7 Ml (Table 5.28) of storage is required at Wartburg Reservoir to accommodate demands in 2020.

Table 5.28 Storage Requirement at Wartburg Reservoir.

<table>
<thead>
<tr>
<th>Reservoir Function</th>
<th>2020 Demand (Ml/day)</th>
<th>Time (hours)</th>
<th>Required Storage (Ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reticulation</td>
<td>0.7</td>
<td>36</td>
<td>1.05</td>
</tr>
<tr>
<td>Distribution</td>
<td>9.5</td>
<td>15</td>
<td>5.94</td>
</tr>
<tr>
<td><strong>TOTAL STORAGE REQUIREMENT</strong></td>
<td><strong>6.99</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Water demands from the Swayimana area have consistently increased over the years with the AADD as at October 2010 at 3 Ml/day. The projected demand for 2020 is 4.6 Ml/day. The capacity of the 250 mm diameter line from Bruyns Hill Pump Station to Bruyns Hill Reservoir is limited to 3 Ml/day because its pipe class (class 6) does not allow for an increased flow. To accommodate this growth, the pump station, supply line to Bruyns Hill Reservoir, as well as the reservoir storage, will need to be upgraded. Currently, the 400kl reservoir is only serving as a break pressure tank.

**Wartburg Reservoir to Dalton Reservoir**

The supply pipelines from Wartburg Reservoir to Dalton are adequate to meet the anticipated demands up to 2030. The pipeline will need to be augmented as and when Efaye and Ozwathini are supplied from the Wartburg System.

The Cool Air Reservoir (0.5 Ml) functions as a distribution reservoir and should have 15 hours balancing storage and 36 hours storage for its supply to the Cool Air community. The current total outflow from this reservoir is 0.9 Ml/day made up of 0.6 Ml/day to Cool Air reticulation and 0.3 Ml/day to Dalton Reservoir. This equates to a current storage requirement of 1.1 Ml. Increased storage is therefore required at Cool Air Reservoir. Table 5.29 indicates the storage requirement at the Cool Air Reservoir.

Table 5.29 Storage Requirement at Cool Air Reservoir.

<table>
<thead>
<tr>
<th>Reservoir Function</th>
<th>2020 Demand (Ml/day)</th>
<th>Time (hours)</th>
<th>Required Storage (Ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reticulation</td>
<td>0.7</td>
<td>36</td>
<td>1.1</td>
</tr>
<tr>
<td>Distribution</td>
<td>0.5</td>
<td>15</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>TOTAL STORAGE REQUIREMENT</strong></td>
<td><strong>1.4</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Recommendations**

Figures 5.17 – 5.21 illustrate schematically the Upper Mgeni System in its current configuration and how it will need to be upgraded over the next 30 years to accommodate the future growth in water demands. This Section should be read in conjunction with these Figures.
Figure 5.17 Demand on the Upper Mgeni System as at October 2010.
Figure 5.18 Five year demand projection for the Upper Mgeni System.
Figure 5.19 Ten year demand projection for the Upper Mgeni System.
Figure 5.20  Twenty year demand projection for the Upper Mgeni System.
Figure 5.21 Thirty year demand projection for the Upper Mgeni System.
In order to meet the anticipated load shift in demand by eThekwini Municipality, from the Lower Mgeni System to the Upper Mgeni System, the following infrastructure projects will be required:

- Construction of MMTS-2 (both Spring Grove Dam and the increased transfer capacity) by DWA;
- Upgrade of Midmar WTP;
- Augmentation of the ‘61 Pipeline from ED2 to Umlaas Road together with an upgrade of the Umlaas Road and World’s View reservoirs; and
- Construction of the Phase 1 of the Mkomazi Water Project, and decommissioning of the ‘53 Pipeline.

Other infrastructure upgrades and additions that will be required over the next 30 years are:

- Increase the capacity of Howick-North Reservoir;
- Increase the capacity of Howick-West Reservoir;
- Increase the capacity of Groenekloof Reservoir;
- Construction of the Richmond Pipeline, and decommission the Thornville Pump Station and Pipeline;
- Construction of the Manyavu Pipeline and later augmentation of the Lion Park Pipeline;
- Augment the ‘69 Pipeline (Claridge to Wartburg) and increase the capacity of Wartburg Reservoir. The Wartburg Pump Station will also need to be upgraded;
- Upgrade the Bruyns Hill Pump Station, replace the pipeline from Bruyns Hill Pump Station to the Bruyns Hill Reservoir, and increase the capacity of the Bruyns Hill Reservoir; and
- Increase the capacity of the Cool Air Reservoir.
- While the Clarendon and Blackridge Reservoirs need to be upgraded, it is recommended that this requirement be transferred to The Msunduzi Municipality because this additional storage is required to satisfy a 2-day emergency storage requirement which is considered to be their responsibility.

**Midmar Water Treatment Plant**

DWA have recently upgraded the existing Midmar Dam outlet works which feeds both Midmar WTP and D.V. Harris WTP (IMP 2008). The capacity of the 1 600 mm diameter pipeline supplying raw water to Midmar WTP is 348 Ml/day at 2 m/s.

To be able to meet the increase in demands when the Western Aqueduct is commissioned in 2014 it is necessary to upgrade the Midmar WTP from its current treatment capacity of 250 Ml/day to 375 Ml/day so that the combined capacity of the Midmar WTP and D.V. Harris WTP would be 485 Ml/day (Section 7.4.2). This is slightly more than the 99% assurance yield of Midmar Dam of 476 Ml/day (173.7 million m$^3$/annum), supported by the MMTS-2.

