# 4. SITUATION ASSESSMENT FOR THE KEISKAMMA SUB-AREA

## 4.1 General Overview

### 4.1.1 Topography and Rivers

This sub-area consists of the R10, R40 and R50 quaternary catchments. The main river in the sub-area is the Keiskamma River (R10). Smaller coastal rivers include the Chalumna and Gulu Rivers (R40) up the coast from the Keiskamma River, and the Bira and Magwalana Rivers (R50) down the coast.

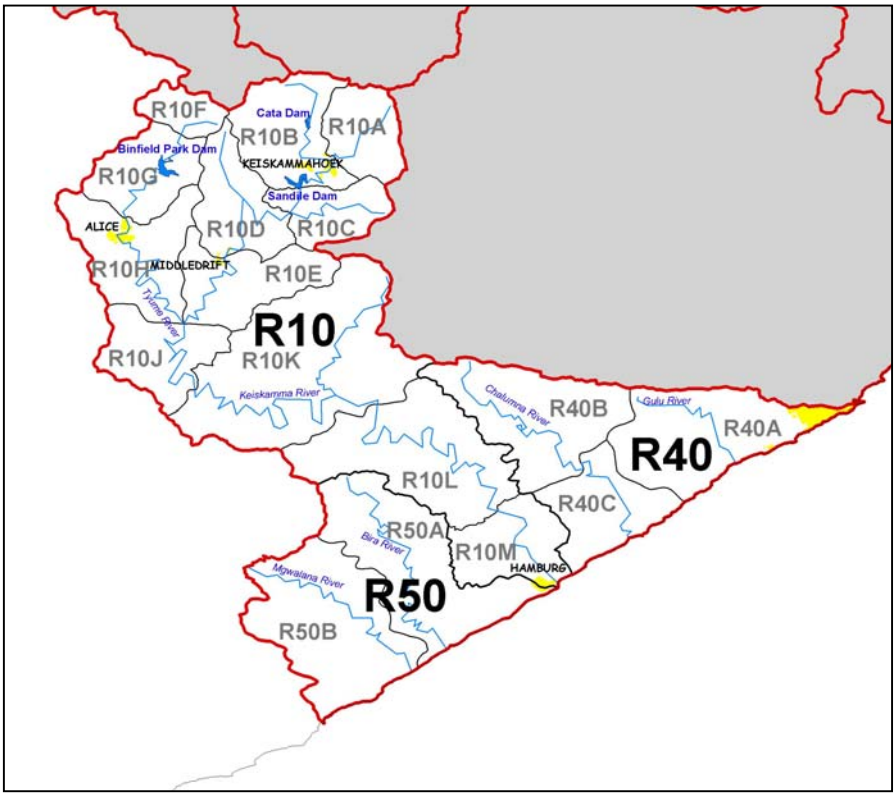


**Figure 4.1 The Keiskamma Sub-area**

As with the Amatole sub-area, the area can be divided into the following three basic topographic zones:

- The coastal belt
- The coastal plateau, and
- The mountain highlands or escarpment zone.

The coastal belt broadens in this sub-area to about 20km wide. The coastal plateau, which extend to the foothills of the Amatola mountain range lies between 600 and 900 masl and covers most of the sub-area. Both the plateau and coastal belt are characterized by the incised Keiskamma River valley, which bisects the area. The remaining rivers are coastal and rise and drain only the lower rainfall coastal belt. As

such, the flows in these smaller rivers tend to be very variable and in most years the estuaries are closed due to the low runoff. The escarpment zone, which lies between the coastal plateau and the catchment divide and includes the Hogsback area is characterized by steep slopes, high altitudes (1938 masl) and high rainfall in the mountains.

The main source of water for use in the sub-area is the Keiskamma River (R10), which has its headwaters in the mountains above Keiskammahoek and flows eastwards to enter the Indian Ocean at Hamburg. Its main tributary is the Tyume River with its headwaters in the Hogsback area.

