Required actions:** | Develop a detailed strategy for improving the reliability of the yield balance in the Berg WMA. The following general actions are required:<br><br>a. Address the diminishing rainfall gauging network. The Regions should indicate needs and propose improvements to the network, along with an implementation plan. The problem of declining networks must also be addressed at National level.<br>b. Identify required improvements to flow gauging immediately. List and implement these on an ongoing basis.<br>c. Establish additional rain stations in the high rainfall areas of the Berg River catchment.<br>d. Update the hydrology at regular intervals and allow for the impacts of climate change.<br>e. Re-determine the yield of the WCWSS.<br>f. Re-determine the yield balance of the Diep River catchment.<br>g. Research the interaction between surface water and groundwater.<br>h. Update the requirements at regular intervals using best available information.<br>i. Keep a watchful eye on water use trends through monitoring and ensure that all observations are brought to the attention of the resource planners.<br>j. Improve methodology for future requirement estimates by incorporating elements such as population, standard of living (as reflected in individual water use), economic activity, etc. |
| **Responsibility:** | The implementation of the **Reliability of the Yield Balance Strategy** is the responsibility of the RO, in consultation with the Directorate: NWRP. |
| **Priority:** | Priority 2 – High. Implementation over the medium term. |

| 1.1 | RELIABILITY OF THE YIELD BALANCE (cntd) |
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| **MANAGEMENT ACTIONS (cntd)** | |
| **Interfaces (cntd):** | **a. Relevant documentation:**<br>a1: NWRS: Chapter 2<br>a1: NWRS: Chapter 2<br>a2: Berg WMA Report: Chapter 5<br>a3: Berg Water Resource Situation Assessment Report: Chapter 7<br>a4: Western Cape System Analysis<br>a5: Skuifraam Dam Feasibility Study Hydrology<br>a6: CMA Integrated Water Resource Planning Study<br>a7: Voëlvlei Augmentation Scheme<br>a8: Appendix 10: Possible Future Bulk Water Supply Schemes.<br>**b. Linked ISPs / WMAs:**<br>Breede WMA.<br>**c. Other role players and their functions:**<br>CCT, West Coast District Municipality and Irrigators: participate on the Western Cape Planning Model Committee and undertake future water requirements studies.<br>**d. Strategies Related to the Reliability of the Yield Balance Strategy:**<br>1.2 Reconciling water supply and demand<br>1.3 Groundwater<br>2.1 Reserve and resource quality objectives<br>3.3 Verification of existing lawful use<br>4.1 Water conservation and demand management : Water Services<br>4.3 Effluent re-use<br>9.2 Monitoring networks and data capture<br>**e. Linked mapping:**<br>None |

| 1.2 | RECONCILING WATER SUPPLY AND DEMAND |
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| **Management Objective:** | To match the demand requirements in the Berg WMA with adequate supply in such a way that growth is not unreasonably constrained nor the environment and long-term future of the WMA in any way compromised. Supply is not infinite and the matching of supply to demand also requires that growth in demand be constrained within reasonable limits. This may impact more on sectors that are particularly demanding of water. |
| **Background information:** | The Berg River System is currently in overall deficit of 28 million $m^3$/a. This requires the joint actions of reducing demand and increasing supplies. A range of interventions is available.<br><br>The completion of the Berg Water Project in 2007 will provide an additional 81 million $m^3$/a, but soon after 2010 the system will again be in deficit. Some water demand scenarios show a slight improvement in the demand situation up to 2010 - after which the situation worsens again.<br><br>Other potential surface water schemes in the Berg WMA include the Voëlvlei Augmentation Scheme (30 million $m^3$/a), and the Lourens (19 million $m^3$/a) and Eerste River (8 million $m^3$/a) Diversion Schemes, as well as a number of other options including the raising of Voëlvlei Dam.<br><br>There are also options for further development of yield in the Breede WMA, for transfer into the Berg WMA. The most favourable appear to be the Michell's Pass Diversion (53 million $m^3$/a) and the Upper Molenaars Diversion (27 million $m^3$/a).<br><br>The very long lead times before any major project comes on stream (often 10-15 years from conceptualisation to completion) require that infrastructure development planning be commenced as soon as a requirement is visualised.<br><br>The next scheme planned is the Voëlvlei augmentation (providing about 30 million $m^3$/a), which will take us up to 2012. However, these dates can change depending on the success of water demand management, which is now making inroads into the water requirement figures of Cape Town. This ISP should focus strongly on Water Demand Management to stretch the next scheme development date.<br><br>There are very large uncertainties in water resource projections (see Reliability of the Yield balance Strategy, No 1.1). It has been the practice of the Department to engage in very detailed and intense planning studies for major supply systems every 15 years or so. The most recent Western Cape Systems Analysis was based on hydrology dating as far back as 1988. Many aspects of this analysis now need to be updated - but the planning urgency is such that the Department cannot wait for a full-scale study which might take five years to complete. A recently proposed approach is that the Reconciliation Strategies Study for the Western Cape Water Supply System (WCWSS) and also for other large systems elsewhere, should be updated on a regular, almost continuous basis, with smaller but more frequent research and information inputs. The Directorate National Water Resource Planning is preparing a Reconciliation Strategies Study which should be completed by the end of 2005. The study will inter alia review requirements, availability, reconciliation interventions and draw up an implementation strategy. |

| 1.2 | RECONCILING WATER SUPPLY AND DEMAND (cntd) |
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| **Background information (cntd):** | There are a very large number of reconciliation interventions available to reconcile demand with supply. These are all covered in greater or lesser detail within this ISP and include:<br><br>• Increased re-use of treated effluent,<br>• Water Conservation and Demand Management - leakage control, abstraction control (monitoring), urban and industrial savings, agricultural savings,<br>• Water pricing (in demand management),<br>• The increased utilisation of groundwater - notably the Cape Flats Aquifer and the TMG Aquifer,<br>• Licensing and the Verification of Existing Lawful Use (this includes the prosecution of unlawful users and return of this water to the common pool),<br>• Water Trading - moving water out of less profitable sectors,<br>• Compulsory Licensing (to reduce existing allocations in order to meet the demands of both Equity and the Reserve,<br>• Improved operations management - seeking optimal efficiencies in the way systems are managed and water is released for different users and purposes,<br>• Removal of invasive alien plants,<br>• The construction of additional storage infrastructure (water works),<br>• The ecological Reserve factors which have impact on most reconciliation interventions (generally this will require more water if our rivers are to be adequately conserved),<br>• Water Quality management - especially pollution control (waste discharge management),<br>• Ultimately there is the option of desalinating seawater. Although expensive, the feasibility of this has been considered by the CCT in its Integrated Water Resource Planning Study. A small reverse osmosis plant is currently used to augment the groundwater supply on Robben Island. |
| **Strategic approach** | The Department's focus should first and foremost be to promote cost effective WC/DM measures.<br><br>Develop a reconciliation strategy aimed at a priority list of reconciliation options based on our current knowledge. This should include a well-structured public participation process.<br><br>Prioritise studies which improve on the uncertainties noted in this ISP. It is also necessary to improve on the cost estimates and yield figures for specific options.<br>Test the future with a range of yield balance scenarios - ranging from the most likely to the extreme.<br><br>Revise the reconciliation strategy on a regular basis in a properly structured way as new information becomes available both from directed research studies and from the monitoring of the basic drivers of demand.<br><br>All of the possible reconciliation intervention options will have to be evaluated through a comparative study so as to enable decisions to be made on which of them, or which combinations of them should be implemented. It will further be necessary to determine the most economical options, the sequence and programme for their implementation and the relative benefit to this WMA, the Breede WMA and the Western Cape region as a whole. This will be part of the output of the Western Cape Reconciliation Strategy Study to be launched by Directorate: NWRP.<br><br>This strategy must be flexible to deal with all the surprises that may arise. Therefore a combination of low impact schemes that can be implemented quickly (possibly the Michell's Pass Diversion), or in small increments (such as the utilisation of groundwater) is preferred to large projects (dams) and costly projects, such as desalination for high assurance users. Groundwater is regarded with such high importance that it warrants a separate strategy as dealt with in 1.3. |

| 1.2 | RECONCILING WATER SUPPLY AND DEMAND (cntd) |
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| **MANAGEMENT ACTIONS** | |
| **Required actions:** | • Update the Western Cape System Reconciliation Strategy at approximately 2 yearly intervals as new information becomes available from studies and monitoring of basic drivers of demand,<br>• Develop the Reconciliation Strategy with a well structured participation process,<br>• Formulate scenarios for reconciling future supplies and demands,<br>• Carry on with implementation of cost effective WC/DM measures,<br>• Develop a priority list of reconciliation intervention options based on current knowledge,<br>• Prioritise studies required to improve uncertainties (as listed in this ISP), as well as to improve cost estimates and yield figures for specific development options,<br>• Investigate the benefits of supplying high assurance users out of the TMG or with de-salinated water, and lower assurance users from existing surface water resources. |
| **Responsibility** | The development and implementation of a reconciliation strategy is the responsibility of the Directorate: NWRP together with the Regional Office (RO) and the Directorate Options Analysis. |
| **Priority** | Priority 1 - Very High. Immediate implementation is necessary to enable future schemes to be planned with confidence. |

| 1.3 | GROUNDWATER STRATEGY |
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| **Management objective:** | The objective of this strategy is to address the uncertainties, assumptions and critical gaps in the hydrogeological database of this WMA, and to promote the conjunctive development of ground- and surface water resources in an Integrated Water Resources Management (IWRM) framework. Central to this objective is to develop a better understanding of the groundwater - surface water interaction. |
| **Background Information:** | The current developed groundwater yield in the Berg WMA is relatively small (57 million $m^3/a$) in comparison to the yield available from developed surface water resources (230 million $m^3/a$ from major dams and 179 million $m^3/a$ from minor dams and run of river). In the future, a stronger reliance will be placed on groundwater by virtue of the fact that the surface water yield potential is reaching its exploitable limitation, whilst the demands for water in the Western Cape will continue to increase.<br><br>The developed groundwater yield is used to augment the surface water supply to the West Coast, where the town of Atlantis, for example, relied on groundwater alone until fairly recently. Many smallholdings along the West Coast continue to rely on groundwater as their only source of supply. On the Cape Flats the Philippi market garden area utilises groundwater. The CCT has investigated (at pre-feasibility level) the option of increased abstraction from the Cape Flats Aquifer to augment its surface water schemes.<br><br>In the Swartland, the natural geology introduces higher levels of salinity to the groundwater, than that found in the primary aquifers and the TMG. However at particular localities in the Swartland, good quality water with moderate yields are achievable. |
| **Strategic Approach:** | The Department favours conjunctive water use solutions. Towns are encouraged to investigate groundwater options where there is a shortfall in available surface water yield. DWAF will support this. A high priority will be given to improved groundwater data gathering and the design of an effective monitoring network for the WMA. |
| **Required actions** | **i. WMA**<br>a. Verify the existing lawful use from groundwater in conjunction with a new borehole-and-spring hydrocensus survey in order to determine more accurately the current levels of groundwater abstraction and future potential from various aquifers.<br>b. Establish data-capture networks to monitor the interactions of groundwater, surface water, and the environment (aquatic and terrestrial ecologies).<br>c. Undertake groundwater Reserve determinations, particularly in areas where future groundwater supply/expansion to local authorities is contemplated.<br>d. Investigate groundwater chemistry in the various aquifers, but particularly the fractured-and-weathered older bedrock, for potentially toxic trace elements (e.g. arsenic, fluorine, nitrates). Evaluate risk of groundwater toxicity due to trace elements in older rocks, viz. granites and Malmesbury bedrock.<br>e. Establish Groundwater protection Zones (GPZs) in the active recharge areas of aquifer systems, placing limits and/or restrictions on changes in land use, the disposal of solid wastes, and the siting of new developments.<br>f. Investigate specific point-source pollution sites (e.g. landfills, industrial plants) for potential or actual impacts on groundwater quality, with a view to the establishment of Groundwater Exclusion Zones (GEZs). (Manage polluting sites – Pollution Control Strategy).<br>g. Determine the likelihood of sea-water intrusion into shallow aquifer systems along the coastline of the WMA - and the extent of current intrusion.<br>h. Offer/facilitate use of groundwater skills in support of planning future emergency provision of water to Cape Town.<br>i. Research the direct discharge of freshwater into the ocean (i.e. freshwater springs beyond the coastline) in terms of quantity, origin, and importance to the marine ecosystem.<br>j. Investigate potential for augmentation of the Steenbras scheme through conjunctive use of the deep groundwater storage in the confined synclinal part of the TMG aquifer system.<br>k. Compile a reference list of available groundwater documentation. |

| 1.3 | GROUNDWATER STRATEGY (cntd) |
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| **Required actions (cntd)** | **ii. Berg River upstream of Hermon**<br>a. Determine groundwater recharge and discharge in conjunction with improved rainfall gauging in uppermost (high rainfall) regions of the Berg River.<br>b. Evaluate lateral recharge from TMG aquifer to intergranular and fractured rock aquifers bounding it.<br>c. Monitor springs at the base of the TMG in the Groot Drakenstein Mountains in order to evaluate the baseflow contribution of the TMG on the northern side of the Groot Drakenstein Mountains. |
| | **iii. West Coast rivers**<br>Investigate the potential use of groundwater, from both the primary and the fractured-and-weathered aquifers of the Cape Granite Suite, for local supply to towns and rural users. |
| | **iv. Diep River**<br>Investigate the potential in the fractured and weathered Malmesbury bedrock as a source for small-scale local supply to towns and rural users but with special precautions concerning toxic trace elements such as arsenic in the Malmesbury Group. |
| | **v. Kuils/Eerste/Lourens/Sir Lowry's Pass Rivers**<br>a. Promote the use of the Cape Flats Aquifer for the greening of the Cape Flats, local subsistence food gardens, emerging market gardeners and as an emergency resource in the event of a supply disaster affecting the CCT.<br>b. Evaluate the potential of the Malmesbury bedrock underlying the main Cape Flats Aquifer as a potential source of local potable supply in moderate quantities but with special precautions concerning toxic trace elements such as arsenic.<br>c. Document and further explore submarine discharges of poorer quality and nutrient rich groundwater of the Cape Flats Aquifer and their impact on the marine ecosystems. |
| | **vi. Cape Peninsula Rivers**<br>a. Evaluate risks of pollution threat and seawater intrusion to the western part of the Cape Flats Aquifer around the Black, Elsies and Lotus River sections.<br>b. Evaluate the potential groundwater use from TMG aquifers to augment seasonal demand in particular areas of the South Peninsula. |
| **Responsibility** | The implementation of the Groundwater Strategy is the responsibility of the RO, providing guidance to local authorities, water management institutions and individuals in co-operation with the Directorate: NWRP and Directorate: Hydrological Information. |
| **Priority** | Priority 1 - Very High. Implementation in the short term and on an ongoing basis. |
| **Interfaces** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Part 12<br>a2: NWRS : Chapter 3<br>a3: Berg Water Resource Situation Assessment Report: Chapter 6<br>a4: CMA Integrated Water Resource Planning Study<br>a5: Appendix 5 : General Authorisations (Groundwater) |
| | **b. Other role players and their functions:**<br>Local Authorities (groundwater monitoring, management, protection and pollution control, land zoning approvals)<br>Department of Agriculture (land sub-division)<br>DEADP (Environmental Control)<br>WCNCB (Environmental Control) Local Authorities |

| 1.4 | AQUIFER STORAGE RECOVERY AND ARTIFICIAL AQUIFER RECHARGE |
|---|---|
| **Management objective:** | To integrate the option of Aquifer Storage Recovery (ASR) techniques in the planning of water resource management in the Berg WMA. |
| **Background information :** | Aquifer Storage Recovery (ASR) and Artificial Aquifer Recharge (AAR), both involve pumping surface water into aquifers and reusing that water at a later stage. The inherent difference between the two is that recharge is associated with replenishing water in an aquifer from which water is currently utilised. ASR on the other hand makes use of recharge techniques to take advantage of available storage within aquifers (that may or may not be currently tapped) akin to the use of available storage in a dam. The same boreholes can be used to pump surplus surface water into the aquifer and to abstract water from that aquifer during the dry season.<br><br>It is estimated that approximately 32 million $m^3$/a is lost from dams in the Berg WMA to evaporation. Of this, the evaporation from Voëlvlei Dam alone, accounts for an estimated 17 million $m^3$/a. One of the key benefits of ASR is that there are no evaporation losses associated with it. Whilst artificial recharge is currently only utilised to a very limited degree, it does hold potential, particularly in the primary aquifers along the West Coast from which water is currently abstracted (Langebaan Road, Elandsfontein and Adamboerskraal). The Langebaan Road aquifer currently supplies the West Coast District Municipality with 4000 $m^3$/d and to date no artificial recharge has been implemented.<br><br>AAR is currently being undertaken at Atlantis where stormwater, and treated effluent from the Wesfleur WWTW (11 Ml/d) is injected into the primary aquifer, to replenish water abstracted from it. This equates to approximately 4 million $m^3$/a of effluent re-use.<br><br>AAR has also been considered as an option within the Cape Flats aquifer. However there are concerns that this may lead to contamination of this resource due to its location within a densely urbanised area as well as associated operating problems.<br><br>The Langebaan Road aquifer holds potential for ASR by possibly making use of pre-treated, excess winter water out of the Berg River and storing that water in the aquifer for use during summer. |
| **Strategic approach:** | Implement studies to investigate the potential use of treated water for ASR and AAR techniques, particularly in the intergranular coastal plain aquifers. Such studies should be undertaken as part of integrated planning of surface and groundwater development in the Berg WMA. |
| **Required actions:** | • Evaluate the potential for further AAR schemes (e.g. Atlantis) and ASR schemes in the intergranular aquifers of the coastal plain using pre-treated water.<br>• Assess the vulnerability of the receiving water to the quality of the injected water where ASR is considered, and take cognisance of the potential for increased use of treated effluent in this regard. |
| **Responsibility** | The implementation of this strategy is the responsibility of the RO in co-operation with the Directorate : NWRP and Directorate : Options Analysis. |
| **Priority** | Priority 3 - Medium. Implement studies to determine viable options for long term application. |
| **Interfaces:** | **a. Related Strategies:**<br><br>1.2 Reconciling water supply and demand<br>1.3 Groundwater<br>4.3 Effluent re-use |

# SECTION 2: WATER RESOURCE PROTECTION STRATEGIES

The NWRS defines two complementary approaches for the protection of water resources. **Resource Directed Measures** focus on the character and condition of the in-stream and riparian habitats, whilst **Source Directed Controls** focus on the control of water use at the point of potential impact, through conditions attached to water use authorisations (licences).

It is not economically viable, nor always necessary, to protect all water resources to the same degree. Each river needs to be classified in terms of the degree of protection it should be accorded. This in turn influences the allowable extent of utilisation. A classification system is being developed by the Directorate: Resource Directed Measures (RDM) to provide a protocol for the classification of rivers.

The evaluation of the ecological component of the Reserve is a requirement for processing applications for authorisations. The absence of a comprehensive Reserve determination in the Berg WMA introduces a number of challenges for water resource management by the RO. Of particular concern are (i) the backlog of authorisation applications, and (ii) the availability of resources to carry out Reserve determinations for licence applications on each and every river reach on which a Reserve has not previously been determined.

The job opportunities accompanying economic development in the Berg WMA have led to a particularly rapid increase in the urban population. The appropriate planning of residential developments, provision of water, and management of waste must take cognisance of the need to protect the water resource.

Four strategies have been identified for development, namely:

2.1 Reserve and resource quality objectives
2.2 Siting of new developments
2.3 Solid waste
2.4 Water quality

| 2.1 | RESERVE & RESOURCE QUALITY OBJECTIVES |
|---|---|
| **Management objective:** | The objective of this strategy is to address the uncertainties relating to the current procedures for Reserve determination, how the authorisation of licence applications will impact on the Reserve, and how implementation of the Reserve in the WMA will affect the availability of water to other users. |
| **Background information** | The implementation of the Reserve can have a major impact on the amount of water available for allocation, with serious economic and social implications.<br><br>All Reserve determinations carried out prior to classification are considered to be preliminary (Refer to Paragraph 1.2 of Part 1 – Integrated Water Resource Management) – but these nevertheless have sufficient legal standing to allow for the issuing of water use licences and for limited other decision making.<br><br>It should also be noted that the Rapid Reserve Determination procedure utilised for the NWRS has subsequently been revised, and if implemented, the Reserve could be substantially increased and the available yield correspondingly reduced.<br><br>The NWA requires that "consideration be given to the Reserve" when addressing applications for new water use licences. As such, the RO is required to carry out ad-hoc preliminary Reserve determinations in every river reach for which an application is received, if no preliminary Reserve has previously been determined for that river reach. This can mean a large number of determinations. These are generally done at rapid or intermediate level. There is often a backlog at the RDM office, which delays approval. Furthermore, the RO does not have the necessary resources to ensure that the preliminary Reserves are actually implemented, according to the conditions attached to the licence. A strategy is required to resolve this with respect to resourcing.<br><br>Projected demand figures suggest that even with the Berg Water Project in place, the WCWSS will need to be augmented again, soon after 2010. As the planning of new schemes can take up to 10 years and more, such planning should be implemented sooner rather than later. Without comprehensive Reserve determinations, authorities such as the CCT are not able to implement effective planning. In view of the approved Berg Water Project and of the potential scheme to utilise excess water for augmenting Voëlvlei Dam, a comprehensive Reserve determination for the Berg River should receive higher priority than the other river systems in this WMA. In particular, the Reserve requirement of the estuary must be determined.<br><br>New schemes should be developed in such a way that they have the least detrimental effect on the environment. Appropriate operating rules should be put in place to make provision for the Reserve. The Berg Water Project, for example has been planned to provide releases of between 65 and 200 $m^3/s$ in order to create floods to meet particular ecological requirements in the river.<br><br>Although a procedure for determining the groundwater Reserve requirement is available, the lack of supporting data to facilitate the determination is a limiting factor. Adequate information is essential for all Reserve determinations. Information pertaining to the groundwater resource is particularly scant. This needs to be addressed by acquiring information through appropriate monitoring.<br><br>The lack of information to support Reserve determinations for estuaries and wetlands needs to be addressed at national level. The need for a Reserve determination on severely modified rivers is also questioned and must be taken up with the RDM Directorate. |

| 2.1 | RESERVE & RESOURCE QUALITY OBJECTIVES (cntd) |
|---|---|
| **Background information (cntd)** | *The following specific issues and concerns were identified in the Berg WMA:*<br><br>**i. WMA**<br>• Preliminary Reserve determinations are currently being done on an *ad hoc* basis. This is time-consuming and resource dependent.<br>• The RO does not have the necessary resources to ensure that the preliminary Reserve requirements are actually being met (See Monitoring Networks and Data Capture – Strategy 9.2).<br>• Many rivers in the Metro are canalised and modified. No framework or classification is available to assist in Reserve determination of modified urban rivers.<br>• A backlog in processing authorisation applications is occurring.<br>• The RDM Directorate requires Reserve determinations before allocations can be made, even in the case of significantly modified rivers. Some relaxation is suggested here.<br>• Authorisations for groundwater abstraction cannot be processed without a groundwater Reserve determination. There is, at the same time, a lack of groundwater data (monitoring) to support these groundwater Reserve determinations.<br><br>**ii. Berg River upstream of Hermon**<br>• Although in progress, the Reserve determination for the Berg River is not yet available.<br><br>**iii. Diep River**<br>• Groundwater recharge in this area is not high. Pollution of groundwater from increasing land sub-division is of concern.<br>• There is poor knowledge of irrigation practice in this area. |
| **Strategic approach** | In order to meet the future requirements in the Berg WMA, the Department must focus attention on comprehensive Reserve determinations for rivers in this WMA, with first priority being the Berg River itself. The Berg WMA is also dependent on the supply of water from the Breede WMA, via inter-basin transfers, to augment the local yield. The Reserve requirement for the Berg River is important in the planning of potential transfer schemes from the Breede WMA and will inform the development of water resources in that WMA as well.<br><br>In the Lower Berg River, suitable baseline monitoring sites will be established to provide data that will be used to determine the requirements of the Berg River Estuary. The implementation of the Reserve itself will be supported through appropriate monitoring, and success in achieving the objective of a river functioning as required and classified, will be evaluated.<br><br>Protocols will regulate the trading of water to ensure that water is not moved across sectors or catchments detrimentally. 'Within catchment' trading keeps the allocation constant and may negate the need for ad-hoc Reserve determinations to be carried out. Where Reserve determinations are required, these will have to be based on best available information and a conservative approach using the rapid or intermediate approach until such time as data has been accumulated to support more reliable evaluations.<br><br>As a long-term solution, the rivers need to be classified and a comprehensive Reserve determination done throughout this WMA, with first priority afforded to the Berg River. This would eliminate the need for ad-hoc Reserve determinations. |

