

The study area is located in quaternary catchment B12B, within the Olifants Water Management Area. The Groundwater Harvest Potential Map of South Africa (Baron et al, 1998) classifies the study area as having an estimated groundwater harvest potential of 10 000 to 15 000 m³/km²/year (i.e. relatively low). The average borehole yield is > 0.4 litres per second (L/s), and the total dissolved solids concentration of the (unpolluted) groundwater is between 200 and 300 mg/l (i.e. relatively fresh). No major groundwater abstractions are shown on the DWA 1:500 000 scale hydrogeology map of the area (Sheet 2526 Johannesburg). The GRA2 data for the quaternary catchment B12B is summarized in **Table 7.10** below:

Table 7.10: GRA2 Data Summary for B12B

QUATERNARY CATCHMENT B12B	
Area (km ²)	658.5
Average water level (metres below ground level)	8.7
Volume of water in aquifer storage (Mm ³ /km ²)	467.7
Specific Yield	0.003
Harvest Potential (Mm ³ /a)	14.6
Contribution to river base flow (Mm ³ /a)	7.8
Utilizable groundwater exploitation potential in a wet season (Mm ³ /a)	9.5
Utilizable groundwater exploitation potential in a dry season (Mm ³ /a)	6.3

Several of the boreholes in the ashing area that are routinely sampled (GHT, 2010) have poor water quality, due to increased concentrations of elements such as K, Cl, Mn, SO₄, or due to low pH values. Low pH can lead to increased mobility of a range of groundwater contaminants, such as trace metals. A range of conductivity values were observed in the boreholes visited, and groundwater levels (with one exception) were found to be within 5 m of the ground surface. With one or two exceptions, groundwater levels appear to be stable in the vicinity of the ash dam (see **Figure 7.10** above). Borehole AB03, which has shown a large rise in groundwater level in the last eight years, is located close to a pumping station used for the control of water from the ash dam, and may have been influenced by leakage or discharge from this facility.

- **Conceptual Model of Groundwater Occurrence**

Recharge moving through the soil zone combines with leachate from the ash storage facility and migrates downwards through the unsaturated zone to the water table. Groundwater below the water table moves with the local groundwater gradient towards discharge zones (surface water resources such as rivers, wetlands and dams). Due to the shallow depth to groundwater in the immediate vicinity of the ash dams and associated infrastructure it is assumed that leakage from the base of the ash dam occurs (i.e. a groundwater mound has formed under the ash dam). This is supported by the poor groundwater quality in some boreholes close to the ash dam, reported by GHT (2010). Following observations made during the field visit, it is likely that any leachate from the current ash disposal area that is not intercepted by the underdrain systems (or other leachate control facilities) will flow through the aquifer towards the lake or dam that is located about 1 km due east of the ash dam. Groundwater will flow at shallow depth in the

weathered zone or via fractures, faults, fissures and other secondary discontinuities in the deeper rock. Locally the groundwater gradients are expected to be modified by mounding associated with the ash dams and other water sources.

