5. WATER RESOURCE PROFILE

All water supplied by the ZDM to the community is from sources within the DM's area of jurisdiction. Although there are sufficient internal resources, the ZDM are looking at the potential for more cost effective bulk water supplies from neighbouring municipalities. With a household count of approximately 144,995 the ZDM requires at least 869,970 kℓ of water per month or 10,440 Mℓ per year to supply the population with basic water services. This does not account for increased consumption in urban areas or industrial requirements.

The ZDM falls within the Mfolozi (W2), Mkuze (W3) and Pongola (W4) secondary catchments of the Usuthu/Mhlathuze Water Management Area (WMA)[1]. The aerial extent of the ZDM occupies approximately 22% of this WMA. The total available water and requirements as at year 2000, based on a 98% assurance of supply within these sub-areas, is summarised in Table 5a[2]. It is evident that apart from the Pongola catchments, water from these sub-areas is currently over-utilised and a deficit is created. However, according to Basson and Rossouw[3], this deficit is a result of the provision made for future implementation of the Reserve. The Reserve is a legislated requirement of the amount of water required to satisfy the ecological needs of a river system (provisionally estimated at 20%), as well as the basic human needs (that have been established as 25 litres per person per day).

Table 5a: Water balance - summary of the water available and required within Zululand District Municipality for the year 2000 (Million m³ (kℓ) per annum).

			Mfolozi	Mkuze	Pongola	Total
Available water	Natural resource	surface water	36	15	616	667
		groundwater	5	12	8	25
	Usable return flow	Irrigation	5	6	21	32
		Urban	4	0	0	4
		Mining & bulk	1	0	0	1
	Total local yield*		**51**	**33**	**645**	**729**
	Transfers in		0	30	0	30
	Total available		**51**	**63**	**645**	**759**
Water requirements	Consumer groups	Irrigation	51	61	213	325
		Urban**	12	1	1	14
		Rural**	11	10	6	27
		Mining & bulk industrial***	4	0	1	5
		Afforestation****	2	6	34	42
	Total local requirements		**80**	**78**	**255**	**413**
	Transfers out		18	0	30	**48**
	Total used		**98**	**78**	**285**	**461**
Balance			**-47**	**-15**	**360**	**298**

Source: Basson and Rossouw (2003).

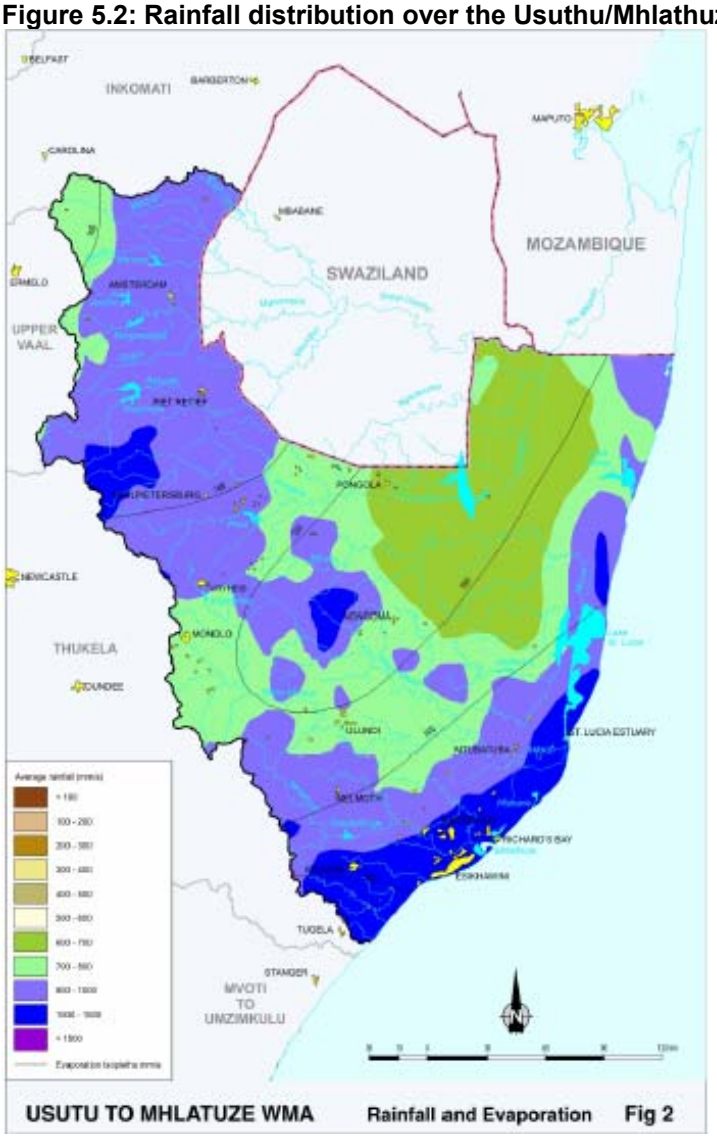
**Includes allowance for impacts of the ecological component of the Reserve, river losses, alien vegetation, rain-fed agriculture and urban run-off on yield.*
***Includes allowance for basic human needs component of the Reserve (25 ℓ/c/d).*
****Mining and bulk industrial water uses that are not part of the urban system.*
*****Afforestation quantities refer to the impact on yield only.*

[1] The Usuthu/Mhlathuze WMA is one of 19 areas defined across South Africa in terms of the National Water Act, 1998 (Act 36 of 1998). These WMAs have been defined to improve water resource management within South Africa. With time, each of the WMAs will establish a catchment management agency (CMA) for the regulation and control of water use in the WMA.
[2] Data for this table have been extracted from Basson and Rossouw (2003). *Usuthu to Mhlathuze Water Management Area: Overview of water resources availability and utilisation, September 2003*. DWAF: BKS. Report no. P WMA 06/000/00/0203. 31pp. At 13 & 21.
[3] Op cit 2 at 23.

5.1 Surface water sources

According to Basson[4], more than 60% of river-flow in South Africa arises from only 20% of the land area. The ZDM forms part of this 20% and has a wealth of surface water resources as a result of the high rainfall over the area (Figures 5.1 & 5.2). The main rivers in the ZDM are the Pongola, Mkuze and the Black and White Mfolozi. The Pongola River flows from the ZDM (some catchments lie in Swaziland) through Umkhanyakude DM and into Mozambique, where it becomes the Maputo River. At the boundary between Zululand and Umkhanyakude DMs, where the Pongola River passes through the Lebombo Mountains, it has been dammed to form the Pongolapoort or Jozini Dam. The Mkuze River flows into the St Lucia wetlands, whilst the Black and White Mfolozi confluence in uThungulu DM and flow southeast into the Indian Ocean just north of Richards Bay. Although the Pongola catchments resources have been developed through the construction of dams, the Mkuze and Mfolozi catchments remain relatively undeveloped.

Figure 5.2: Rainfall distribution over the Usuthu/Mhlathuze WMA (after Basson and Rossouw, 2003).



[4] *Basson, M.A. (1997). Overview of water resources availability and utilisation in South Africa*. DWAF: BKS. 72 pp at 8-9.

In terms of water resource management, this entire primary catchment forms the Usuthu/Mhlathuze WMA. The jurisdictional area of the ZDM encompasses large portions of the secondary catchments of the Mfolozi (W21 & W22) and Pongola (W41, W42 and W44) and a small portion of Mkuze (W31). The main surface water resources include the Bivane and Pongolapoort Dams that account for 88% of the available water resources (Table 5.1a). In the natural state, the water quality is of a high standard[5]. However, localised water quality problems and health risks associated with the proximity of settlements to resources and the lack of sanitation facilities occur within the region. This is being addressed through planning to eradicate the water services backlogs. This planning includes an education component that addresses the issues of health, hygiene and water conservation and use.

Table 5.1a: Storage of water resources in the Zululand District Municipality.