| 2.1 | RESERVE & RESOURCE QUALITY OBJECTIVES (ctnd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | Develop a detailed strategy for the Reserve and resource quality objectives in the Berg WMA. The following actions are required:<br>a. Reserve determinations require additional resources and these must be assigned. In making the case for these resources it may be necessary to determine the extent of need, delays, cost of delays, what functions the Regions would be able to perform instead of head office staff, etc.<br>b. Work within the existing RDM methodologies for streamlining authorisation applications, prior to the completion of the Reserve determination.<br>c. Implement a river classification matrix to facilitate rapid decision making in terms of the level of Reserve determination required for rivers of varying ecological importance, such as pristine rivers and degraded urban rivers in the WMA.<br>d. Identify and consult with the relevant local authorities where abstraction under Schedule 1 requires amendment through by-laws which can be introduced by the local municipalities.<br>e. Prioritise the completion of the Berg River comprehensive Reserve determination. Ideally this should be synchronised with DWAF's intended Compulsory Licensing project for the Berg River, if that project is commenced within the next year.<br>f. Abstraction under Schedule 1 should be reviewed and areas identified where abstraction is increasing significantly, particularly from the groundwater resource. The RO is to liase with the relevant local authority, through which by-laws can be implemented (if necessary) to amend the quantities of abstraction under Schedule 1.<br>g. On account of the integration of the Riviersonderend catchment of the Breede WMA into the WCWSS, the Reserve of the Riviersonderend/Breede Rivers should be determined at the same time as the Reserve of the Berg River. |
| **Responsibility:** | The implementation of the **Reserve and Resource Quality Objectives Strategy** is the responsibility of the RO in conjunction with the Directorate: RDM. |
| **Priority:** | Priority 1 – Very high. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 3, Part 2<br>a2: NWRS: Chapter 3, Part 1<br>a3: National Water Quality Framework<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>Local Authorities : amending by-laws relating to Schedule 1 use.<br><br>**d. Related Strategies:**<br>1.1 Reliability of the yield balance<br>1.3 Groundwater<br>3.1 Implementing Schedule 1<br>3.2 General authorisations<br>3.4 Licensing<br>3.5 Pollution control<br>4.3 Effluent re-use<br>9.1 Abstraction control<br>9.2 Monitoring networks and data capture<br><br>**e. Linked mapping:**<br>None |

| 2.2 | SITING OF NEW DEVELOPMENTS |
|---|---|
| **Management objective:** | The objective of this strategy is to ensure protection of water resources by appropriate planning when siting new developments. |
| **Background information:** | This is most applicable to the West Coast where developments include both industrial and residential expansion. The West Coast Region relies heavily on groundwater resources. Increasing sub-division of land is taking place with a corresponding increase in abstraction under Schedule 1. The coastal resort areas up the West Coast are expanding rapidly and adequate services are often not available. Return flows from domestic and industrial users in close proximity to groundwater resources, is of concern in terms of the possible impacts on water resource quality. |
| **Strategic Approach:** | A system must be put in place to ensure that the siting of new developments is properly planned, with due consideration given to the potential impact on the water resource of the area. Protective measures are required for areas with a high impact risk. Mapping of sensitivities must focus first on those areas where impact is likely to be most pronounced (notably the developing West Coast region). Co-operative governance with local authorities is an essential element of this approach. |
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br>a. Development of 'area-sensitive' mapping to prescribe the level of services that are required in the event of development within a particular area.<br>b. Protocols must be drawn up to guide development from a water resource perspective. This includes, *inter alia*, the availability of surface water and the possible impacts on the groundwater resource.<br>c. Groundwater monitoring networks are required for impact evaluation.<br>d. Close liaison with local authorities is necessary in order to ensure that they are able to make informed decisions. |
| **Responsibility:** | The implementation of the **Siting of New Developments Strategy** is the responsibility the RO in conjunction with the Directorate: Waste Discharge and Disposal. |
| **Priority:** | Priority 3 – Medium. To be implemented on an ongoing basis. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 3, Part 5<br>a2: NWRS: Chapter 3, Part 1<br>**b. Linked ISPs / WMAs:**<br>None**.**<br>**c. Other role players and their functions:**<br>Department of Land Affairs : Responsible for land sub-division approval.<br>**d. Related Strategies:**<br>1.3 Groundwater<br>3.5 Pollution control<br>9.2 Monitoring networks and data capture<br>**e. Linked mapping:**<br>None |

| 2.3 | SOLID WASTE MANAGEMENT |
|---|---|
| **Management objective:** | Solid waste sites need to be correctly sited and suitably managed to ensure that there is no contamination of the water resource. Existing sites which fail to meet these criteria should either be upgraded, or closed and rehabilitated. Sites already closed need rehabilitation.<br><br>This strategy aims to raise the necessary awareness with respect to solid waste management, to ensure that licences are not issued for unsuitable sites, that licence conditions are met, and that sites which continue to contaminate the water resource, whether closed or operational, are rehabilitated. |
| **Background information:** | Solid waste sites are generally poorly managed in the Berg WMA. There are some exceptions which include Malmesbury, Vissershok, Coastal Park and Stellenbosch. In some cases, industrial solid waste has been stored, dumped or stockpiled in close proximity to the specific industry.<br><br>Many industrial operators are taking the initiative in rehabilitating previously contaminated land. These include AECI and SOMCHEM in the Kuils/Eerste River catchment as well as KYNOCH and CALTEX in the Diep River catchment. In the absence of official guidelines, the scope within which rehabilitation is undertaken is largely dependent on the recommendations of service providers and consultants.<br><br>The absence of a remediation strategy for contaminated land is discussed in Section 6.2.3 of the draft National Water Quality Framework Policy (June 2002). This highlights that present rehabilitation efforts are not consistent and are sometimes inadequate.<br><br>*The following general issues and concerns have been identified:*<br><br>• There is no policy in place for the rehabilitation of contaminated land. This is of particular concern in view of the possible impact on local surface and groundwater bodies in close proximity to these contaminated areas. Some industries have appointed consultants to offer guidance.<br>• Rehabilitation is done on an ad-hoc basis without guidelines as to what is required and who is responsible.<br>• Pollution of ground and surface water resources is ongoing.<br><br>*Along with the above, the following were specific issues*:<br><br>**i. Diep River**<br>• KYNOCH fertilizer manufacturer and CALTEX refinery have had industrial waste stored on their grounds. The possible contamination of Rietvlei from CALTEX needs to be considered. Both industries have marine outfalls. KYNOCH are rehabilitating old disposal sites. CALTEX have appointed consultants to investigate the impact on the groundwater. Malmesbury and Vissershok solid waste sites are well managed.<br>**ii. Kuils/Eerste/Lourens/Sir Lowry's Pass Rivers**<br>• Stellenbosch solid waste site is well managed.<br>• AECI and SOMCHEM have undertaken rehabilitation of contaminated land at their premises.<br>**iii. Cape Peninsula rivers**<br>• Coastal Park solid waste site is well managed. |
| **Strategic Approach:** | The siting of new solid waste sites will be considered in the same light as that of new developments. Priority must be given at National level for the development of strategic guidelines that will be used to define the requirements for rehabilitation of contaminated land. In the interim, the recommendations of the Remediation Working group must be implemented until a formal strategy is in place. |

| 2.3 | SOLID WASTE MANAGEMENT (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following general actions are required:<br><br>a. Development of a protocol for rehabilitation of contaminated land, taking the recommendations of the National Water Quality Framework Policy into account.<br>b. Liaison with the Remediation Working Group, established at a National level, and on an interim basis, to advise on the application of remedial measures.<br>c. Development of area sensitive mapping to classify areas in which solid waste sites may be extended and new sites developed.<br>d. A detailed Solid Management Strategy must be developed. |
| **Responsibility:** | The implementation of the **Solid Waste Management Strategy** is the responsibility of the RO, together with the Directorate: Waste Discharge and Disposal, taking cognisance of the National Water Quality Framework Policy. |
| **Priority:** | Priority 3 - Medium. |
| **Interfaces:** | **a. Relevant documentation:**<br><br>a1: NWRS: Chapter 3, Part 1<br>a2: National Water Quality Framework<br>a3: Appendix 4: Solid Waste Disposal Sites<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br><br>*Department Land Affairs :*<br>To be consulted in the development of official rehabilitation guidelines.<br><br>*Remediation Working Group :*<br>Acts as an interim advisory forum in the absence of official guidelines on rehabilitation.<br><br>*Local Authorities* :<br>Responsible for siting of solid waste sites and local land use.<br><br>**d. Related Strategies:**<br><br>1.3 Groundwater<br>3.5 Pollution control<br>5.2 Co-operative governance<br><br>**e. Linked mapping:**<br><br>Figure 3.5.1 - Municipal Boundaries and Waste Disposal Sites |

| 2.4 | WATER QUALITY |
|---|---|
| **Management objective:** | Water quality needs to be appropriately managed to ensure that there is water of acceptable quality available to meet the needs of the environment and of all users in the WMA. Salinity concentration and nutrient content must be reduced to the most practically manageable levels.<br><br>This strategy aims to address the problems associated with water quality in the Berg WMA and to recommend steps that can be taken to improve the quality where problems currently exist. |
| **Background information:** | Water quality in the Berg WMA, varies not only between the individual river basins but also within individual river systems, such as the Berg River system. The natural geology, agricultural practises and point source polluters all play a role in determining the quality of water in this WMA.<br><br>**<u>Berg River Catchment</u>**<br><br>The most significant water quality problem in the Berg River catchment is the salinity of the water in the middle and lower reaches of the Berg River. The causes of this problem are two-fold, namely:<br><br>• leaching from the natural geology, which to the north of Paarl and extending to the Berg River mouth, consists of Malmesbury shale; and<br>• the agricultural practises and the wash-off of salts from irrigated and dryland agricultural lands.<br><br>The problem is exacerbated during the first winter rains, when accumulated salts are washed into the river and result in elevated salinity in Misverstand Dam.<br><br>Water diverted into Voëlvlei Dam from the Klein Berg, Leeu and Twenty-four Rivers does not pose a salinity problem to the quality of water in the dam. The Swartland WTW is supplied directly from the dam via a canal and as such, is not exposed to the same salinity problems as Withoogte WTW. A final TDS of 75mg/*l* is typical out of the Swartland WTW.<br><br>Withoogte WTW treats the water abstracted from Misverstand Dam for use by the West Coast region. The final average TDS concentration is approximately the same as that of the abstracted water, as the works cannot remove salinity. This fluctuates around 200mg/*l* but has on occasions (as recently as 2001) risen to concentrations in excess of 400mg/*l* for periods of up to 3 weeks on account of local high salinity runoff.<br><br>There is concern that the concentrations and durations of the higher salinity events may increase after the construction of the Berg Water Project. Whilst adequate for domestic and some industrial users, the steel and mineral processing industries along the West Coast pre-treat this water to TDS concentrations of less than 80 mg/*l* and are apparently not able to cope with the higher concentrations. This sector is likely to experience increased water demands through the anticipated industrial expansion in the region. The supply of water of high quality is an important factor in their production costs.<br><br>Other water quality concerns in the Berg River include nutrient enrichment as a result of the discharge of treated sewage effluent from WWTWs, irrigation with winery effluent and the direct discharge of winery effluent. Refer to the Pollution Strategy (No 3.5) and the General Authorisation Strategy (No 3.2) for detail. Diffuse pollution from informal settlements in the Klein Berg catchment impacts on the quality of water diverted into Voëlvlei Dam. This is further addressed under the Strategy for the Lower Berg (No 8.4). |

| 2.4 | WATER QUALITY (cntd) |
|---|---|
| **Background Information (cntd)** | **The Urban Catchments**<br><br>Certain of the urban river systems serve as conduits for treated effluent discharged to sea. Bellville, Scottsdene, Kraaifontein, Zandvliet, Stellenbosch and Macassar WWTWs discharge treated effluent into the Kuils/Eerste River system. Borcherds Quarry and Athlone WWTWs discharge into the Black/Salt River and the Potsdam WWTW discharges into the Diep River, which feeds Rietvlei. The Cape Flats WWTW discharges into the canal downstream of the Zeekoevlei outlet control weir. These rivers no longer display seasonal flow patterns, and some, notably the Black/Salt and Kuils Rivers have become severely modified. High residual nutrients can lead to eutrophication related problems such as nuisance algal growth and excessive growth of aquatic weeds. Other problems associated with urban rivers include leaking sewers, contaminated stormwater runoff, litter, oil and toxic spills. Refer to the Pollution Control Strategy (No 3.5). |
| **MANAGEMENT ACTIONS** | |
| **Strategic Approach:** | The Department has commissioned studies at various levels of feasibility to address the salinity problems in the middle and lower reaches of the Berg River. In the interim, prior to any future interventions (by the Department) and potential water quality improvements, those industrial users requiring reduced salinity concentrations will have to continue pre-treating water themselves.<br><br>Certain WWTWs are not treating to the quality standards required under their authorisations. Co-operative governance between the Department and local authorities must be focussed on this problem, to ensure that the local authorities accept responsibility for the quality of effluent from all WWTWs in their areas of jurisdiction.<br><br>The severely degraded rivers such as the Black/Salt and Kuils Rivers cannot be rehabilitated. Such rivers must however not be considered as entirely sacrificial and their condition should, at worst, be maintained at current levels. Further degradation will result in undesirable social, health and aesthetic impacts. The required standards for treated effluent discharged into such rivers should be appropriate to at least maintain the current condition.<br><br>The focus on improved operation and management of WWTWs must be on those works that are discharging into river systems that are not already severely degraded (the Eerste River and Berg River for example) and those feeding highly sensitive wetlands and estuaries (the Diep River).<br><br>The pollution problem in the Klein Berg catchment must be addressed with the local authority. |
| **Required actions:** | The following general actions are required:<br><br>a. Investigate options for improved salinity management of water in the middle and lower reaches of the Berg River taking account of the future Berg Water Project and the needs of urban and agricultural users.<br>b. Determine the extent of reduced salinity that may be achieved if releases of the first winter run-off water (high salinity) from Misverstand Dam were implemented.<br>c. Investigate the benefit of using alternative abstraction points within Misverstand Dam.<br>d. Investigate the options of diverting the small local tributaries (Moorreesburgspruit and Nogospruit) around Misverstand Dam, so as to reduce the salinity concentration in the dam itself.<br>e. Investigate the potential to desalinate water for sensitive needs, such as Saldanha Steel.<br>f. Implement the actions referred to in the Pollution Control Strategy (No 3.5) and the Effluent Re-use Strategy (No 4.3).<br>g. Implement the actions referred to for managing water quality in Voëlvlei Dam which are addressed under the strategy for the Lower Berg (No 8.4) |

| 2.4 | WATER QUALITY (cntd) |
|---|---|
| **MANAGEMENT ACTIONS (cntd)** | |
| **Responsibility:** | The implementation of the **Water Quality Strategy** is the responsibility of the RO, together with the Directorate: Water Resource Planning Systems, taking cognisance of the National Water Quality Framework Policy. |
| **Priority:** | Priority 2 - High. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWRS: Chapter 3, Part 1<br>a2: National Water Quality Framework<br>**b. Linked ISPs / WMAs:**<br>None.<br>**c. Related Strategies:**<br>1.3 Groundwater<br>3.2 General Authorisations<br>3.5 Pollution control<br>4.3 Effluent Re-use<br>5.2 Co-operative governance<br>**d. Linked mapping:**<br>None |

# SECTION 3: WATER USE MANAGEMENT STRATEGIES

Chapter 4 of the NWA describes the provisions by which water use may be progressively adjusted to achieve the Act's principle objectives of equity of access to water, and sustainable and efficient use of water. Many of the Act's sustainability and efficiency related measures will be applied through conditions of use imposed when authorisations to use water are granted. Formal water use authorisations (licences) will also facilitate administrative control of water use by water management institutions, form the basis upon which charges for water use may be made, and provide for the collection of water-related data and information.

Compulsory licensing will be carried out through a long-term programme based on both the local and national requirements for re-allocation. Areas where water has been fully allocated or over-allocated (and which are therefore under stress), and areas where there is a clear equity demand and therefore require a re-allocation of existing resources, have been prioritised. The ISP is a tool to help in evaluating the need for compulsory licensing in the Berg WMA, and can carry this information forward to the national office.

Changes in water use are anticipated in the Berg WMA, as water becomes available through the removal of invasive alien plants and through changes in land use.

Eight water use management strategies have been identified for this ISP, namely:

3.1 Implementing Schedule 1
3.2 General authorisations
3.3 Verification of existing lawful use
3.4 Licensing
3.5 Pollution control
3.6 Changing land use – forestry
3.7 Changing land use – Clearing of Invasive Alien Plants
3.8 Water Pricing

| 3.1 | IMPLEMENTING SCHEDULE 1 |
|---|---|
| **Management objective:** | The objective of this strategy is to prevent over-exploitation of limited water resources by large numbers of Schedule 1 users in areas which cannot support such use. One way of achieving this is to work with Municipalities in developing site-specific limitations on Schedule 1 abstraction. |
| **Background information:** | Water use under Schedule 1 of the NWA, is exempt from the need for authorisation. Schedule 1 deals with small volume water use for purposes including reasonable domestic use, small gardening and stock watering. Such use should not be of a commercial nature although some livelihood transactions may be expected and permitted. Feedlot operations are excluded from Schedule 1 water use.<br><br>The NWA does not specify the quantities which may be abstracted under Schedule 1 but does allow for limitations to be introduced through by-laws of local municipalities. A maximum of 1 hectare per household is used as a practical limit in some WMAs where there is sufficient water. Land sub-divisions, in particular, introduce the potential for increased water use under Schedule 1. This is of particular concern in the expanding West Coast region of the Berg WMA, where an increasing number of boreholes are being sunk, as land parcels become sub-divided, with water used under Schedule 1. In many cases this leads to an over abstraction of the local groundwater resource and some form of control is required.<br><br>The following issues and concerns are identified:<br><br>• Land sub-division may be approved by local authorities, without cognisance being given to the fact that water use must be authorised or allowed for by another authority (DWAF).<br>• We do not yet know the extent of land restitution.<br>• Land sub-divisions in the Yzerfontein area (in particular the Rondeberg and Jakkalsfontein sub-divisions) are resulting in pressure on the Grootwater aquifer.<br>• Inadequate monitoring of groundwater resources means that the impact on the aquifers cannot be tracked.<br>• Abstractions under Schedule 1 from some of the Cape Metropolitan rivers could cumulatively exceed the allowance for Reserve requirements. |
| **Strategic approach:** | Schedule 1 water use plays an important role in the provision of free water to small users and will continue to do so. However it is apparent that as the population density in developing areas increases and land parcels become further sub-divided, the extent of use under Schedule 1 also increases, whilst limitations on this use are not being imposed. This is threatening the sustainability particularly of certain of the West Coast groundwater resources.<br><br>The volume of water allowable through Schedule 1 has never been strictly defined and the first step would be to set a very tight limitation, governed by what the system can supply, on Schedule 1 users in areas with limited resources. The NWA allows Municipalities to place limitations on Schedule 1 use. It is important that any by-laws should not completely subvert the purposes of Schedule 1, and particularly the needs of the rural poor. DWAF should provide inputs into any restrictions imposed.<br><br>Along with the use of municipal by-laws, other forms of control, and other sources of supply need to be explored. The suggested actions of this strategy should be implemented in the Berg WMA and used to provide direction towards the development of a National Strategy on Schedule 1 use. |

| 3.1 | IMPLEMENTING SCHEDULE 1 (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. List those areas where introduction of limitations on Schedule 1 abstractions are appropriate.<br>b. Prioritise the West Coast area and Diep River catchments for restrictive by-laws to be introduced by municipalities.<br>c. Assist local authorities to develop by-laws in relation to Schedule 1 use.<br>d. Improve consultation between the RO, Department of Land Affairs and local authorities, regarding land sub-division, noting the implications for water resources. |
| **Responsibility:** | The **Implementing Schedule 1** Strategy is the responsibility of the RO. |
| **Priority:** | Priority 1 – Very high. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Part 1<br>a2: NWRS: Chapter 3, Part 2<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>Department Land Affairs : Responsible for authorising land sub-division.<br>Local authorities : By-laws may need to be considered to introduce limits on Schedule 1 abstractions.<br><br>**d. Related Strategies:**<br>1.3 Groundwater<br>2.1 Reserve and resource quality objectives<br>3.2 General authorisations<br>3.3 Verification of existing lawful use<br>3.5 Pollution control<br>3.8 Water pricing<br>5.2 Co-operative governance<br>6.1 Supply to local authorities<br><br>**e. Linked mapping:**<br>None |

| 3.2 | GENERAL AUTHORISATIONS |
|---|---|
| **Management objective:** | Appropriate General Authorisations will simplify the management of the water resources of the Berg WMA. This strategy aims at putting such appropriate GAs in place, but also at ensuring that regular review and amendment of existing GAs should circumstances change. |
| **Background information:** | GAs have been introduced in the country for water abstraction, storage, irrigation using treated effluent, discharge of effluent and solid waste disposal.<br><br>There are no GAs for abstraction of surface water and water storage in the Berg WMA given the general stressed nature of the resources and the resulting shortfall in the yield balance. This means that all prospective users (other than Schedule 1) must apply for water use licences, even if that use is relatively small. In the absence of GAs for surface water abstractions, authorisations are required for any surface water abstraction, even from severely modified rivers.<br><br>Current GAs for groundwater abstraction are listed in Appendix 5 and represented graphically on Figure 3.2.1. There is at present no protocol for a GA allowing river channel modifications. This means that any modification of any river channel (including, for example, culverts required in road construction), requires a licence. The nature of GAs for river channel modification must be defined at national level before such a GA can be introduced locally. This has been identified as a matter of urgency in several ISPs.<br><br>Irrigation with treated effluent is a controlled activity in terms of the NWA, but one which can, and for certain instances is, authorised through a General Authorisation. However, the actual impact from irrigation using effluent from wineries, in particular, is not well established. The RO is concerned that this activity may be having adverse impacts on river water quality, due to the many small operators, which cannot all be monitored. This is an example of a General Authorisation which should be regularly reviewed.<br><br>The GA is a useful tool which reduces unnecessary management control. However the situation can change very fast and all GAs should be regularly reviewed on a catchment by catchment basis. Typically a GA for either abstraction or discharge may be fit for certain catchments and not for others. This once again highlights the need for monitoring.<br><br>*The following specific issues and concerns were identified in the Berg WMA*:<br><br>**i. WMA**<br>• GAs allow for effluent volumes of up to 10 $m^3$/day (per user per property) to be used for irrigation purposes. A licence is required only once this rate is exceeded.<br>• Many small operators are irrigating with treated effluent. This is difficult to monitor and there is concern at the cumulative impact on the water quality of adjacent rivers. Wineries are of particular concern.<br>• Control and management of river channel modification is not effective given that all modifications must be applied for. This is unreasonable and the outcome is that there is much unauthorised construction. This is bolstered by the perception that GAs will eventually cater for some of these activities.<br><br>**ii. Berg River upstream of Hermon**<br>• Unauthorised channel modification (e.g. bulldozing of the river channel) is taking place where abstractors are attempting to keep their points of abstraction clear from debris and silt.<br><br>**iii. Kuils/Eerste/Lourens/Sir Lowry's Pass Rivers**<br>• The Kuils River essentially serves as conduit for effluent discharge to sea.<br>• Many small wineries are irrigating using their treated effluent, the impact of which is not well established.<br><br>**iv. Cape Peninsula rivers**<br>• In the absence of GAs for surface water abstraction, licences are required for abstractions from the urban rivers, some of which are already severely modified (canalised) and serve as conduits for effluent discharge. |

| 3.2 | GENERAL AUTHORISATIONS (cntd.) |
|---|---|
| **Strategic approach:** | GAs currently play an important role in easing the burden of licensing many small users of groundwater in the Berg WMA, and can continue to do so. Given the complete absence of surface water GAs throughout this WMA, the use of relatively small volumes of surplus surface water, even from severely modified urban rivers, requires a formal licensing procedure. This in turn requires that a Preliminary Reserve determination be done in support of such an application. The introduction of GAs for abstraction from severely modified rivers needs to be considered.<br><br>All the GAs in this WMA need to be reviewed annually, and steps taken to implement monitoring wherever this can lead to improved management decisions. This may require restrictive conditions to be attached to GAs in certain catchments, whilst more relaxed conditions (as described above) could be considered in others. The review must be on a catchment for catchment basis and not a blanket approach to the Berg WMA as a whole. |

| 3.2 | GENERAL AUTHORISATIONS (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | Develop a detailed strategy for the application of GAs. The following general actions are required:<br><br>a. Introduce area specific GAs for surface water abstraction, where water is available.<br>b. Review and revise GAs on controlled activities.<br>c. Consider withdrawing the GAs for the controlled activity of irrigation using effluent and introduce licensing for all irrigation activities where effluent is used. Implement a short term monitoring initiative to establish the actual extent and impact of irrigation using winery effluent.<br>d. Implement GAs for river channel modification, after guidelines become available.<br>e. Revise GAs on groundwater (consider impact of GA abstraction on surface water yield).<br>f. Develop a programme for regularly reviewing GAs. |
| **Responsibility:** | The implementation of the **General Authorisations** Strategy is the responsibility of the RO, in conjunction with the Directorate: Water Abstraction and Instream Use. |
| **Priority:** | Priority 1 – Very high. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Part 6<br>a2: NWRS: Chapter 3, Part 2<br>a3: Appendix 5: General Authorisations (Groundwater)<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br>**c. Other role players and their functions:**<br><br>None.<br><br>**d. Related Strategies:**<br>1.3 Groundwater<br>2.1 Reserve and resource quality objectives<br>3.1 Implementing Schedule 1<br>3.3 Verification of existing lawful use.<br>3.4 Licensing<br>3.5 Pollution control<br>3.8 Water pricing<br>4.3 Effluent re-use<br>9.1 Abstraction control<br><br>**e. Linked mapping:**<br>Figure 3.2.1 - General Authorisations (Groundwater Abstraction)**.** |

