5. GENERAL DESCRIPTION OF THE STUDY AREA ENVIRONMENT

5.1. Locality

The study area is located approximately 10 km east of Lephalale in the Limpopo Province. Within the study area eight farms were nominated, for investigation during the Environmental Scoping Study, for the establishment of a new power station and ancillary infrastructure. The location of these farms is shown in Figure 5.1. General GPS locations for the respective farms are as follows:

- Appelvlakte S23.63134° & E27.58245°
- Nelsonskop S23.65201° & E27.59873°
- Naauwontkomen S23.70193° & E27.56574°
- Eenzaamheid S23.70941° & E27.52924°
- Droogeheuvel S23.61485° & E27.62578°
- Zongesien S23.63706° & E27.64183°
- Kuipersbult S23.72414° & E27.56310°
- Kromdraai S23.73624° & E27.52594°

Through the Environmental Scoping study's site selection process, the farms Naauwontkomen 509 LQ and Eenzaamheid 687 LQ were nominated as preferred for the development of the proposed new power station and the ancillary infrastructure respectively.

5.2. Climate

The climatic regime of the study area is characterised by hot, moist summers and mild, dry winters. The long-term annual average rainfall is 485 mm, of which 420 mm (86,5%) falls between October and March. The area experiences high temperatures, especially in the summer months, where daily maxima of >40^{o}C are common. The annual evaporation in the area is approximately 2 281 mm. Frost is rare, but occurs occasionally in most years, though usually not severely.