### 4.1.2 Climate and Rainfall

The climate in this sub-area is similar to that of the Amatole sub-area but with less humidity and slightly lower average temperatures down the coast and inland. The Amatola mountain areas from above Keiskammahoek to the Hogsback area experience very cold temperatures during the winter months with occasional snowfalls. The mean annual precipitation (MAP) varies from 600 mm along the coast to a low of 450 mm in parts of the dryer coastal plateau areas to over 1 200 mm on the mountain peaks (refer **Fig 2.4**). Rain falls predominantly in the summer months with June and July being the driest months.

### 4.1.3 Vegetation

The natural vegetation consists mainly of coastal grasslands, savanna (thornveld or sourveld) in the coastal areas up to the escarpment with areas of dense bush (valley thicket) in the river valleys and indigenous forest in the mountain zone (refer **Fig. 2.5**). Invasions of black and silver wattle are found throughout the area with the largest concentrations in the Upper Keiskamma and Tyume catchments. Exotic weeds are also found in all riparian vegetation but the problem is not as serious as in the Amatole sub-area.

### 4.1.4 Land Use and Settlement Patterns

The catchment is relatively undeveloped with most land being communal and used predominantly for stock grazing or dry land cultivation. Less than 1 500 ha is cultivated under irrigation. The largest scheduled irrigation areas include the Keiskammahoek (854 ha), Zanyokwe (471 ha) and Tyume (231 ha) irrigation schemes in the upper catchment. These schemes, which were located in the former Ciskei are not fully operational and rehabilitation of the schemes and establishment of Water User Associations is currently underway. Commercial forestry (less than 1000ha) is located in the Hogsback and Upper Keiskamma catchment in the higher rainfall areas in the Amatola mountain range.

The majority of the area once fell within the borders of the former Ciskei and the residential settlement pattern is mainly scattered rural type villages located throughout the catchment. The main formal towns in the area are Hamburg at the mouth of the Keiskamma River and Alice, Middledrift, Keiskammahoek and Dimbaza in the upper

catchment. Peddie town, although located in the catchment of the Fish River, which is outside this ISP area, obtains its water from the Keiskamma River (the Peddie RWSS).

Small coastal towns/resorts with permanent populations are located along the coast especially between Winterstrand, Kidds Beach and Kaysers Beach. Small holiday resorts are found further down the coast, the largest being at Bira and the Fish River Hotel complex. Marginal growth is expected in these coastal areas in the medium term.

### 4.1.5 Demography

The total population of the sub-area was estimated based on 1995 data (**Ref. 24**) and Census 2001 data (**Ref. 6**) at approximately 223,000 people in the year 2000. The bulk of the population lives in the small formal towns and associated peri-urban areas where services and educational facilities are available. The population is expected to show little growth mainly due to the lack of employment opportunities in the rural areas and the resultant outward migration to large towns and cities. Alice with its educational facilities (University of Fort Hare), and Keiskammahoek and Dimbaza, which serve as dormitory towns for King William's Town are expected to be the main growth areas.

**Table 4.1 Population Estimates of the Keiskamma Sub-area (Year 2000)**

| Quaternary Catchment | Population |
|---|---|
| R10 | 161,000 |
| R40 | 32,000 |
| R50 | 30,000 |
| **Totals** | **223,000** |

### 4.1.6 Economic Development

The West Bank and the new ELIDZ within Buffalo City Municipality (catchment R40A), which forms part of this sub-area has been discussed in **Chapter 3** as part of the Amatole sub-area of which it forms a part. Other than this area aligned to BCM, the area is economically deprived. The only other formal industrial complex in the sub-area is located at Dimbaza. The area was established under the previous government's homelands policy to attract industries to the former Ciskei. As with other such areas most of the industries have now relocated and the area is in decline with very few industries remaining.

Economic related activities in this sub-area are mainly based on commercial agricultural activities including the cultivation of pineapples, oranges, commercial forestry and dairy farming. Proposals for the establishment of an export-orientated industry based on eel farming in the catchment have been made, but progress is unknown. Small-scale tourism in the Hogsback area and along the coastline provides some employment to an economically deprived region. Post-school educational activities are based at Fort Hare University and Lovedale College in Alice.

Rehabilitation of the irrigation schemes at Tyume, Zanyokwe and Keiskammahoek is seen as the main catalyst for economic growth in this sub-area.