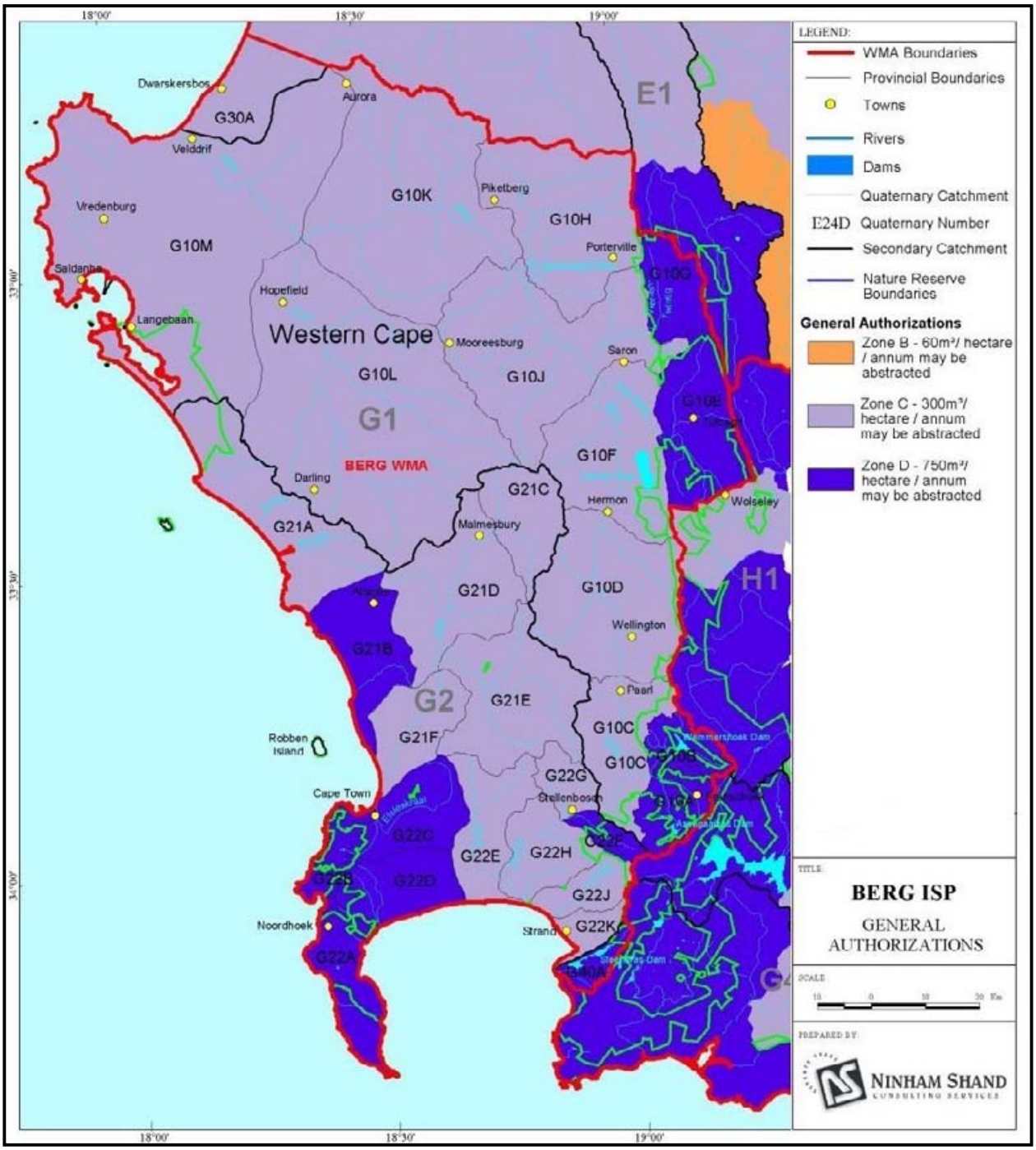


**Figure 3.2.1: General Authorisations (Groundwater Abstraction)**

| 3.3 | VERIFICATION OF EXISTING LAWFUL USE |
|---|---|
| **Management objective:** | The objective of this strategy is to verify the extent of existing water use as registered on WARMS, and from there to determine the lawfulness of the use. Verified existing lawful use will form the basis for re-allocation during compulsory licensing. |
| **Background information:** | The Berg WMA is under stress and it is important that only lawful water use is allowed. Before abstraction (or discharge) control can be effectively managed, the existing use, and the lawfulness of that use must be established. Reliable information on existing use is also very important for updating of hydrological records and determination of yield.<br><br>At the Year 2000 level of development, the total irrigation water demand (NWRS) in the Berg WMA was 301 million $m^3/a$. Of this, approximately 123 million $m^3/a$ (41%) was supplied from the WCWSS. The larger component is supplied from farmers' own sources and from run of river. It is this component of the total agricultural water use which is not well established.<br><br>Verification of existing lawful use is an important step to ensure that the correct volumes are registered for licensing, the actual requirements are accurately known, and no unlawful users are inadvertently licensed. All water users (excluding Schedule 1 users) must first register their use. This is a statutory obligation and a process largely completed in the Berg WMA. Registration is required of both surface and groundwater users, and includes Stream Flow Reduction Activities and those users who utilise water under GAs. Registration does not, however, serve as a check on the lawfulness of the use and checks carried out in some catchments indicate huge inaccuracies although initial indications in the Berg WMA suggest that verification of actual water use reasonably accurately reflects the use registered by farmers.<br><br>Illegal users should not only be denied a license, but disallowed further use. It is expected that in this way more water may be found for the system.<br><br>Verification of existing lawful use serves the following functions:<br>• to reconcile registration, identify and correct errors<br>• to take water out of the hands of illegal users and return this to the system<br>• determine long-term water use<br>• ensure lawfulness of continued water use |
| **Strategic approach:** | The verification process in the Berg WMA must be used to obtain a more reliable indication of quantities of irrigation water use and to ensure that any illegally used water is returned to the system.<br><br>Through the process of registration and verification, the Department will identify illegal water users, who will be held accountable for this illegal use. Only those users who have registered a legal water use during the required registration process will qualify for the category of existing lawful use during the Compulsory Licensing process. Any current user who has not registered that use, or whose use is found to be unlawful, will have to apply for a "new" allocation during Compulsory Licensing. In the water stressed situation of the Berg it is unlikely that they will receive an allocation.<br><br>The extent of currently unexercised but nevertheless 'lawful' allocations must also be determined as a priority. This will allow the regulator to assess what impact these unused allocations might have if they were to be fully exercised by the current holder, or traded for use by others. |

| 3.3 | VERIFICATION OF EXISTING LAWFUL USE (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br>a. Ensure that all users currently deemed to be existing lawful users, register their use. This is an ongoing process.<br>b. Set up a process to:<br>• verify existing use according to guidelines made available from the Directorate: Water Abstraction and Instream Use.<br>• determine lawfulness of use according to these guidelines. |
| **Responsibility:** | The implementation of the **Verification of Existing Lawful Use** Strategy is the responsibility of the RO in conjunction with the Directorate Water Abstraction and Instream Use. |
| **Priority:** | Priority 1 – Very high. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Part 3<br>a2: NWRS: Chapter 3, Part 2<br><br>**b. Linked ISPs / WMAs:**<br>None.<br><br>**c. Other role players and their functions:**<br>WUAs : Responsible for monitoring water use by members.<br>SFRA LAAC (Streamflow Reduction Activities Licence Assessment Advisory Committee) Involved in assessing licences of streamflow reduction activities.<br>Department Land Affairs : Involved in matters relating to land use change.<br><br>**d. Related Strategies:**<br>1.1 Reliability of the yield balance<br>3.1 Implementing Schedule 1<br>3.2 General authorisations<br>3.4 Licensing<br>3.6 Changing land use – forestry<br>3.7 Changing land use – clearing of invasive alien plants<br>3.8 Water pricing<br>4.2 Agricultural water conservation and demand management<br><br>**e. Linked mapping:**<br>None |

| 3.4 | LICENSING |
|---|---|
| **Management objective:** | The objective is the implementation of a streamlined interim strategy to assist the RO in reaching decisions on licence applications and to issue authorisations, when required, with the appropriate conditions attached. |
| **Background information** | Any water use that exceeds Schedule 1 or the limits of any GA, must be authorised by a licence. A water use licence:<br><br>• Replaces all previous entitlements, if any, to use water for the purpose specified in the licence;<br>• Is specific to the user to whom it is issued and to a particular property or area;<br>• Is specific to the uses for which it is issued;<br>• Is valid for a specified time period, which may not exceed forty years;<br>• May have a range of conditions attached to it and<br>• Must be reviewed by the responsible authority at least every five years.<br><br>As a transitional measure the NWA permits "existing lawful water use" to continue until such time as it is licensed through the compulsory licensing process.<br><br>Potential requirements from the domestic and industrial sectors are expected to increase significantly, particularly in the Greater Cape Town and West Coast regions.<br><br>The current yield balance estimate at Year 2000 level of development indicates that there is no spare water in the Berg WMA. This places an immediate constraint on the licensing of any new irrigation or Stream Flow Reduction Activity until such time as additional water can be 'found' or otherwise made available (e.g. users who construct dams to increase available yield after allowing for Reserve requirements or, perhaps, clear invasive alien plants to increase supply.<br><br>The majority of the urban users in the Berg WMA rely on water supplied via the integrated WCWSS. More than 40% of the total irrigation requirement is also supplied from this system. The system is described in detail in Paragraph 2.2 of Part 1. By virtue of the integrated manner in which the system operates and the complex reticulation networks within it, the evaluation of yield balance figures for small sub-areas within the Berg WMA is not easily undertaken. Furthermore these are not representative of how the system is operated. As such it not meaningful to produce a set of yield balance tables for each of the eight management units that make up the Berg WMA.<br><br>These eight sub-areas are described below, with comment on the scope for issuing new licenses.<br><br>**<u>Berg River Upstream of Hermon</u>**<br>There is little or no further water available for any additional irrigation. The system is already under stress, new dams will have to be constructed to provide any additional water and this water is likely to be extremely expensive. Allowance must also be made for the future growth that Cape Town is sure to experience. This is recognised in the Berg Water Project Agreement between DWAF and CCT.<br><br>It is recommended that no further licences be issued for surface water abstraction or storage by WUAs or local authorities. Licences for major projects to supplement the WCWSS should be considered on an ad-hoc basis, within the constraints of vested interests and the Reserve. Preference should be given to TMG groundwater, particularly where there is small or no influence on surface water resources. Trading of existing authorisations, including those allocated but unexercised, should be encouraged as an alternative.<br><br>This situation will be reviewed during the proposed Compulsory Licensing exercise, which is a priority and should be commenced within the next two years. |

| 3.4 | LICENSING (cntd) |
|---|---|
| **Background information (cntd):** | **Berg River Downstream of Hermon**<br>The anticipated expansion of the urban and industrial sectors in the Saldanha area is expected to place additional demands on Voëlvlei Dam. Irrigation is mainly concentrated within the Lower Berg Irrigation Boards, as well as the Riebeek-Wes, Riebeek-Kasteel and Twenty-four Rivers Irrigation Boards. None of the existing irrigation boards in the Berg WMA have yet to be officially converted into WUAs.<br><br>Groundwater is abstracted from the Langebaan Road upper aquifer for irrigation. Some farmers are of the opinion that the abstraction of water from the lower aquifer for supply to Saldanha Steel (1,5 million $m^3$/a) is impacting on their assurance of supply out of the upper aquifer.<br><br>There is no surplus surface water available and as such, licences should not be considered for abstraction or storage of surface water. Applications for groundwater abstraction can be considered but should attach conditions for monitoring.<br><br>As for the Upper Berg this situation will be reviewed during the Compulsory Licensing exercise, which is a priority and should be commenced within the next two years.<br><br>**The Klein Berg**<br>This catchment is severely stressed due to the extensive irrigation already taking place and the diversion of a high proportion of the flow from the Klein Berg into Voëlvlei Dam. This is a very important component of the WCWSS and the main source of supply to the West Coast. Of the total catchment area, approximately 10% is under irrigation. No new authorisations should be issued for surface water abstraction or storage for irrigation purposes.<br><br>With no local resources available for allocation the stressed nature of this catchment would be relieved if the Michell's Pass transfer were implemented. This could be used to supplement Tulbagh. However, and in line with other strategies, Water Conservation and Demand Management, Groundwater Abstraction and other sources should first be optimised. Lei-water exchange should be immediately considered by the Tulbagh Local Authority.<br><br>**The West Coast Rivers**<br>This catchment has negligible yield from surface water and is entirely reliant on groundwater and water transfers. Uncertainties include the groundwater potential as well as the possible impacts of coastal resorts on the primary aquifers (use and pollution). Furthermore, the recharge of these aquifers is poor due to the low precipitation in the area. Saline intrusion from over abstraction near the coast is a potential threat. Increased artificial aquifer recharge should be considered at the Silverstroom and Witsand wellfields. Small scale resource poor farmers are likely to emerge at Mamre through land restitution. These farmers anticipate utilising groundwater for small scale farming.<br><br>There is no opportunity for authorisations to abstract or store surface water. Authorisations to abstract groundwater can be considered but monitoring conditions need to be attached to these.<br><br>**The Diep River**<br>Five applications for small storage dams have been submitted by farmers north of Durbanville. These proposed farm dams would be situated on tributaries of the Mosselbank River. Similarly there have been a number of applications for dams on tributaries of the Diep River near Klipheuwel Road, Malmesbury. The preliminary Reserve determination for the Diep River catchment has not yet been completed. |

| 3.4 | LICENSING (cntd) |
|---|---|
| **Background information (cntd):** | The yield balance in this catchment, determined in the WRSA study, showed a deficit of 10 million $m^3$/a. However, the same report concluded that the yield balance is of a very low level of confidence due to the uncertainty regarding the irrigation water requirement and the supply of water from farm dams. Once the preliminary Reserve has been determined, and Existing Lawful use verified, the yield balance for this catchment needs to be re-determined before any decisions can be made in terms of issuing licences for surface water abstraction or storage.<br><br>It is estimated that 13 million $m^3$/a is supplied from groundwater, much of which is used for irrigation purposes. Land sub-division at Riverlands and resulting increase in groundwater abstraction under Schedule 1 is of concern, in terms of the impact on groundwater quality. Pit latrines and diffuse pollution pose a threat to surface and groundwater quality. Applications for groundwater abstraction should only be considered once a groundwater quality Reserve determination has been carried out.<br><br>**The Cape Peninsula Rivers**<br>In Philippi, there is increasing use of groundwater from the Cape Flats Aquifer. Although improved monitoring is necessary, the Cape Flats aquifer does offer potential for supporting local commercial vegetable farming enterprises – very important to Cape Town. As such applications for groundwater use can be considered, with associate monitoring conditions attached.<br><br>Applications for new licences have been received for surface water abstraction out of the Shusters River in Noordhoek, for development of vineyards. Those rivers in the Peninsula which have not been severely modified or degraded, remain ecologically important. As such, no further authorisations to abstract or store water from these rivers, should be considered at least until the Reserve has been determined and local yield balances accounted.<br><br>Future planning by major users (notably CCT) is of concern, as the comprehensive Reserve requirements essential to that planning, are not yet available.<br><br>**The Kuils / Eerste / Lourens / Sir Lowry's Pass Rivers**<br>There is potential for further use of the Cape Flats aquifer and provision of water to commercial vegetable farmers on the Cape Flats. As such, applications for groundwater abstraction can be considered. Surplus water is also available in those severely modified rivers serving as conduits for transporting effluent to sea. The objective here should be to see as much as possible of this effluent treated and re-used by the CCT, and not allocated to irrigation.<br><br>Most irrigators utilising surface water in this sub-area, do so through the provision of water allocated to them from Theewaterskloof Dam. Therefore, it is unlikely that there will be new irrigation developments outside of the schemes. Capping limits have been set on the amount of allocable water for irrigation, supplied from the WCWSS.<br><br>**The Steenbras River**<br>A reduction in the upstream area under forestry is bringing about change in land use - either rehabilitation to natural catchment or possibly a conversion to wild flower production or fruit orchards. The preferable strategy is to capitalise on this available water by rehabilitating the catchments and meeting the growing needs of the CCT with the additional water. |

| 3.4 | LICENSING (cntd) |
|---|---|
| **Strategic approach** | There is very limited opportunity for issuing new licences for the abstraction and storage of surface water in the Berg WMA. Some opportunity for groundwater abstraction is possible, with appropriate monitoring conditions attached to any such licences. New licences for augmenting urban supply can be considered once WC/DM objectives have been achieved, providing that the requirements of the Reserve are met.<br><br>It would be irresponsible of the Department to issue new individual licences for surface water abstraction until more reliable and updated yield information is available, on both the resource and the Reserve, on which to support decisions. Certainly there is no more water available from current sources. It is highly unlikely that the irrigation sector would pay for further augmentation but this is the only way towards further licences unless water can be found through conservation or re-use. Priority must be given to re-assessing the yield within the WCWSS by remodelling the system and extending it to cover the full extent of the Berg River, from source to the Estuary.<br><br>The priority in the Berg WMA must lie with the provision of water to the urban sector so as to optimally develop the economic potential of the Western Cape. Potential augmentation schemes will rely on the construction of major infrastructure so as to primarily take advantage of surplus winter water. Schemes such as the Lourens and Eerste River Diversions and the augmentation of Voëlvlei dam, will be considered, where such schemes are required to provide water to the urban sector, whilst meeting the requirements of the Reserve. More water will also be imported from the Breede.<br><br>Licences for water trades will be considered, particularly where the trades are within the same sector or from a low value to a high value sector, benefiting both society and economy. Trades within the same catchment are also more likely to be licensed. |

| 3.4 | LICENSING (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br>a. Implement the available RDM streamlining procedures for reducing the backlog of authorisation applications. The need for Reserve determinations on severely modified rivers needs to be relaxed.<br>b. Determine additional resources required at RO for processing applications for authorisations.<br>c. No further authorisations to be issued for surface water use along the Berg River.<br>d. No further authorisations to be issued for surface abstraction in the Diep River catchment, until the yield balance has been more reliably determined.<br>e. No further authorisation to be considered for surface water use in the Klein Berg catchment.<br>f. Authorisations for groundwater abstraction can be considered, with the exception of the Diep River catchment where there is a need to first carry out a Reserve determination on the quality component of the groundwater.<br>g. Allow the use of groundwater on the Peninsula. Reserve effluent return flows for recycling and urban/industrial use by the CCT.<br>h. Prioritise Reserve determinations giving priority to major users for planning purposes (CCT, WCDM).<br>i. Prioritise the processes towards compulsory licensing in the Berg WMA. WUAs to ensure compliance among its members of the conditions of their authorisations.<br>j. Simple operating rules to be provided with each new authorisation to facilitate compliance with the Reserve requirement, for example, demarcating river water levels below which the farmer may not abstract. |
| **Responsibility:** | The implementation of the **Licensing** Strategy is the responsibility of the RO in conjunction with the Directorate: Water Abstraction and Instream Use and the Directorate: Water Allocation. |
| **Priority:** | Priority 1 – Very high. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Parts 1 to 10<br>a2: NWRS: Chapter 3, Part 2<br><br>**b. Linked ISPs / WMAs:**<br>Breede WMA**.**<br><br>**c. Other role players and their functions:**<br>Local authorities : By-laws to be considered for limitations on Schedule 1 use.<br><br>**d. Related Strategies:**<br>1.3 Groundwater<br>2.1 Reserve and resource quality objectives<br>3.2 General authorisations<br>3.3 Verification of existing lawful use<br>3.6 Changing land use – forestry<br>3.7 Changing land use – clearing of invasive alien plants<br>3.8 Water pricing<br>4.2 Agricultural water conservation and demand management<br>8.4 Strategy for the Lower Berg<br>9.1 Abstraction control<br><br>**e. Linked mapping:**<br>None |

| 3.5 | POLLUTION CONTROL |
|---|---|
| **Management objective:** | The primary objective of the Pollution Control Strategy is improved management of:<br>• River systems to achievable and acceptable water quality standards.<br>• Point source pollution, diffuse pollution and spills. |
| **Background information:** | Chapter 3, Part 1 of the NWRS refers. The approach to water resource protection in the NWA includes consideration of water quantity and water quality. Water quality management deals with **point sources** (such as discharges from sewage treatment works or industrial sites), and **diffuse sources** (such as settlements without a sewerage system) of pollution through the discharge of waste, or water containing waste, into rivers or other water resources. In addition, because of their potential to impact on surface and groundwater resources, the Department is responsible for overseeing the management of sites where waste is disposed onto land. This is in terms of Section 20 of the Environmental Conservation Act, and by agreement with the Department of Environmental Affairs and Tourism.<br>Decisions about the nature and extent of resource pollution which can be permitted are guided by a *hierarchical decision-making framework*, which takes account of the balance between the need to protect water resources for sustainable use, and the need to allow water-polluting activities in order to support social and economic development.<br><br>The highest priority in the decision-making framework is to prevent water pollution through waste prevention and reduction, recovery, treatment and final safe disposal. It is however acknowledged that in many cases the discharge of pollutants into water resources is unavoidable, and in these cases the emphasis is on minimising the pollution and its effects on water resources. Where pollution has already caused degradation of water resources, or where contaminated land areas pose a threat to water quality, improvements and remediation must be effected where it is necessary and practical.<br><br>Each application for authorisation to discharge wastes into water resources is preceded by an assessment of the probable impacts of the discharge on the water resource and other water users. For hazardous wastes, the aim is to prevent discharge wherever possible or, if this is not possible, to minimise the extent of the discharge and its impacts. For non-hazardous wastes the 'Receiving Water Quality Objectives' approach will continue to be used. This approach assumes that the water environment has a finite and quantifiable capacity to assimilate non-hazardous waste discharged into it without violating predetermined water quality objectives. The assimilative capacity, which will be different for each water resource and for each management class, must be equitably shared among all water users.<br><br>Irrigation return flows, land use practice and reduced dilution due to upstream abstractions can also impact on salinity. This is a particular issue in the Lower Berg River at Misverstand Dam.<br><br>Wherever possible, best management practices, relating to the treatment and recovery of waste, will be incorporated into licence conditions / source-directed controls, to prevent water resources being polluted.<br><br>Whilst the overall intention is to prevent further degradation of the quality of the country's water resources, and to effect improvements where possible, limited and short term degradation of the water quality of specific water resources could be allowed if it can be demonstrated with confidence that the degradation will not be irreversible, and that pollution costs are not externalised to other users of the water resources.<br>This strategy is closely related to the Water Quality Strategy (No 2.4) and should be read in conjunction with it. |