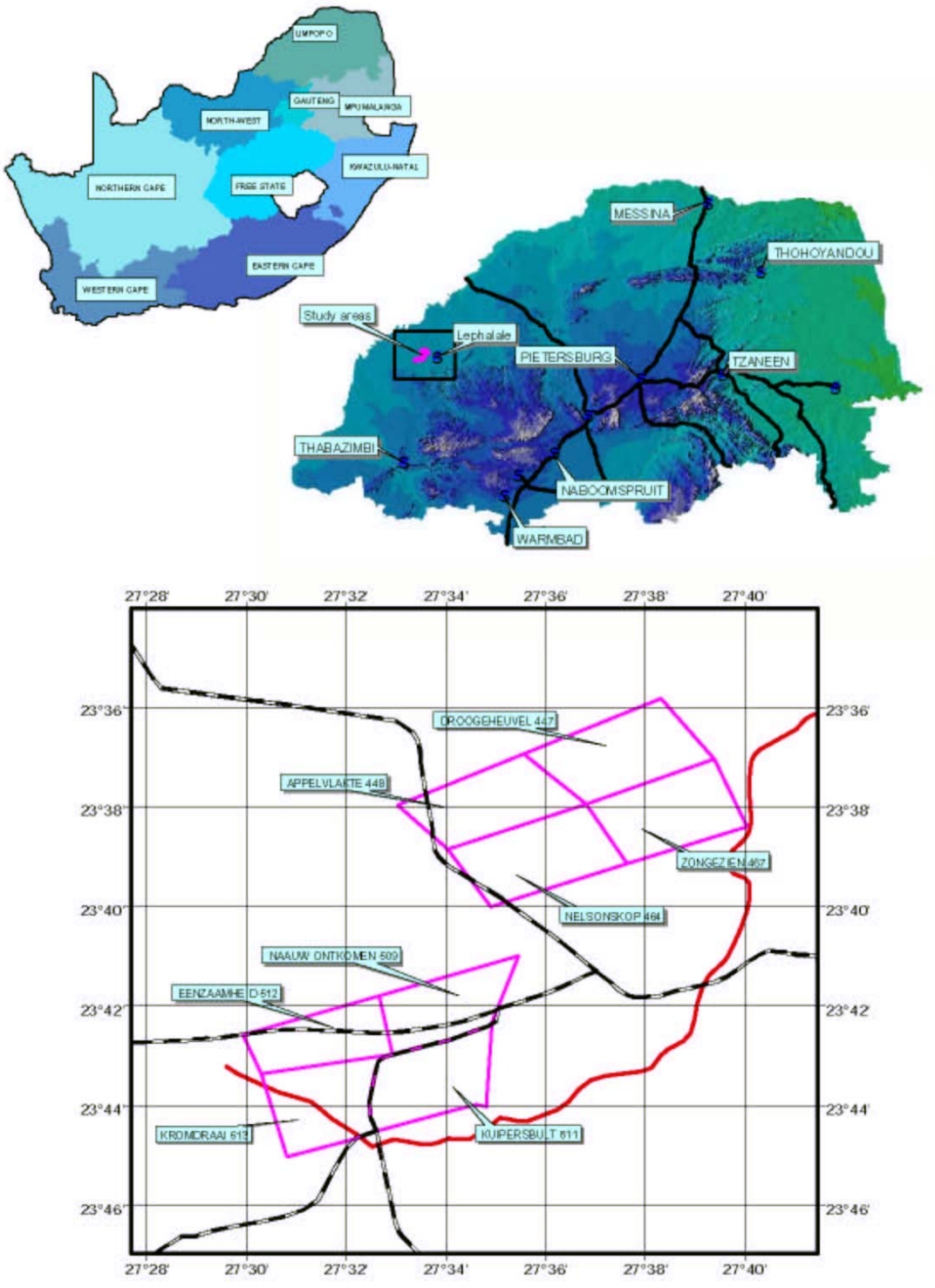

Figure 5.1: Regional location of the farms studied during the Environmental Scoping Study.

5.3. Geology

Sediments and volcanics of the Waterberg Group and Karoo Supergroup underlie the study area. Figure 5.2, a portion of the 1:250 000 geological map 2326 Ellisras, indicates the study area geology.