Surface Resource	Situation	Catchment	Owner	Usage	Natural MAR
Bivane Dam	Pongola River		DWAF	Domestic	
Pongolapoort Dam	Pongola River	W44E	DWAF	Domestic & irrigation	1114
Klipfontein Dam	White Mfolozi River	W21A	DWAF	Domestic	46.8
Bloemveld	Amagoda	W21A		Domestic	46.8
Grootgewaagd	Amagoda	W21A		Domestic	46.8
Van Niekerk Broers	Gola	W21J		Domestic	338.8
Boulder	Mbilane	W31A		Domestic	35.1
Kranskop		W31B		Irrigation	63.5

Source: Basson and Rossouw (2003) at Appendix 5.

The largest water user is the irrigation sector (approximately 50%), predominantly for sugarcane in the Pongola catchments. The ecological reserve accounts for 40% of the water use in the ZDM. There is also a significant proportion of forestry in the ZDM that is classified and regulated as a stream flow reduction activity (SFRA). Over the entire ZDM a surplus water yield is available, almost entirely due to the Pongolapoort/Jozini Dam that is not fully utilised. However many uncertainties exist relating to the magnitude of this surplus and these need to be resolved before any large-scale allocations are made. The Pongola River may experience some deficits during the winter months that can either be resolved by releases from Bivane Dam or off channel storage to make use of the summer surpluses. In addition, the lower Mfolozi and Mkuze catchments have a yield deficit due to large irrigation abstraction and water transfer from the Mfolozi to the Mhlathuze catchments[6]. However, some surplus yield may be available from the Klipfontein Dam in the upper reaches of the Mfolozi catchments and using off channel storage for summer surpluses, although compulsory licensing may be required to resolve these deficits. This will be determined and implemented by the catchment management agency (CMA) through their catchment management strategy (CMS). As the Mkuze Catchments experience both winter and summer deficits, these catchments should not be targeted as a water resource for any of the RWSS. Expectations are that the overall ZDM population will experience little change within the next 25 years, with a decline in rural population likely to be balanced by increased urbanisation.

To obtain a better perspective of the localised surface water resources within the ZDM, each of the secondary catchments is considered individually. Discussion of these basins is divided into key areas and is limited to the point where the river exits the ZDM boundary, however if headwater catchments are outside the ZDM they

[5] Op cit 2 at 19.
[6] This transfer occurs at the mouth of the Mfolozi River for the use of Richards Bay Minerals, who have a license to abstract 18 million m^3/annum.

are included in the analysis (Table 5.1b). The major water users/requirements, resources and reconciliation for current conditions are summarised in Table 5.1c.

Table 5.1b: Key areas for yield determination.

Key area	Catchments outlet	Description of area	Quaternaries
Klipfontein Dam	W21A	Klipfontein Dam catchment	W21A
White Mfolozi	W21K	White Mfolozi River below Klipfontein Dam to ZDM Boundary	W21B to W21K
Black Mfolozi	W22L	Black Mfolozi to ZDM Boundary	W22A to W22L
Mkuze	W31G	Mkuze River to ZDM Boundary	W31A to W31G
Bivane Dam	W41F	Bivane Dam on Bivane River	W41A to W41F
Pongolapoort Dam	W44E	Pongola River to Pongolapoort Dam excluding Paris Dam Catchment	W41G, W42A to W42M, W44A to W44E

Table 5.1c: Major water users/requirements, resources and reconciliation for current conditions within the ZDM.

User sector	ZDM (million m^3/annum)
Irrigation	273
Urban	17
Industrial and mining	2
Rural (25lcd)	17
Transfers out	36
Ecological requirements	230
Total water use	***575***
Stream flow reduction activities	110
Rural (12lcd)	12
Rural (60lcd)	30
Yield from Major Dams	902
Yield from Minor Dams	17.9
Annual Run of River Yields	51.8
Usable Return Flows	32.7
Total resource	***1004.4***

5.1.2 The Mfolozi Catchments (W21 and W22)

The major water users/requirements, resources and reconciliation for current conditions in the Mfolozi Catchments are summarised in Table 5.1d. A discussion of the White and Black Mfolozi Catchments follows.

Table 5.1d: Major water users/requirements, resources and reconciliation for current conditions in the Mfolozi Catchments.

User sector	Klipfontein Dam Catchment (million m^3/annum)	White Mfolozi below Klipfontein Dam (million m^3/annum)	White Mfolozi Catchment (million m^3/annum)	Black Mfolozi Catchment (million m^3/annum)
Irrigation	0	5	5	11
Urban	7	7	14	0
Industrial and mining	0	0	0	1
Rural (25lcd)	1	4	5	5
Transfers out	0	0	0	0
Ecological requirements	5	34	34	30
Total water use	***13***	***50***	**58**	***47***
Stream flow reduction activities	4	7	11	11
Rural (12lcd)	1	3	4	4
Rural (60lcd)	3	6	9	10
Yield from Major Dams	15	0	15	0
Yield from Minor Dams	2.6	4.4	7	2.3
Annual Run of River Yields	0	12.5	12.5	13
Usable Return Flows	2.2	2.5	4.7	1.2
Total resource	***19.8***	***19.4***	**39.2**	***16,5***
Annual Yield Balance (Mm^3/a)	5	-		-
Yield Balance in Summer (Mm^3/8 months)	-	18		15
Yield Balance in Winter (Mm^3/4 months)	-	-5		-4
Yield Available in Upstream Catchment (Mm^3/a) after making d/s requirements	-	1		

5.1.2.1 The White Mfolozi Catchments (W21A TO W21K)

The White Mfolozi catchment consists mostly of commercial farming in the northwest and Traditional Authority land in the southeast, with the main activity being cattle farming. Approximately 120 km^2 of commercial forestry (or 2,5% of the land cover) and 30 km^2 of alien vegetation (less than 1% of the land cover) are situated in the upper reaches of the catchment. Only a small portion of the catchment area is irrigated, estimated at about 8 km^2, downstream of Klipfontein dam. Some farmers have reduced their irrigation requirements because of the high cost of water. The Mfolozi Game Reserve lies at the outlet of the catchments from the ZDM. Significant towns include Vryheid, Ulundi and Emondlo.

The source of the White Mfolozi River is near Vryheid, from where it flows eastward past Ulundi out of the ZDM at the Mfolozi Game Reserve and across the Zululand coastal plain before discharging into the Indian Ocean. The catchments cover approximately 4,750 km^2 in the ZDM, with a MAR of 410 million m^3 per annum. The average MAP for the White Mfolozi river basin is 800 mm with a maximum value of 880 mm near Vryheid

and a minimum value of 700mm in the east. The general trend is that the rainfall increases moving westward, with the high lying areas receiving more rainfall. Runoff generally tends to follow rainfall and topography trends, ranging from 138 mm in W21A near Vryheid to 61 mm in W21F near Ulundi. The total surface water resources of the White Mfolozi system are estimated at 38 million m^3/annum, including an adjustment for stream flow reduction activities. However, return flows are limited and are estimated to be 4.7 million m^3/annum. Water resources within the catchments are mostly undeveloped with the most significant being the Klipfontein Dam in the upper reaches. This dam has a capacity of 19 million m^3 and was constructed to augment water supply to the towns of Vryheid and Ulundi. Provision was also made for irrigation requirements.

Domestic consumers from Ulundi and Vryheid, as well as the proposed Regional Water Supply Schemes (RWSS) for Emondlo and Nkonjeni (see Section 12), are the major water use in these catchments. Vryheid receives water from Bloemveld and Grootwaagd Dams upstream from the town, and to a lesser extent Klipfontein Dams. Preference is given to water from the Bloemveld and Grootwaagd Dams to reduce the tariff charges to DWAF. Ulundi receives water from an abstraction weir on the White Mfolozi River. The weir has gates that when closed yield a storage capacity of 0,19 x $10^6 m^3$. The gates are closed in winter to capture low flows and open in summer to avoid the weir being silted up. River yields are supplemented during low flows with releases from Klipfontein Dam that is underutilised and has capacity. However, losses between Klipfontein Dam and the Ulundi weir are large and this method of operation is not efficient. The Emondlo Regional Scheme proposes to supply the region from the Klipfontein Dam, whilst the preferred option for the Nkonjeni Regional Scheme is to take the bulk of the water from the White Mfolozi River near Ulundi and the balance from the Mpembeni and Thaka Rivers via an off channel storage. To increase the security of supply to Ulundi and to provide a higher level of service to the Nkonjeni RWSS (60 litres per capita per day), the excess yield in the summer months should be targeted via off channel storage. Alternatively, Klipfontein dam could be raised. Emondlo receives water from the Mvunyana Dam that is almost completely silted. A survey of Mvunyana Dam basin should be done to determine the extent of the silting. A significant amount of water is transferred out of the lower Mfolozi, just before it flows into the sea, to the Mhlathuze catchments for mining use by Richards Bay Minerals.