| 3.5 | POLLUTION CONTROL (cntd) |
|---|---|
| **Background information (cntd):** | *The following specific issues and concerns were identified in the Berg WMA*:<br><br>**i. Berg River upstream of Hermon**<br>• Aquaculture impacts on the water quality of rivers and dams (for example in the future Berg River Dam), increasing the costs of water purification. |
| | **ii. Klein Berg River**<br>• Diffuse pollution from settlements in close proximity to the Klein Berg River, which feeds Voëlvlei Dam, is impacting on water quality in the dam. Runoff from the first winter rains is the most polluted and should preferably be allowed to bypass the dam in an attempt to reduce the impact. This however affects the yield of the dam.<br><br>**iii. Berg River downstream of Hermon**<br>• Salinity, particularly in the Lower Berg River, is experienced from time to time.<br><br>**iv. Diep River**<br>• Nitrate rich diffuse pollution occurs throughout the WMA, from feedlots, piggeries and chicken farms. The Diep River catchment is of particular concern.<br>• Development, and sand mining in particular, are causing siltation problems in the Diep River.<br>• Increased groundwater abstraction at Riverlands, and the use of pit latrines may be impacting on the groundwater quality. This needs monitoring.<br><br>**v. Kuils/Eerste/Lourens/Sir Lowry's Pass Rivers**<br>• Pollution in the Plankenbrug River (Stellenbosch) is impacting on water quality. The Khayamandi residential area (Stellenbosch) has inadequate services resulting in diffuse pollution, particularly after rains. Potential future schemes on the Eerste River may require pre-treatment, which has cost implications. |
| **Strategic approach:** | The disposal of pollution from both point source polluters as well as that from diffuse sources is threatening the water quality of the surface water resource in the Berg WMA. This impacts directly on the river health, on other users abstracting from the river further downstream and on the costs of treatment required to achieve potable water standards. Certain WWTWs are not treating to the quality standards required under their authorisation. Co-operative governance between the Department and local authorities must be focussed on this problem, to ensure that the local authorities accept responsibility for the quality of effluent from all WWTWs in their areas of jurisdiction.<br><br>Voëlvlei Dam forms an integral part of the WCWSS, supplying the CCT and the West Coast District Municipality with water. The already stressed dam is likely to be further stressed if the quality of inflow from the Klein Berg River is so poor that this water must be made to bypass the dam at the start of the winter, with inflows only allowed once the river has flushed sufficiently. The problem in the Klein Berg catchment must be addressed with the local authority. |

| 3.5 | POLLUTION CONTROL (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | Develop a detailed strategy for pollution control. The following actions are required:<br><br>a. Dischargers are to be identified and registered. Once the waste discharge pricing strategy is in place a tariff will be imposed for discharging into rivers.<br>b. GAs relating to the use of effluent for irrigation purposes need to be reviewed and revised as appropriate.<br>c. Co-operative consultation between the relevant authorities is required to manage urban and agricultural diffuse pollution (co-operative governance)<br>d. Procedures to be developed and implemented by operators of WWTW for emergency control of spillages, power failure, mechanical breakdown.<br>e. Evaluate the existing pollution control mechanisms of wineries and industry.<br>f. Co-operation between the RO, Departments of Agriculture and Mining, as well as local authorities, is required to manage sand mining and related rehabilitation (co-operative governance)<br>g. The impacts of aquaculture on surface water quality need to be established.<br>h. Aquaculture water users to be recognised as a waste discharger / polluter.<br>i. A salinity modelling study is needed for the Berg River.<br>j. The flushing in the Klein Berg River should be evaluated prior to the intended start of diversion, each year. Early rains that may occur in some years, might produce sufficient flushing, in which case the proposed bypass may not be necessary every year.<br>k. Implement the dense settlement strategy (DWAF/DANIDA), drawing on co-operative governance with local authorities. |
| **Responsibility:** | The implementation of this strategy is the responsibility of the RO in conjunction with both the Water Resource Planning Systems and the Waste Discharge and Disposal directorates. |
| **Priority:** | Priority 1 – Very high. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 3, Part 1<br>a2: NWRS: Chapter 3, Part 1<br>a3: Appendix 3: Wastewater Treatment Works<br>a4: Appendix 4: Solid Waste Disposal Sites<br><br>**b. Other role players and their functions:**<br>Department Agriculture : To investigate agricultural activities which impact on water quality.<br>Department Public Works : Management and control of prison WWTW.<br>Local authorities<br><br>**c. Related Strategies:**<br>1.3 Groundwater<br>2.1 Reserve and resource quality objectives<br>2.2 Siting of new developments<br>2.3 Solid waste management<br>2.4 Water Quality<br>3.1 Implementing Schedule 1<br>3.2 General authorisations<br>3.8 Water pricing<br>5.2 Co-operative governance<br>6.1 Supply to local authorities<br>8.4 Strategy for the Lower Berg<br><br>**d. Linked mapping:**<br>Figure 3.5.1 - Municipal Boundaries and Waste Disposal Sites |

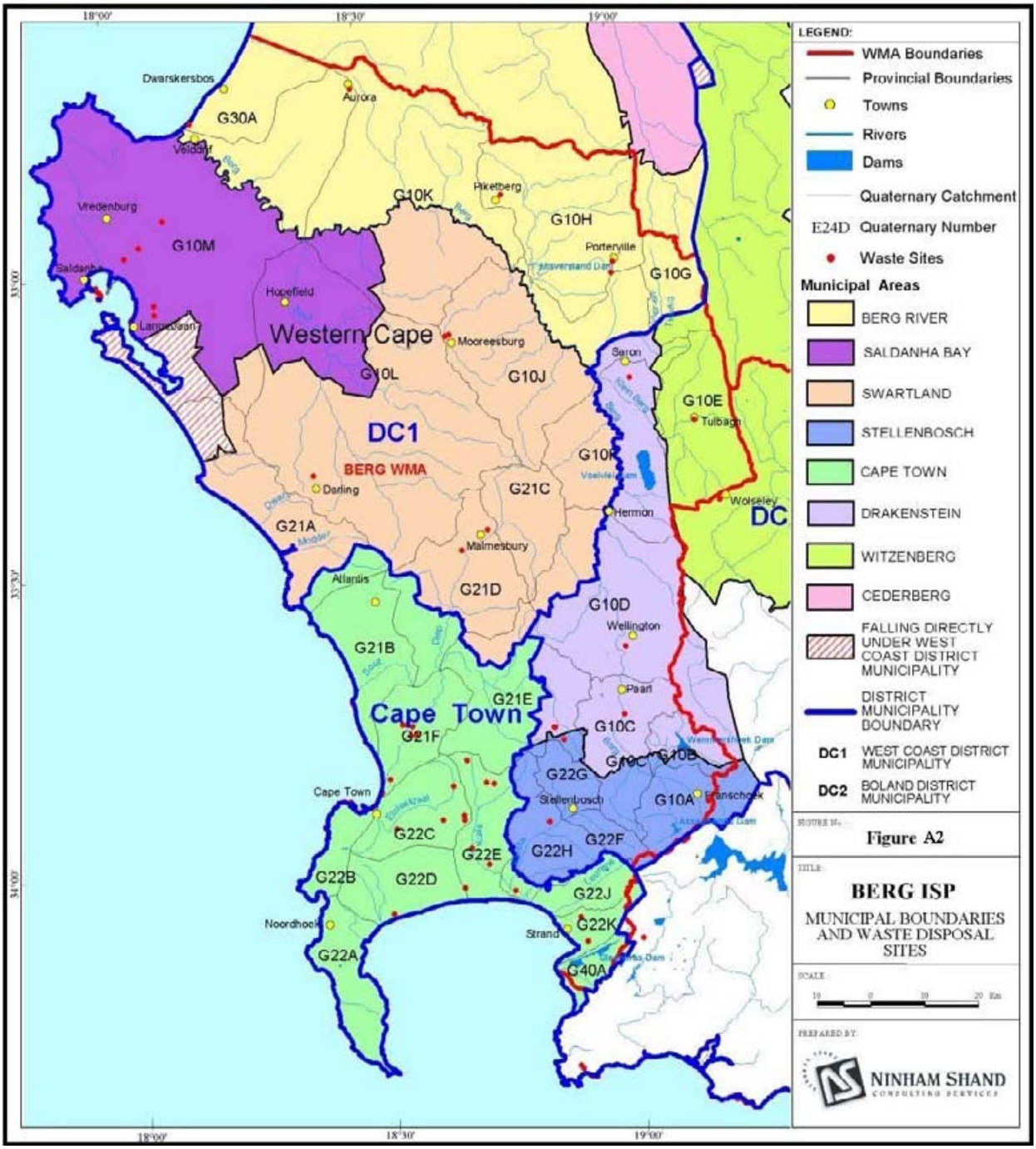


**Figure 3.5.1: Municipal Boundaries and Waste Disposal Sites**

| 3.6 | CHANGING LAND USE - FORESTRY |
|---|---|
| **Management objectives:** | The primary objective of this strategy is to facilitate the processes required to address the decommissioning of commercial forestry operations in the Berg WMA. |
| **Background information:** | A broad policy is in place at National level for the trading of water rights. Section 25 of the NWA allows for transfer of water use authorisations, from the same resource, subject to application for such transfer. For example, a person holding an entitlement or current authorisation may surrender it (or part of it) to facilitate a licence application by another, for the use of that water (from the same resource) on other land. The recipient must, however, apply for a new authorisation.<br><br>The decommissioning of much of the commercial forestry industry will release water and this may allow for trading of existing authorisations currently held by the commercial forestry operators, of which SAFCOL holds the predominant market share.<br><br>The following issues/concerns have been identified:<br>• For each proposed change in land use, a site-specific investigation is required, which is time-consuming. The core principle is that there should be no negative impact on other downstream users.<br>• SAFCOL (existing lawful user) is decommissioning its forestry operation and felling its plantations in the Western Cape. This forestry is on State Land and its proposed future use is still uncertain.<br>• SAFCOL should be entitled to enter into trading of their existing authorisations. This would need to be based on impact on yield, and would have to take Assurances of Supply into account. The State is also the sole shareholder in SAFCOL and could therefore presumably influence any attempt to trade water rights.<br>• No mapping of forestry is recorded, other than that held by commercial operators.<br>• The verification of lawful use in terms of private afforestation is difficult without mapping. |
| **Strategic approach:** | Water Resource Managers must develop a clear picture of the water resource implications of SAFCOL's exit strategy in each quaternary catchment, and of the opportunities this presents. This applies to any other operators who are also choosing to leave the forestry sector in the Western Cape. The water that will be released through the closure of plantations should be known to managers through the forestry licence. If there is no licence then the same computation used in issuing a licence, can be applied. If not licensed then this water returns straight to the State and decisions with regard to reallocation can be made on the basis of condition of the catchment, the allocations strategy for that catchment, and on special demands (such as resource poor farmers). Applications for new forestry required to compensate this loss in timber resources need to be considered sympathetically by the SFRA Licence Assessment Advisory Committee, particularly where this calls for the use of the same water that is being freed up.<br><br>Should the plantations have been licensed then SAFCOL may have some claim to the water for trading purposes. Alternatively (and more likely) some water should be available for reallocation. Any water becoming available should be reallocated to poverty alleviation / rural development if at zero or low cost. Trading should be into urban use. In many cases water from deforestation could feed into the WCWSS. Only as a last resort (no other takers) should this water be allowed to go into commercial irrigation.<br><br>The RO must be in possession of SAFCOL's exit strategy, and of the various plans for alternative uses suggested in that strategy. DWAF must also stay on top of any other possible closures. Possible alternatives to forestry need to be assessed and at least provisionally approved from a water resources perspective. It is important that SAFCOL be fully aware of their rights and responsibilities with regard to the water resource, particularly where the company is suggesting alternative water demanding activities in the place of existing forestry. |

| 3.6 | CHANGING LAND USE - FORESTRY (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. A co-operative governance decision is required regarding the decommissioning of SAFCOL and the use of the State owned land (RO in conjunction with Department of Environmental Affairs and Development Planning, Department of Agriculture and local authorities).<br>b. Liaison with SAFCOL and the SFRA LAAC (Stream Flow Reduction Activities Licence Assessment Advisory Committee) to discuss whether there are any water use rights attached.<br>c. The availability of water resulting from changes between certain land use types needs to be studied on an area-specific basis.<br>d. RO to develop plans and procedures for re-allocation of water which becomes available from changing land use, taking assurances of supply into consideration.<br>e. Registration and licensing of all commercial afforestation to be completed. |
| **Responsibility:** | The implementation of the **Changing Land Use – Forestry** Strategy is the responsibility of the RO in conjunction with the Directorate: Water Abstraction and Instream Use. |
| **Priority:** | Priority 1 – Very high. To be implemented over the medium term. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Part 2<br>a2: NWRS: Chapter 3, Part 2<br>a3: Berg Water Resource Situation Assessment Report: Chapter 5<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>*SAFCOL* :<br>Largest commercial forestry operator in the Berg WMA.<br><br>*Department Agriculture and Department of Land Affairs:*<br>Opportunities on converting forestry land - especially for resource poor farmers<br><br>*Department Environmental Affairs and Development Planning:*<br>To participate in the review of future land use where State owned land becomes available.<br><br>*SFRA LAAC:*<br>Licensing of new forestry to replace declining supplies of raw material.<br><br>**d. Related Strategies:**<br>3.4 Licensing<br>3.7 Changing land use – clearing of invasive alien plants<br>3.8 Water pricing<br>5.1 Support to resource poor farmers<br>5.2 Co-operative governance<br><br>**e. Linked mapping:**<br>None |

| 3.7 | CHANGING LAND USE – CLEARING OF INVASIVE ALIEN PLANTS |
|---|---|
| **Management objective:** | The goal is to optimise benefits to the water resource through the clearing of invasive alien plants. The first objective is to ensure that Working for Water and other initiatives responsible for the clearing of invasive alien plants are fully aware of the extent of invasive alien plants, the water used, and the water resource management priorities. Working for Water must work closely with water resource managers in both planning and action. |
| **Background information:** | The clearing of invasive alien plants, primarily through the WfW (Working for Water) programme has site-specific impacts. There is a need to focus the clearing effort on areas in which the greatest maximum benefit may be achieved, particularly in terms of the water resource. Whilst water benefits are recognised there has been no clear strategy to maximise the impacts.<br><br>The introduction of a water resource management charge (April, 2002) payable by all users will put pressure on managers to see that clearing is directed at achieving the best results. Although increased surface runoff is the primary yardstick with which to measure the impact of clearing, it is important to recognise that the groundwater resource is also impacted upon by invasive alien plants. There are also many other pressures - notably the value of biodiversity, the control of erosion of both stream banks and landscapes with water repellent soils, the reduction in fire hazard, the need to provide a social benefit (with much of the funding coming for the national poverty relief programme), and the sheer practicality of employing large numbers of workers in remote areas under difficult circumstances.<br><br>The following aspects relating to clearing of invasive alien plants are relevant to the Berg WMA:<br>• 2001 aerial photography was done for the whole WMA, but interpretation of information was focused only on areas where WfW projects are being implemented. Mapping of the aerial photography is not yet complete.<br>• The removal of blue-gums (Category 2 IAP) upsets the bee keepers – affecting both the production of honey and the maintenance of hives necessary for fruit tree pollination.<br><br>WfW in the Berg WMA has concentrated on State owned land through funding provided mainly by the DWAF trading account. Clearing has been focused on the uppermost reaches of the Berg River, 30m on either side of the river channel and in the high mountain areas where priority is on light infestations so as to reduce the spreading of seeds.<br><br>The priority is firstly to provide more water, thereafter bio-diversity and job creation. The benefits of clearing can only be determined through ongoing monitoring which links to the need for mapping.<br><br>Invasive alien plants are known to use significant volumes of water – dependent on biomass but not dissimilar to forestry plantations. Water use in riparian zones, where invasive alien plants are most prevalent, including much of the mainstem of the Berg River, is generally reckoned to be double that of landscape invasions. The Berg River is one of the most densely invaded, if not the most densely invaded WMA in South Africa.<br><br>Water use by invasive plants must be seen as that water over and above that water which would be used by the natural vegetation it has replaced. It is also necessary to partition impact into the impact on available resources – in other words the reduction in supplies which would otherwise be available to other users (typically storage in dams) and the impact on the Reserve, which would be how the whole resource is affected – and this particularly in the dry season, low flow months. |

| 3.7 | CHANGING LAND USE – CLEARING OF INVASIVE ALIEN PLANTS (cntd) |
|---|---|
| **Strategic approach:** | The priority in this WMA is to provide more water, thereafter bio-diversity and job creation. The magnitude of impact of invasive alien plants on the water resource, and more importantly what would happen if there were no clearing, are numbers that should be on every water manager's desk (this includes institutions outside of DWAF). At the moment they are not!<br><br>The clearing of invasive alien plants is an important water conservation and demand management strategy (Strategies 4.1 and 4.2). DWAF will not approve further infrastructure development to supply water to Local Authorities unless it is clear that all possible steps are being taken to maximize other available water through this strategy.<br><br>Management of the Berg River cannot afford to lose the battle with invasive alien plants. The first strategy is that 'prevention is better than cure' and the first level of focus should be on the control of further infestations through restrictions on new sources (e.g. forestry plantations in remote areas), and through the clearing of remote, scattered and outlying invasive plants. WfW must be encouraged to take this approach.<br><br>The second strategy is to ensure that clearing activity (and it can be accepted that much of this activity will be centred on densely infested areas and this is where jobs can most easily be created) is focused in those areas where the maximum benefit to the water resource can be achieved. This is dependent on both the nature of downstream use and the availability of dam storage.<br><br>It is absolutely essential that the clearing operation is consistent and that WfW stick to their plans and stay up to date with their tasks, especially follow-up operations. This becomes even more important where water is estimated to have been freed up through clearing and has since been allocated to other users.<br><br>Finally, impacts need to assessed through monitoring – both the mapping of the extent of invasions, and actual benefits to the resource experienced through clearing. Some small farmers have taken to clearing their own catchments and the publication of their 'success stories' could encourage other farmers in the WMA to take responsibility.<br><br>It should be noted that the black wattle industry plays no part in the economy of the Western Cape, yet the wattle species (*Acacia mearnsii, Acacia decurrens, Acacia dealbata*) are major invaders, especially of riparian zones. Bio-control is an obvious solution. It is necessary to estimate the costs of wattle invasions to both water and the environment in order to encourage decision-makers that bio-control research must be pursued and bio-control implemented.<br><br>One important additional strategy would be to offer incentives to private landowners for the clearing of invasive alien plants. These could include subsidies for clearing, provision of free or subsidised herbicides, and the taking of good land use practice into consideration when evaluating re-allocations. Much of this can be seen as the function of WfW and perhaps the most that Water Resource Management can do is to make sure that WATER stays on the top of the agenda. |

| 3.7 | CHANGING LAND USE – CLEARING OF INVASIVE ALIEN PLANTS (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. Establish a co-operative planning process together with Working for Water (and CCT and other interested parties as appropriate), to ensure that the clearing of IAPs in the Berg River is effectively prioritised, and that water resource provision plays its due role in that prioritisation.<br>b. Improve estimates of the actual extent of invasive alien plants in the Berg WMA, and the impact on water resources – as a matter of urgency in support of planning and strategy. Estimates should include species, location (key area, and position in the landscape), and density.<br>c. Prepare a strategy for the clearing of invasive alien plants in the Berg from a water resource management perspective. This should include priority areas, a strategy of prevention by tackling less invaded areas and thus avoiding the densification of populations and the need for later rehabilitation of these areas, and support for bio-control initiatives.<br>d. Determine the priority areas for clearing from a water resource perspective.<br>e. Consider the provision of incentives to private landowners for clearing invasive alien plants. These could include subsidies for manual clearing, provision of free or subsidised herbicides, and taking good land use practice into consideration when evaluating re-allocations. The biggest incentive of all would be to allow land-owners to use some or all of the water released through clearing practices on own land.<br>f. Ensure that catchment management charges are applied equitably and effectively towards invasive alien plant clearing, with the ultimate goal being the removal of all invasive alien plants.<br>g. Working for Water need to attend (i) to the completion of invasive alien plant mapping and interpretation from 2001 aerial photography (ii) Reconciliation of mapping with clearing data collected.<br>h. Monitor the impacts of clearing of invasive alien plants – water yield, sedimentation and quality. |
| **Responsibility:** | The implementation of the strategy **Changing Land Use – Clearing of Invasive Alien Plants** is the responsibility of the RO in conjunction with the Directorate: Working for Water as well as the Directorate: Water Abstraction and Instream Use.. |
| **Priority:** | Priority 1 – Very high. To be implemented over the medium term. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Part 4<br>a2: NWRS: Chapter 3, Part 3<br>a3: Berg Water Resource Situation Assessment Report: Chapter 5.<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>WfW : clearing of invasive alien plants.<br><br>**d. Related Strategies:**<br>3.4 Licensing<br>3.6 Changing land use – forestry<br>3.8 Water pricing<br>5.2 Co-operative governance<br><br>**e. Linked mapping:**<br>None |

| 3.8 | WATER PRICING STRATEGY |
|---|---|
| **Management objective:** | Ensure financial sustainability and generation of funds for water resource management, whilst achieving social equity and efficient water use. |
| **Background information:** | Section 56 of the NWA provides for a pricing strategy, allowing for differentiation among geographical areas, categories of water users or individual water users.<br>The *"Pricing strategy for raw water use"* was tabled in November 1999. Pricing requires that water use has been registered or licensed. Charges are being phased in. The pricing of waste discharge was not covered under the initial pricing strategy but is now in preparation (2003).<br>Differential charges for geographic areas, different categories of water use, and different water users are provided for. It is aimed to eventually recover the full financial cost of 1st tier water from water users. An economic charge could eventually be introduced to reflect the relative scarcity of water.<br>The activities of the CMAs (or DWAF in the interim) will be funded from the water resource management charges. Tariffing in a WMA will eventually be set by the CMA, and funds due will be passed on.<br>The following relevant aspects were identified:<br>• The CCT pays a single system tariff as it utilises three major schemes (Palmiet, Riviersonderend and Voëlvlei schemes). This brings inherent efficiency as the System is managed to maximise resources, and not cost saving.<br>• The West Coast District Municipality currently pays no system tariff. It is reliant on the regional schemes which draw on bulk water from Voëlvlei Dam Government Water Supply Scheme.<br>• A payment agreement has been reached with the CCT, in which they will pay the capital redemption for the Berg Water Project, whilst the scheme will be owned by the implementing agent (Trans Caledon Tunnel Authority, TCTA) for 20 years.<br>• Catchment management charges contributed to, amongst other things, WfW. The use of these funds was aimed at benefiting the major contributors.<br>• In April 2002, the catchment management charge was superceded by a Water Resource Management charge, which is directed at all users.<br>• An agreement has been reached with agriculture in which that sector will pay system depreciation charges for supplies from existing government water schemes. This sector will not contribute to the capital costs existing schemes, but will pay both depreciation and capital contribution costs for water supplied from any new government water scheme.<br>• The RO performs its own tariff calculations, contrary to the rest of the country, where the Directorate Water Abstraction and Instream Use performs that task. |
| **Strategic approach:** | Pricing is critical to the raising of catchment management funds – and therefore also to the sustainability of the resource. Pricing is also a fundamental tool in Water Demand Management. The key strategy to be adopted in tariffing in the Berg WMA is to ensure that there are no inducements to users to draw water from particular systems to the detriment of the overall management of the resource.<br>The impact of pricing on both use and behaviour patterns needs to be closely monitored.<br>The link between Pricing and Assurance of Supply should be clearly made.<br>Pricing should not serve as a constraint to desirable development, or result in the unreasonable demise of any particular sector, or cause undue and unfair hardship. It is the responsibility of the Region to keep an eye on the situation and to either make internal adjustments or to advise and negotiate with the National Department should this at any time seem necessary and appropriate. |

| 3.8 | WATER PRICING STRATEGY (cntd) |
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| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. Incremental implementation of the *National Pricing Strategy*. Prioritise the water uses that have the most significant impact and are consumptive.<br>b. Set charges for funding water resource management, development and use of waterworks, and for achieving the equitable and efficient allocation of water.<br>c. Implement pricing for waste discharge as soon at this approach has been finalised.<br>d. Prioritise implementation of tariffs for water supplied from Government Water Schemes.<br>e. Implement effective mechanisms and structures for income generation, proportioning and accounting of funds collected from tariffing.<br>f. Consider introducing a system tariff to the West Coast District Municipality.<br>g. Monitor the impact of the implementation of pricing on land use, the economy, the environment and society (especially jobs). Indicate immediately should contrary effects be observed. Pricing, along with predicted and observed impacts, should be a fixed item on the agenda of local and regional water management structures. |
| **Responsibility:** | The implementation of the **Water Pricing** Strategy is the responsibility of the Directorate Water Utilisation in conjunction with the RO. |
| **Priority:** | Priority 1 – Very high. To be implemented incrementally over the medium term. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 5, Part 1<br>a2: NWRS: Chapter 3, Part 4<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>None<br><br>**d. Related Strategies:**<br>3. Water use management strategies<br>4. Water conservation and demand management strategies<br>8. Waterworks development and management strategies<br><br>**e. Linked mapping:**<br>None |

## SECTION 4: STRATEGIES FOR WATER CONSERVATION AND DEMAND MANAGEMENT

The NWRS indicates that at a national level, the options for further augmentation of water supply through further physical infrastructure (particularly new dams) are limited. Attention needs to be devoted to managing the demand for water, encouraging the efficient and effective use thereof and minimisation of loss or waste of water.