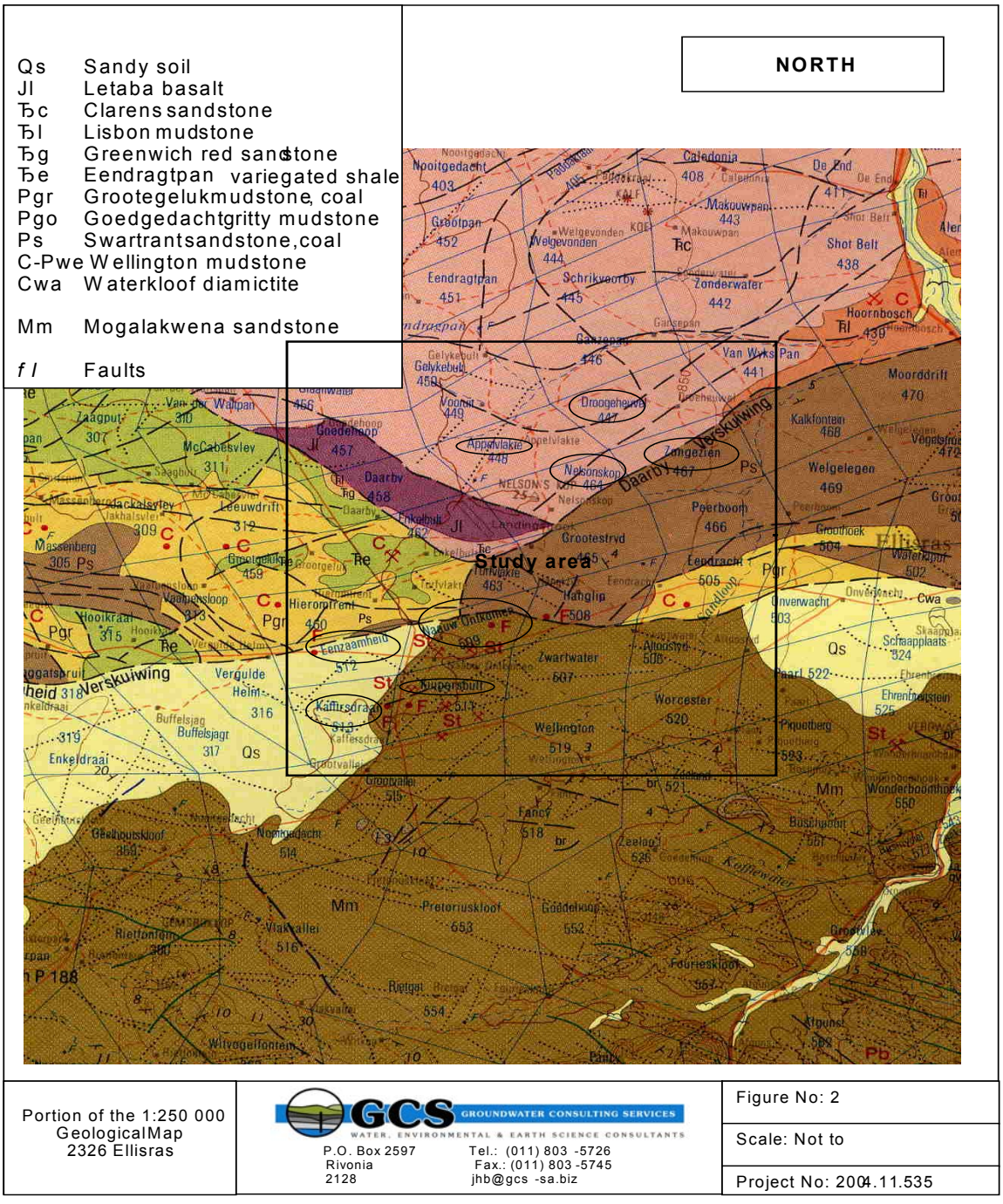

Figure 5.2: A portion of the 1:250 000 geological map 2326 Ellisras, showing the study area geology

The Waterberg Coalfield comprises a graben structure with the Eenzaamheid fault forming the southern boundary and the northern boundary being delineated by the Zoetfontein fault. Archaean granite rocks outcrop to the north of the Zoetfontein fault and sediments of the Waterberg Group outcrop to the south of the Eenzaamheid fault.

The study area is further subdivided by the Daarby fault, a major northeast, then northwest, trending fault. The Daarby fault has a down throw of 360m to the north, at an angle of 50° to 60°. The down throw of 360 m to the north serves to bring the Grootegeluk Formation rocks to the south in contact with the younger Clarens Formation sandstone and Letaba Formation basalts in the north. Thus the fault divides the coalfield into a shallow (opencast) coal area to the south of the Daarby Fault, and a deep north coal area.

The Eenzaamheid fault has a throw of 250 m to the north and the fault is near vertical. The fault brings the upthrown Waterberg Group sediments on the south side of the fault in contact with shallow coal on the northern side of the fault.

5.4. Land Types

A Land type unit is a unique combination of soil pattern, terrain and macroclimate, the classification of which is used to determine the potential agricultural value of soils in an area. The land type units represented within the study area include Ae252, Ah85, Ah86, Bc46 and Bd44 (Land Type Survey Staff, 1987) (ENPAT, 2001) (Figure 5.3). The agriculture potential of soils in the general area are divided into two classes, namely 'Soils highly suited to arable agriculture where climate permits' and 'Soils of poor suitability for arable agriculture' (ENPAT, 2001) (Figure 5.4).

A- land type units refer to yellow and red soils without water tables and belonging in one or more of the following soil forms: Inanda, Kranskop, Magwa, Hutton, Griffin or Clovelly.

In Ae (red, high base status, >300 mm deep, no dunes) yellow soils occupy less than 10% of the area while dystrophic and/ or mesotrophic soils occupy a larger area than high base status red-yellow apedal soils. Slopes within the Ae252 land type varies from 0% to 2%. Only footslopes and valley bottoms are represented in this land type unit. Footslopes are dominated exclusively by the Hutton soil form with clay content of the A-horizon varying between 4% and 20%. The Oaklands soil formation is prevalent in the bottomlands (Hutton to a lower degree) and the clay content of the A-horizon varies between 6% and 12%. Soil depth in this land type is generally less than 1 200 mm.

Midslopes and footslopes predominate within the Ah85 unit, with Hutton and Clovelly soil formations occurring predominantly. The clay content of the A-horizon varies between 2% and 7%. Slopes within this unit are typically low, varying between 0% and 3%. Soil depth in this land type is generally deeper than 1 200 mm.

Topography of the Ah86 unit is similarly dominated by footslopes and midslopes with the Hutton and Clovelly soil formations occurring exclusively. Clay content within these regions varies between 2 and 6%. Soil depth in this land type is generally deeper than 1 200 mm.

The B- group includes a large area of the South African interior that is occupied by a catena, which in its perfect form is represented by (in order from highest to lowest in the upland landscape) Hutton, Bainsvlei, Avalon and Longlands forms. The valley bottoms are occupied by one or other gley soil. Soils with hard plinthite are common over sandstones in the moist climate zones in the eastern part of the country. Depending on the extent to which water tables have been operative over a landscape, Longlands and Avalon and related grey and yellow soils may predominate, even to the exclusion of red soils. Where water tables have not extended beyond the valley bottoms, red soils may predominate with plintic soils restricted to narrow strips of land around valley bottoms or pans. In order for plinthic soils to be included into units Bc and Bd, they must cover more than 10% of the area. Unit Bc indicates land in which yellow and/ or red apedal soils are eutrophic and red soils are widespread, while red soils are not widespread in unit Bd.