The impact of the ecological Reserve on the yield of these catchments is significant. The relative impact is large at the Klipfontein Dam while the impact on the run-of-river yields in the rest of the catchments is also significant. The winter and summer low flow ecological reserve based on the desk top method is 4 million m^3 for the four driest months and 30 million m^3 for the eight wettest months.

The annual estimates on water resources and the water requirements obscure the seasonal distribution. The run of river yield is completely different for the summer months compared with the winter months for the same level of assurance of supply. Irrigation requirements can also have a strong seasonal variation, as does the environmental reserve. A reconciliation that includes the Nkonjeni and Emondlo RWSS, with estimated water requirements of 8x$10^6 m^3$/annum and 3,5 x $10^6 m^3$/annum respectively, indicates that there is a deficit in the lower White Mfolozi during the winter months. This deficit can be overcome by releases from Klipfontein Dam. However the analyses indicate that when the rural water demand increases to 60lcd then there is a shortfall in

supply from Klipfontein dam. This may be resolved by either provision of off channel storage at Ulundi or the reallocation of irrigation water use.

5.1.2.2 The Black Mfolozi Catchments (W22A to W22L)

The Black Mfolozi catchments consist mostly of Traditional Authority land, with the main activity being cattle farming. There is approximately 100 km^2 of commercial forestry (or 3% the land cover) and 20 km^2 of alien vegetation (or less than 1% of the land cover) situated in the upper reaches of the catchment. Only a small portion of the catchment area is irrigated, estimated at about 15 km^2. The Mfolozi Game Reserve lies at the outlet of the catchment from the ZDM. The only significant town is Nongoma.

The source of the Black Mfolozi River is approximately 20 km east of Vryheid, from where it flows southeast through Traditional Authority areas, out of the ZDM at the Mfolozi Game Reserve and across the Zululand coastal plain before discharging into the Indian Ocean. The confluence of the Black and White Mfolozi Rivers occurs in the Mfolozi Game Reserve. The catchments cover approximately 3 600km^2 within the ZDM, with an MAR of 390 million m^3 per annum. The average MAP for the Black Mfolozi river basin is 800 mm, with a maximum of 1,055 mm near Ngome State Forest and a minimum of 700 mm to the east. Runoff generally tends to follow rainfall and topography trends, ranging from 141 mm in W22A near Vryheid to 80 mm in W22D in the Thaka River catchments. The total surface water resources of the Black Mfolozi system are estimated at 17 million m^3/annum, including an adjustment for stream flow reduction activities. However, return flows are limited and estimated to be 1.2 million m^3/annum. The water resources of the Black Mfolozi catchments are mostly undeveloped and underutilised.

The major water users in these catchments are irrigation and domestic rural water supply. Nongoma receives water from the Vuna River (W22G). The preferred option to supply water for the proposed Usuthu RWSS is from the Black Mfolozi River with off channel storage to manage drought low flows (80% of W22F). An alternative is to abstract part of the water requirements for the Mandhlakazi RWSS from the Mona River (60% of W22K). The impact of the ecological Reserve on the yield of this catchment is significant. The winter and summer low flow ecological reserve based on the desk top method is 4 million m^3 for the four driest months and 26 million m^3 for the eight wettest months.

The annual estimates on water resources and the water requirements obscure the seasonal distribution. The run of river yield is completely different for the summer months compared with the winter months for the same level of assurance of supply. Irrigation requirements can also have a strong seasonal variation, as does the environmental reserve. A reconciliation that includes the Usuthu RWSS, with estimated water requirements of $2.5x10^6m^3$/annum, indicates that there is a deficit in the lower Black Mfolozi during the winter months owing to large scale irrigation development near the mouth of the Mfolozi River and abstractions for transfer to the Mhlathuze catchments. This deficit can be overcome with the use of off channel storage to store the excess water available in summer for use in winter.

5.1.2 The Mkuze Catchments (W31A to W31G)

The Mkuze catchments consist mostly of commercial cattle or game farming, with a small area of Traditional Authority land located in the southeast. There is a significant amount of afforestation, estimated to be nearly 114 km^2 (or 4% of the land cover), and an estimated 49 km^2 of alien vegetation (or 2% of the land cover). Irrigation of sugarcane is another significant land use covering area of approximately 68 km^2 (2,6% of the land cover). The only significant town in the area is Hlobane that is situated river's headwaters.

The source of the Mkuze River is east of Vryheid with the catchments covering approximately 2,600 km^2 of the ZDM, and experiencing unusual rainfall distribution. MAP is high at the coast (about 1,000 mm/annum), over 900 mm/annum in the high lying western area of the catchments, but only 600 mm/annum in certain other areas as a result of the rain shadow of the Lebombo Mountains. The MAR is 147 million m^3/annum (catchments W31A to W31G), ranging from 132 mm in W31C near Hlobane to 20 mm in W31G. The total surface water resources of the Mkuze system are estimated at 37 million m^3/annum, including an adjustment for stream flow reduction activities. However, return flows are limited and are estimated to be 7.5 million m^3/annum. The water resources are mostly undeveloped, with only a number of farm dams for irrigation purposes.

The major water users in these catchments are irrigation and commercial forestry. Irrigators abstract water from run-of-river flows or from farm dams, with the exception of Senekal Estates who receive water from the Pongolapoort Dam. This abstraction occurs in terms of a licence to abstract 30 million m^3/annum from Pongolapoort Dam to W31H for the primary purpose of irrigation. However, the licence conditions make allowance for supply of domestic rural water requirements. Although W31H is outside the ZDM, this transfer is significant as it is the proposed water resource for the Mandhlakazi RWSS. The town of Hlobane obtains its water from the Hlobane and Boulder Dams. As the Hlobane mine is no longer in operation, the excess available water from these dams is planned to supply both the Coronation and Khambi RWSS.

The impact of the ecological Reserve on the yield of these catchments is uncertain. However, the winter and summer low flow ecological reserve based on the desk top method is 2 million m^3 for the four driest months and 11 million m^3 for the eight wettest months. This is a very low-confidence estimate that needs refining.

The annual estimates on water resources and the water requirements obscure the seasonal distribution. The run of river yield is completely different for the summer months compared with the winter months for the same level of assurance of supply. Irrigation requirements can also have a strong seasonal variation, as does the environmental reserve. A reconciliation that includes the both Coronation and Khambi RWSS, with estimated water requirements of 1 x $10^6 m^3$/annum and 0,2 x $10^6 m^3$/annum respectively, indicates that there is a deficit in the Mkuze River during both the winter and summer months owing to irrigation utilising the entire available yield without maintaining water for the Reserve. This deficit can be overcome with the use of compulsory licensing and the reallocation of water between sectors. The requirements of the Mandhlakazi RWSS are excluded from the analysis as this scheme is expected to obtain raw water from Senekal Estates (transferred from Pongolapoort Dam).

The major water users/requirements, resources and reconciliation for current conditions in the Mkuze Catchments are summarised in Table 5.1e.

Table 5.1e: Major water users/requirements, resources and reconciliation for current conditions in the Mkuze Catchments.