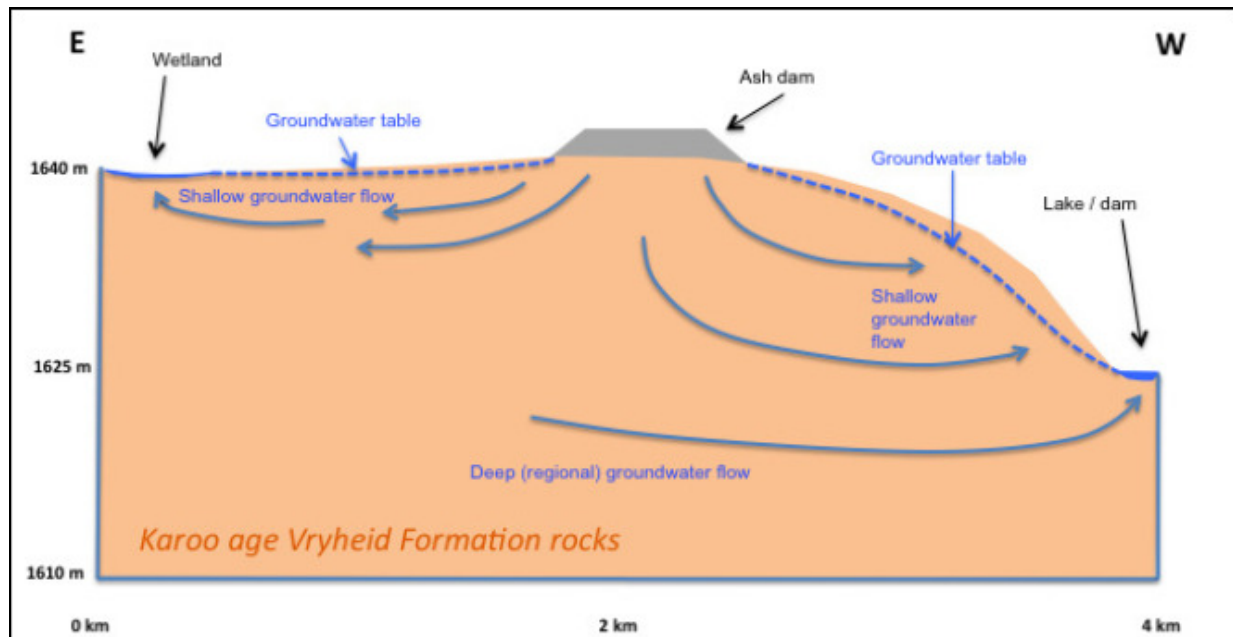


Figure 7.8: Sketch Cross-Section of Groundwater occurrence at Hendrina (note vertical Exaggeration)

Further detail can be obtained from the Ground Water Specialist Report in **Appendix N**.

7.3.11 Sites of Archaeological, Historical and Cultural Interest

The only known significant heritage sites are situated outside of the study area and are therefore more than 8km from the power station. Due to the fact that the study area is characterised by agricultural, industrial and mining activities it is anticipated that no significant heritage sites will be identified in the area. A full Heritage impact assessment will be undertaken on the preferred sites in the EIA phase of the study.

7.3.12 Visual Aspects

The study area for the visual assessment is located close to Hendrina in the Steve Tshwete Municipality of the Mpumalanga Province.

There are no major towns in the immediate area. Middelburg lies 40 km to the north west, and Hendrina some 16km to the south east. A number of farms and homesteads occur throughout the study area, and in close proximity to the power station.

The N11 bypasses the site in the east and the R542 traverses a section of the study area in the south west. In addition, a number of secondary roads interconnect with the national and arterial roads, as well as with one another.

Mining and related activity is a prolific land use in the study area, which in combination with the existing power station results in a decidedly industrial visual character within an otherwise rural and agricultural regional setting. Power lines which extend to the north, west and east of the power station contribute further to this existing visual intrusion. Refer to **Figure 7.9**.

The topography of the area is typical of the Mpumalanga Highveld, mainly a gently undulating plateau, varying between 1680m and 1600m amsl along the Woes-Alleen Spruit. The north of the study area appears lower lying and undulating, while the south is characterised by low hills.

In addition to the above mentioned spruit, a large number of dams and pans are present in the study area, although many of these have been disturbed to some extent by mining activity. The drainage lines which traverse the study area all flow north towards the Olifants River.

The ENPAT describes the terrain as *moderately undulating plains and pans* and the natural vegetation type as *Bankenveld*.

With its moderately dry subtropical climate, the study area receives between 621 and 752 mm of rainfall per annum.

No formally protected areas or conservation areas are located in close proximity to the proposed site, or within the identified study area.

The study area falls within the Mpumalanga Province, which is a particularly popular and well frequented tourist destination in South Africa. There are no known tourist facilities or destinations within the study area, but tourists en route to other parts of Mpumalanga may utilise the main regional access routes such as the N11 and the R542.

Further detail can be obtained from the Visual Impact Specialist Report in **Appendix O**.