Within unit Bc44 footslopes and valley bottoms predominate and Hutton, Avalon and Clovelly soil formations are found. Clay content of the A-horizon is typically below 10%. Soil depth in this land type is generally deeper than 1 200 mm. Footslopes predominate in the Bd46 unit with variations of Glencoe, Constantia, Westleigh, Valsrivier, Hutton and Longlands present. Clay content varies, but is generally low. Soil depth in this land type varies between 500 and 1 200 mm.

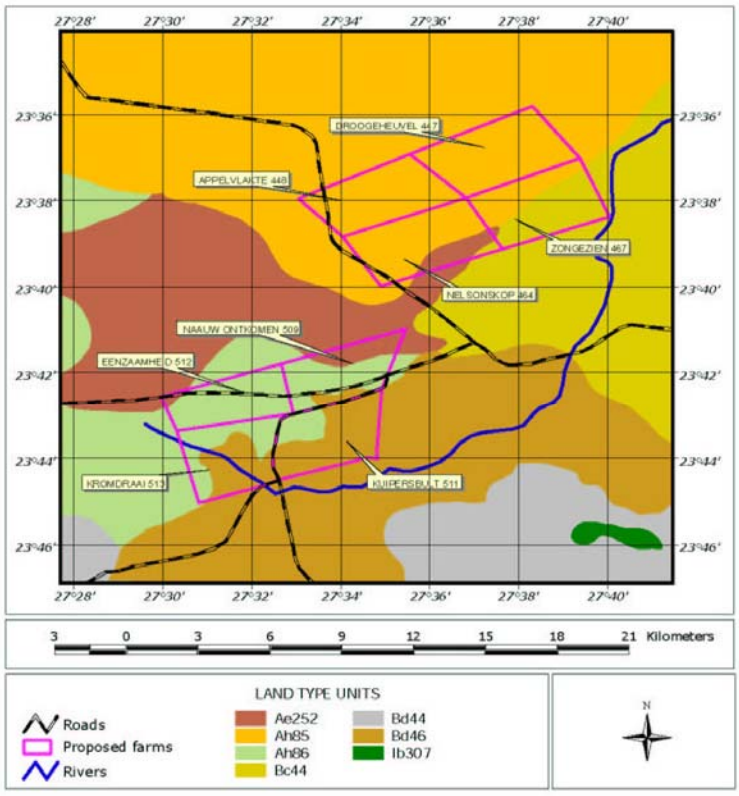

Figure 5.3: Distribution of land type units

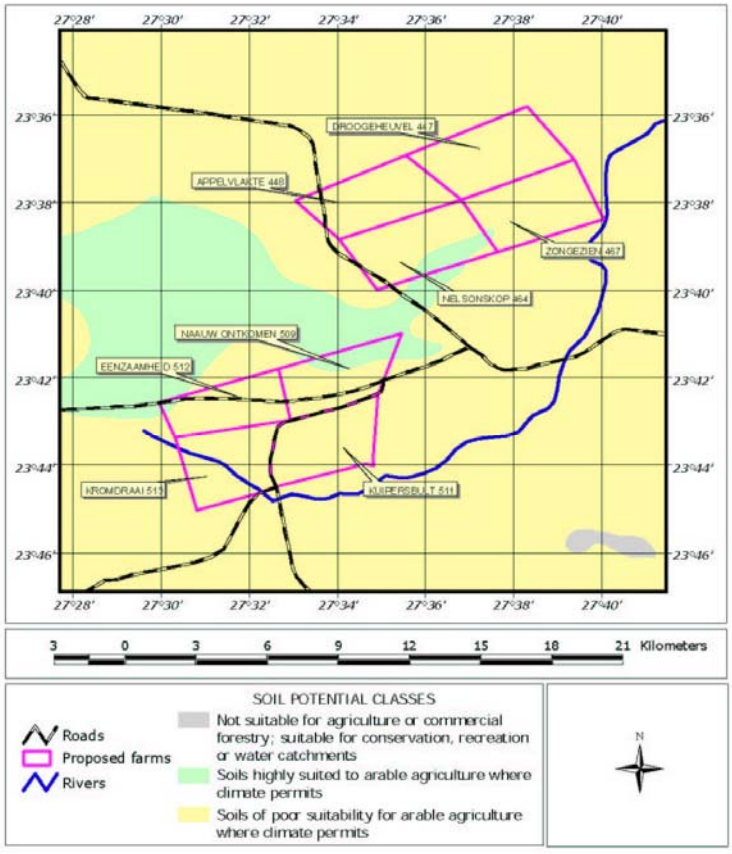

Figure 5.4: Soil Potential Classes

5.5. Water Resources

5.5.1. Surface Water

The study area falls within the Mogol River Catchment, which drains into the Limpopo River to the north (Figure 5.5). The Mokolo River catchment covers an area of 8 387 km^2. The catchment stretches from the Waterberg Mountains though the upper reaches of the Sand River, and includes the Mokolo Dam and a number of small tributaries that join the main Mokolo River up to its confluence with the Limpopo River. The topography of the area is flat, varying between 900 and 922 mamsl[1]. The general topographical drainage system is poorly developed and drains in an easterly direction towards the Mogol River (810 mamsl)

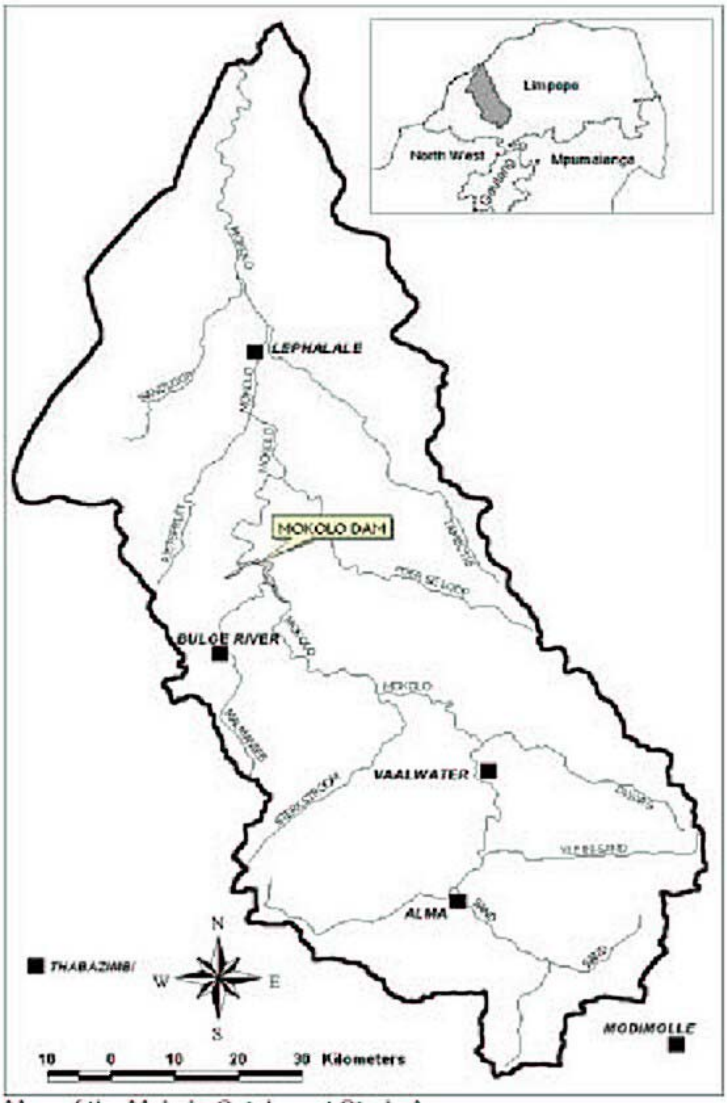

Figure 5.5: The Mokolo River Catchment (DWAF, 2005)

[1] The Nelson's kop is a prominent landmark at 922 mamsl; this hill is an inselberg (erosional relic) of the Clarens Formation sandstone.

5.5.2. Groundwater

The groundwater potential of the formations located in the study area is limited in their pristine state due to low permeability, storage, and transmissivity. There are no artesian boreholes located within the study area. No large-scale groundwater abstraction occurs in the study area, even along the numerous faults.

The geological structures can enhance the groundwater potential in the area by increasing the permeability and transmissivity of the host rock. Secondary processes, such as faulting and fracturing, can create secondary fractured rock aquifers. Groundwater occurs within the joints, bedding planes, and along dolerite contacts within the Waterberg Group sediments.

The groundwater potential of the fractured transitional zones between weathered and unweathered crystalline Letaba basalt rocks is good. Deeper fractures within the basalt, associated with faulting, have good groundwater potential. Fractured fault zone, especially if related to tensional stresses, are potentially rich targets for groundwater development. The graben structures are associated with tensional stresses, thus the Eenzaamheid fault could be an area of increased groundwater potential. The Daarby thrust fault is impermeable.