## 4.2 Water Resources Overview

### 4.2.1 Surface Water

(a) Raw Water Resources and Supply Systems

The Keiskamma River and its tributary, the Tyume River, are the main sources of water for this sub-area. The R40A coastal catchment receives its water supply from the Buffalo River as part of the Amatole Water Supply System (AWSS).

The only coastal rivers of any importance with respect to water resources and supply potential are the Bira and Chalumna Rivers. Bira River was previously used for supply to Peddie and to some coastal villages, but due to the unreliability of supply this scheme has been replaced by the Peddie RWSS, which obtains water from the middle reaches of the Keiskamma River. The Chalumna area is now also supplied with water from the Peddie RWSS. The other smaller coastal rivers in the sub-area are mainly non-perennial rivers, their importance being their attraction for tourism at the estuaries. Small-scale irrigation and stock watering is the main consumptive user of water from these smaller rivers.

Many of the rivers and estuaries are pristine with no major impacts and are therefore highly valued for their ecological importance. Overgrazing and subsequent erosion in the area is however on the increase. This will in turn lead to an increase in sediment in the rivers and deterioration in the quality of the water.

The water resources of the upper reaches of the catchment are fairly well developed with the Sandile, Binfield Park, Cata and Mnyameni Dams providing the assurance for water supply to irrigation schemes, towns and rural villages (refer **Appendix B10**). Other smaller DWAF owned dams in the upper catchment include the Dimbaza, Debe and Pleasant View Dams, which are currently used mainly for stock watering. As these dams do not generate any income and do not form part of DWAF's strategy for water resource management, the Department is keen to transfer them to the Amatole District Municipality (Water Services Authority), or Water User Associations, due to their requirement for ongoing maintenance. This especially applies to Pleasant View Dam.

**Table 4.2 Main Rivers and Dams in the Keiskamma Sub-area**

| Catchments | Rivers | Main Dams | Owner |
|---|---|---|---|
| R10 | Keiskamma | Mnyameni | DWAF |
| | | Cata | DWAF |
| | | Sandile | DWAF |
| | Tyume | Binfield Park | DWAF |
| | | Pleasant View | DWAF |
| | Debe | Debe | DWAF |

The water available from the catchment before accounting for the ecological Reserve or invasive alien plants is estimated at 53 million $m^3$/a (1 in 50 year assurance). Based on a desktop assessment undertaken as part of the NWRS, the impact of the ecological Reserve on the yield is estimated at 4 million $m^3$/a. More than half of this yield is from the R10B/G catchments, with the major contributions coming from the Sandile Dam (20 million $m^3$/a) and Binfield Park Dam (19 million $m^3$/a). Total return flows are negligible and add only about 1 million $m^3$/a to the yield.

**Table 4.3 Available Water in the Keiskamma Sub-area (Year 2000)**

| Type of Water Resource | Amount (million $m^3$/a) |
|---|---|
| Total surface water resource yield | 53 |
| Subtract: | |
| - Ecological Reserve | 4 |
| - Invasive alien plants | 2 |
| Net surface water yield available for use | 47 |
| Available groundwater resource | 0 |
| Usable return flows | 1 |
| **Total Local Yield** | **48** |

(b) Water Supply Infrastructure

The domestic water supply system in this sub-area consists of a number of separate schemes. In the upper catchment, water supply from Binfield Park Dam is treated and reticulated to Alice and surrounding rural villages. Sandile Dam supplies water to Middledrift, Dimbaza and surrounding rural villages. Cata and Mnyameni Dams supply Keiskammahoek and surrounding villages.

In addition to domestic water supply schemes, these dams all have allocations for water supply to scheduled irrigation schemes viz. Binfield Park Dam to the Tyume scheme (231 ha), Sandile Dam to the Zanyokwe scheme (471 ha) and Cata/Mnyameni Dams to the Keiskammahoek scheme (854 ha) (refer **Appendix B6**). These schemes have been allowed to fall into a state of disrepair, but new efforts are being made to rehabilitate the schemes either partially or wholly through poverty alleviation schemes supported by DWAF, the Provincial Department of Agriculture (PDoA), and the Amatole District Municipality (ADM). It is expected that at least some of the water allocations will be taken up in the next few years. The establishment of Water User Associations (WUAs) for the use of this water is already progressing with the recent establishment of the Keiskammahoek WUA.

