SECTION I

OTHER SCHEMES

I.1 Water transfers from the Congo River

1. INTRODUCTION

Information presented here is drawn from the Western Cape System Analysis, engineering publications and other sources, including the public process. Three potential means of utilising water from the Congo River (west coast of Central Africa) have been identified, namely :

- Importation by tanker
- Towing of inflatable bladders
- Undersea pipelines

Conventional overland conveyance infrastructure such as pipelines and canals have not been considered due to :

- the risks associated with potential sabotage
- the challenges of multi-national agreements in relation to the overland route
- the anticipated high capital and maintenance costs
- the challenges associated with maintenance.

2. IMPORTATION BY SEA FARING TANKERS

This option involves transporting freshwater taken aboard at the mouth of Congo River on the west coast of central Africa. A fleet of 9 super tankers, each capable of delivering 280 000 m^3 (one round trip) every 17 days could be considered.

Based on 1992 cost estimates, escalated at 7% per annum, one super tanker chartered on a three year contract would cost about R240 000 per day. Fuel costs would be about R50 000 per day. On this basis, the Unit Reference Value of the water would be R17/m^3. Of the options investigated in this study, this represents the most uneconomical of all options.

To achieve a yield of about 50 million m^3/a, a fleet of 9 tankers would be required. Table Bay harbour would not be able to accommodate tankers in excess of 90 000 m^3. Consequently, facilities would be required from an offshore loading point to convey water to a water treatment works such as Faure. These additional costs, as well as payment to the Democratic Republic of Congo, would significantly further increase the URV.

2.1 Other Factors

Other factors to be taken into account include: :

- slight risk of marine pollution
- impact of off-shore conveyance infrastructure
- visual impact of tankers in Table Bay
- political uncertainties could make this an unreliable source.
- High financial costs

3. TOWING INFLATABLE BLADDERS

This option has neither been investigated by DWAF nor the CCT. The information presented is based on an article in the Water 21 Journal of October 2004.

A company operating from the Greek mainland has developed a successful operation in which some Greek Islands in the Mediterranean Sea are supplied with water. Bladders of between 750 m^3 and 2 000 m^3 are towed from the mainland. A similar operation from the Turkish mainland to supply the Turkish region of northern Cyprus has failed. In this case, bladders of 30 000 m^3 units experienced towing problems, eventually causing the contract to be abandoned. Similar attempts to apply this technology along the west coast of the USA have been equally unsuccessful, despite years of research and development.

Challenges in considering such options for South Africa include :

- sea conditions along the towing route
- loading and unloading operations
- the economics of long distance transport.

Sea conditions off both coasts of South Africa are likely to render this type of operation unsuccessful.

4. UNDERSEA PIPELINE

A proposal dating back to 1995 suggested the option of pumping fresh water from the Congo River down the west coast of Africa via a submerged pipeline. The rationale of the option is that a large diameter (12 m) plastic conduit be positioned about 2 m above the sea bed level. The lower density fresh water in the conduit (also of lower density than water) would result in a buoyancy uplift force at a certain depth, sufficient to enable the conduit to be secure, using nylon netting and anchoring ropes. Massive balloon-type containers would be permanently anchored in the sea opposite off-take points, functioning as buffer storage. The proposal was not supported with technical calculations but indicated that for a yield of 700 million m^3/a, the average cost to supply the coast of South Africa would be about R2/m^3.

As part of this study, references to other similar schemes were investigated. It was found that :

- Taiwan officials had conducted a feasibility study to import water from mainland China via a 25 km undersea pipeline. The results for that study indicated that this could potentially supply water at a third of the cost of desalination.
- In Turkey, a feasibility study investigated pumping 75 million m^3 of water per year to Cyprus via a 78 km submerged pipeline. The study was carried out in 1998 with the intention to implement in 1999. The use of HDPE pipe (1,6 m dia, density 960 kg/m^3) was proposed with the same anchoring method (inverse hanging) as described above.
- The option of pumping water from Alaska to California (2 200 km) has not been studied at feasibility level, but some cursory engineering and feasibility work has been undertaken.

Challenges in considering such an option in Southern Africa include :

- pipeline subject to marine hazards.
- passage of the routing would be through the coastal waters of a number of countries.
- environmental concerns.
- high costs and unproven technology.

I2. Water transfers from the Orange River

Neither surface nor undersea conveyance options have been investigated as water from the Orange River is close to being fully allocated. Refer to DWAF's Orange River Development Replanning Study. In addition, the pipeline route to Cape Town would be approximately 600 km long and would either follow the restricted coastal area or the route of the N7. A number of booster pump stations would be required. Therefore, even if surplus water was available for transfer, the cost is likely to be very high. For reasons of availability and cost, this option is not considered feasible and has not been investigated.

I3. Towing of icebergs

1. SCHEME DESCRIPTION

The use of icebergs as a source of fresh water would involve capturing and towing them from the Antarctic and extracting the water in the deep ocean before the continental shelf is too shallow to prevent towage. A processing plant heat exchange plant, smaller vessels, tankers or an undersea pipeline to convey the water to shore would be required. Costs have not been estimated but are likely to be high.

The challenges associated with this option involve untried technology, including :

- selection, wrapping and towing the iceberg;
- how to prevent the iceberg melting before it reaches its required destination;
- how to physically harvest the ice from the iceberg in a manageable way;
- what environmental impacts would be associated with the waters of the Antarctic.

2. OTHER ISSUES

Specific strengths and weaknesses of the scheme are:

- **Strengths**
  - Untapped source.

- **Weaknesses**
  - The difficulties that could be encountered during towing, the process of melting the ice, cutting the icebergs into fragments, and collecting the water and conveying it to a point where any necessary treatment could be carried out.
  - Negative environmental impact in the vicinity of mooring and converting sites.
  - High costs and unproven technology.

I4. Other options arising from public meetings

1 CLOUD SEEDING

Cloud seeding has not been considered as an option as it is not suited to the type of cloud cover experienced in the Western Cape but rather to areas in which Cumulo-Nimbus cloud cover is typical.

2 A DAM ON THE KUILS RIVER

This is not an option as there are no suitable dam sites on the Kuils River. Much of the flow in the Kuils River is attributed to return flows from waste water treatment works which discharge into it. The effluent portion could be treated for re-use and this would not require a dam on the river.

3 DREDGING OF EXISTING DAMS RATHER THAN RAISING OF DAMS

The dams in the Western Cape System do not experience significant silt loading. Dredging may be an option in decades to come but within the next 50 years would not be viable. Deepening of dam basins (other than silt removal) would be expensive, both due the nature of excavation and the need to modify existing outlet structures to be able to take advantage of the additional storage.

4 RAISING NUWEBERG DAM ON THE PALMIET RIVER

Eikenhof Dam on the Palmiet River lies downstream of Nuweberg Dam. Eikenhof was raised in 1999 as this proved to be the most effective means of increasing the yield from that system. Raising Nuweberg Dam would offer little benefit as the dam basin is small and would require significant relocation of the existing road.