5.5.3. Water Users

Currently, water use in the catchment broadly comprises:

- 87% for agricultural activities.
- 13% for the industrial, mining, power generation and domestic water supply service sectors (municipalities).

According to the Internal Strategic Perspective (Report WMA 01/000/00/0304 available at www.dwaf.gov.za/documents) presently, water availability and water use in the catchment are in balance. However, within the provisions of the National Water Act (Act 36 of 1998) as stipulated in the National Water Resources Strategy, there is a need to meet the water requirements of the Reserve (Basic Human needs and Ecological requirements) in terms of both water quantity and quality. When this requirement is determined and imposed on the current water supply system, presently there would be insufficient water to maintain the required balance (see Appendix J). The area has been earmarked as a growth node by the provincial government and plans are in place to increase the water resource to assist with development in the area (Limpopo Province Development Blueprint Vision 2020). It is anticipated that water demand will increase with new developments proposed in the Mokolo Catchment, such as new or expanded mining activities, new power stations and other developments.

5.6. Ecology and Biodiversity

Vegetation types that occur in the study area include (refer to Figure 5.6) (Low & Rebello, 1996):

- Mixed Bushveld, as is deduced from the name, represents a great variety of plant communities, with many variations and transitions. The vegetation varies from a dense, short bushveld to a rather open tree savanna. The structure of this vegetation type is determined by fire and grazing.
- Sweet Bushveld occurs on fertile soils in the dry and hot valleys of the Limpopo River and the thorny, small-leaved vegetation is dominated by *Acacia* species that increase to dense, impenetrable thickets at the expense of the grass layer when over-utilised
- Waterberg Moist Mountain Bushveld is a typical example of moist, infertile savanna. Due to the high proportion of unpalatable grasses, the area has become known as 'sour bushveld'. This vegetation type occurs on the sandstone and quartzite of the Waterberg Mountains.

All three of the above vegetation types form part of the Savanna Biome.

The Savanna Biome is the largest biome in Southern Africa, occupying over one-third of the area of South Africa. It is characterised by a grassy ground layer and a distinct upper layer of woody plants. The environmental factors delimiting the biome are complex; altitude ranges from sea level to 2 000 m; rainfall varies from 235 mm to 1 000 mm per year; frost may occur and almost every major geological and soil type occurs within the biome. A major factor delimiting the biome is the lack of sufficient rainfall which prevents the upper layer from dominating, coupled with fires and grazing, which keep the grass layer dominant. The shrub layer may vary from 1 m to 20 m in height, but in Bushveld typically varies from 3 m to 7 m. The shrub-tree element may come to dominate the vegetation in areas which are being overgrazed. The interaction of vegetation, fire and animals play important roles in maintaining savanna ecosystems.

The savanna biome is populated by a greater diversity of bird species than any other biome in South Africa. Much of the area is used for game farming and big game hunting, illustrating that utilisation and conservation of an area are not mutually exclusive. The savanna biome is the core of the wildlife, ecotourism and meat-production industries. Threats include rapidly expanding development of settlements for impoverished human populations and the associated need for firewood and building materials, diminishing water supply, agriculture and over-grazing.

The savanna of South Africa includes numerous animal species; approximately 167 mammals (15% endemism), 532 birds (15% endemism), 161 reptiles (40% endemism), 57 amphibians (18% endemism) and an unknown number of invertebrates. Flagship species include the Starburst Horned Baboon Spider, ground Hornbill, Cape Griffon, Wild dog, Short-Eared Trident Bat and the White Rhinoceros (Knobel, 1999).