**Howick-North Sub-System**

Taking into consideration the high-level reservoir required by uMngeni Local Municipality to reticulate to newly developed areas to the north of Howick, the Howick Reservoir Complex would serve as a distribution reservoir that should have 36 hours for reticulation storage and 15 hours balancing storage. The determination of the storage requirement at Howick Reservoir is indicated in Table 5.27. The current storage of 6.6Ml needs to be increased by adding a new 6.5 Ml reservoir (Section 7.4.3).
Howick-West Sub-System

Howick - West Reservoir to Groenekloof Reservoir

When required through growth in demands, the storage at Howick-West Reservoir will need to be increased by 8.25 Ml, bringing the total storage to 24.75 Ml. This should then adequately serve as a distribution reservoir until 2030 (Section 7.7). A new 400 mm diameter pipeline dedicated to serve the Mpophomeni area will be required by the uMngeni Local Municipality once the new Khayalisha housing development is constructed. The existing 250 mm diameter pipeline will then become a backfeed from the Mpophomeni Reservoir.

Groenekloof Reservoir Supply

An additional 10 Ml storage is proposed to provide adequate capacity up to 2040 (Section 7.4.5). The timing for this infrastructure will be determined by the growth in water demands from this reservoir over time. At this stage, it is anticipated that the upgrade will be required in 2016.

Midmar WTP to Umlaas Road Sub-System

’61 Pipeline: World’s View Reservoir to ED2

An additional 115 Ml will be required to provide 15 hours of storage for the 330 Ml/day demand which is the maximum flow into the reservoir. It is recommended that an additional 50 Ml storage be constructed at World’s View to provide balancing storage. This storage requirement can initially be deferred to the Umlaas Road Reservoir if this is upgraded, and the World’s View Reservoir can be operated as a break pressure tank having 6 hours of storage. However, this should be considered an interim measure, and World’s View Reservoir will need to be upgraded as demands grow.

’61 Pipeline: ED2 to Umlaas Road Reservoir

- ED2 to Richmond take-off point
  A 1 300 mm diameter pipeline is proposed to augment the existing 800 mm diameter pipeline. This intervention will bring the velocities in this section below 2 m/s and reduce head loss in the pipeline. It will also increase the capacity of the pipe to the maximum that the Midmar WTP can provide to this point (Section 7.4.7). This project is required immediately to alleviate current capacity problems being experienced.

- Richmond take-off point to Umlaas Road
  Once the Western Aqueduct is commissioned in 2014, the demand in the pipeline between Richmond take-off point and Umlaas Road will be approximately 215 Ml/day. The current capacity of the pipeline is not sufficient to carry this demand and a 1 100 mm diameter pipeline has been proposed to augment the existing 800 mm diameter (Section 7.4.8). This intervention will bring the velocities in this section below 2 m/s and reduce head loss in the pipeline. It will also increase the capacity of the pipeline to the maximum that the Midmar WTP can provide to this point. This project is required to be functional when the Western Aqueduct is commissioned and the load shift is implemented.

Thornville/Hopewell Supply

When the proposed Richmond pipeline comes on-line, Thornville Reservoir will be supplied from the Richmond pipeline and the existing Thornville Pump Station will be decommissioned. The rising main from the ’61 Pipeline to Thornville will then revert to a back-feed gravity main.
‘53 Pipeline: D. V. Harris WTP to Umlaas Road Reservoir
This pipeline needs to remain operational until such time as the MWP is commissioned. Thereafter it is recommended that it be decommissioned. In the interim caution should be taken not to exceed the “safe load carrying capacity” of 45 ML/day.

Umlaas Road Sub-System
The current storage will be grossly undersized when required to accommodate the WA load shift. It is recommended that the Umlaas Road Reservoir complex be increased by 45 ML (Section 7.4.11). This will result in 9 hours of balancing storage in 2020. Together with the new reservoir, the inlet control arrangement must ensure that the maximum available supply through the ’61 pipeline can be delivered to the reservoir. This project is required to be functional when the Western Aqueduct is commissioned.

Lion Park Pipeline
In order to supply the Manyavu rural community in the long-term it will be necessary to augment the existing Lion Park Pipeline when demand exceeds 3ML/day. This will provide a dedicated supply pipeline from Umlaas Road Reservoir to Manyavu. A new 160 mm diameter pipeline will be required, which should follow the alignment of the existing Lion Park Pipeline and extend into Manyavu (Section 7.4.12).

Wartburg Sub-System
‘69 Pipeline: Claridge Reservoir to Wartburg Reservoir
The existing pipeline from Claridge Reservoir to the Wartburg Reservoir has a capacity of 8ML/day. The current demand on the pipeline is close to its capacity and it is therefore recommended that a new pipeline be installed from Claridge Reservoir, along the existing servitude, to the Wartburg Reservoir situated within the town of Wartburg (Section 7.4.13). The Wartburg Reservoir and the Wartburg Pump Station will need to be upgraded as part of this project. The section through the built-up area of Claridge is planned as an 800 mm diameter pipeline to cater for the ultimate demand of approximately 47ML/day and to ensure that further augmentation will not be necessary at a later stage through this built up area. The remainder of the pipeline to Wartburg Reservoir should be a 450 mm diameter pipeline with provision made for further augmentation in the future.

Wartburg Reservoir to Bruyns Hill Reservoir
Bruyns Hill Pump Station needs to be upgraded and a 260 mm diameter pipeline is to be constructed between the pump station and Bruyns Hill Reservoir. It is also necessary to increase the storage at Bruyns Hill with a new 6 ML reservoir (Section 7.4.14).

Wartburg Reservoir to Dalton Reservoir
The pipelines feeding Cool Air and Dalton Reservoirs have adequate capacity. However, storage limitations in the Cool Air Reservoir. A new 1 ML reservoir is required to augment the existing 0.5 ML storage (Section 7.4.15).