User sector	Mkuze Catchment (million m^3/annum)
Irrigation	74
Urban	1
Industrial and mining	0
Rural (25lcd)	1
Transfers out	0
Ecological requirements	13
Total water use	***89***
Stream flow reduction activities	12
Rural (12lcd)	1
Rural (60lcd)	2
Yield from Major Dams	0
Yield from Minor Dams	5.6
Annual Run of River Yields	26.3
Usable Return Flows	7.5
Total resource	***39.4***
Annual Yield Balance (Mm^3/a)	-
Yield Balance in Summer (Mm^3/8 months)	-20
Yield Balance in Winter (Mm^3/4 months)	-5
Yield Available in Upstream Catchment (Mm^3/a) after making d/s requirements	-

5.1.3 The Pongola Catchments (W41, W42 and W44)

The Pongola catchments form part of an International River Basin shared with both Swaziland and Mozambique. Although neither of these countries currently have high demands on these water resources, it may be easier to supply Maputo's future requirements from the Pongola River where there is a surplus (sourced from the Pongolapoort Dam) than from the Inkomati River that is stressed. An amount of 87 million m^3/annum has been reserved for the future use of Mozambique in the agreement while current use is set at 6 million m^3/annum of high assurance use and 60 million m^3/annum of irrigation use.

The Pongola catchments are characterised by large-scale afforestation estimated at 480 km^2 (or 6% of the land cover) in the upper Pongola and Bivane tributaries, and large-scale irrigation of approximately 200 km^2 (or 2,5% of the land cover) in the W44 catchments upstream of the Pongolapoort Dam. The main irrigated crop is sugarcane. There is approximately 150 km^2 of alien vegetation (or 2% of the land cover). The significant towns in the area include, Pongola, Paulpietersburg and Frischgewaagd.

The source of the Pongola River is on the eastern escarpment at the boarder of Mpumalanga and KwaZulu-Natal near Wakkerstroom, from where it flows eastwards carving a gorge through the Lebombo Mountains before joining the Usuthu River just before the Mozambique border and flowing into the Maputo Basin. The catchments cover approximately 7,800 km^2 in the ZDM, with an estimated MAR of 1421 million m^3/annum at Pongolapoort Dam. The average MAP for the area is 800 mm, ranging from 580 mm in the rain shadow (caused by the Lebombo Mountains) to 1,060 mm on the eastern escarpment. Topographic influences are

present in the rainfall patterns, however there is a general increase in the amount of rainfall as one moves westward. The total surface water resources of the Pongola catchments are estimated at about 910 million m^3/annum, and return flows are estimated to be about 10% of the irrigation demand, or 20million m^3/annum. The water resources of the Pongola catchments are fully developed through the Pongolapoort Dam. This 2.5 MAR dam produces a large yield from the substantial runoff of the Pongola catchments and there is no further scope for increasing the yield as a whole. However, surplus yield is available although the magnitude is due to uncertainties surrounding the environmental requirements. Recently the Bivane Dam has been constructed in the Bivane catchments to increase the assurance of supply to irrigators upstream of the Pongolapoort Dam. A rapid assessment of the ecological Reserve has been carried out for the Pongolapoort and Bivane Dams. There is an existing operating rule that determines the frequency and magnitude of flood releases from the Pongolapoort Dam to meet social and environmental requirements on the flood plains downstream of the dam. These releases reduce the yield of the Pongolapoort Dam substantially (by about 250 million m^3/annum). However, the downstream parties do not always welcome these releases and Mozambique has recently objected, as have riparian farmers along the lower Pongola River. The possible dam sites on the upper Pongola River that have been investigated for the possible transfer of water to the Vaal System will not increase the system yield significantly; only move the yield of the Pongolapoort Dam upstream.

The major water user in these catchments is irrigation, at an estimated to be 197 million m^3/annum (including losses). The other significant water user is afforestation that reduces runoff by an estimated 76 million m^3/annum. The impact of this reduction in runoff depends on the location of yield utilisation. Competition between forestry and irrigation in the Upper Pongola and Bivane catchments resulted in the Impala Water User Association (previously the Impala Irrigation Board) to commission the Bivane Dam to increase the assurance of supply to irrigators. The Association believe that the forestry sector (as a stream-flow reduction activity) should contribute towards the cost of the dam, however the forestry sector does not see why they should. In addition, irrigation under the control of the Impala Water User Association continues to expand illegally and is currently estimated to be 17,000 ha, of which only 14,700 ha is registered. Legitimising this water use would assist the Association in paying off the dam and rescue it from financial difficulties. Apart from the Pongola and Bivane Dams, irrigators receive water through a system of canals constructed by the Department of Water Affairs in 1970's in a scheme known as the Pongola Government Water Scheme that was upgraded in the early 1990's and later privatised. These canals are supplied through releases from the Bivane Dam and run-of-river diversions out of the Pongola River at the Grootdraai weir. Approximately 3,000 ha of irrigated land abstract directly from the Pongolapoort River downstream of the Grootdraai weir. The town of Pongola receives water from irrigation canals in the lower Pongola catchments, but more recently has also been supplied from the Bivane Dam. Simdlangenstha Phase 1 RWSS receives 90% of its water from Pongola town, that is approximately 10% of the town's own requirements. Simdlangenstha Phase 2 RWSS is planning to get 66% of its water from the Frischgewaagd weir on the Pongola River (W42E 50%), and the remaining 34% from the Monzana River (W42L 15%). Off channel storage is available at Belgrade. The impact of the ecological Reserve on the yield is estimated to be about 152 million m^3/annum. This estimate was made using the ecological requirements as determined by the Hughes Desktop method coupled with a yield analysis of the Pongolapoort Dam (a Class B EMC was assumed).

The annual estimates on water resources and the water requirements obscure the seasonal distribution. The run of river yield is completely different for the summer months compared with the winter months for the same level of assurance of supply. Irrigation requirements can also have a strong seasonal variation, as does the environmental reserve. A reconciliation that includes the Simdlangenstha Phases 1 and 2 RWSS indicates a large surplus in this catchment. However, the magnitude of the surplus is uncertain since the current releases for flood plain management have not been taken into account. According to the rapid reserve determination carried out in 2000, these should be considered as being independent of each other. The shortfall in the winter months is due to a combination of the large irrigation requirements and the ecological reserve. Upstream of Bivane Dam there are a few deficits, however below the dam these deficits can be resolved through releases. After supplying the existing downstream requirements from the dam there is no significant spare yield. Another important factor is that the National Water Resource Strategy (NWRS) recommends that water in the upper Pongola be reserved for possible transfer to the Vaal system in the future. This will definitely reduce the existing available surplus. However, in terms of alleviation of water services backlogs in the ZDM, the basic human need supply is accounted for in the Reserve and domestic supply is a Constitutional right that will be prioritised above that of industrial and agricultural use. Nevertheless, based on the operating programme of the Bivane Dame for irrigation there should be scope for expansion of irrigation in the Impala Water User Association area if a lower level of assurance is accepted.

The major water users/requirements, resources and reconciliation for current conditions in the Pongola Catchments are summarised in Table 5.1f.

Table 5.1f: Major water users/requirements, resources and reconciliation for current conditions in the Pongola Catchments.

User sector	Bivane Dam Catchment (million m^3/annum)	Pongolapoort dam catchment (increm) (million m^3/annum)	Pongolapoort dam catchment (Total) (million m^3/annum)
Irrigation	18	169	197
Urban	0	1	1
Industrial and mining	0	1	1
Rural (25lcd)	1	4	5
Transfers out	0	35	35
Ecological requirements	62	152	152
Total water use	***81***	***362***	***391***
Stream flow reduction activities	17	59	76
Rural (12lcd)	1	1	2
Rural (60lcd)	1	9	10
Yield from Major Dams	153	734	887
Yield from Minor Dams	1.8	1.2	3
Annual Run of River Yields	0	0	0
Usable Return Flows	1.8	17.4	19.2
Total resource	***156.6***	***752.6***	***909.2***
Annual Yield Balance (Mm^3/a)	72	538	
Yield Balance in Summer (Mm^3/8 months)	24	6	
Yield Balance in Winter (Mm^3/4 months)	-6	-20	
Yield Available in Upstream Catchment (Mm^3/a) after making d/s requirements	-	4	

5.1.4 Surface water schemes

Most surface water used for domestic supply within the ZDM is from rivers, however a number of dams are used to supplement this supply.