The National Water Conservation / Demand Management (WC/DM) Strategy is currently being developed. This strategy is based on the reasonable premise that many water users can maintain their quality of life and achieve the desired outcomes from their water use, whilst using less water. Furthermore significant reductions in water use can be achieved by changes in behaviour and the adoption of water-saving technologies.

The National WC/DM Strategy is based on three basic principles, namely:

i. Water institutions should strive to supply water efficiently and effectively, minimise water losses, and promote WC/DM among their consumers.

ii. Users should not waste water, and should strive to use it efficiently.

iii. WC/DM should be an integral part of water resources and water services planning processes. Where future schemes are proposed, the appropriateness and cost effectiveness of demand-side solutions must be considered alongside supply-side augmentation options.

The foundation of the WC/DM Strategy is the creation of a WC/DM culture within all water management and water services institutions and among water users. The main sectoral users within the Berg WMA are the urban and the agricultural sector. The extent of consumptive bulk water use by mining, major industry and thermal power stations is not significant in the Berg WMA. As such, a stand-alone strategy for industrial water conservation and demand management has not been developed in this ISP. The water services water conservation and demand management strategy is deemed to cover industry as well.

Three strategies have been identified for development, namely:

4.1 Water Services Water Conservation and Demand Management
4.2 Agricultural Water Conservation and Demand Management
4.3 Effluent Re-Use

| 4.1 | WATER CONSERVATION AND DEMAND MANAGEMENT: WATER SERVICES |
|---|---|
| **Management objective:** | The objective of this strategy is to entrench the concept of effective water conservation and demand management by local authorities, most particularly in areas of stress and where new supplies otherwise have to be developed. |
| **Background information:** | The National Water Conservation and Demand Management Strategy, currently being developed by DWAF, aims at entrenching WC/DM by insisting on efficient water management and use before additional supplies are considered. The "*Water Resource Situation Assessment Report*" for the Berg WMA, identifies the fact that despite the implementation of several water conservation and demand management programmes over time, the levels of "unaccounted for" water are growing. The implementation of water restrictions, which has been necessary in recent years, is indicative of the stressed nature of the Berg WMA.<br>The anticipated economic growth in this region will further increase the water requirements of the urban sector. Effective water conservation and demand management may allow for improved assurances of supply as well as the postponement of new schemes – even though these may prove inevitable in the longer term.<br>The comprehensive Reserve requirements have yet to be determined. Indications are that these may well exceed the current requirements set through initial determinations. It is likely, therefore, that the availability of water will be further reduced once the Berg WMA Reserves are finally established.<br>The CCT has embarked on a water conservation and demand management programme and a demand management target of 20% reduction on projected demands by 2013 has been set.<br>See also the strategy for Effluent Re-use (Strategy 4.3). The CCT has a "zero effluent" discharge plan which is looking at making optimal use of the effluent currently being discharged to sea. |
| **Strategic Approach:** | The Department will continue to entrench the importance of and encourage the implementation of WC/DM as an effective reconciliation intervention. Local authorities will be required to implement WC/DM before DWAF will permit the development of new local supply schemes.<br>User education, and capacity building within the provider, are fundamental steps to be taken in implementing WC/DM effectively. In line with the strategy to provide degrees of technical assistance to local authorities for managing their supply schemes, support will be provided by DWAF in facilitating the implementation of WC/DM.<br>A lot can still be achieved in terms of effluent re-use in the Berg WMA and this must be strongly encouraged. Return flows in the Peninsula rivers should not be allocated to agriculture but held over for recycling for urban and industrial use (see also Strategy 6.1).<br>The key approach is to support the CCT and smaller Local Authorities in their endeavours, to recognise successes, and to offer support or incentives where these are appropriate. |

| 4.1 | WATER CONSERVATION AND DEMAND MANAGEMENT: WATER SERVICES (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following further actions are required to improve demand management efforts in the urban sector of the WMA:<br><br>a. The WSDPs of local authorities should list the water conservation and demand management initiatives that are being implemented as well the associated targets that have been set by local authorities.<br>b. The WSDPs submitted need to be reviewed to ensure that water conservation and demand management objectives that have been included are realistically achievable.<br>c. Water 'recovered' through demand management should be prioritised to meet the needs of urban growth and of the Reserve. |
| **Responsibility:** | The implementation of the Strategy for **Water Conservation and Demand Management : Water Services** is at National level (Directorate: Water Use Efficiency) with input from the RO. |
| **Priority:** | Priority 1 – Very high. To be implemented on an ongoing basis. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWRS: Chapter 3, Part 3<br>a2: Berg Water Resource Situation Assessment Report: Chapter 5<br>a3: CMA Integrated Water Resource Planning Study – Report 6<br>a4: Appendix 8: Old and New Municipalities<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>Local authorities : To complete and submit realistic WSDPs.<br><br>**d. Related Strategies:**<br>3.8 Water pricing<br>4.2 Agricultural water conservation and demand management<br>4.3 Effluent re-use<br>6.1 Supply to local authorities<br>8.5 Operation during extreme drought<br><br>**e. Linked mapping:**<br>None |

| 4.2 | AGRICULTURAL WATER CONSERVATION AND DEMAND MANAGEMENT |
|---|---|
| **Management objective:** | To create a culture of water conservation through efficient irrigation methods and to promote equity amongst all users. |
| **Background information:** | The National Water Conservation and Demand Management Strategy, currently being developed by DWAF, aims at entrenching and insisting on efficient water management and use. The "*Water Resource Situation Assessment Report"* for the Berg WMA, identifies the fact that despite the implementation of several water conservation and demand management programmes over time, the levels of "unaccounted for" water are growing.<br><br>In the agricultural sector, conveyance losses and poor efficiency contribute to the overall losses. Irrigation accounts for an estimated 41% of total consumptive water requirements (i.e. excluding the ecological Reserve) in the Berg WMA. Irrigation losses are often quite significant and it is estimated that where inefficient irrigation methods are practised, often no more than 80% of water abstracted from water resources is correctly applied to the root systems of plants. However, efficient on-farm irrigation methods are generally used in the Berg WMA.<br><br>Some irrigation system losses return to the river systems but this 'Return Flow' can be of reduced quality. Irrigation methods, irrigation scheduling, soil preparation, crop selection, crop yield targets and evaporation all affect the efficient use of water. Conveyance losses can be significant and in the Berg WMA these are mainly due to riparian losses as rivers serve as the main bulk distribution system. Irrigation losses could be reduced in the Berg WMA by reducing riparian losses though the removal of invasive alien plants from the riparian zones.<br><br>Procedures need to be in place to ensure that water which is made available through WC/DM is used appropriately elsewhere. This is of particular importance if the water saving has been achieved through incentives directed at farmers. |
| **Strategic Approach:** | The Department will continue to entrench the importance of WC/DM as an effective reconciliation intervention. The suite of tools comprising of Best Management Practices, water audits and benchmarks developed by the Directorate: Water Conservation will be tested and refined in specific case studies. These will be implemented through the WUAs.<br><br>Water conservation and demand management, compulsory licensing, and re-allocation must be carefully synchronised. WC/DM can be aimed at (i) bringing more water into immediate production, or (ii) taking inefficiencies out of the system and recovering this water for use by others, notably in the meeting of urban, industrial and equity needs. Synchronisation with Compulsory Licensing is important so that when cuts in allocations are made (for the Reserve or for Equity) the adjustments can relatively easily be made, at least by some, through improved efficiencies. It is a concern that farmers implement WC/DM, and then promptly expand their agricultural activity to take up the water saved. If the objective is to bring this water back into the bigger system it will require that safeguards and incentives are put in place at the outset.<br><br>When evaluating re-allocation options, cognisance should be given to those farmers who have conscientiously made long-standing and ongoing efforts to be more efficient in their use of water for irrigation. |

| 4.2 | AGRICULTURAL WATER CONSERVATION AND DEMAND MANAGEMENT (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. Synchronise the implementation of water conservation and demand management with the introduction of compulsory licensing and re-allocations.<br>b. Consider (i) the use of subsidies for installation of efficient irrigation systems, (ii) incentives/subsidies for clearing invasive alien plants on private land, and (iii) rewards for increased efficiency, e.g. by offering a higher assurance of supply.<br>c. Recognition of efficiency could be taken into account in the determination of re-allocations during compulsory licensing.<br>d. Set targets with WUAs for the re-allocation, particularly to equity users, of water which can be made available through water conservation and demand management. |
| **Responsibility:** | The implementation of the strategy for **Agricultural Water Conservation and Demand Management** in the Berg WMA is a Regional responsibility, in consultation with the Directorate: Water Use Efficiency. |
| **Priority:** | Priority 1 – Very high. To be implemented on an ongoing basis. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWRS: Chapter 3, Part 3<br>a2: Berg Water Resource Situation Assessment Report: Chapter 5<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>Department of Agriculture.<br><br>**d. Related Strategies:**<br>3.3 Verification of existing lawful use<br>3.4 Licensing<br>3.8 Water pricing<br>4.1 Water conservation and demand management : water services<br>4.3 Effluent re-use<br>8.5 Operation during extreme drought<br><br>**e. Linked mapping:**<br>None |

| 4.3 | EFFLUENT RE-USE |
|---|---|
| **Management objective:** | To maximise the re-use of effluent rather than allowing for its discharge to the sea. |
| **Background information :** | The NWRS highlights the fact that in the inland parts of the country, water returned to rivers either directly or as seepage return flow and becomes available for re-use further downstream. In areas close to the coast, this is often not the case and the focus becomes one of direct use of treated effluent. Agricultural, industrial and domestic use each require different treatment processes, each with their own cost implications. |
| | The relatively low exploitation of effluent re-use has both demand management and environmental impacts. On the environmental side urban rivers are serving as conduits for ever-increasing volumes of effluent. These urban rivers have long ceased to behave according to any seasonal pattern, and remain full flowing for much of the year. Typical examples are the Black / Salt River and the Kuils River. |
| | Approximately 180 million $m^3$ of treated effluent is currently discharged annually from WWTWs in the Berg WMA. 22 million $m^3$/a is currently directly re-used from the CCT's WWTW. |
| | Clearly if all additional effluent in the Berg WMA could be re-used then the need for other augmentation could be substantially reduced and delayed. Full re-use would bring an extra 158 million $m^3$ in to the system, but at increased cost. |
| | The CCT is currently investigating the re-use of effluent as part of its Integrated Water Resources Planning Study and has an objective of achieving zero effluent discharge although precise dates for this have not been set. |
| **Strategic approach:** | Effluent from the Greater Cape Town Metropolitan Area represents a significant opportunity for re-use. This applies to all local authorities. The effort by the CCT to explore the most cost effective means of utilising this potential serves as an example to other local authorities as to what can be achieved. |
| | Cost effective effluent re-use must be encouraged in all cases. This particularly where there is a need to augment supplies. The development of new water resources infrastructure will not be sanctioned by DWAF until it is apparent that the potential for effluent re-use has been determined and implemented, where it is proven cost effective to do so. |
| | DWAF will, wherever possible, provide technical assistance to those local authorities and implementing stakeholders, where technical capacity may be a limitation. |

| 4.3 | EFFLUENT RE-USE (cntd) |
|---|---|
| **Required actions:** | The following actions are required:<br><br>a. Promote maximum re-use of effluent. This can also be encouraged through the pricing and licensing, with licenses for additional water conditional on maximum re-use.<br>b. Review the approaches undertaken by the CCT in terms of its objective regarding the increased use of treated effluent.<br>c. Ensure information will be compatible with information needs, to make final decisions on best reconciliation intervention options.<br>d. Initiate similar investigations by other local authorities, outside of the CCT.<br>e. Identify and address gaps in planning for re-use of treated effluent.<br>f. Identify the points of discharge for all WWTW. Only CCT WWTW discharge points have been established (see Appendix 3).<br>g. Investigate the viability of piping treated effluent to appropriate areas for recharging aquifers.<br>h. Determine the environmental impacts (positive and negative) that may result from a decrease of flows in the urban rivers, if direct re-use of effluent is increased. |
| **Responsibility:** | The implementation of the **Effluent Re-Use Strategy** is the responsibility of the RO in consultation with the Directorate: NWRP. |
| **Priority:** | Priority 1 – Very high. Ongoing implementation over the long term. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 4, Part 5<br>a2: NWRS: Chapter 2<br>a3: CMA Integrated Water Resource Planning Study<br>a4: Appendix 3: Wastewater Treatment Works<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>Local authorities : Operate and maintain WWTW in the Berg WMA.<br>Department of Public Works : Operate and maintain WWTW at prisons in the Berg WMA.<br>**d. Related Strategies:**<br>1.1 Reliability of the yield balance<br>1.3 Groundwater<br>2.1 Reserve and resource quality objectives<br>3.2 General authorisations<br>4.1 Water conservation and demand management: Water Services<br>4.2 Agricultural water conservation and demand management<br>5.2 Co-operative governance<br><br>**e. Linked mapping:**<br>None. |

## SECTION 5: INTEGRATION AND CO-OPERATIVE GOVERNANCE STRATEGIES

The Berg WMA has no international borders and there is therefore no interface with international authorities. However, the strategies developed for any WMA interface with those of other South African Government Departments, local authorities and water resource institutions. The task of Integrated Water Resources Management creates an inherent need for establishing co-operative relationships with those organisations.

The water resource management of the Berg WMA involves close interaction with the other major owner and operator of water resource infrastructure, namely the CCT. This relationship has developed through the need to jointly plan and manage the operation of the WCWSS. Various other initiatives have been introduced to further establish co-operative planning in terms of water resource management.

In addressing inequities of the past, the provision of an equitable share of available water to previously disadvantaged communities is being addressed. The establishment of resource poor farmers and the provision of water to areas in which land restitution is in progress must be prioritised. The water reconciliation for the Berg WMA has shown that there is no surplus water for allocation to resource poor farmers. An approach must therefore be adopted to make water available. This is likely to involve re-allocation of existing authorisations through a process of compulsory licensing. Co-operation between DWAF, the Department of Agriculture, and the Department of Land Affairs is fundamental to addressing the needs of resource poor farmers.

The National Environmental Management Act (NEMA) was gazetted in 1999. This is a ' Framework Act'. The implementation of the NWA and the management of water resources are subject to NEMA (See strategy for Managing the Environment, No 5.3).

Three strategies have been identified under Integration and Co-operative Governance, namely:

5.1 Support to resource poor farmers
5.2 Co-operative governance
5.3 Managing the environment

| 5.1 | SUPPORT TO RESOURCE POOR FARMERS |
|---|---|
| **Management objective:** | The objective of this strategy is to provide a measure of equity in the allocation of water resources within the WMA and to offer further assistance to resource poor farmers. This can be achieved through the Irrigation Action Committee (IAC) and the Water User Associations (WUAs). |
| **Background information:** | The rural population in the Berg WMA constitutes only 5% of the total, hence the rural (non-commercial) water use is small when compared with urban water use. Re-addressing inequities of the past includes the needs of rural settlements and those of resource poor farmers (also referred to as "emerging farmers"). There are two aid components which need to be distinguished from one another, namely:<br>• Assistance to resource poor farmers.<br>• Assistance to small towns and settlements for general access to water.<br>The latter component is the responsibility of the relevant local authority. Making water available is the key in both instances.<br><br>Subsidies are available to resource poor farmers via two funding mechanisms, namely:<br>• The pricing strategy for bulk water<br>• Capital cost subsidies from Government.<br><br>DWAF provides support to resource poor farmers through the IAC. Once WUAs are in place, they too will be able to assist resource poor farmers through subsidies from Government.<br><br>Individual resource poor farmers seeking assistance are typically identified through non-governmental organisations (NGOs). The question of land availability for such farmers is addressed through the Department of Agriculture or the Department of Land Affairs. From here, the provision of water to irrigate the land is addressed through the IAC.<br><br>There appears to be a relatively low demand from resource poor farmers for new agricultural land within the WMA – but this must be carefully assessed. |
| **Strategic approach** | An important part of the vision and mission of DWAF is to address past inequities with regard to the way water has been allocated. One obvious strategy is to make water more readily available to resource poor farmers. In the case of the Berg WMA there is immense pressure on the resource to meet the needs of the CCT, the West Coast, and all its people. The role that these areas play in the economy of the WMA, and in generating wealth for the bulk of its population means that any constraint to its development will contribute to the poverty of all who live there. This has meant that little or no new water can be made available to new irrigation. DWAF nevertheless has a responsibility to resource poor farmers and this can be met in the following ways:<br>(i) If and where resource poor farmers have a requirement for water, and should that water be available, then these applications should be given priority over any other agricultural use. Where water does become available the possible use by the resource poor should be determined before any allocations are made to others;<br>(ii) The redistribution of land out of the hands of the establishment and into the hands of the resource poor, with the concomitant water allocation, should be facilitated. Co-operation with the Department of Land Affairs is required for this;<br>(iii) Great care should be taken to ensure that resources currently utilised by existing resource poor farmers, such as the Philippi vegetable growers, are not threatened. The Cape Flats Aquifer offers an opportunity here.<br>(iv) Investigation and promotion of small-scale (community garden) irrigation based on groundwater resources.<br>(v) The use of joint ventures in which established commercial farmers are teamed up with emerging farmers and receive a shared allocation. |

| 5.1 | SUPPORT TO RESOURCE POOR FARMERS (cntd) |
|---|---|
| **Strategic Approach:** | The re-allocation of water to the resource poor through compulsory licensing is a drastic step, which must be taken in the face of major inequity and demand. This does not appear to be the situation at all in the Western Cape, where there is no communal land and very few 'disadvantaged' farmers. Pockets of demand and any broad trends need to be identified and taken into the planning process.<br><br>Close negotiations should be entered into with the Departments of Agriculture and Land Affairs to ensure that expectations are not raised amongst the resource poor, and that the capacity of the resource is not exceeded in trying to meet these development needs in the face of the overall development imperative. The limitations on the water resource must be very clear to these Departments. Together with these Departments, innovative solutions must be sought and found.<br><br>The establishment of the IAC provides the platform for co-operative governance between the relevant government departments, in relation to resource poor farmers. This platform should be used to define the roles of each authority with regard to the development of these farmers. |

| 5.1 | SUPPORT TO RESOURCE POOR FARMERS (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. Assess the demand for equity water for agriculture (emerging farmers). Identify land reform and restitution initiatives. Assess the various projects which the Department of Agriculture has initiated or is planning and work through the water resource implications with that Department.<br>b. Sharing of available water resources in certain areas will require re-allocation through compulsory licensing.<br>c. Support for resource poor farmers to be a continued focus of the IAC, through co-operative governance between DWAF, the Department of Land Affairs, the Department of Agriculture and the Western Cape Nature Conservation Board (WCNCB).<br>d. The inclusion of resource poor farmers within WUAs.<br>e. The use of groundwater is to be evaluated in terms of a source of supply to small schemes.<br>f. Areas need to be identified where it may be possible to develop and sustain resource poor farmers in the WMA. |
| **Responsibility:** | The implementation of the Strategy for **Support to Resource Poor Farmers** is the responsibility of the RO in conjunction with the Directorate: Water Resource Finance and Pricing and the Directorate: Water Allocation. |
| **Priority:** | Priority 2 – high. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 5, Part 2<br>a2: NWRS: Chapter 3, Part 4<br>a3: Appendix 6: Existing Irrigation Boards<br>a4: Appendix 9: Resource Poor Farmers and Communities<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>Department Land Affairs<br>Department Agriculture<br>Irrigation Action Committee<br>WCNCB<br><br>The role of the above institutions is to ensure a co-operative approach to the development and capacity building of resource poor farmers.<br><br>**d. Related Strategies:**<br>1.3 Groundwater<br>3.6 Changing land use – forestry<br>5.2 Co-operative governance<br><br>**e. Linked mapping:**<br>None |

| 5.2 | CO-OPERATIVE GOVERNANCE |
|---|---|
| **Management objective:** | The objective of co-operative governance is to ensure that all regulating authorities which are involved in the management of the WMA are fully aware of the impact which their functions, decisions and planning have on the water resources of the WMA. |
| **Background information:** | The implementation of the NWA is rapidly bringing about the devolution of management of water resources to regional (or catchment) level. WUAs within each WMA operate at restricted local level as a co-operative association of individual users. WUAs may comprise of a 'transformed' Irrigation Board' or may be a new co-operative of users who undertake related water activities for mutual benefit. As a forerunner to the CMA, catchment forums have been established to involve the responsible authorities and stakeholders which have an interest in the particular river system. The forums function to assist the DWAF RO to manage the river system from both a quality and quantity perspective.<br><br>Each of the three above mentioned institutions (CMA, WUAs and forums) involve input from various local authorities and government departments. Good co-operative governance is essential to ensure that the objectives of these institutions can be realised.<br><br>Co-operative governance is in itself an over-arching strategy. In view of the many institutions which play a role in water resource management, this strategy is linked to most of the strategies in the ISP. Furthermore, land affairs issues, land use issues and marine issues are all related to water resources in one or more ways. The effective management of water resources in the WMA requires co-operation between DWAF, other government departments and local authorities.<br><br>The RO has embarked on a number of co-operative governance initiatives to date. These include:<br>• The development of the Western Cape Planning Model Committee for integrated systems planning of the WCWSS. Other participants are water service providers (local authorities including CCT) and Water User Associations.<br>• Liaison with the Department of Environmental Affairs and Development Planning, the Department of Agriculture and local authorities, through SFRA LAAC (Streamflow Reduction Activities Licence Assessment Advisory Committee).<br>• The establishment of the Irrigation Action Committee (IAC) involving DWAF, the Department of Agriculture, WCNCB and the Department of Land Affairs. The IAC addresses, amongst other issues, the provision of water to resource poor farmers.<br>• The ongoing establishment of committees with other government departments to streamline processes of common interest.<br>• A co-operative monitoring initiative aimed at the collection of all water management related data of common interest, and the mutual sharing of both raw data and derived information.<br><br>*The following specific issues and concerns were identified in the Berg WMA*:<br><br>**i. WMA**<br>• The decommissioning of SAFCOL and resulting management of land use change, water availability, levels of assurance and water use.<br>• The need to improve the sharing of water resource related information.<br>• The management of WWTWs by one authority (local authorities, Department of Public Works) to meet the requirements set by another (DWAF).<br>• The absence of litigation procedures between government departments to deal with water resource related issues and disputes.<br>• The approval of land sub-divisions by the Department of Land Affairs without due consideration to the provision of water by DWAF.<br>• Development planning by Local Authorities without due consideration to the provision of water by DWAF.<br>• Mountain Catchment Area management for water provision. |

| 5.2 | CO-OPERATIVE GOVERNANCE (cntd) |
|---|---|
| **Background information (cntd)** | **ii. Klein Berg River**<br>• The effluent quality, vandalism of wastewater infrastructure, and spills into the stormwater system in Tulbagh, requires addressing with the local authority. Pollution of rivers due to inadequate services in the informal settlement in Tulbagh also requires addressing with the local authority.<br>**iii. Diep River**<br>• Siltation of the Diep River due to sand mining activities involves co-operation between the RO, Departments of Agriculture and Mining, as well as local authorities.<br>**iv. Kuils/Eerste/Lourens/Sir Lowry's Pass River**<br>• Pollution of the Plankenbrug River due to inadequate services in the Khayamandi residential area requires addressing with the local authority.<br>**v. The Cape Peninsula rivers**<br>• The integrated nature of the WCWSS and the ownership of infrastructure by both DWAF and CCT. |
| **Strategic approach** | The importance of co-operation across Government Departments is now recognised more clearly than ever at all levels. Water is absolutely central to this, given the pivotal role it plays in all development. It is probable that DWAF is more aware of this than most other Departments. The historical approach of 'demand and we will deliver' has become one of 'if you require, or are going to require water, we will explore options with you once you have yourselves exhausted all other possibilities'.<br>DWAF does not wish to exercise undue power through its control over the water resource. The approach is one of maximum information and understanding to all water users, and cooperation and negotiation to ensure wise management and an equitable sharing. This requires taking a very active role in all development and other co-operative governance, and in ensuring that water has a permanent position on the planning agenda of our co-departments.<br>A major issue is the frequent lack of compliance by some local authorities, particularly in terms of discharges from WWTWs. Co-operative governance approaches are at present the only available tool, but DWAF has been required to investigate whether other methods can be invoked against non-compliant authorities. This is being addressed at national level, but it would be best to find regional solutions.<br>Data and information should be seen as a joint asset and should not be held for gain. Data and information should as far as possible be shared amongst potential beneficiaries. The only proviso is that it should not be reasonably possible to misuse or misrepresent such data or information. |

| 5.2 | CO-OPERATIVE GOVERNANCE (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | A strategy for co-operative governance at National level will require a set of guiding principles. The following general actions are required at Regional level:<br><br>a. The RO, with Department of Environmental Affairs and Development Planning, the Department of Agriculture and local authorities to jointly address the future of the State owned land currently operated by SAFCOL.<br>b. Compliance in the management of WWTW and discharge of effluent needs urgent attention. Policies must be developed to deal with disputes between local authorities, the Department of Public Works and the RO in relation to effluent quality and management of WWTWs. A process of litigation between government institutions is required at National level.<br>c. Identify opportunities for sharing both monitoring and the capture of water management information, and for the sharing of information with other authorities, to avoid duplication of effort.<br>d. Consultation between DWAF and relevant authorities regarding land sub-division and land use activities (e.g. sand mining) which impact on water quality.<br>e. Identify the relevant local authorities and develop strategies with them relating to pollution of rivers, taking into account the recommendations of the dense settlement strategy (DWAF/DANIDA).<br>f. Siltation in the Diep River to be investigated and addressed, involving the RO, the Department of Agriculture, Department of Minerals and Energy and local authorities. |
| **Responsibility:** | The implementation of the Strategy on **Co-operative Governance** is at National level (Directorate: Institutional Oversight) with input from the RO. |
| **Priority:** | Priority 2 – High. To be implemented on an ongoing basis. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWRS: Chapter 3, Part 5<br>a2: Appendix 3: Wastewater Treatment Works<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>Department Land Affairs, Department Agriculture, Department Minerals and Energy, Department Environmental Affairs and Planning, Department Public Works, Irrigation Action Committee, WCNCB, Local authorities, SAFCOL<br><br>**d. Related strategies:**<br>Due to the integrated nature of water resource management in the Berg WMA, all strategies have an element of co-operative governance needs.<br><br>**e. Linked mapping:**<br>None. |

| 5.3 | MANAGING THE ENVIRONMENT |
|---|---|
| **Situation Assessment:** | A key environmental issue in the ISP area relates to the Reserve and over-abstraction of water. This includes the regulation and use of the Berg River mainstem. The WMA includes the CCT, with all of the associated environmental risks and hazards, exacerbated by an extremely fast growing population. The settlement pattern tends to be first one of informal settlement – with attendant sewerage and wastewater problems polluting streams and groundwater.<br><br>The CCT still has scope to better manage its wastewater effluent. Solid waste sites are reasonably under control. Much of the WMA once comprised lowland fynbos and this biotype has been almost completely transformed in favour of agriculture (primarily wheat). The mountains, on the other hand, hold mountain fynbos and a significant portion of the world's sixth floral kingdom. This has priceless ecological worth. The biggest immediate threat to both water resources and biodiversity, except for man, is that of invasive alien plants. Of no little concern is the longer-term threat of global warming which threatens the fynbos biome.<br><br>Additional environmental issues include water pollution and especially diffuse pollution by fertilisers; the siting of new developments; and mountain catchment area management and the use of fire to reduce biomass and increase water provision. These and other issues are contained in specific ISPs – along with strategies to address priority concerns to DWAF.<br><br>DWAF has developed a national strategy setting out its particular place and role in environmental management, notably the requirements of other environmental legislation (especially NEMA) by which DWAF must abide. |
| **Strategic approach:** | DWAF takes the conservation of the environment extremely seriously. It is important that the Department should view its own actions (such as the construction of weirs or diversions) through an environmental impact assessment. Broad decisions relating to allocation or other matters relating to water resource management should first be exposed to full consideration through Strategic Environmental Assessment. |

## SECTION 6: INSTITUTIONAL DEVELOPMENT AND SUPPORT STRATEGIES

The NWA provides for the transfer of water resources management responsibility to appropriate regional institutions. These include Water User Associations (WUAs), Water Service Providers, Water Services Authorities and Catchment Management Agencies (CMAs).