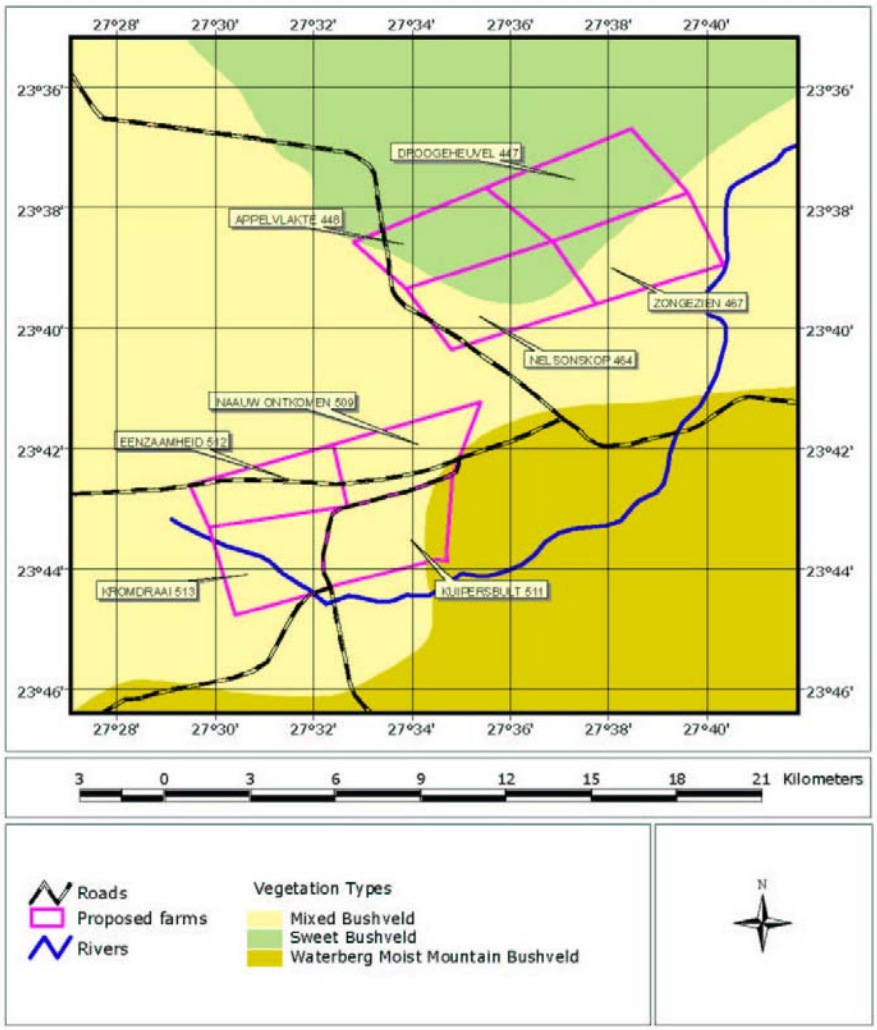

Figure 5.6: Vegetation types

5.7. Social Environment

The study area is situated approximately 20 km west of Lephalale in the Limpopo Province. The study area is situated in the area under the jurisdiction of Lephalale Local Municipality (NP362), which forms part of the Waterberg District Municipality (DC36). The Lephalale Local Municipality covers an area of 19 605 square kilometres (km^2), and consists of 11 wards. The study area comprises three wards:

- Ward 2, which has an area of 77 km^2, and includes Grootegeluk Mine and the township of Maropong;
- Ward 3, a much larger ward directly to the south of Ward 2, with an area of 2 047 km^2. Onverwacht, a residential area to the west of the town of Lephalale, lies in Ward 3; and
- Ward 4, which has an area of 16 km^2 metres and comprises the town of Lephalale (formerly Ellisras).

5.7.1. Land Use

Principle land uses in the study area include:

- Agricultural land devoted mainly to game and cattle farming.
- Residential and industrial areas – i.e. Onverwacht, the town of Lephalale, and Maropong. Plans have been made to expand Maropong towards the east.
- Grootegeluk Mine, which is owned by Kumba Resources Pty Ltd.
- The existing Matimba Power Station.
- Game farms and lodges including the Ferroland Private Game Reserve.
- Sewage works on the farms Zongezien and Nelsonskop.

5.7.2. Population

The total population of Lephalale Local Municipality is in the order of 100 000. About 3% of this population (3000 people) live in the town of Lephalale. Ward 2 (Maropong), with a population of about 6000, accounts for 6% of the total population of the municipal area, while Ward 3 (with 10 000) people accounts for a further 10%.

The average population density of Ward 3 (at 5 people per km^2) is similar to that of Lephalale Local Municipality as a whole. By contrast, Ward 2 is more densely populated at about 75 people per km^2, while the town of Lephalale is still more densely populated (about 180 people per km^2).

About 90% of the population of Lephalale Local Municipality is African, with the remainder made up almost exclusively of Whites. According to the 2001 Census results, the populations of the town of Lephalale and the larger Ward 3 consisted of roughly equal proportions Africans and Whites, although the balance has swung in the direction of Africans in the intervening years. Ward 2 (Maropong) is almost exclusively African.