Table 5.1g lists the surface water resources and the known abstraction permitted per source. Certificates of registration for an existing lawful water use in terms of Section 22 of the National Water Act, 1998 or water use permits in terms of the old Water Act, 1956 have not yet been for these abstractions. These certificates are required to ensure that water supply within the ZDM is legally compliant, and is accounted for in the long-term sustainability of the water resources in the region. A more detailed breakdown of the 36 schemes currently utilising these surface water resources is given in Table 5.1h.

Table 5.1g: Surface water resources and permitted abstractions.

Source name	Source	Permitted abstraction (Ml/year)	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	Use*
Pongola	River		882							
Vuna (Nongoma)	Dam		1,533							
White Umfolozi	River		7,350							
Mtiki (Mondlo)	Dam		2,737							
Total			**12,502**							

**D is domestic and I is industrial use*

Table 5.1g: Utilisation of surface water resources.

LM #	LM	Scheme	Settlement type	Function	Number of people	Water source	Bulk Water Operator	Resource Type
KZ261	eDumbe	Paulpietersburg (eDumbe)	Urban	Water & sanitation	15,200	Paulpieterberg WTW	eDumbe LM	Dumbe Dam
KZ261	eDumbe	Frischgewaagd/Bilanyoni	Urban	Water & sanitation	8,158	Bilanyoni WTW	ZDM	River weir
KZ261	eDumbe	Obivane	Rural	Water	1,057	Bivane WTW	ZDM	Obivane Dam
KZ261	eDumbe	Ophuzane	Rural	Water	7,980	Bivane WTW	ZDM	Obivane Dam
KZ261	eDumbe	Tholakela	Rural	Water	5,962	Tholakela WTW	ZDM	River weir
KZ262	uPhongolo	Pongola/Ncotshane	Urban	Water & sanitation	20,000	Pongola WTW	uPongolo LM	River weir
KZ262	uPhongolo	Belgrade	Rural	Water & sanitation	5,359	Belgrade WTW	ZDM	River weir
KZ262	uPhongolo	Khiphunyawo/Siyaphambili	Rural	Water	3,554	Siyapambili WTW	ZDM	River weir
KZ262	uPhongolo	Msibi	Rural	Water	1,099	Msibi WTW	ZDM	River weir
KZ262	uPhongolo	Nkosentsha	Rural	Water	1,620	Nkosentsha WTW	ZDM	River weir
KZ262	uPhongolo	Ombimbini	Rural	Water	6,664	Msibi WTW	ZDM	River weir
KZ263	Abaqulusi	Vryheid (Bhekuzulu)	Urban	Water & sanitation	33,666	Klipfontein & Bloemveld WTWs	Abaqulusi LM	Klipfontein Dam
KZ263	Abaqulusi	eMondlo	Urban	Water & sanitation	21,550	Emondlo WTW	Abaqulusi LM	River weir
KZ263	Abaqulusi	Bhekumthetho Phase 1 and 2	Rural	Water	4,765	Emondlo WTW	Abaqulusi LM	River weir
KZ263	Abaqulusi	Bhekumthetho Phase 3	Rural	Water	3,434	Emondlo WTW	Abaqulusi LM	River weir
KZ263	Abaqulusi	Cliffdale	Rural	Water & sanitation	5,434	Coronation WTW	Abaqulusi LM	Hlobane Dam
KZ263	Abaqulusi	Coronation	Rural	Water & sanitation	3,143	Coronation WTW	Abaqulusi LM	Hlobane Dam
KZ263	Abaqulusi	Hlobane	Rural	Water & sanitation	2,400	Hlobane WTW	Abaqulusi LM	Hlobane Dam
KZ263	Abaqulusi	Louwsburg	Rural	Water & sanitation	3,120	Louwsberg WTW	Abaqulusi LM	Louwsberg Dams
KZ263	Abaqulusi	Mvuzini	Rural	Water	2,500	Mvuzini WTW	ZDM	River weir
KZ263	Abaqulusi	Mountain View Mission	Rural	Water	1,700	Mountain View WTW	ZDM	River weir
KZ263	Abaqulusi	Nkongolwane	Rural	Water & sanitation	6,566	Coronation WTW	Abaqulusi LM	Hlobane Dam
KZ263	Abaqulusi	Vrede	Rural	Water	Unknown	Coronation WTW	Abaqulusi LM	Hlobane Dam
KZ265	Nongoma	Nongoma	Urban	Water & sanitation	3,842	Nongoma Vuna & Mbile WTWs	ZDM	Vuna, Vukwaqna & Mbile Dam
KZ265	Nongoma	Bukhalini	Rural	Water	Unknown	Package plant	ZDM	River weir
KZ265	Nongoma	Gwebu	Rural	Water	2,000	Nongoma WTWs	ZDM	Unknown
KZ265	Nongoma	Kangela Palace	Rural	Water	100	Kangela WTW	ZDM	River weir
KZ265	Nongoma	Matshemhlope	Rural	Water	1,560	Package plant	ZDM	River weir
KZ265	Nongoma	Sidinsi	Rural	Water	2,320	Sindinsi WTW	ZDM	Unknown
KZ266	Ulundi	Ulundi	Urban	Water & sanitation	55,000	Ulundi WTW	ZDM	White Umfolozi River weir
KZ266	Ulundi	Ceza Hospital	Rural	Water & sanitation	2,400	Ceza WTW	ZDM	River weir
KZ266	Ulundi	Emakhosini	Rural	Water	4,992	Emakhosini WTW	ZDM	River weir
KZ266	Ulundi	Mahlabatini	Rural	Water & sanitation	370	Unknown	Unknown	Unknown
KZ266	Ulundi	Mpungamhlope / Denny / Dalton	Rural	Water & sanitation	2,650	Mpungamhlope WTW	ZDM	River weir
KZ266	Ulundi	Nondayana	Rural	Water	1,801	Package plant	ZDM	Unknown
KZ266	Ulundi	Thulasizwe Hospital	Rural	Water & sanitation	4,500	Thulasizwe WTW	ZDM	River weir

5.2 Groundwater sources – aquifer characteristics

Groundwater is a useful water resource with potential quality and quantity being controlled by the geology of an area (Figure 5.3). The Zululand district is underlain predominantly by Karoo Sequence basalts, shales, siltstones, sandstones and conglomerates that have been intruded by dolerite dykes, sills and plugs of Jurassic age (i.e. post Karoo; see Appendix 6 for geological maps). The formations making up the Karoo Supergroup sediments are often relatively massive such that primary storage and permeability is negligible. Groundwater storage and movement is confined to joints and bedding planes within the rock mass that yield between 0.5 and 2 ℓ/s. In the absence of faulting or dolerite intrusions, the groundwater potential of these sediments is marginal to poor (i.e. 0 to 0.5 ℓ/s (0 to 1,800 ℓ/h)). In addition, water quality is generally poor (Class 2) and some boreholes produce high concentrations of dissolved salts (Nyoka Formation), with high NaCl and SO_4 concentrations (Vryheid and Dwyka Formations) or high Iron and/or Manganese (Pietermaritzburg Formation). The indurated contact zones in the sediments adjacent to the intrusive Jurassic age dolerite intrusions are often highly fractured and these discrete zones enhance groundwater storage and rockmass permeability. As a result, boreholes drilled to intersect these structures usually produce higher yields and superior quality groundwater than that of the surrounding host rock. These contact zones usually produce yields ranging from 0.1 – 10 l/s and groundwater quality range from Class 0 to Class 3 depending on the composition of the sedimentary host rock.