WUAs are co-operative associations of individual water users who wish to undertake water-related activities at a local level for their mutual benefit. They operate in terms of a formal constitution as set out in guidelines prepared by the Department. They are expected to support themselves financially through water use charges, set in terms of the pricing strategy, and payable by members. A WUA falls under the authority of the CMA in whose area it operates.

CMAs are statutory bodies, established by Government Notice, with jurisdiction in a defined WMA. Functions and responsibilities of CMAs include:

- Development of a Catchment Management Strategy (CMS). This may not be in conflict with the NWRS but is required to give effect to its provisions and requirements. The DWAF ISP for the particular WMA should provide a useful input to the CMS.
- Management of water resources, and co-ordination of the water-related activities of water users and other water management institutions within WMAs.

Additional functions may be delegated or assigned to a CMA by the Minister. The delegation and assignment of duties and responsibilities should progress to include the financial and administrative responsibilities for setting and collecting water use charges and the technical water resources management functions based on the CMS.

Three strategies have been identified as pertinent to the WMA. The first two are for the establishment of Water User Associations and for the establishment of a Catchment Management Agency. Both of these strategies are in fact national functions, and part of the fixed duties of the Department. National strategies with guidelines, plans of action and priority lists have been developed, and this ISP will not cover that ground again. The following brief specifics can however be mentioned:

**Establishment of WUAs**: The establishment of WUAs includes the transformation of irrigation boards as one of the first steps to be taken. This process is lagging behind the other three WMAs of the Western Cape. However there are groups of water users who are already combining resources to become more effective, whilst working towards the process of amalgamation into WUAs. The three irrigation boards in the Eerste River catchment have held a first public meeting towards forming one WUA. The downstream stakeholders in the Lower Berg River have also initiated joint discussions regarding water quality issues. Their intention is to be part of the Lower Berg WUA (in the process of transformation from irrigation board).

Priority should be given to the establishment of a WUA in the Klein Berg catchment, which is stressed. This may be best achieved through a leading role being played by the Klein Berg Irrigation Board.

**Establishment of the CMA**: The CMA establishment process in the Berg WMA will only commence in 2004. This is currently lagging behind that of the other three Western Cape WMAs, primarily due to the complex nature of the institutional arrangements, and lack of adequate funding. The Berg CMA proposal will only be drafted once there has been input from all stakeholders. A well structured public participation process must be put in place. A draft submission of the CMA proposal has been compiled by the RO for discussion purposes and to motivate for the funds required.

The third is the **Supply to Local Authorities** strategy which has been developed to address the current water supply options to local authorities. This emphasises the need for them to actively implement WC/DM and take all possible steps to manage their existing allocations carefully. The Department will ensure that the local authorities have access to the necessary information for decision-making. This strategy is presented in more detail in the following sections:

| 6.1 | SUPPLY TO LOCAL AUTHORITIES |
|---|---|
| **Management objective:** | The objective of this strategy is to ensure that the WSDPs, IDPs and all other planning processes are aligned with this ISP and with the realities of available water supply to Local Authorities and District Municipalities. The current sources of supply to all towns and the potential options for future supply need to be identified. |
| **Background information:** | As part of the Integrated Development Plans (IDPs), local authorities have been requested to prepare Water Services Development Plans (WSDPs). These are intended to highlight the current sources of supply and future anticipated sources of supply to these authorities. Certain of the WSDPs have already been submitted. However, the detail and information provided varies and, in some cases, is incomplete. Until the WSDPs are completed to a suitable level of detail, the potential future sources of supply to local authorities are as suggested in this ISP (see Table 6.3.1). |
| | Certain local authorities and sub-areas of the CCT provide for their requirements through schemes operated by themselves, but augment these from the WCWSS as and when necessary. Typically Piketberg obtained water from local sources but since 1995 supply has been augmented from the Withoogte WTW, via Misverstand Weir. Franschhoek obtains water from streams in the Mount Rochelle Nature Reserve but has been supplied via a pipeline from Wemmershoek Dam since 2001. The towns of Pniel and Kylemore (G10C) also rely on local mountain streams but can be supplemented from Stellenbosch Municipality. Details of the potable water supply schemes in the Berg WMA are given in Appendix 2. These include Atlantis, Paarl, Simon's Town, Somerset West, Stellenbosch, Wellington and Strand. |
| | There are a number of towns in the Berg WMA that do not receive any water from the WCWSS. Tulbagh for instance obtains water from local sources only, but these are proving to be insufficient through the summer. The WSDP of the local authority has yet to be submitted and the extent of the problem cannot be well established. Two licence applications from the local authority are pending. One is for the raising of a small municipal dam, with the intention to divert water into it from a mountain stream. The second is for groundwater abstraction. Yzerfontein does not draw on the regional scheme but does get water through a 200mm diameter supply line from Darling. This is likely to become a limiting factor. |
| | These cases are also discussed under the Licensing Strategy (No 3.4).<br><br>The expanding West Coast region and the Swartland were allocated 11 million $m^3/a$ from Voëlvlei Dam in 1995. This allocation has subsequently doubled and the anticipated expansion of the West Coast region is likely to further increase their requirements. |
| | Table 6.3.1 provides the details of current supply and potential future supply options to the towns in the Berg WMA and indicates under which local authority the town resides. |

| 6.1 | SUPPLY TO LOCAL AUTHORITIES (cntd) |
|---|---|
| **Strategic Approach** | DWAF is not involved in providing water to those towns in the WMA which are not supplied through the WCWSS. Applications may however be made to DWAF for System water, or for the licensing of additional sources. With regard to the allocation of possible resources to be used in supply (either from the System, or a licence to use local resources), DWAF will first focus on ensuring that adequate steps are taken by local authorities to firstly implement the broad principles of Water Conservation and Demand Management (effluent re-use, savings, leakage reduction, invasive alien plant removal, etc) and other reconciliation interventions.<br><br>Where consideration is given to the development of new schemes for local supply, DWAF will require first that the emphasis be placed on the development of local resources by that local authority. Groundwater will often be the preferred resource and DWAF will insist on proper groundwater investigations. Technical guidance will be made available from DWAF where possible and appropriate. More supportive technical assistance will be considered only where the towns do not have adequate resources themselves. |
| | From this it is clear that the responsibility for resolving local water supply problems lies with the local authority. DWAF is nevertheless responsible for the overall management of the resource and will, before authorising any new allocation, take steps to ensure that the local authorities have access to the necessary information for decision-making, and that they have taken all possible steps to manage the existing allocation carefully. |
| | IDPs and WSDPs should include a review of supply options (as per Table 6.3.1), indications of growth rates and plans for growth, and trends in the use of water (e.g. shifts from pit latrines to water borne sewerage). Water Supply and Sanitation Systems must be appropriate to available supply and the ability of the resource to handle discharges. DWAF will support the preparation of these documents through the provision of ideas, information, and technical expertise. |

| 6.1 | SUPPLY TO LOCAL AUTHORITIES (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | Local authorities need to be assisted by DWAF in the planning of local schemes. The following actions are required in this regard:<br><br>a. Study available IDPs and WSDPs and check for alignment with the ISP in terms of water conservation and demand management, future supply, as well as projections of future requirements.<br>b. Liase with local authorities and District Municipalities where this is not the case to ensure that alignment is reached, either through adjustments to the IDP / WSDPs or to the ISP.<br>c. Develop and provide local authorities with the principles against which DWAF will license water use.<br>d. Indicate to the local authorities the degree to which support could be provided by the Department.<br>e. Develop a specific strategy for the provision of water to Tulbagh. |
| **Responsibility:** | The implementation of the **Local Supply Strategy** is the responsibility of the RO, providing guidance to local authorities and in consultation with the Directorate: National Water Resource Planning. |
| **Priority:** | Priority 2 – High importance. Ongoing implementation over the long term. |
| **Interfaces:** | **a. Relevant documentation:**<br><br>a1: NWRS: Chapter 2<br>a2: Berg Water Resource Situation Assessment Report: Chapter 4<br>a3: Appendix 2 : Potable Water Supply Schemes<br>a4. Appendix 8 : Old and New Municipalities<br><br>**b. Linked ISPs / WMAs:**<br><br>None**.**<br><br>**c. Other role players and their functions:**<br><br>Local authorities : They are responsible for the implementation of local supply schemes.<br><br>**d. Related Strategies:**<br><br>1.1: Reliability of the yield balance<br>1.3: Groundwater<br>3.5: Pollution control<br>4.1: Water conservation and demand management: Water Services<br><br>**e. Linked mapping:**<br>Figure 3.5.1 - Municipal boundaries and waste disposal sites |

**TABLE 6.3.1 CURRENT AND POTENTIAL SUPPLY OPTIONS TO TOWNS IN THE BERG WMA**

| District Municipality / METRO | Local Municipality | Towns | Current Source of Supply | Future Source of Supply |
|---|---|---|---|---|
| CITY OF CAPE TOWN | CCT | All towns within the CCT. | The WCWSS | The WCWSS |
| WEST COAST DISTRICT MUNICIPALITY | Berg River Municipality | Aurora | Groundwater abstraction from the Skurweberg Aquifer using 6 boreholes on Grootkloof Farm. Yield is approximately 8 *l*/s. Water quality is good. Because of the high iron content which is easily removed, treatment is required. | Additional utilisation of groundwater. |
| | | Piketberg | Local spring provides good quality water at a yield of approximately 5 *l*/s. Since 1995, supply to the town has been augmented from the Withoogte WTW, supplied from Misverstand Weir. | First investigate groundwater utilisation. Alternatively Voëlvlei Dam, pending implementation of Voëlvlei Augmentation Scheme. |
| | | Porterville | Local supply from a mountain spring. | Possible development of TMG groundwater resources in the vicinity. |
| | | Hopefield | These towns are supplied by the West Coast District Municipality, which acquires water from the Berg River / Saldanha Regional Scheme.<br><br>Water is abstracted from Misverstand Weir, treated at Withoogte Purification Works, pumped to Vergeleë Reservoir and distributed. | First option is the possible development of local resources in the intergranular aquifers/reservoirs.<br><br>Voëlvlei Dam, pending implementation of Voëlvlei Augmentation Scheme. |
| | | Langebaan | | |
| | | Paternoster | | |
| | | Laaiplek | | |
| | | Veldrift | | |
| | | Saldanha | | |
| | | Vredenburg | | |
| | Swartland Municipality | Darling | These towns are supplied from the Berg River / Swartland Schemes, which receives bulk water from Voëlvlei Dam, treated at the Swartland Purification Works. | |
| | | Koringberg | | |
| | | Riebeek-Wes | | |
| | | Riebeek-Kasteel | | |

**TABLE 6.3.1 (Cntd) CURRENT AND POTENTIAL SUPPLY OPTIONS TO TOWNS IN THE BERG WMA**

| District Municipality | Local Municipality | Towns | Current Source of Supply | Future Source of Supply |
|---|---|---|---|---|
| WEST COAST DISTRICT MUNICIPALITY | Swartland Municipality | Hermon | Supplied from the Berg River / Swartland Scheme. | First option is the possible development of local groundwater resources.<br><br>Voëlvlei Dam, pending implementation of Voëlvlei Augmentation Scheme. |
| | | Gouda | | |
| | | Moorreesburg | | |
| | | Yzerfontein | From Voëlvlei Dam via the Swartland Purification Works as well as individual developments of the intergranular/reservoir. | |
| | | Malmesbury | 0,25 million $m^3$/a from local supply (Perdeberg Dam). Also from Voëlvlei Dam via the Swartland Purification Works. | |
| BOLAND | Witzenberg Municipality | Tulbagh | Local supply from Moordenaarskloof stream as well as from local springs. Shortages occur in summer. | Development of local groundwater resources in the vicinity. The alternative is an Inter Basin Transfer from the Breede WMA (Michell's Pass Diversion). |
| | Drakenstein Municipality | Paarl | From local supply out of two dams (Nantes and Bethel), which store abstracted winter water from the Berg River, as well as from the Wemmershoek Scheme. | Minor augmentation of supply to local dams from the Berg River. Also additional supply from the WCWSS. |
| | | Saron | Abstracts water from the Leeu River from where it is piped over 8km to a reservoir in the town. The water is chlorinated before being distributed. | Investigate groundwater resources.<br>Additional abstraction from the Leeu River. |
| | | Wellington | 80% of supply is from the Wemmershoek Scheme. A small component of local supply from Antoniesvlei in Bains Kloof. | Minor augmentation of existing local schemes. Also additional supply from the WCWSS. |
| | Stellenbosch Municipality | Franschhoek | Local supply from streams in the Mount Rochelle Nature Reserve can be supplemented via a new pipeline from Wemmershoek. | Additional supply from boreholes. Also from the CCT's pipeline off-take at the Berg River siphon (from the Riviersonderend Berg Tunnel) to Wemmershoek Dam or from the Berg River Dam. |
| | | Pniel & Kylemore | Local supply from mountain streams via small reservoir. Supplemented by Stellenbosch Municipality | Supplement supply from the Banhoek Irrigation Scheme, which abstracts water from the Banhoek shaft of the Riviersonderend Berg Tunnel. |
| | | Stellenbosch | Local abstractions from the Eerste River. Excess winter water stored in two off-channel dams (Idas Valley). | Additional abstraction from the Stellenboschberg tunnel outlet, to Paradyskloof Treatment Works. |

## SECTION 7: SOCIAL STRATEGY

The Department of Water Affairs and Forestry recognises that no decision regarding the use of water resources should be made without due consideration of the social, economic and ecological impacts of such a decision. Together with the technical and economical aspects this multi-faceted decision base has become more and more necessary as the resource becomes ever more scarce.

It is important that DWAF highlights the social aspects of its agenda. These are already very clear in the quest for equity, in the support for resource poor farmers, in the water supply and sanitation programme, and in the poverty alleviation drive, but it is nevertheless very important that any decision by DWAF remains transparent and that the Department never loses sight of its social responsibilities. Extensive public participation has been mandated through the NWA for many DWAF activities and those strategies appearing in this ISP with a strong social and public participation component are:

- Strategy for Supply to Local Authorities
- Groundwater Strategy
- Pollution Control Strategy
- Water Conservation and Demand Management Strategies
- Institutional development and support Strategies
- Changing land use – Clearing of Invasive Alien Plants Strategy
- ISP Implementation Strategy

DWAF is required to include the public in much of its management and decision–making process and the ISP Implementation Strategy (No 10.1) should be aimed at putting this into effect for the ISP process.

# SECTION 8: WATERWORKS DEVELOPMENT AND MANAGEMENT STRATEGIES

Options for the future ownership of major water resource infrastructure currently owned and operated by DWAF, is being investigated at national level. In the interim, there is an ongoing need to manage the existing DWAF water resource infrastructure. New infrastructure must also be timeously planned - particularly National Infrastructure and local bulk supply schemes that will later become the responsibility of the CMA.

In the Berg WMA, ownership of major water resource infrastructure involves both DWAF and the CCT, while small schemes are operated by various water user associations, water service providers and authorities, as well as private users. This is of relevance when considering the operation, management and safety aspects of the individual infrastructure components. Of particular importance is the integrated operation, management and planning relating to the WCWSS as a whole, as well as the future implementation of new schemes.

Seven strategies have been identified for development, namely:

8.1 Strategy for System Management and Reconciliation
8.2 Theewaterskloof Tunnels
8.3 Implementing the Berg Water Project
8.4 Strategy for the Lower Berg
8.5 Operation during extreme drought
8.6 Recreation on dams and rivers
8.7 Public health and safety

| 8.1 | STRATEGY FOR SYSTEM MANAGEMENT AND RECONCILIATION |
|---|---|
| **Management objective:** | To optimise the integrated operation of the Western Cape Water Supply System (WCWSS). |
| **Background information:** | The WCWSS is operated in an integrated, shared manner with the major components of infrastructure predominantly owned and operated by DWAF and the CCT. Some local authorities own and operate their own schemes, but most of them receive supplementary water from the WCWSS when required.<br><br>The Broad Overview (Chapter 2, of Part 1) describes the various regional and local bulk water supply schemes and Appendix 2 summarises the existing potable water supply schemes.<br><br>Appendix 6 lists the details pertaining to the existing irrigation boards. Major dams are listed in Appendix 11, which also provides information on the characteristics of each dam.<br><br>The details of possible future bulk water supply schemes within the Berg WMA are given in Appendix 10.<br><br>The WCWSS supplies water to the CCT, the West Coast District Municipality, to irrigators along the Upper Berg and Eerste Rivers, and to irrigators in the Swartland. The integrated nature of the system and ownership of the infrastructure within it, has necessitated an integrated management approach. Through the Western Cape Planning Model Committee (consisting of DWAF, the CCT and all major urban and agricultural stakeholders), operating rules have been developed for managing the system in the most efficient way. This approach is to be encouraged to ensure that yield is optimised and the risks of spillage from the system, reduced.<br><br>DWAF has commissioned a pre-feasibility study to identify the potential sources of water supply to the area served by the West Coast District Municipality. This is currently in progress and includes interventions such as the implementation of WC/DM, effluent re-use, removal of riparian alien invasive plants, water trading and improved operation of Misverstand Dam (refer to the Water Quality Strategy, No 2.4). The potential development of new schemes to augment the yield out of Voëlvlei Dam is also addressed. The available yield is subject to the classification of the Lower Berg River and the resulting requirement of the Reserve.<br><br>The Department's intention is to undertake a *WCWSS Reconciliation Strategies Study*, to commence in the 2004/05 financial year. The proposed approach is that the system should be updated on a regular, almost continuous basis, with smaller but more frequent research and information inputs regarding the review of requirements, availability, reconciliation interventions and an implementation strategy. |
| **Strategic Approach:** | The WCWSS is dependent on the supply of water from inter-basin transfers out of the Breede WMA. This interdependency must be taken into account during all planning of water resource development. Priorities need to be defined as to which users should receive preference such that the economic development of the Western Cape as a region is ensured.<br><br>The Berg Water Project and any other future augmentation options, including options to augment the supply of water to the West Coast must be considered as part of any future development of the WCWSS, on which this region is also dependent. |

| 8.1 | STRATEGY FOR SYSTEM MANAGEMENT AND RECONCILIATION (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | To optimise the efficiency of the operation and management of the WCWSS in an integrated manner and to develop reconciliation strategies to ensure adequate assurance of supply to all users of water from the system and equitable allocations during normal droughts. |
| **Responsibility:** | The implementation of the **System Management and Reconciliation Strategy** is the responsibility of the RO in conjunction with the Directorate: National Water Resource Planning and the Directorate: Planning Systems. |
| **Priority:** | Priority 1 – Very high. To be implemented on an ongoing basis. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: Western Cape System Analysis<br>a2: Berg Water Resource Situation Assessment Report: Chapter 4<br>a3: Appendix 2 : Potable Water Supply Schemes<br>a4: Appendix 6 : Existing Irrigation Boards<br>a5: Appendix 10 : Possible Future Bulk Water Schemes<br>a6: Appendix 11 : Major Dams<br><br>**b. Linked ISPs / WMAs:**<br>None.<br><br>**c. Other role players and their functions:**<br>CCT : Owner of major water resource infrastructure components.<br><br>**d. Related Strategies:**<br>3.8 Water pricing<br>5.2 Co-operative governance<br>8.2 The Theewaterskloof Tunnels<br>8.3 Implementing the Berg Water Project<br>8.4 Strategy for the Lower Berg<br>8.5 Operation during extreme drought<br>8.6 Recreation on dams and rivers<br>8.7 Public health and safety<br><br>**e. Linked mapping:**<br>None. |

| 8.2 | THE THEEWATERSKLOOF TUNNELS |
|---|---|
| **Management objective:** | To improve the operation and maintenance of the Theewaterskloof Tunnel system, which forms an integral part of the infrastructure of the WCWSS. |
| **Background information:** | The Riviersonderend-Berg River Government Water Scheme includes the tunnel system for the major inter-basin transfers between the Breede and Berg WMAs. The tunnel extends from the inlet/outlet works at Theewaterskloof Dam to the Kleinplaas balancing dam on the Jonkershoek River, via the Berg River Siphon. The Stellenboschberg Tunnel extends from Kleinplaas Dam, through the Stellenboschberg Mountains to the tunnel outlet. A short branch tunnel (Dasbos Tunnel) and the outlet into the Berg River are located near Franschhoek.<br><br>The tunnel section between Theewaterskloof Dam and Kleinplaas Dam is equipped with two vertical inlet shafts for diverting the river flows at the Wolwekloof and Banhoek Weirs into the tunnel. By operating the control valves at Kleinplaas Dam, this section of the tunnel is capable of bi-directional flow. Water is transferred from Theewaterskloof Dam into the Berg WMA in summer. During winter, water from the Banhoek and Wolwekloof Weirs is transferred in the opposite direction for storage in Theewaterskloof Dam. The Charmaine Shaft serves to assist de-watering, which is primarily carried out via the tunnel outlet at the Berg River siphon.<br><br>The operation and maintenance of the tunnel system is subject to a number of shortcomings. These include:<br><br>• Cumbersome dewatering operations<br>• Limited access for maintenance and repair work<br>• Debris accumulation at the weirs feeding the vertical inlet shafts.<br>• Access to the weirs is difficult during periods of high rainfall<br>• Alkali aggregate reaction damage is evident at Kleinplaas Dam and at the Wolwekloof and Banhoek Weirs.<br>• Limited ability to maintain supply to Cape Town during emergency closure. |
| **Strategic Approach:** | Whilst there are operating options available in terms of reducing spillage from the storage dams in the WCWSS, the critical infrastructure component remains the tunnel system between the Breede and Berg WMAs. There is no alternative means of transferring water between these two WMAs in the event of emergency tunnel closure, with potentially dire consequences for the CCT and irrigators. Emergency supply measures to the city must be identified for potential durations of tunnel closure. The Berg Water Project will offer some potential in this regard, through the construction of a water purification works and reticulation infrastructure to supply the city directly from the Berg River Dam, in isolation of the tunnel system.<br><br>In light of the critical importance of these tunnels to the region, attention must be paid to remedial work required to improve the de-watering of the tunnels, the operation of the shafts and the Kleinplaas balancing dam. |