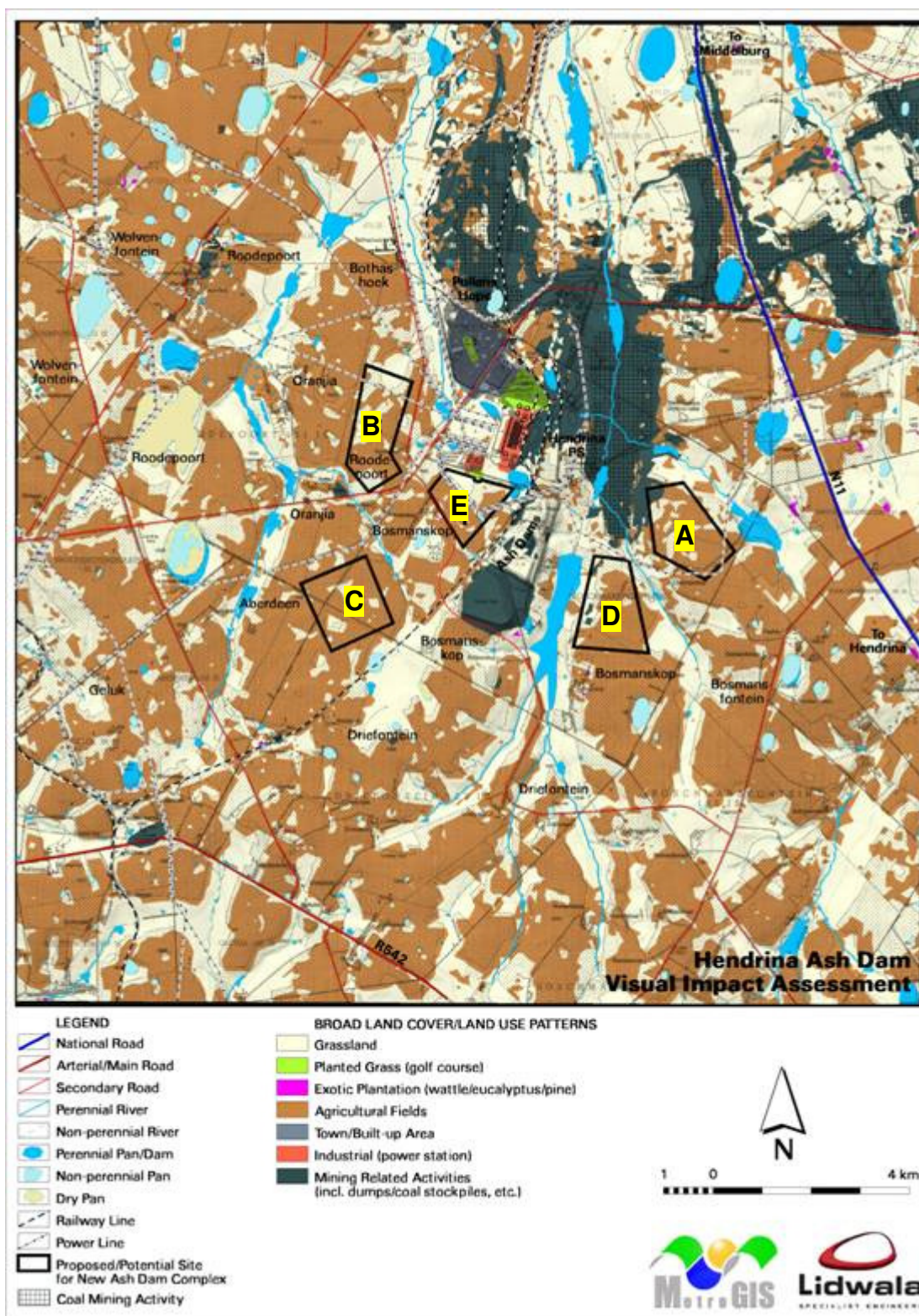


Figure 7.9: Land cover / land use patterns of the study area.

7.3.13 Social Environment

The Hendrina Power Station is situated in the Mpumalanga Province and within the Steve Tshwete Local Municipality area of jurisdiction.

The closest towns include Hendrina and Middleburg with the small community of Pullen's Hope situated right next to the power station.

The town of Hendrina was proclaimed on 5 June 1916 and is approximately 20 km from the power station. Hendrina is the second largest town in the municipality (after Middelburg). The main business / commercial activities in Hendrina include the OTK co-operation and a large manufacturing company.

Pullen's Hope is situated directly adjacent to the power station and is considered to be the fourth largest settlement in the municipal area. The original stands were developed by Eskom to accommodate personnel employed at the Hendrina power station. The current ownership of the community is assumed to be municipal however, this remains to be confirmed.