The groundwater development potential of each of the quaternary catchments have been characterized using the criteria outlined as follows:

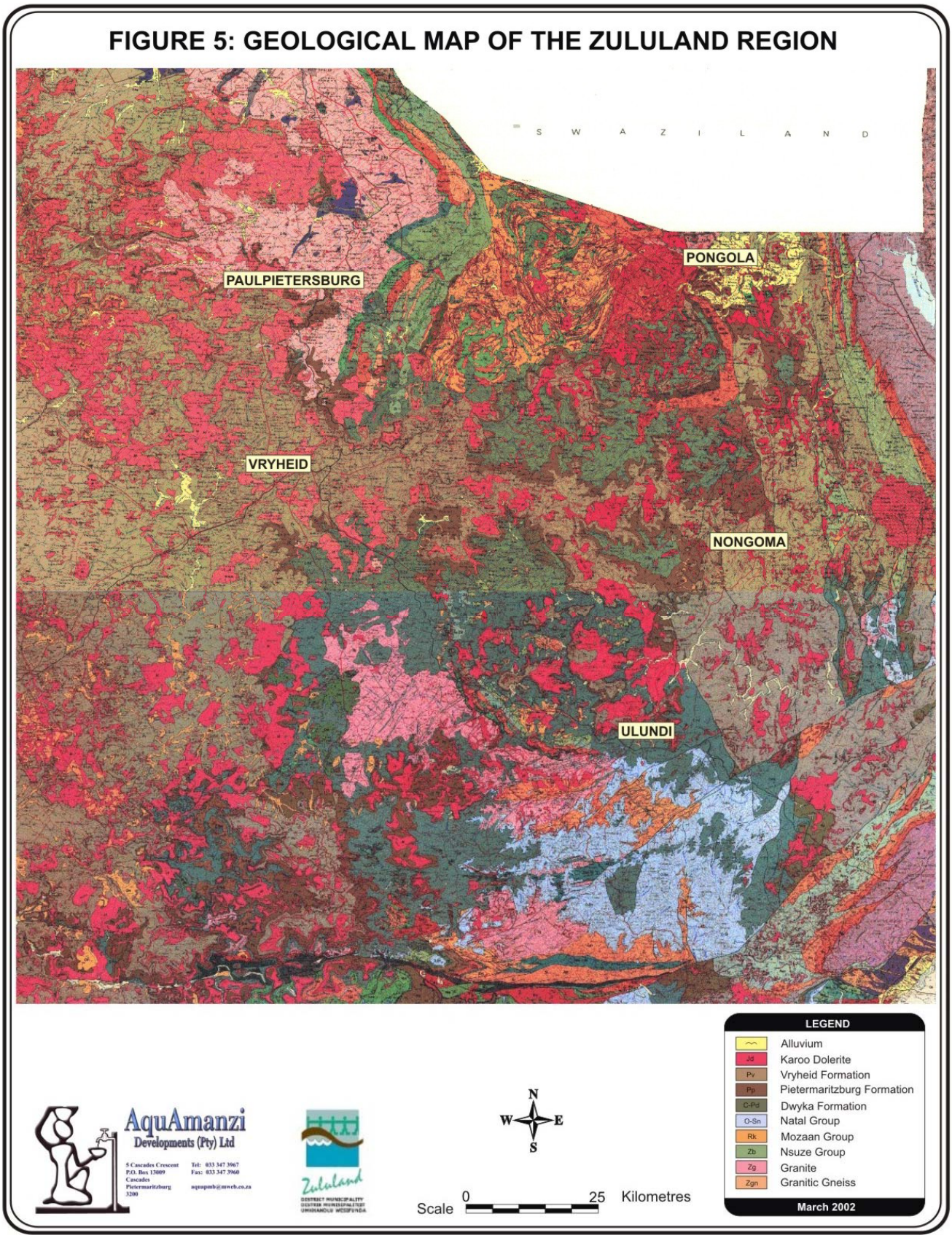
- The geological information underlying each quaternary and associated median yields for the geological formations.
- The ambient groundwater quality each of the geological formations.
- The renewable resource derived from rainfall recharge as a percentage of MAP over the effective surface area of the quaternary (base flow included in the estimates).
- Current utilization was calculated using the following assumptions
  - Handpumps - 250 l/hr for 12 hours = 3 kl/day
  - Motorized systems - 1000 l/hr for 10 hours = 10 kl/day

The potential extractable volume was derived from the difference between renewable groundwater resource (recharge) and current utilization (groundwater abstraction).

In general the overall groundwater quality in the ZDM is good (see Appendix 6), with the water quality in eDumbe, uPhongola and Abaqulusi LMs falling within Class 0 and 1 (Kempster Classification) and Nongoma and Ulundi LMs ranging from Class 0 to Class 4 (mostly due to the high NaCl concentrations). It is pertinent to note that a large number of the Traditional Authority areas are situated within these areas of poorer groundwater quality. The deterioration of groundwater quality from west to east, can be ascribed to:

- Declining rainfall from west to east.
- Concentration of dissolved solids from through flow below the Dwyka Formation and coal seams in the Vryheid Formation in the central and eastern regions of the catchments.

Figure 5.3: Geology of the Zululand District Municipality.



The sedimentary rocks that underlie the study area represent a secondary or fractured rock aquifer with negligible primary porosity or permeability. Groundwater storage and movement is therefore mainly confined to fractures and joints that occur within the rock mass, and is therefore structurally controlled.

The groundwater development potential within each of the quaternary catchments is adequate to meet the basic water demand of rural communities (see Appendix 6) either through:

- Stand-alone basic levels of water supply by boreholes equipped with handpumps; or
- Limited reticulation schemes through production boreholes that target structural features offering high groundwater development potential.

Currently many communities within the ZDM rely on groundwater; this includes both formal rural water schemes as well as rudimentary project communities. The rudimentary (survival) service level consists of boreholes equipped with hand-pumps or protected springs supplying at least 5 ℓ/c/d. A full spatially referenced groundwater database can be obtained from the ZDM[7]. As this database is extensive, Table 5.2a has not been completed in this document.

Table 5.2a: Groundwater resources and abstraction.

Borehole/ well number	Aquifer type	Permitted abstraction (Ml/year)	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	Use
Total										

A list of the 24 formal schemes that abstract groundwater for water supply is given in Table 5.2b. In addition to these schemes there are a number of formal schemes for which the resource is unknown. These are listed in Table 5.2c, and are potentially supplied through groundwater. This should be clarified once the Section 78 process is complete. The groundwater schemes and Rudimentary Programme make use of the groundwater resources shown in Figure 5.4.

[7] A hydrocensus of all water supply points used by communities in Traditional Authority areas as domestic water supply sources was carried out within the ZDM by AquAmanzi and this information was captured into a spatial data-set by Intermap. A total of 1,256 boreholes equipped with handpump abstraction systems and 25 wells were counted. The field water quality measurements included EC, pH and Nitrate values, however laboratory water quality analysis was not included.

Table 5.2b: Utilisation of groundwater resources.