| 8.2 | THE THEEWATERSKLOOF TUNNELS (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | Develop a detailed strategy for the operation, maintenance and disaster management for the Theewaterskloof tunnel system. The following actions are required:<br><br>**OPERATION AND ROUTINE MAINTENANCE ACTIONS**<br>a. The construction of a suitable access adit in the vicinity of the intersection of the Charmaine Shaft or the Berg River siphon should be considered during the implementation of the Berg Water Project design.<br>b. The existing operation and ongoing maintenance procedures for the tunnel system should be documented by the RO, in conjunction with CCT.<br>c. The extent of leakage in the shaft at Kleinplaas Dam to be established and repairs considered to ensure improved and safe access to the valves. Attention to be paid to the possible cavitation occurring at the Kleinplaas Dam control valves and the extent of leakage into the access shaft. Inspection and possible repair of alkali aggregate damage to Kleinplaas Dam and other components of the system (inlet weirs, shafts, etc).<br><br>**DISASTER MANAGEMENT ACTIONS**<br>a. Emergency supply arrangements to Cape Town in the event of tunnel closure need to be developed and documented for various durations of possible closure (days, weeks, months).<br>b. The opportunity to develop an emergency supply system (treatment works, pump station, reticulation) should be considered as part of the Berg Water Project design. |
| **Responsibility:** | The implementation of the Strategy for the **Theewaterskloof Tunnels** is the responsibility of the RO in conjunction with the Directorate: National Water Resource Planning, the Directorate: Planning Systems and in consultation with the CCT. |
| **Priority:** | Priority 1 – Very high. To be implemented in parallel with the Berg Water Project. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: Western Cape System Analysis<br>a2: Berg Water Resource Situation Assessment Report: Chapter 4<br><br>**b. Linked ISPs / WMAs:**<br>None.<br><br>**c. Other role players and their functions:**<br>CCT : Owner of major infrastructure components of the Western Cape Water Supply Scheme.<br><br>**d. Related Strategies:**<br>3.8 Water pricing<br>5.2 Co-operative governance<br>8.1 Strategy for system management and reconciliation<br>8.3 Implementing the Berg Water Project<br><br>**e. Linked mapping:**<br>None. |

| 8.3 | IMPLEMENTING THE BERG WATER PROJECT |
|---|---|
| **Management objective:** | To optimise the implementation of the Berg Water Project within the existing WCWSS, allowing for improvements to the existing transfer system infrastructure, safety of downstream users and appropriate Reserve release operation. |
| **Background information:** | The Berg Water Project will consist of two sub-schemes, namely the Berg River Dam and the Berg River Supplement Scheme. The proposed overall scheme will consist primarily of:<br>• The construction of the Berg River Dam on the Berg River at La Motte forestry plantation near Franschhoek.<br>• The Dasbos pump station situated just downstream of the dam, with a pipeline to deliver water to the Dasbos Tunnel entrance of the existing Theewaterskloof Tunnel system.<br>• Abstraction works on the Berg River downstream of the Dwars River confluence, with the Drakenstein pump station and delivery pipeline connecting to the Berg River Dam.<br><br>Agreements have been entered into between DWAF and the Trans Caledon Tunnel Authority (TCTA), and between DWAF and the CCT for the Berg Water Project as follows:<br>• In terms of the Agreement between DWAF and TCTA, TCTA will act as the implementing agent for the design and construction of the BWP and also for the funding of the capital cost thereof. DWAF will be responsible for the repayment of the capital plus finance charges to TCTA over a period of 25 years and for the operation of the BWP as an integral part of the WCWSS while complying with the requirements of the Reserve and the Dam Safety Office.<br>• In terms of the agreement between DWAF and the CCT, the CCT will repay to DWAF the full capital cost of the project through the sale of water to the City less the capital cost component of any sales of water to other authorities. DWAF's operating costs of the BWP will be shared by all users of the WCWSS.<br><br>The following operating issues and concerns were identified:<br>• The proposed Reserve releases are significant (65 – 200 $m^3/s$) and the human factor in controlling such flood releases can impact on the safety and property of downstream inhabitants.<br>• Certain rainfall and flow gauging stations in the upper reaches of the Berg River should be monitored as part of a flood warning system for the 200 $m^3/s$ releases as well as the Wemmershoek Dam releases.<br>• The timing of and level in the Berg River Dam from which the Reserve low flow and flood releases are to be made must still be planned, and operating rules for the releases formulated to ensure that water of acceptable temperature and quality is released into the river.<br>• Rules for operating the Supplement Scheme and releasing the Reserve.<br>• Possible water quality impacts from aquaculture activities. |
| **Strategic Approach:** | The Berg Water Project for which construction is due to be completed by 2007, will add an additional 81 million $m^3/a$ to the yield of the WCWSS. This is intended primarily for the CCT. The design is such that Reserve releases simulating floods of up to 200 $m^3/s$ will be possible. This capacity to release water up to such a significant rate, ensures that the project will ultimately be able to accommodate the Reserve requirements for the Berg River, once these have been finally determined. In so doing the opportunity to improve the ecological condition of the river will be possible. |

| 8.3 | IMPLEMENTING THE BERG WATER PROJECT (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br>a. Adequate flood warning systems upstream of the dam and at Wemmershoek Dam to ensure appropriate timing and magnitude of Reserve releases.<br>b. Installation of landline telephones to remote gauging stations is recommended, particularly where cellular reception is unreliable or unavailable.<br>c. Planning of arrangements and development of operating rules for making the Reserve releases.<br>d. Adequate training of personnel for operation of infrastructure is paramount to safe operation of releases. |
| **Responsibility:** | The implementation of the **Berg Water Project Strategy** is the responsibility of the RO (existing infrastructure), the Directorate: Options Analysis and the implementing agent (TCTA). |
| **Priority:** | Priority 1 – Very high. To be implemented from the design stage. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: Skuifraam Dam Feasibility Study<br>a2: CMC Integration of Raw Water Sources supplying the CMA<br>a3: Appendix 10: Possible Future Bulk Water Schemes<br><br>**b. Linked ISPs / WMAs:**<br>None.<br><br>**c. Other role players and their functions:**<br>CCT (primary water user), TCTA (implementing agent)<br><br>**d. Related Strategies:**<br>2.1 Reserve and resource quality objectives<br>3.8 Water pricing<br>8.2 The Theewaterskloof Tunnels<br>8.4 Strategy for the Lower Berg<br>8.6 Recreation on dams and rivers<br>8.7 Public health and safety<br>9.2 Monitoring networks and data capture<br><br>**e. Linked mapping:**<br>None. |

| 8.4 | STRATEGY FOR THE LOWER BERG |
|---|---|
| **Management objective:** | The improved management and operation of the Lower Berg System, which forms an integral part of the WCWSS and supply to the West Coast and Swartland. |
| **Background information:** | The Swartland and West Coast regions are among those users reliant on water from the Voëlvlei Government Water Scheme, of which Voëlvlei Dam (off-channel storage) forms an integral part. The natural catchment of the dam itself is only 31 $km^2$. Three diversion weirs, one on each of the Klein Berg, Leeu and Twenty Four Rivers feed a canal system which transfers water from these rivers into Voëlvlei Dam. Raw water from Voëlvlei Dam is released via a canal into the Lower Berg River.<br><br>The Swartland Purification Works abstracts water directly from this canal. The Withoogte Purification Works abstracts water further downstream at Misverstand Dam, for supply to the Saldanha and West Coast regions. The Voëlvlei Purification Works is situated at Voëlvlei Dam and supplies water to the CCT via a pumping pipeline to Plattekloof Reservoir, from where it is distributed.<br><br>The current operation and maintenance of the system has a number of shortcomings. These include:<br><br>• Alkali aggregate damage to the feeder canals.<br>• Leakage from the 24 Rivers siphon under the Klein Berg River.<br>• Water quality problems in the Klein Berg River, which feeds Voëlvlei Dam, causing algal blooms in the reservoir.<br>• Limited telemetry for monitoring abstractions from the river.<br>• Absence of remote sensing to co-ordinate releases from Voëlvlei Dam.<br>• Spills from Voëlvlei Dam outlet canal.<br>• Inappropriate flow release mechanism at Misverstand Dam.<br>• Operation of abstractions at Misverstand Dam could be improved.<br>• Occasional high salinities of abstractions at Misverstand Dam when high salinity runoff from the local catchment occurs.<br><br>*The following specific issues and concerns were identified in the Lower Berg*:<br><br>**<u>OPERATION AND ROUTINE MAINTENANCE ISSUES</u>**<br><br>• Voëlvlei Dam is stressed and is likely to be further stressed by the increasing demands in the expanding West Coast/Saldanha region.<br>• The Leeu and Twenty Four Rivers weirs are alkali aggregate damaged and are silted.<br>• The Klein Berg canal feeding Voëlvlei Dam leaks. Repairs will be costly and only selected slabs have been replaced to date.<br>• The Klein Berg siphon leaks and requires maintenance.<br>• Monitoring of abstractions from the Berg River downstream of Sonquasdrift (near Hermon) is not currently possible as no telemetry is in place.<br>• There is no flow gauging in the Berg River downstream of Misverstand Dam.<br>• Releases from Misverstand Dam are via a bottom gate outlet, unsuitable for controlled releases.<br>• The water quality in the Klein Berg River is poor and the CCT has requested that DWAF bypass the first winter flows to reduce the impact on Voëlvlei Dam water quality.<br>• Sanity in and downstream of Misverstand Dam may exceed 400mg/*l* for extended periods and affect certain West Coast industrial users and irrigators. (Refer to Water Quality Strategy, No 2.4) |

| 8.4 | STRATEGY FOR THE LOWER BERG (cntd) |
|---|---|
| **Background information (cntd)** | **OPERATION AND ROUTINE MAINTENANCE ISSUES (cntd)**<br><br>• Voëlvlei Dam outlet canal is undersized and spills into an adjacent farm dam.<br>• There is no remote sensing facility between Voëlvlei Dam and Misverstand Dam to control releases from the former and reduce spills from the latter.<br>• Unless operated at full supply level, air is sometimes drawn in at the chamber feeding the Withoogte Pump Station from Misverstand Dam. Remedial measures have been implemented and the problem has improved.<br><br>**DISASTER MANAGEMENT**<br><br>• Repair work to the feeder canals and the Klein Berg Siphon will impact on the supply of water into Voëlvlei Dam.<br>• Repairs to the Klein Berg siphon may not be possible in one dry season and will impact on the flow into the dam if repair work extends into the winter months. |
| **Strategic Approach:** | The focus of the management of the WCWSS, is on the prevention of spills. However, no automated systems are in place between Misverstand Dam and Voëlvlei Dam, with the result that water released from Voëlvlei is sometimes spilled from Misverstand. The installation of telemetry to automatically control releases and reduce spillage from the system, is seen as essential (and highly cost effective).<br><br>The operation and maintenance of the diversions, canals and the Klein Berg siphon that feed Voëlvlei Dam are critical to ensuring that the yield of the dam is optimised. The current operation and maintenance procedures for this infrastructure must be documented and extended to include the way in which repairs to the feeder canals and siphon can be undertaken with least impact on the yield of the dam. |

| 8.4 | STRATEGY FOR THE LOWER BERG (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | Develop a detailed strategy for the operation, maintenance and disaster management for the Lower Berg system. The following actions are required:<br><br>**OPERATION AND ROUTINE MAINTENANCE ACTIONS**<br><br>a. Reassess the timing for the implementation of the proposed Voëlvlei Augmentation Scheme in relation to the Berg Water Project. The introduction of the Voëlvlei Augmentation Scheme is possibly required ahead of the completion of the Berg Water Project.<br>b. An assessment of the extent of repairs to the weirs, feeder canals and the 24 River siphon under the Klein Berg River that feed Voëlvlei Dam is required.<br>c. The flushing in the Klein Berg River should be evaluated prior to the intended start of diversion, each year. Early rains that may occur in some years, might produce sufficient flushing, in which case the bypass may not be necessary every year.<br>d. The proposed weir downstream of Misverstand Dam should be constructed and long term flow gauging implemented.<br>e. Telemetry along the Berg River downstream of Sonquasdrift is to be considered for monitoring of abstractions.<br>f. Overtopping of the canal from Voëlvlei Dam is not considered to be a major concern but upgrading of the canal is to be given consideration.<br>g. To reduce spills from Misverstand Dam, a remote sensing facility to control Voëlvlei releases is recommended.<br>h. The Voëlvlei Water Quality Forum is investigating the causes of water quality problems in Voëlvlei Dam. This includes the management of water quality in the catchment of the Klein Berg River and in Voëlvlei Dam.<br>i. Raising of Misverstand Dam to be considered so as to reduce air intake at the Withoogte abstraction.<br>j. Consideration to be given to replacing the existing bottom gate outlet at Misverstand Dam with sleeve valves.<br>k. The existing operation and maintenance procedures for the Lower Berg System should be documented, reviewed and amended, if considered necessary.<br>l. Means of managing abstractions from Misverstand Dam to provide water of acceptable salinity for the industrial development at Saldanha Bay should be investigated.<br><br>**DISASTER MANAGEMENT ACTIONS**<br><br>a. Emergency supply procedures need to be developed, in the event of repair work being required to the canals or the Klein Berg siphon.<br>b. Integrate any disaster management plans with the Disaster Management Bill of January 2002.<br>c. Possible sabotage of infrastructure to be addressed. |
| **Responsibility:** | The implementation of the **Lower Berg Strategy** is the responsibility of the RO (existing infrastructure), the Directorate: Options Analysis (feasibility analysis of new infrastructure) and the Directorate: National Water Resource Planning (all planning in the system context). |
| **Priority:** | Priority 1 – Very high. Decisions regarding the implementation of the augmentation schemes are required. |

| 8.4 | STRATEGY FOR THE LOWER BERG (cntd) |
|---|---|
| **MANAGEMENT ACTIONS (cntd)** | |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: Berg Water Resource Situation Assessment Report: Chapter 4<br>a2: CMC Integration of Raw Water Sources supplying the CMA<br>a3: Voëlvlei Augmentation Scheme<br>a4: Appendix 10 : Possible Future Bulk Water Schemes<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>CCT : Receives approximately 70 million $m^3$/a from Voëlvlei Dam.<br>West Coast District Municipality : Reliant on the Swartland and Saldanha Schemes<br><br>**d. Related Strategies:**<br>1.1 Reliability of the yield balance<br>2.1 Reserve and resource quality objectives<br>2.4 Water quality<br>3.5 Pollution control<br>3.8 Water pricing<br>8.3 Implementing the Berg Water Project<br>8.6 Recreation on dams and rivers<br>8.7 Public health and safety<br>9.2 Monitoring networks and data capture<br><br>**e. Linked mapping:**<br>None |

| 8.5 | OPERATION DURING EXTREME DROUGHT |
|---|---|
| **Management objective:** | The development of an operational plan defining the provision of water to users during severe drought conditions, under which normal restrictions are no longer effective. |
| **Background information:** | Users of water from the WCWSS, and most critically Cape Town and environs, will increasingly experience the effects of drought as demands grow and exceed the yields of the sources of supply. Restrictions on use may quite often be required and these have significant economic consequences. The duration of a drought cannot be accurately predicted and when indications suggest the onset of a particularly dry period, water in storage dams must be used judiciously. When restrictions are put in place, the water allocated to meet basic human needs receives priority, followed by strategically important uses.<br><br>Through the Western Cape Planning Model Committee (DWAF, the CCT and all other major urban and agricultural stakeholders) recommendations regarding water restrictions are presented to the Minister who finally decides on the imposition of restrictions or not. As such water shortages (common to the Western Cape) are effectively managed in this way.<br><br>However a strategy defining how water will be provided to users during periods of extreme drought (water crisis situation) is not in place. A requirement of the NWRS is that the Department will co-operate with the National Department of Agriculture, which leads the drought working group established by the National Disaster Management Centre, in developing prevention and mitigation measures for drought conditions. |
| **Strategic Approach:** | Water resource management during drought is a function of both water supply and demand. The greater the demand and the smaller the supply the more susceptible the users become to drought. This requires keeping a close eye on the most likely user development scenario and ensuring that steps are taken to keep supply in tune with demand. WC/DM implementation is an ongoing priority.<br><br>Over and above the standard restrictions, the operation of the system under increased severities of drought needs to be defined. There is no formal strategy in place defining how the WCWSS should be operated during severe drought, from whence emergency water supply will be provided and which users will be required to sacrifice water for the benefit of others.<br><br>One mechanism to deal with extreme drought is short-term water trading across sectors. This would entail one sector sacrificing all or part of its allocation for use by another sector. In the Western Cape this is most likely to be via compensating agricultural losses for emergency water supply to urban users. The increased use of groundwater (under emergency conditions) is a further option.<br><br>Other options include the increased use of treated effluent, the de-salination of seawater, the utilisation of dead storage in the Theewaterskloof and Misverstand Dam (40 and 5 million $m^3$ respectively) and the possibility of utilising storage in the Kogelberg / Rockview Dam, which would severely affect the operation of the Palmiet Pumped Storage Scheme. The effluent re-use option and the de-salination option would both require significant infrastructure development to be put in place (treatment plants and reticulation), before being able to function as emergency supply options.<br><br>It would appear that the most feasible arrangement would be through short-term water trading and financial compensation to those users sacrificing their primary water needs for the benefit of others. |

| 8.5 | OPERATION DURING EXTREME DROUGHT (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. A review and documentation of procedures adopted during previous droughts highlighting shortcomings and successes.<br>b. Identify the priority of sectoral water requirements under extreme drought conditions.<br>c. Investigate the scale of balance between sacrifices made by the agricultural sector (taking financial compensation into account) in meeting the needs of the urban sector during extreme drought.<br>d. Assess the possibility for emergency supply out of the TMG aquifer to the urban sectors in the Berg WMA, during periods of extreme drought.<br>e. Evaluate the feasibility of establishing emergency de-salination facilities and increased effluent re-use for meeting essential needs during extreme drought events.<br>f. Protocols need to be developed between the Breede and Berg WMAs with regard to the possible increase in supply of water from the Breede to the Berg as a drought alleviation option.<br>g. Determine the measures and protocols that would be necessary to access the dead storage in the Theewaterskloof and Misverstand Dam and possibly also the storage in the Kogelberg / Rockview Dam. |
| **Responsibility:** | The implementation of the Strategy for **Operation During Extreme Drought** is the responsibility of the RO in conjunction with the Directorate: National Water Resource Planning. |
| **Priority:** | Priority 4 – Low. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 14, Part 3<br>a2: NWRS: Chapter 3, Part 7<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>CCT : Owns water resource infrastructure<br>Department of Agriculture : Responsible for managing the impacts of drought<br><br>**d. Related Strategies:**<br>4.1 Water conservation and demand management: Water Services<br>4.2 Agricultural water conservation and demand management<br>8.1 Strategy for system management and reconciliation<br>8.6 Recreation on dams and rivers<br>8.7 Public health and safety<br><br>**e. Linked mapping:**<br>None |

| 8.6 | RECREATION ON DAMS AND RIVERS |
|---|---|
| **Management objective:** | To identify and implement the zoning policy on existing and new dams and to manage recreational activities on the inland water bodies of the WMA. |
| **Background information:** | The NWA defines recreation on rivers and dams as a water use. General Authorisations have been developed to establish the limits within which water resources may be used for recreational purposes. There is an existing policy in place for zoning of dams, concessions, and stakeholder involvement as far as recreational use is concerned.<br><br>The Berg River WMA holds one of the biggest metropolitan areas in the country. Many of the population are 'immigrants' from very poor parts of the country seeking jobs and new lives. Although outdoor recreational opportunities abound in both the Berg and Breede WMA with expanses of both mountain and coastline, the growing population, pressure of urban living, and squalor of squatter settlements places a particular responsibility on DWAF to ensure that dams and rivers under its control are open to recreational use - and particularly use by the disadvantaged, although these may not be the traditional users of such facilities.<br><br>The Berg River in particular, is of significant recreational importance in the WMA, one notable event being the Berg River Canoe Marathon between Paarl and Velddrif. The dams in the Berg WMA also offer recreational opportunities. In particular, Voëlvlei Dam is used extensively for fishing and non-motorised water sports. The Berg River Dam will offer further opportunities for recreation. |
| **Strategic Approach:** | In the Berg WMA, DWAF sees its role as being to maximize recreational benefit from the use of state assets. At the same time this should not be at unreasonable cost to other water users. The RO needs first to list and categorise all those dams and rivers that serve as 'recreational assets' in this WMA. The status of management of these assets, and the likely negative impacts which current use might have, need to be evaluated. At the same time the very real social benefits of the recreational opportunities provided by dams and rivers need to be taken into account. No asset should be further restricted or closed to use without very close consideration of the social cost that this might carry, and such a decision should not be taken lightly. |

| 8.6 | RECREATION ON DAMS AND RIVERS (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. Review and implement the existing recreational use policy in the Berg WMA.<br>b. Operational procedures should be developed for all those dams which have an impact on recreational use of the Berg River and other rivers in the WMA.<br>c. Identify conditions and operating rules under which releases for recreational use may or may not take place (e.g. during drought years). Releases for recreational purposes should be linked wherever possible to releases also required by the Reserve.<br>d. Focus on the dams which impact on flow in the Berg River, namely:<br>- Berg River Dam<br>- Wemmershoek Dam<br>- Voëlvlei Dam<br>- Misverstand Dam |
| **Responsibility:** | The implementation of the strategy for **Recreation on Dams and Rivers** is the responsibility of the RO. |
| **Priority:** | In view of the importance of the Berg River for recreational purposes, this strategy is of Rank 3 importance. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 12<br>a2: NWRS: Chapter 4, Part 1<br><br>**b. Linked ISPs / WMAs:**<br>None.<br><br>**c. Other role players and their functions:**<br>CCT : Owner of certain water resource infrastructure<br><br>**d. Related Strategies:**<br>5.2 Co-operative governance<br>8.3 Berg Water Project<br>8.4 Strategy for the Lower Berg<br>8.5 Operation During Extreme Drought<br><br>**e. Linked mapping:**<br>None |

| 8.7 | PUBLIC HEALTH AND SAFETY |
|---|---|
| **Management objective:** | The objective of this strategy is in the first instance to prevent water related disasters, and in the second to mitigate the effects of disasters which may occur. This should be done by implementing the strategies and policies which have already been developed through the National Disaster Management Act, as well as those developed by DWAF. |
| **Background information:** | Disaster management planning, floods, dam safety, emergency pollution and droughts are all aspects of water resource management, which impact on public safety. The National Disaster Management Centre, established under the National Disaster Management Act, will be responsible for the development of the National Disaster Management Framework.<br><br>The aspects requiring strategies are dealt with below only at National Level. Strategies outlining issues specific to the WMA, and approaches to these issues, must still be developed.<br><br>**A: DISASTER MANAGEMENT PLANNING**<br><br>DWAF is investigating the establishment of a dedicated public safety unit to deal with its water resources management, relating to disasters and emergencies. These include:<br><br>• Droughts (discussed under Strategy No 8.5)<br>• Naturally occurring floods or dam failures<br>• Dam safety<br>• Pollution of water resources from spills of hazardous or toxic materials<br><br>A typical disaster would be the collapse of the Theewaterskloof Tunnel. This is discussed under Strategy No 8.2.<br><br>The following issues and concerns have been raised:<br><br>• There is a need for each District Municipality to have a disaster management forum.<br>• Emergency Preparedness Plans (EPPs) should be in place for DWAF's dams in the WMA, as should EPPs for private dams (for Category 2 and 3)<br><br>**B: FLOODS**<br><br>The National Disaster Management Centre has established working groups to provide input to the National Disaster Management Framework. DWAF will lead the working group which has been tasked with developing a National Flood Management policy. The policy will include proposals for guidelines and standards, and institutional responsibilities, relating to:<br><br>• The safe operation of large storage dams and protection of downstream areas<br>• The safe and sustainable use of the floodplains of rivers<br>• The appropriate design of services infrastructure situated on or adjacent to rivers<br>• Effective flood warning systems for all flood-prone areas |