The socioeconomic analysis is specifically aimed at spatial related matters, i.e. demographics, employment and income and economic profile. The 2001 Census figures were used and comparisons were made with the Demarcation Board Data. The latter is based on the 1996 Census data which has been statistically manipulated to coincide with the newly demarcated study area.

- **Demographics**

Table 7.11: Population Growth in Steve Tshwete Local Municipality

	2001	1996	% Growth	% Average Annual Growth
African	114 371	91 224	25,4	5,1
Coloured	3 547	3 530	0,5	0,1
Indian	1 313	1 900	31,0	6,2
White	23 541	37 747	38,0	7,6
Total	142 772	135 412	5,4	1,08

Source: 2001 Census data

The African population increased by 25,4% over 5 years or 5,1% on average annually. The Indian and White population decreased by 31% and 38% respectively over the 5 years or 6, 2% and 7,6% on average annually. Therefore, the need for housing in the lower income brackets, mainly subsidy linked housing has increased and will tend to increase over time.

- **Population Estimates**

Population estimates for Steve Tshwete Municipality are reflected in **Table 7.12 below** and includes the total number of people.

Table 7.12: Number and Percentage by Gender

	Male	Female	Total	Male %	Female %	Total %
Steve Tshwete	70 596	72 184	142 772	49,4	50,6	100
Nkangala	491 225	529 363	1 020 590	48,1	51,9	100
Mpumalanga	1 497 325	1 625 985	3 122 985	47,9	52,1	100

Source: 2001 Census data

The study area has an advantage in terms of its male population compared to that of the Nkangala District and Mpumalanga. This can mainly be attributed to more job opportunities created by the mining and industrial sectors.

- **Level of Education**

The level of education for the population in the study area is reflected in **Table 7.13 below** format with specific reference to number of people with primary, secondary and tertiary qualifications.

Table 7.13: Level of Education in Steve Tshwete Local Municipality

Persons	2001	%
None	15 769	27,8
Pre School	2 063	3,6
School	37 243	65,6
College	958	1,7
Technikon	319	0,6
University	226	0,4
Adult Education Centre	48	0,1
Other	132	0,2
Total	56 758	100

Source: 2001 Census data

- Only 3% of the population has a tertiary or higher qualification.
- 27,8% of the population have no qualification. It is noted that infants and children less than 5 years are excluded from this figure.
- Access to farm schools and the availability of schools for specially the rural population have been highlighted as part of the IDP prioritisation process. The high levels of illiteracy reflect the need for education facilities and after school learning.

- **Population Growth Estimates**

It should be noted that population growth statistics should only be used as a guideline for future planning. These figures must be reviewed and adjusted on an ongoing basis with the availability of more relevant and specific data. Specific reference is made to the latest Census figures.

The population growth estimates are reflected for the time period 1996 to 2001 and the time period 2001 to 2006. However, the latest Census figures are disputed by Council. It was therefore suggested that the following assumptions are made for the short term as the next cycle in the Census data capturing will commence early in 2006. Any changes in the tendencies relating to population trends will then be captured.

The growth rates will be as follows for the period 2001 to 2006, namely:

- Middelburg: 3,3%
- Mhluzi: 0,0%
- Hendrina: 0,0%
- Kwazamokhule: 2,0%
- Middelburg NU: 2,3%

Table 7.14: Population Growth Rate 1996 – 2006 in Steve Tshwete Local Municipality

Area	Population Growth		Population 2001	Population Increase 2001 - 2006
	1991 - 1996	1996 - 2001		
Middelburg	1,1	3,3	42 296	49 750
Mhluzi	10,6	1,7	46 011	46 011
Hendrina	1,5	8,9	885	885
Kwazamokhule	17,9	2,0	12 843	14 180
Middelburg NU	12,0	2,3	40 737	45 642
Middelburg (MP 313)	0,7	1,1	142 772	156 468

Source: Census 2001

- The proposed population growth implies that an additional 13 696 people will reside in the study area. At a household size of approximately 3,94 people, this represents an additional 3 476 households.
- The increase in population and number of households has a significant influence on service delivery, provision of affordable housing, education, health facilities and infrastructure.
- The need for additional housing are outlined as part of the spatial analysis (refer to Chapter 2).
- A relatively high population growth rate is predicted for the urban areas with specific reference to Middelburg and Kwazamokhule. The current estimated backlog of 6 883 stands consist of 2 308 stands in Newtown accommodating 9 289 residents, whilst approximately 4 575 backyard families are residing in Mhluzi (Waste disposal survey:

October 2000). In Middelburg an additional 1 500 units should be developed annually from 2001 to 2006 to address the expected growth. The bulk of the residential units will be required to accommodate the homeless, mainly relying on government housing subsidies.