LM #	LM	Scheme	Settlement type	Function	Traditional Authority	Number of people	Water source	Bulk Water Operator	Reticulation Water Operator
KZ261	eDumbe	Balmoral	Rural	Water	Ndlangamandla	5,356	Borehole	Not applcable	ZDM
KZ261	eDumbe	Emathunzini (Vlakplaas)	Rural	Water	Ndlangamandla	Unknown	Borehole	Not applcable	ZDM
KZ261	eDumbe	Gwebu/Scotshill	Rural	Water	Dlamini	969	Spring	Not applcable	ZDM
KZ261	eDumbe	Nqobiswe	Rural	Water	Dlamini	3,024	Borehole	Not applcable	ZDM
KZ262	uPhongolo	Dwarsrand	Rural	Water	Not applicable	320	Borehole	Not applcable	ZDM
KZ262	uPhongolo	Itshelejuba Hospital	Rural	Water & sanitation	Not applicable	900	Itshelejuba WTW	ZDM	ZDM
KZ262	uPhongolo	Mavuso	Rural	Water	Mavuso	3,000	Borehole	Not applcable	ZDM
KZ262	uPhongolo	Ntungwini	Rural	Water	Dlamini	1,704	Spring	Not applcable	ZDM
KZ263	Abaqulusi	Atdoro	Rural	Water	Not applicable	910	Spring	Not applcable	ZDM
KZ263	Abaqulusi	Dlomodlomo	Rural	Water	Khambi	684	Borehole	Not applcable	ZDM
KZ263	Abaqulusi	Isulabasha Mvunyane	Rural	Water	Hlahlindlela	10,000	Boreholes	Not applcable	ZDM
KZ263	Abaqulusi	Kromellenboog	Rural	Water	Othaka	1,305	Borehole	Not applcable	ZDM
KZ265	Nongoma	Buxedeni	Rural	Water	Mandhlakazi	3,050	Borehole	Not applcable	ZDM
KZ265	Nongoma	Enyokeni Palace	Rural	Water	Not applicable	50	Enkonyeni WTW	ZDM	ZDM
KZ265	Nongoma	Gobamagagu	Rural	Water	Matheni	1,150	Spring	Not applcable	ZDM
KZ265	Nongoma	Kwashoshamasa	Rural	Water	Usuthu	1,510	Borehole	Not applcable	ZDM
KZ265	Nongoma	Njoko/Msebe	Rural	Water	Mandhlakazi	8,795	Borehole	Not applcable	ZDM
KZ266	Ulundi	Hlungulwane	Rural	Water	Nobamba	794	Borehole	Not applcable	ZDM
KZ266	Ulundi	Mvula	Rural	Water	Mlaba	4,275	Borehole	Not applcable	ZDM
KZ266	Ulundi	Njomelwane	Rural	Water	Mlaba	2,673	Borehole	Not applcable	ZDM
KZ266	Ulundi	Nkonjeni Hospital	Rural	Water & sanitation	Not applicable	120	Nkonjeni WTW	ZDM	Not applicable
KZ266	Ulundi	Nkonjeni	Rural	Water	Buthelezi	578	Borehole	Not applcable	ZDM
KZ266	Ulundi	Nsukazi/Mfabeni	Rural	Water	Buthelezi	8,330	Borehole	Not applcable	ZDM
KZ266	Ulundi	Thuthukani	Rural	Water	Mlaba	3,429	Borehole	Not applcable	ZDM

Table 5.2c: Schemes for which the water resource is unknown.

LM #	LM	Scheme	Settlement type	Function	Traditional Authority	Number of people	Water source	Bulk Water Operator	Reticulation Water Operator	Water resource
KZ261	eDumbe	Mangosuthu	Rural	Water	Not applicable	8100	Paulpieterberg WTW	eDumbe LM	ZDM	Unknown
KZ261	eDumbe	Natal Spa	Rural	Water & sanitation	Unknown	Unknown	Unknown	ZDM	ZDM	Unknown
KZ262	uPhongolo	Gulela	Rural	Water & sanitation	Unknown	Unknown	Unknown	ZDM	ZDM	Unknown
KZ262	uPhongolo	Highlands – Ndlagamandla	Rural	Water	Ndlangamandla	1157	Unknown	ZDM	ZDM	Unknown
KZ262	uPhongolo	Illovo	Rural	Water	Unknown	Unknown	Unknown	ZDM	ZDM	Unknown
KZ262	uPhongolo	Magudu	Rural	Water & sanitation	Not applicable	380	Unknown	Unknown	Unknown	Unknown
KZ262	uPhongolo	Simdlangentsha	Rural	Water	Ntshangase & Mthethwa	19983	Unknown	ZDM	ZDM	Unknown
KZ263	Abaqulusi	Alpha	Rural	Water & sanitation	Not applicable	Unknown	Alpha WTW	ZDM	ZDM	Unknown
KZ263	Abaqulusi	Bhekephi	Rural	Water	Khambi	3500	Unknown	Not applcable	ZDM	Unknown
KZ263	Abaqulusi	Enyathi	Rural	Water & sanitation	Not applicable	734	Enyathi WTW	ZDM	ZDM	Unknown
KZ263	Abaqulusi	Gluckstad	Rural	Water & sanitation	Not applicable	176	Unknown	Unknown	Unknown	Unknown
KZ263	Abaqulusi	Ncome Prison	Rural	Water	Unknown	Unknown	Unknown	ZDM	ZDM	Unknown
KZ263	Abaqulusi	Sikhwebezi	Rural	Water	Unknown	Unknown	Unknown	Unknown	ZDM	Unknown
KZ265	Nongoma	Esiphambanweni	Rural	Water	Mandhlakazi	3731	Unknown	Unknown	ZDM	Unknown
KZ265	Nongoma	Fankoma	Rural	Water	Usuthu	Unknown	Unknown	Unknown	ZDM	Unknown
KZ265	Nongoma	Kwakheta Palace	Rural	Water	Not applicable	100	Kwakheta WTW	ZDM	ZDM	Unknown
KZ265	Nongoma	Kwamajamelo	Rural	Water	Usuthu	Unknown	Unknown	Unknown	ZDM	Unknown
KZ266	Ulundi	Babanango	Rural	Water & sanitation	Not applicable	3000	Babanango WTW	ZDM	Ulundi LM	Unknown
KZ266	Ulundi	Esigodiphola	Rural	Water	Nobamba	2174	Unknown	ZDM	ZDM	Unknown
KZ266	Ulundi	Ezembeni	Rural	Water	Ndebele	9170	Unknown	ZDM	ZDM	Unknown
KZ266	Ulundi	Isangoyane	Rural	Water	Mpungose	5435	Unknown	ZDM	ZDM	Unknown
KZ266	Ulundi	Mabedlane	Rural	Water	Mpungose	7139	Unknown	ZDM	ZDM	Unknown
KZ266	Ulundi	Nodwengu	Rural	Water	Mbatha	1500	Unknown	ZDM	ZDM	Unknown
KZ266	Ulundi	Thokoza/Mtikini	Rural	Water	Mpungose	6397	Unknown	ZDM	ZDM	Unknown
KZ266	Ulundi	Ukuku	Rural	Water	Unknown	Unknown	Unknown	Unknown	ZDM	Unknown

5.3 Groundwater monitoring

Owing to the fact that groundwater is utilised extensively in the supply of water services to the rural communities of the ZDM, it is important that groundwater levels and quality are monitored to ensure sustainability and SABS drinking water standards. The outbreak of cholera in KZN in 2000 resulted in extensive emergency work into protection of surface water resources and sanitation supply. However, as indicated in Table 5.3 groundwater quality is only occasionally monitored. The regular monitoring of groundwater resources will form part of the Water Services Provider (WSP) contractual obligation once the appointment has been finalised.

Table 5.3: Groundwater monitoring.

	Yes	No
Are groundwater levels regularly monitored?		No
Is the groundwater monitoring data regularly processed and reported on by a qualified hydrogeologist?		No
Is ground water quality monitored and reported on?	Yes	

5.4 External sources (where the WSA purchases water from others)

All water currently supplied by the ZDM to the communities is from water resources within the DM's area of jurisdiction. However, as part of the regional scheme planning (see Section 12) to alleviate the water services backlogs, the ZDM is approaching the surrounding WSAs to determine whether water can either be purchased from or supplied to others more cost effectively.

5.5 Water returned to resources

Water is returned through discharge from Wastewater Treatment Works (WWTW) in the urban areas into the Pongola and White Umfolozi River systems (Table 5.5a). However, the quantities of water returned to resources still needs to be obtained from the WWTWs, therefore Table 5.5b has not been completed. Certificates are said to exist for wastewater released from these WWTW, however these have yet to be obtained.

Table 5.5a: Wastewater treatment works in the ZDM.