| 8.7 | PUBLIC HEALTH AND SAFETY (cntd) |
|---|---|
| **Background information (continued) :** | **C: DAM SAFETY**<br><br>DWAF's Dam Safety Office administers the Act's provisions relating to the safety of all new and existing dams. These provisions ensure that dams are designed, constructed, operated and maintained according to the requirements of approved professional persons to minimise the risk of loss of life or damage to property caused by dam failure or operational shortcomings. All dams with a safety risk must be registered with the Department.<br><br>All dam owners are required to have their dams regularly inspected by an approved professional person and to make any necessary repairs or alterations to ensure the safety of the dam. For Category 2 and 3 dams, dam owners are required to prepare an EPP detailing the actions to be taken in the event of an actual or imminent dam failure, or any other emergency situation relating to the dam.<br><br>DWAF is currently preparing new regulations relating to the safety of dams. The drafting process is expected to be complete in 2003. Thereafter the proposed regulations will be the subject of a public consultation process.<br><br>**D: HAZARDOUS SPILLS**<br><br>DWAF's approach to water quality management is, as far as possible, to promote the reduction of discharges of waste or water containing waste into water resources. In emergency situations, where harmful substances are accidentally or negligently discharged into water resources, the NWA makes those who have caused the pollution responsible for remediating the impacts. At present all pollution incidents must be reported to DWAF, so that appropriate Departmental responses can be co-ordinated with the relevant emergency services and disaster management centres.<br><br>**E: DROUGHTS**<br><br>As discussed under Strategy No 8.5 (Operation during Extreme Drought Strategy). |
| **Strategic Approach:** | 'Public Heath and Safety' has been taken, for the purposes of this ISP to deal strictly with direct water related issues / disaster – notably floods, dam safety, hazardous spills and droughts. Droughts are covered under Strategy No 8.5 (Operation during Extreme Drought). Only the national approach is presented in the Background Information above. Several national policy frameworks are either in place or in development.<br><br>Specific strategies appropriate to specific regional concerns must still be developed. The situation with regard to the Berg WMA needs to be unpacked in more detail and this calls for a local strategy that can refer to the national frameworks provided. Specifically this strategy needs to highlight areas of risk (for example by pin-pointing the sites and chances of hazardous spills, or those areas particularly vulnerable to flood damage, such as dense settlements on floodplains). Contingency plans must be developed and this information widely disseminated amongst both water managers and potentially affected stakeholders. A number of other specific actions that should be included in this strategy are listed below under 'Management Actions'. This ISP has not achieved this, but the development of a thorough Public Health and Safety Strategy must be seen as a Departmental responsibility, and one that should be taken on with concern and immediacy. |

| 8.7 | PUBLIC HEALTH AND SAFETY (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>Develop a Public Health and Safety Strategic Plan for the Berg WMA which focuses on specific concerns in the WMA, but brings the national context strongly to bear.<br><br>**A: DISASTER MANAGEMENT PLANNING:**<br><br>The actions required for appropriate disaster management planning are:<br><br>a. Development of procedures to supply water during periods of partial supply or non-supply due to drought or infrastructure failure.<br>b. Integration of any disaster management plans with the National Disaster Management Framework.<br>c. The establishment of disaster management forums at District Municipality level (DWAF to encourage this).<br>d. Ensure EPPs are in place for all dams (including those owned by other authorities or private owners) of Category 2 and 3.<br><br>**B: FLOODS**<br><br>a. Ensure that suitable flood warning systems are in place.<br>b. Evaluate the need for, and implement, flood-warning systems at those dams where downstream inhabitants or property are at risk.<br><br>**C: DAM SAFETY**<br><br>The actions required regarding dam safety are:<br><br>a. Implement the requirements of the NWA.<br>b. Take action against owners of unsafe dams.<br>c. Ensure dam safety inspections are conducted as required by the Dam Safety Office.<br><br>**D: HAZARDOUS SPILLS**<br><br>The actions required are:<br><br>a. Maintain a register of relevant emergency services and disaster management centres.<br>b. Develop a register of risk sources and areas and prepare emergency plans.<br>c. In the event of a spill, contact the relevant emergency services and disaster management centres.<br>d. Ensure that the polluter remedies the effect of the spill.<br><br>**E: DROUGHTS**<br><br>Refer to Strategy No 8.5 (Operation During Extreme Drought). |
| **Responsibility:** | The implementation of the strategy on **Public Health and Safety** is the responsibility of the RO in conjunction with the Directorate: Policy and Strategy Coordination. |
| **Priority:** | In view of the current development of surface water resources in the Berg WMA, this strategy is of priority 2 – High. Implementation is ongoing. |

| 8.7 | PUBLIC HEALTH AND SAFETY (cntd) |
|---|---|
| **MANAGEMENT ACTIONS (cntd)** | |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWRS: Chapter 3, Part 7<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players and their functions:**<br>CCT<br>Local authorities<br><br>**d. Related Strategies:**<br>5.2 Co-operative governance<br>8.1 Strategy for system management and reconciliation<br>8.3 Implementing the Berg Water Project<br>8.4 Strategy for the Lower Berg<br>8.5 Operation during extreme drought<br><br>**e. Linked mapping:**<br>None |

# SECTION 9: MONITORING AND INFORMATION MANAGEMENT STRATEGIES

To meet the requirement for integrated information the Department is reviewing, and revising where necessary, all data-acquisition, monitoring and information systems. National systems will be designed so that CMAs, when they are established, can take responsibility for information management in their WMAs, as well as have access to information from any other WMAs. The national information system for water services, required by the Water Services Act, will be linked to information systems for water resources.

The Act requires any person, on the request of the Minister, to provide data and information to facilitate the management and protection of water resources. Regulations may be written in this respect.

The Act requires the Minister to establish national monitoring systems for water resources to collect appropriate data and information. This puts a strong responsibility on the Department. The Department operates several monitoring systems that collect some of the required data and information. The Department is addressing the shortcomings of the current arrangements by amalgamating all existing and planned monitoring and assessment systems into a structured and coherent monitoring, assessment and information system.

An important component of the monitoring and assessment strategy will be to develop co-operative, collaborative relationships between the Department and other organisations that also operate water-related monitoring, assessment and information systems. The achievement of this high level of co-operation and information sharing is being piloted in the Berg WMA.

Three strategies have been identified for development, namely:

9.1 Abstraction control strategy
9.2 Monitoring networks and data capture strategy
9.3 Information management strategy

| 9.1 | ABSTRACTION CONTROL |
|---|---|
| **Management objective:** | To facilitate improved control and management of water abstractions, compliance with authorisations and reliable information on actual water use. |
| **Background information:** | The control of over abstraction for use is applicable to both surface and ground water resources. So too are tariff calculations by municipalities, Irrigation Boards, WUAs, and private users.<br>Abstraction control is generally managed through the installation of bulk meters at abstraction points from bulk infrastructure. Abstraction control by service providers and large private users from their own infrastructure is their responsibility but will ultimately become the responsibility of the WUAs.<br>The monitoring of abstractions is necessary to ensure that:<br>• Records of actual water use are kept<br>• Tariff calculations can be made and applied where necessary<br>• Sectoral water use can be determined<br>• Authorisations are complied with<br>The following issues and concerns were identified:<br>• Abstraction of groundwater is poorly monitored<br>• There is a need to ensure adequate technical capacity within local authorities to conduct monitoring of surface and groundwater<br>• There is limited monitoring along the Berg River downstream of Sonquasdrift to monitor (and thus control) abstraction. |
| **Strategic Approach:** | Control of over abstraction is going to become ever more critical as water becomes scarcer and competition for the resource intensifies. This is a particular concern in the case of relatively uncontrolled shared water, such as open aquifers accessed by many different users, and where dam releases are made for selective uptake by farmers further downstream. These are systems open to abuse. However first indications show verification of actual water use to reasonably accurately reflect the use registered by farmers, which suggests a lesser level of concern in this WMA than may be the case in others.<br>Abstraction control must, as far as possible be left in the hands of WUAs, with users expected to care for their collective interests through self-policing. Additional monitoring is always going to be required – particularly on behalf of the Reserve, which is in no position to fight for itself. A strategy for the WMA is required which identifies hot spots and potential trouble spots and then seeks to get the resources in place to implement this first commandment of water management. This must be prepared by the RO as a matter of urgency. |

| 9.1 | ABSTRACTION CONTROL (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. Review the current efficiency and acceptability of abstraction control by DWAF, other service providers and large private users.<br>b. Ensure that the scope of appointment of the WUAs addresses their responsibility in terms of monitoring of abstractions.<br>c. Develop an Abstraction Control Strategy Plan for the Berg WMA. |
| **Responsibility:** | The implementation of the Strategy **Abstraction Control** is the responsibility of the RO, in consultation in with the Directorate: Water Abstraction and Instream Use. |
| **Priority:** | Priority 1 – Very high. To be implemented over the long term. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 14<br>a2: NWRS: Chapter 3, Part 6<br><br>**b. Linked ISPs / WMAs:**<br>None**.**<br><br>**c. Other role players :**<br>CCT of Cape Town<br>WUAs<br>Large private abstractors<br><br>The above role-players are each responsible for monitoring of abstraction to some degree.<br><br>**d. Related Strategies:**<br>2.1 Reserve and resource quality objectives<br>3.2 General Authorisations<br>3.4 Licensing<br>9.2 Monitoring networks and data capture<br><br>**e. Linked mapping:**<br>Figure 3.2.1 : General Authorisations (Groundwater Abstraction) |

| 9.2 | MONITORING NETWORKS & DATA CAPTURE |
|---|---|
| **Management objective:** | The design and implementation of 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. |
| **Background information:** | Resources currently available for monitoring are generally inadequate throughout all existing systems across South Africa. A National Monitoring Strategy is currently being developed by the Department.<br><br>Some notable issues in the Berg WMA relate to inadequate groundwater monitoring, groundwater / surface water interaction and a need to implement estuarine flow gauging.<br><br>*The following specific issues and concerns were identified for the Berg WMA*:<br><br>**A. SURFACE WATER MONITORING**<br><br>**i. WMA**<br>• A base-line monitoring programme of the Berg River is currently in progress to establish the existing biota in the river. This will be used to evaluate the extent of potential impacts of Reserve releases from the Berg River Dam and other potential schemes.<br>• Monitoring of wetlands and estuaries is insufficient.<br>• Monitoring of the interaction between surface and groundwater is insufficient.<br>• There is a need for monitoring of Reserve releases to ensure compliance with the applicable authorisation requirements.<br>• There are a number of major players in the gathering of hydrological information, notably DWAF, CCT, Department of Agriculture, and CSIR. A coordinating committee has already been established.<br>• Global warming is predicted to have a very serious impact on the Western Cape, with a possible 30% reduction in MAR. This must be monitored, predicted, and steps taken to mitigate reduced flows. A specific strategy may necessary in future ISPs.<br>• A number of rainstations with long-term records operated by the Weather Bureau have been closed, adversely affecting the ability to calibrate rainfall runoff models. This is a National issue.<br><br>**ii. Berg River upstream of Hermon**<br>• During the Berg River Dam Feasibility study, it was identified that the spatial distribution of rain stations in the upper catchments of the Berg River is inadequate to support accurate modelling.<br>• The impact of snow and snowmelt on the hydrograph affects our interpretation of catchment hydrology (rainfall: runoff response).<br><br>**iii. Berg River downstream of Hermon**<br>• The Berg River estuary has a high ecological importance associated with it, yet there is no monitoring of inflow to the estuary. Consequently the estuarine Reserve requirement is not established and cannot be reliably allowed for in the evaluation of the system yield.<br><br>**iv. Cape Peninsula Rivers**<br>• The interaction between surface and groundwater and the possibility of attenuating flooding by drawing down the Cape Flats aquifer, prior to winter is not established.<br><br>**v. Steenbras River**<br>• There is no water quality monitoring of the Steenbras River, other than in the dam itself. The effect of dilution in the Upper Steenbras Dam, of the Palmiet River IBT (23 million $m^3$/a) is not well established. |

| 9.2 | MONITORING NETWORKS & DATA CAPTURE (cntd) |
|---|---|
| **Background information:** | **B. GROUNDWATER MONITORING**<br><br>**i. WMA**<br>• The location and status of monitoring boreholes in this WMA is not well documented.<br>• The quality component of the groundwater Reserve assumes a baseline condition of "no deterioration" and does not take resource specific water quality aspects into consideration.<br>• A Reserve determination procedure for groundwater is available, but there is generally insufficient monitoring data available to support the determination. In the absence of a groundwater Reserve determination, authorisations for groundwater abstractions have been put on hold.<br>• Aquifer recharge dynamics are not well understood.<br>• Resource capacity for monitoring is inadequate.<br>• Very little groundwater monitoring is done by the RO and the impacts of pollution from industry, land contamination, cemeteries, sub-surface fuel tanks and sand-mining operations cannot be observed.<br><br>**ii. Berg River downstream of Hermon**<br>• The natural recharge (rainwater) of the Langebaan Road upper aquifer has been confirmed. Recharge of the lower aquifer is uncertain as this is not monitored<br><br>**iii. Cape Peninsula Rivers**<br>• Monitoring boreholes are in place in the Cape Flats but many are not in operation - only three boreholes are monitored. |

| 9.2 | MONITORING NETWORKS & DATA CAPTURE (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Strategic approach** | As water resources get scarcer ever better information is required for its careful management. This especially when funds must be raised through the sale of water. Some data is national in nature and concern. It is critical that national networks are well funded and maintained – both as input into regional management and *vice versa*.<br><br>In the Western Cape a start has already been made by getting all the co-operative governance partners involved in monitoring, to coordinate a strategy, based on mutual needs and on achieving efficiencies by combining efforts in terms of both data collection and information management. DWAF has proved to be an obvious driver in this process and has been requested to maintain this role. More attention and resources are required if this is to keep its momentum. This is of particular relevance to the Berg WMA as the Berg River catchment was selected as the first system in which to pilot co-operative monitoring and information management.<br><br>One of the core strategic approaches already adopted by this group is that no data should have exclusive ownership and that the sharing of data should be maximized to the benefit of all. There are concerns regarding the possible mis-interpretation of organisation-specific data by others, and there will inevitably be the need for some cost recovery in certain instances – however these broad principles are endorsed and need to be carried forward through this strategy. |
| **Required actions:** | Develop a detailed regional strategy for the monitoring needs of the WMA, taking the following into account:<br><br>• The importance of national networks – these must be well supported and funded.<br>• Catalogue of all aspects that need to be monitored - grouping all monitoring requirements into goal-oriented logical systems and sub-systems.<br>• The information requirement / monitoring needs for the various systems.<br>• Identification and motivation of required or additional monitoring points or functions required for the WMA.<br>• Amalgamation of the identified existing and planned monitoring and assessment systems needs, into a coherent and structured monitoring, assessment and information system.<br>• Review resources required for adequate monitoring of surface and groundwater.<br>• Regularly review and update the regional monitoring strategy.<br>• Develop co-operative relationship between the RO and other organisations or individuals that have relevant data or operate water-related monitoring.<br><br>**A. SURFACE WATER MONITORING**<br><br>a. Implement monitoring of all wetlands and estuaries.<br>b. The monitoring requirements related to the implementation and control of Reserve requirements need to be defined.<br>c. Establish flow-gauging facilities on the Berg River downstream of Misverstand Dam and implement long term monitoring for the in-stream and estuarine flow requirements. |

| 9.2 | MONITORING NETWORKS & DATA CAPTURE (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required Actions (cntd):** | **B. GROUNDWATER MONITORING**<br><br>**i. WMA**<br>a. A site-specific approach to be investigated in which acceptable levels of deterioration are identified for certain groundwater resources.<br>b. Monitoring should form a requirement of future groundwater authorisations so as to improve the availability of data.<br>c. Initiate a co-operative approach to establish monitoring requirements between the CCT, the RO and the Water Research Commission. The CCT is busy with a study to establish the status of borehole monitoring.<br>d. A Western Cape Monitoring Study should identify the optimum monitoring options, monitoring networks and monitoring programme to be implemented (what is currently monitored and what is required).<br>e. Identify research done to date on the impact of global warming on aquifer recharge.<br>f. Re-establish old monitoring boreholes.<br>g. Consolidate available data from private monitoring operations, consultants and drilling contractors.<br><br>**ii. Berg River downstream of Hermon**<br>a. Boreholes need to be established to monitor ground, surface and seawater interaction.<br><br>**iii. West Coast Rivers**<br>a. Completion of a groundwater Reserve determination is required in order to process the applications for authorisation to abstract groundwater in this area.<br>b. Boreholes need to be established to monitor ground, surface and seawater interaction.<br><br>**iv. Cape Peninsula Rivers**<br>a. Investigate the possibility of flood control in the Cape Flats by intentionally lowering groundwater levels in the Cape Flats Aquifer prior to winter (could form part of the Berg River Baseline Monitoring Study). |
| **Responsibility:** | The implementation of the strategy on **Monitoring Networks and Data Capture** is the responsibility of the RO, in conjunction with the Directorate: Hydrological Information, the Directorate: Information Programmes and the Directorate: Waste Discharge and Disposal. |
| **Priority:** | Priority 1 – Very high. To be implemented over the long term. |

| 9.2 | MONITORING NETWORKS & DATA CAPTURE (cntd) |
|---|---|
| **MANAGEMENT ACTIONS (cntd)** | |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 14<br>a2: NWRS: Chapter 3, Part 6<br>a3: Western Cape System Analysis<br>a4: Skuifraam Dam Feasibility Study – Hydrology<br><br>**b. Linked ISPs / WMAs:**<br>None.<br><br>**c. Other role players and their functions:**<br>CCT : Monitors certain rivers and groundwater resources in the WMA.<br>Water Research Commission : Needs to be co-operatively involved in establishing monitoring requirements.<br><br>**d. Related Strategies:**<br>2.1 Reserve and resource quality objectives<br>2.3 Solid waste management<br>3.2 General Authorisations<br>3.4 Licensing<br>3.5 Pollution control<br>8.3 Implementing the Berg Water Project<br>8.4 Strategy for the Lower Berg<br>9.1 Abstraction control |

| 9.3 | INFORMATION MANAGEMENT |
|---|---|
| **Management objective:** | To facilitate improved access to shared information within the WMA. |
| **Background information:** | There is a need to facilitate sharing of information and integrity of information between the various role players in the WMA. Both the CCT and DWAF have extensive databases of information which are relevant to the water resource management in the Berg WMA. As such, information held by those and other institutions (Government and private) should be appropriately shared.<br><br>The RO is currently investigating the implementation of the HYDSYS data management system. This system will allow for data to be stored, verified and processed locally. This information will then be copied to the National database and, as such, the local database serves as a backup.<br><br>The following shortcomings were identified:<br><br>• Capturing of registration data is still in progress and verification of that data is required.<br>• The mapping of invasive alien plants from 2001 aerial photography is not yet complete.<br>• There is a need to improve the sharing of information between DWAF and local authorities. |
| **Strategic Approach:** | As for Strategy No 9.2 (Monitoring Networks and Data Capture) the Western Cape Region has agreed to co-ordinate and share both data collection and information management to the best of its ability. This strategy will seek to enhance this process, whilst respecting organisational needs for data security and the maintenance of data integrity. DWAF will endeavour to ensure that the data it gathers and the information it has at its disposal is made available as widely as is possible, practical, and useful to the common benefit of the water resource and its users. |

| 9.3 | INFORMATION MANAGEMENT (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br>a. Support the coordinating committee for monitoring and information.<br>b. The WUAs should be equipped in such a way that they are able to access the relevant information on the HYDSYS system (or any other preferred system) for its own purposes. |
| **Responsibility:** | The implementation of the strategy for **Information Management** is the responsibility of the RO, in consultation with the Directorate: Information Programmes and the CCT. |
| **Priority:** | Priority 4 – Low. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA: Chapter 14<br>a2: NWRS: Chapter 3, Part 6<br><br>**b. Linked ISPs / WMAs:**<br>None.<br><br>**c. Other role players and their functions:**<br>CCT : RO and CCT to facilitate sharing of and access to information.<br>WUAs : Will eventually need to access the information management system for their own monitoring purposes.<br><br>**d. Related Strategies:**<br>5.2 Co-operative governance<br>8.1 Strategy for system management and reconciliation<br>9.2 Monitoring networks and data capture<br><br>**e. Linked mapping:**<br>None. |

# SECTION 10: IMPLEMENTATION STRATEGIES

This ISP will be made available to a wider audience at the same time as water resource planning and management is being implemented in terms of the strategies contained therein. Some strategies still need to be developed and the ISP is open to continuous improvement. Input from stakeholders is both expected and desired to ensure acceptability of the strategies presented and to assist in their improvement.

One strategy has been identified for development, namely:

10.1 ISP implementation strategy

| 10.1 | ISP IMPLEMENTATION |
|---|---|
| **Management objective:** | To ensure that the approaches put forward by the Department through this ISP are adopted and implemented in the Berg WMA. This will require commitment, funding and capacity. |
| **Background information:** | The ISP is an internal document developed by the Department pf Water Affairs and Forestry. The ISP sets out the approaches which the Department is taking towards water management in the Berg WMA – and lists suggested actions towards achieving good management of its water resources.<br><br>The wider public has not been given opportunity to input into this ISP – yet it is recognised that the approaches adopted have a significant impact on the populace of the Berg WMA. Whilst the approach to date in developing this ISP has been non-participatory, it must be remembered that this is not a Catchment Management Strategy – but DWAF setting out how it sees the situation, and the steps which it views as most appropriate in dealing with the situation.<br><br>However the ISP is not a closed document and it will to be made available to the wider public for comment and input. This makes the ISP an inherently transparent document – opening out 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. |
| **Strategic approach:** | The ISP is guided by the approach set out in the NWRS – and details this approach for the Berg WMA. The ISP 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. As such the ISP may be adjusted and adapted when new and better ideas are presented. Despite this the approaches and requirements of this ISP may not be ignored.<br><br>The implementation of the ISP is an enormous task and will have to be tackled in a stepwise fashion. 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.<br><br>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 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.<br><br>The position with regard to the 'Authority of Information Contained in the ISP' is set out in Para. 1.3.4 of Chapter 1 of this ISP document. |

| 10.1 | ISP IMPLEMENTATION STRATEGY (cntd) |
|---|---|
| **MANAGEMENT ACTIONS** | |
| **Required actions:** | The following actions are required:<br><br>a. Publish the ISP to be accessible for public input and comment (consider hard-copy and web-based options). Copies will be presented to key stakeholders on request. It is not the intention to have a major drive for public input, but merely to create opportunity for input.<br>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 WC/DM, is delivered forcefully both to local authorities, other direct water users such as agriculture, and the wider public.<br>c. Collate and consider all comment in revising and improving the ISP.<br>d. The ISP should be open to continuous improvement, with possible updating on a bi-annual basis.<br>e. All Regional Office water resource management staff, Working for Water, CCT and other major stakeholders should have access to, or copies of, the ISP<br>f. 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.<br>g. The practicalities of implementation demands must always be considered.<br>h. 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. |
| **Responsibility:** | The RO is responsible for implementing this strategy.. |
| **Priority:** | Priority 1 – Very high. The implementation is to be ongoing until the Berg CMA is established and the ISP is superceded by a CMS. |
| **Interfaces:** | **a. Relevant documentation:**<br>a1: NWA<br>a2: NWRS<br><br>**b. Linked ISPs / WMAs:**<br>Breede WMA.<br><br>**c. Other role players and their functions:**<br>None<br><br>**d. Related Strategies:**<br>All ISP strategies.<br><br>**e. Linked mapping:**<br>None |

# SECTION 11: ADDITIONAL STRATEGIES TO BE DEVELOPED

The following strategies have been identified for development during the next revision of this ISP document. A brief motivation for their need is provided.

## YIELD BALANCE AND RECONCILIATION STRATEGIES

### Imports from other Water Management Areas

A strategy is required to address the importation of additional water from the Breede WMA as well as the possibility of importing water from the Olifants / Doring WMA.

### Water Supply to the Saldanha area

A strategy is required to address the anticipated industrial expansion in this area and the provision of water to meet the anticipated increase in requirements. Water conservation and demand management, securing water from Voëlvlei Dam, trading of existing authorisations, groundwater development, artificial aquifer recharge and other interventions need to be assessed and compared.

### Use of the Cape Flats Aquifer

A strategy is required to address how the available yield from the Cape Flats aquifer could be best utilised. Options include augmenting the WCWSS, and serving the local requirements of commercial irrigation (vegetable farmers) and greening of the Cape Flats.

### Water Supply to Tulbagh

A strategy must be developed to address the water shortages at Tulbagh.

## WATER RESOURCE PROTECTION STRATEGIES

### Impacts of Agricultural Practices

A strategy is required to address the impacts of farming practices on the water quality of the surface and groundwater resource.

## WATER USE MANAGEMENT STRATEGIES

### Compulsory Licensing

A strategy is required to address the priority for Compulsory Licensing in the Berg WMA.