- A backlog of approximately 350 stands is present in Kwazamokhule. The development of Kwazamokhule X7 consisting of 600 residential stands will, once servicing has taken place, address the backlog sufficiently.

- **Economic:**

- *Employment and Income*

The analysis of employment and income levels in the study area are reflected as informal, formal and unemployed workforce, and average income per capita.

Table 7.15: Informal, Formal and Unemployed Workforce 2001 in Steve Tshwete Local Municipality

Area	1996	%	2001	%
Employed	47 423	80,4	41 678	64,6
Unemployment	11 574	19,6	22 798	35,4
Not economically active	-	-	31 619	-
Total labour force	58 997	100	64 476	100

Source: 2001 Census data

- The economic active population decreased by approximately 15,8% from 1996 to 2001.
- The total labour force increased by 9,3%.

- *Income*

The per capita income for the study area is provided for 1996 and 2001.

Table 7.16: Individual Monthly Income in Steve Tshwete Local Municipality

Persons	1996	%	2001	%
None	91 608	64,2	54 806	53,7
R1 - R400	6 258	4,4	3 586	3,5
R401 - R800	13 100	9,2	17 642	17,3
R801 - R1600	9 897	6,9	6 257	6,1
R1 601 - R3 200	9 888	6,9	6 057	6,0
R3 201 - R6 400	6 723	4,7	9 666	9,5
R6 401 - R12 800	3 593	2,5	2 957	2,9
R12 801 - R25 600	1 177	0,8	624	0,6
R25 601 - R51 200	278	0,2	285	0,3
R51 201 - R102 400	135	0,1	93	0,1
R102 401 - R204 800	90	0,08	-	-

Over R204 801	25	0,02	-	-
Total	142 772	100	101 973	100

Source: 2001 Census data

Table 7.16 indicates that the percentage of people with no income increased from 53,7% to 64,2% as percentage of the total in the respective census. However, the increase over the 5 years is 67%, or 13,42% on average annually. People earning between R1 and R1 600 totals 29 255 compared to 27 485 during 1996. This represents an increase of 6,4% between 1996 and 2001, or 1,2% on average annually. In total 84% of the inhabitants of Steve Tshwete Local Municipality falls within the lower income bracket.

Table 7.17: Annual Household Income in Steve Tshwete Local Municipality

Household	1996	%	2001	%
None	5 578	15,1	1 691	7,1
R1 - R4 800	2 163	5,8	929	3,9
R4 801 - R9 600	5 068	13,7	3 122	13,1
R9 601 - R19 200	6 397	17,3	5 417	22,8
R19 201 - R38 400	6 705	18,1	4 740	19,9
R38 401 - R76 800	5 008	13,5	3 269	13,7
R76 801 - R153 600	3 604	9,7	2 947	12,4
R153 601 - R307 200	1 784	4,8	1 563	6,6
R307 201 - R614 400	479	1,3	113	0,5
R614 401 - R1 228 800	123	0,3	-	-
R1 228 801 - R2 457 600	95	0,3	-	-
Over R2 457 600	39	0,1	-	-
Total	37 043	100	23 791	100

Source: 2001 Census data

From the above mentioned table it is clear that 51,8% of the households earn less than R19 200 per year. This reflects on monthly household income of less than R1 600. This figure has increased from 46,9% during 1996 to 51,8% during 2001. Therefore, it is clear that more low income households within the lower bracket of the Governments Housing Subsidy Scheme are moving to the study area. The pressure on limited financial resources will increase which will negatively impact on service delivery. If R3 200/month or R38 400 per annum is used as the cut off point for people qualifying for Government subsidies, the percentage increase to an alarming 69,9% of the total number of households, compared to 66,8% during 1996. Household with no annual income increase from 7,1% to 15,1% from 1996 to 2001.