Source name	LM	Wastewater source	Resource Name
Paulpietersberg WWTW	eDumbe	Domestic & Industrial	Unknown
Bilanyoni/Frischgewaagd WWTW	eDumbe	Domestic	Pongola River
Pongola WWTW	uPhongolo	Domestic & Industrial	Unknown
Itsjelejuba Hospital WWTW	uPhongolo	Domestic	Maturation ponds
Gulela WWTW	uPhongolo	Domestic	Unknown
Belgrade	uPhongolo	Domestic	Pongola River
Vryheid WWTW	Abaqulusi	Domestic & Industrial	Unknown
eMondlo WWTW	Abaqulusi	Domestic	Stream (Mvunyana River)
Coronation WWTW	Abaqulusi	Domestic & Industrial	Unknown
Hlobane WWTW	Abaqulusi	Domestic	Unknown
Nkongolwane WWTW	Abaqulusi	Domestic	Unknown
Cliffdale WWTW	Abaqulusi	Domestic	Unknown
Enyathi WWTW	Abaqulusi	Domestic	Unknown
Alpha WWTW	Abaqulusi	Domestic & Industrial	Unknown
Nongoma WWTW	Nongoma	Domestic	Vuna
Ulundi WWTW	Ulundi	Domestic & Industrial	White Mfolozi River
Ceza WWTW	Ulundi	Domestic	Maturation ponds
James Nxumalo WWTW	Ulundi	Domestic	Maturation ponds
Nkonjeni WWTW	Ulundi	Domestic	Maturation ponds
St. Francis WWTW	Ulundi	Domestic	Maturation ponds
Thulasizwe WWTW	Ulundi	Domestic	Maturation ponds
Mpungamhlope	Ulundi	Domestic	White Umfolozi River

Within the most of the rural areas the water supply is at the basic national standard (or below), therefore no large volumes of wastewater are produced and no formal wastewater treatment processes are in place. In these areas the wastewater flows directly into the ground via French drains or the like. In addition, there is no current requirement for bulk sanitation disposal as the rural areas are supplied through VIPs and not waterborne sewerage systems. However, no formal contingency plan currently exists for major pollution events. This is an area where the municipality will have to focus in the near future (see Section 6). No known initiatives by the DM exist to ensure the optimal functioning of and adequate flows from the resource (including the removal of invading plants and the recharge of aquifers).

Table 5.5b: Water returned to resources in the ZDM.

Source name	Type	Permitted amount return flow (Mℓ/a)	2001/ 2002	2002/ 2003	2003/ 2004	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	Additional requiremet at year 5
Paulpietersberg	WWTW									
Bilanyoni	WWTW									
Pongola	WWTW									
Itsjelejuba Hospital	WWTW									
Gulela	WWTW									
Belgrade										
Vryheid	WWTW									
eMondlo	WWTW									
Coronation	WWTW									
Hlobane	WWTW									
Nkongolwane	WWTW									
Cliffdale	WWTW									
Enyathi	WWTW									
Alpha	WWTW									
Nongoma	WWTW									
Ulundi	WWTW									
Ceza	WWTW									
James Nxumalo	WWTW									
Nkonjeni	WWTW									
St. Francis	WWTW									
Thulasizwe	WWTW									
Mpungamhlope										
TOTAL										

5.6 Quality of water taken from source: urban

The quality of bulk water taken from the resource is measured at the source, Water Treatment Works (WTW) and the reservoir (Table 5.6). More detailed information on water quality and monitoring frequency per WTW and WWTW is given in Section 7 on Infrastructure.

Table 5.6: Urban water quality monitoring.

	At source	At treatment plant	At reservoir	At tap
Is water quality measured?	Yes	Yes	Yes	No
Do you monitor it yourself?				No
If no, who does?				NA
Monitoring intervals	Daily	Daily	Daily	NA
Are these results available in electronic format?	Unknown	Unknown	Unknown	NA
% time (days) within SABS 241 standards per year	100	100	100	NA

5.7 Quality of water taken from source: rural

Monitoring of water quality within the rural areas is dependent upon the water source. Water supplied through boreholes and protected springs are not monitored for quality (Table 5.7). In these instances the boreholes are not equipped, nor the springs protected if the water quality does not satisfy the SABS drinking water specifications. Water abstracted from surface water or supplied from urban areas is usually treated at a WTW and will have undergone the necessary quality monitoring and testing. However, although there is currently no monitoring programme or regular testing of water quality in the rural areas, the ZDM recognises that this is a priority to ensure long-term sustainability of the water resource. This is an area of concern owing to the risk of groundwater contamination as a result of the high backlog in the provision of sanitation facilities. Therefore, once the long-term WSP is appointed, the periodic testing of these rural resources will form part of their function through a contractual obligation.

Table 5.7: Rural water quality monitoring.

	At source	At reservoir	At tap
Is water quality measured?	Unknown	Unknown	Unknown
Do you monitor it yourself?	Unknown	Unknown	Unknown
If no, who does?	NA	NA	NA
Monitoring intervals (daily, weekly, monthly, quarterly, bi-annually, annually)	NA	NA	NA
Are these results available in electronic format? (yes/no)	NA	NA	NA
% time (days) within SABS 241 standards per year	NA	NA	NA

5.8 Reporting on quality of water taken from source: urban and rural

The ZDM currently does not have a facility to report the non-compliance of water quality to consumers (Table 5.8). However, they are in the process of drafting a Communications Strategy that should highlight both the internal and external reporting structure. In addition, once the long-term WSP/s have been appointed, part of their contractual obligation will be to provide the WSA Manager with monthly quality, quantity, and overall distribution and maintenance reports. Customer relations management may also form part of the WSP/s contractual obligation.

Table 5.8: Water quality reporting.

	Yes/ No	Method of notification
If quality of water taken from source does not comply, are urban residents notified?	No	NA
If quality of water taken from source does not comply, are rural residents notified?	No	NA

5.9 Quality of water returned to the resource: urban

The water returned to resource in the urban areas is from the WWTW and stormwater systems (Table 5.9). Monitoring of stormwater quality does not occur. The WWTW treat domestic wastewater and wet industrial effluent, and once treated the return effluent is sampled. The effluent produced by "wet" industries needs to be monitored and sampled to ensure compliance with the municipal by-laws in terms of discharge into the WWTW. Once the long-term WSP/s have been formally appointed, data on the WWTW return flow (quality, quantity and compliance) will need to be submitted to the WSA Manager.

Table 5.9: Urban return flow quality.

	In the return effluent	In the storm-water	In the river
Is water quality measured?	Yes	No	Yes
Do you monitor it yourself?	No	NA	No
If no, who does?		NA	
Monitoring intervals (weekly, monthly, quarterly, bi-annually, annually)		NA	
Are these results available in electronic format?	Yes	NA	Yes
For wastewater treatment works discharges to water resource: % time within requirements of special or general standards (Regulation 991).	100%		

5.10 Quality of water returned to the resource: rural

There is no formal water treatment process in the rural areas (Table 5.10). Wastewater flows directly into the ground via French drains or the like. There is no current requirement for bulk sanitation disposal as the rural areas are supplied through VIPs and not waterborne sewerage systems. To ensure that wastewater will not pollute water resources in the rural areas, education programmes will be conducted (see Section 6).

Table 5.10: Rural return flow quality.

	In the return effluent	In the storm-water	In the river
Is water quality measured?	NA	NA	NA
Do you monitor it yourself?	NA	NA	NA
If no, who does?	NA	NA	NA
Monitoring intervals (weekly, monthly, quarterly, bi-annually, annually)	NA	NA	NA
Are these results available in electronic format?	NA	NA	NA
For wastewater treatment works discharges to water resource: % time within requirements of special or general standards (Regulation 991).	NA		

5.11 Pollution contingency measures

The ZDM forms part of the Usuthu/Mhlathuze WMA and as such will form part of the CMA for this region. A proposal for the establishment of the Usuthu/Mhlathuze CMA has been put forward to national government. Once established the ZDM and all other water users within the Usuthu/Mhlathuze WMA will have input into, and have to comply with, the Usuthu/Mhlathuze catchment management strategy (CMS). This strategy should include pollution contingency measure/s that may be required to maintain the desired river reach classes. However, although groundwater forms part of holistic water resource management it is likely that this aspect may be treated as secondary by the CMA and it will therefore fall on the ZDM to ensure that they put suitable contingency measures in place.

Currently, no formal contingency plan exists for major pollution events (Table 5.11). However, the ZDM recognises that this is an important aspect to ensuring the long-term sustainability of the water resources and planned water services infrastructure. This is an area where the municipality will have to focus in the near future (see Section 6).

Table 5.11: Pollution contingency measures.

Resource description	List potential source of pollution	Formal contingency measures (Yes / No)
To be determined		