In the middle Keiskamma catchment, water released from Binfield Park and Sandile Dams is abstracted from the Craig Head Weir and treated at the Peddie regional treatment works. Water is supplied to Peddie town and the surrounding rural villages

(Peddie RWSS), to Hamburg and down the coast to Wesley and Bira (Bira/Wesley RWSS) and up the coast to Chalumna within the BCM area.

Sandile Dam on the Keiskamma River has been considered as a possible future raw water source for supplementing the Amatole Water Supply System (**Ref. 4**). However, in view of the numerous new schemes that abstract water from the Keiskamma River, the uncertainty of the ecological Reserve and the possibility that the allocation for some irrigation will be exercised in the future, a comprehensive yield analysis of the Keiskamma System will be required to ascertain the extent and location of available water supplies.

(c) Institutional Arrangements

The large dams in the sub-area are owned by DWAF but are operated by Amatola Water (AW) (refer **Appendix B10**). Regional water supply schemes have been funded and implemented by DWAF over the past ten years and they are currently in the process of being transferred to the Amatole District Municipality (ADM) as the local Water Service Authority. Operation of the bulk schemes is being undertaken by the AW acting as the Water Service Provider. Operation of any rehabilitated irrigation schemes will require the establishment of Water User Associations (WUAs) as required by DWAF.

4.2.2 Groundwater

The total available groundwater resource in the area is unknown but the area generally displays a low potential (**Ref. 17**). The best groundwater potential is located in the upper catchment of the Keiskamma River above Sandile Dam in the high rainfall area with potential reducing towards the coast. The Peddie Regional Groundwater Scheme, which was commissioned in 2002, is based in an isolated area where moderate groundwater potential was identified and developed due to a lack of adequate surface water resources. However, the groundwater varies in term of both quality and quantity and proposals to link the scheme to the Peddie RWSS are being considered.

Until recently the villages to the east of Alice were supplied with groundwater but due to the inadequacy of the supply, these villages now receive water from regional surface water supply schemes from Binfield Park and Sandile Dams. Hamburg is now part of the Bira/Wesley RWSS having been previously reliant on a borehole scheme.

Small borehole schemes are known to supply some of the small coastal resorts. These tend to suffer from quantity and salinity problems. Most rural settlements have to date been provided with a treated surface water supply due to the generally poor groundwater yields and quality in the sub-area.

4.2.3 Current Water Requirements

Water use in the catchment is limited. The major water allocations are for the irrigation sector (40%) and the urban and rural domestic water sector (56%). The actual water use for irrigation is substantially less than the allocations as the main irrigation

schemes of Tyume, Zanyokwe and Keiskammahoek are currently in a state of disrepair. Proposals are currently being considered for rehabilitating these schemes either partially or wholly.

Water available from the Binfield Park, Sandile, Mnyameni and Cata Dams of 43,0 million $m^3$/a (at 98% assurance) (**Ref. 24**) exceeds the irrigation water requirements/ allocations of 11,85 million $m^3$/a for the Tyume, Zanyokwe and Keiskammahoek irrigation schemes. The Binfield Park Dam also supplies water to Alice and surrounding rural villages but appears to have the largest surplus available for other uses (9,2 million $m^3$/a). The main allocation from Sandile Dam is for supply to Dimbaza (domestic and industrial), Middledrift and surrounding rural villages. This together with the relatively high ecological Reserve requirements should be taken into account when considering the use of Keiskamma water for future supply to the BCM. A comprehensive study is needed to determine the water requirements (domestic, industrial and irrigation) of the area that could be supplied from these dams. Previous studies have also investigated the use of surplus water from Binfield Park Dam for the proposed Hogsback Pumped Storage Scheme, but these proposals appear to have been shelved.