- *Employment and GGP Contribution to the Local Economy*

The Steve Tshwete Local Municipality is situated in the centre of the Nkangala District Municipality. The economic structure of the Steve Tshwete economy is presented graphically in **Figure 7.10** below.

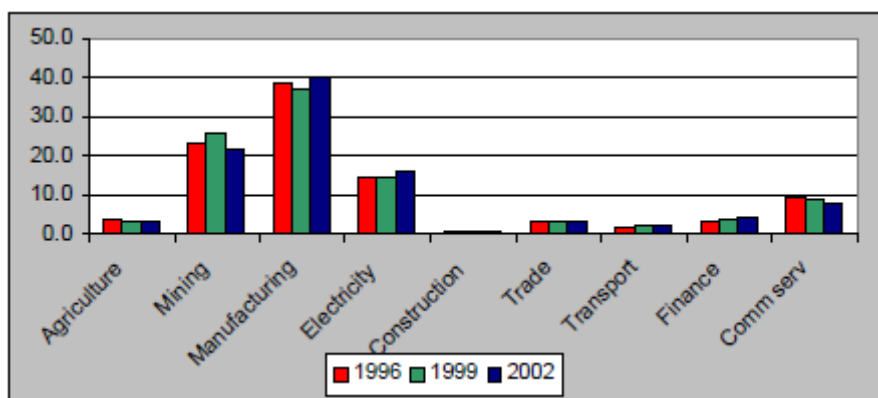


Figure 7.10: GGP profile by sector, 1996 to 2002

Source: Global Insight Version, 1.50 (172), 2003

Manufacturing dominates the local economy. This is followed by the mining, electricity and community services sectors. As a result of growth in the remaining sectors, the relative importance of the manufacturing sector decreased during 1996 – 1999 but during 1999 – 2002 the relative contribution of the manufacturing sector increased to levels higher than in 1996. Conversely, the mining sectors proportional contribution increased during 1996 – 1999 and decreased to levels lower than in 1996.

The agriculture and community services sectors' proportional contribution decreased during the medium term (1996 - 2002) while the transport and finance sectors contribution increased during the same period.

The growth rates achieved by the various sectors are presented in **Table 7.18** below.

Table 7.18: Growth rates 1996 - 2002

Sectors	1996 - 1999	1999 - 2002	1996 - 2002
Agriculture	0.2	3.4	1.6
Mining	7.5	2.0	2.6
Manufacturing	2.7	7.3	5.0
Electricity	2.9	7.8	5.3
Construction	6.9	2.1	2.3
Trade	3.8	4.1	3.9
Transport	12.6	9.0	10.8
Finance	12.4	7.0	9.7
Comm. services	0.3	0.6	0.4
Total	4.1	4.2	4.2

Source: Global Insight Version, 1.50 (172), 2003

Transport, finance, electricity and manufacturing recorded relatively high growth rates between 1996 and 2002, whereas mining and construction declined significantly recently (1999 - 2002).

The aggregate Steve Tshwete economy recorded a relatively high growth rate for all the periods under observation. This economy grew at the second highest growth rate when

compared to the other local municipalities in the Nkangala District. The above economic analysis presents the following implications for Steve Tshwete:

- Middelburg constitutes one of Nkangala's two key industrial areas. Hence, the strong growth in the manufacturing sector should be stimulated and maintained. This implies that the growth should be stimulated in specific subsectors to facilitate a diversification of the manufacturing base.
- The agriculture sector should be included in the development initiatives in a manner that exploits the opportunities associated with the Maputo Corridor.
- The high growth of the transport sector indicates that opportunities exist for the establishment of transport related initiatives, as well as the formation of a transport hub that serves as a link between the remainder of Mpumalanga and Gauteng.

Apart from the above mentioned implications, various initiatives should be formulated and implemented to ensure that Steve Tshwete's sectoral advantages (agriculture, mining, manufacturing, and finance) are leveraged/exploited.

During the EIA phase the latest statistics will be included in order to determine if the trend that is seen with these figures are still relevant. If major changes did occur within this local municipality it will be reflected in the EIA. It must also be investigated if these trends differ if in actual fact this will have a influence on this project from a social point of view.