**Table 4.4 Local Water Requirements* in the Keiskamma Sub-area (Year 2000)***

| Sector | Amount (million $m^3$/a) |
|---|---|
| Irrigation | 10 |
| Urban** | 11 |
| Rural*** | 3 |
| Afforestation | 1 |
| **Total Local Requirement** | **25** |

*At a 1 in 50 year assurance.

**Industrial demand has been included in the urban demand.

*** Stockwatering has been included in the rural water requirements.

### 4.2.4 Yield Balance

Based on the available yield of the system and water allocations as described above, the yield balance in the year 2000 is summarised below.

**Table 4.5 Reconciliation of the Keiskamma Sub-area in Year 2000**

| Description | Amount (million $m^3/a$) |
|---|---|
| Local yield | 48 |
| Transfer in | 0 |
| Total yield | 48 |
| Local requirement | 25 |
| Transfer out | 0 |
| Total requirement | 25 |
| **Water Balance** | **23** |

These figures are based on data that needs to be confirmed by way of a comprehensive study into the water requirements and system yield of the Keiskamma River. It should be noted the water requirements in the table take into account the water needed for the revitalisation of the former irrigation schemes. The surplus available in the Keiskamma catchment is due to dams such as Sandile, Cata, Binfield Park and Mnyameni. The releases from the above-mentioned dams are also supporting the existing water use in the lower catchments of the Keiskamma sub-area.

4.2.5 Future Water Requirements

Due to the apparent surplus of water in the Keiskamma catchment, the Keiskamma River could be an important future source of water for the Amatole Water Supply System (**Ref. 4 and 5**). A comprehensive system yield analysis, including requirements for a more accurate ecological Reserve and water allocation for irrigation, needs to be undertaken as part of the AWSS reconciliation strategy to confirm this possibility.

4.2.6 Water Quality

(a) Surface Water Quality

The quality of water in the Keiskamma River and the smaller rivers is presently average to good and is determined mainly by the erosion in the catchment due to poor farming techniques and effluent run-off from the urban areas, especially Dimbaza. The latter needs to be quantified as it was a serious problem when the Dimbaza industrial complex was fully occupied but may no longer be so. Some pollution from solid waste sites has been identified, but this is mainly an operational problem as all solid waste sites have either recently been upgraded or are in the process of being upgraded. It is believed that some of the smaller estuaries, which should be in relatively pristine conditions, are being impacted by sewage run-off either from septic tanks or small sewage treatment plants (Kidds Beach).

The capacity of the dams in the system to release water for ecological Reserve purposes is currently under investigation with a view to releasing water in the near future.

(b) Groundwater Quality

As with the Amatole sub-area groundwater quality is generally poor with high salinity problems especially along the coast.

## 4.3 Key Issues

Based on a detailed assessment of the Keiskamma System sub-area as outlined above, the following key issues have been identified.

### 4.3.1 Water Balance and Reconciliation

Issue : Numerous regional water supply schemes which extract water from the Keiskamma River have been implemented over the past decade. Desktop estimates also show a high relative ecological Reserve requirement for the Keiskamma River. It is not known if these Reserve requirements are being fully met at present. However, due to the current under-utilisation of the water allocations from the dams, it is believed that they are being met. It must be emphasised that the hydrology and yield balance of the system is not accurately known and until studies reveal the actual situation, comments on water surpluses/deficits are made with a low degree of confidence. The perceived surplus/unused water in the Keiskamma system dams is also seen as a potential future raw water source to augment the AWSS which supplies BCM. A detailed system yield analysis is required for the Keiskamma catchment. Refer Strategy No. 1.1.

### 4.3.2 Water Resource Protection

Issue : Accuracy of the ecological Reserve and RQOs of the Keiskamma River need to be addressed as part of the recommended system yield analysis.

### 4.3.3 Institutional Development and Support

Issue : Support for the rehabilitation of the three irrigation schemes at Tyume, Zanyokwe and Keiskammahoek and the establishment of WUAs is a priority in terms of poverty relief in the area and in order to enable DWAF to transfer assets.

Issue : Ownership of Pleasant View Dam and other DWAF owned dams and infrastructure that require maintenance but produce no income. These need to be transferred to the Water Services Authority or WUAs who could use the infrastructure.