5.7.3. Age and gender distribution

One-third of the population of Ward 2 (Maropong) is under 15 years of age. This is similar to the age distribution of Lephalale Local Municipality as a whole. By

contrast, the population of Ward 3 and the town of Lephalale is slightly older, with between one-quarter and one-fifth of the population being under 15 years of age.

In Maropong, as well as in the town of Lephalale, the population distribution displays a preponderance of males over 35 of age. In these areas, males between 35 and 64 years of age constitute 60% of the total population in this age group. This pattern is indicative of large numbers of migrant workers. These workers are attracted by the possibility of employment at the Grootegeluk Mine and the existing Matimba Power Station. They most probably originate from other parts of Limpopo Province, which is one of the poorest provinces in South Africa, and consequently has a high unemployment rate.

5.7.4. Education

In Wards 2, 3 and 4, about 10% of the population over 20 years of age report not having had any schooling. This figure is significantly lower than for Lephalale Local Municipality as a whole, where nearly one-quarter of over 20-year olds have not had any schooling. In Maropong, approximately a quarter of the adult population is functionally illiterate.

5.7.5. Employment

- *Unemployment rates*
  The unemployment rate in Lephalale Local Municipality is in the order of 20%. This figure is higher in Maropong, where roughly one-third of the workforce is unemployed. In Ward 3 the unemployment rate is about 10%, while in the town of Lephalale it is less than 5%.
- *Sectoral employment*
  In Lephalale Local Municipality, agriculture is the largest source of employment, with one-third of the active labour force employed in this sector. In Maropong, mining is the largest source of employment (40%). In the town of Lephalale, the largest source of employment is the Community/Social/Personal Services sector (30%). Game farming constitutes an important economic activity on many of the farms surrounding the study area (including those in Ward 3).

5.7.6. Income

Limpopo Province is one of the poorest provinces in the Republic of South Africa. Poverty is also a widespread problem in Lephalale Local Municipality: roughly 20% of households report not earning any income, while an additional 45% of households earn less than R800 per month. The situation is slightly less severe in Ward 2 (Maropong), where 15% of households earn no income and 25% earn less than R800 per month. In Ward 3 and the town of Lephalale, by contrast,

only 8% of households report not earning any income, while one-quarter of households earn less than R800 per month.

5.7.7. Housing

In Lephalale Local Municipality, 80% of households live in formal dwellings, while roughly equal proportions of the remainder live either in traditional or informal dwellings. In Ward 2, slightly less than 50% of households live in formal dwellings, while the remainder live in informal dwellings. The township of Maropong itself is a formal settlement to which infrastructure has been supplied. In Ward 3 and the town of Lephalale, the vast majority (more than 90%) of households live in formal dwellings.

The average household size in Lephalale Local Municipality is 3,5 persons per household. This figure is slightly larger in Maropong (4 persons per household) and smaller in Ward 3 and the town of Lephalale (2,6 persons per household). The average dwelling size in Maropong is 3,3 rooms per dwelling. Dwellings in Ward 3 and the town of Lephalale are somewhat larger (3,9 and 4,2 rooms per dwelling, respectively).

5.7.8. Services

- *Transport*
  The most common methods of travelling to work or school in Ward 2 (Maropong) is by foot (49% of people), followed by buses (36%). In Ward 3 and the town of Lephalale, 40% of people travel to work or school by foot, while 20% make use of buses and 30% of cars. The three main roads utilised within the study area include Nelson Mandela Drive, the Steenbokpan road and the Stockpoort Road. The greater Lephalale area is accessed via the Vaalwater (R33) and Thabazimbi (R510) roads.
- *Access to electricity*
  Approximately 70% of households in Lephalale Local Municipality have electricity for household lighting, while the remainder use candles. In Ward 2 (Maropong), this figure is slightly higher (75%), and in Ward 3 it is still higher (85%). Virtually all households in the town of Lephalale have access to electricity.
- *Water and sanitation*
  A very high percentage of communities in Limpopo Province are still below 50% of RDP standards in terms of water supply. In the Waterberg District Municipality, about 235 688 of people (i.e. 48 000 households) do not have access to water at least 98% of the time. On the other hand about 130 000 people still have to walk more than 200 m to fetch water from the nearby water sources.

In Lephalale Local Municipality, one-third of households do not have access to water in the dwelling or yard, but are required to make use of community standpipes. In Maropong, this figure is somewhat lower (15% of households make use of community standpipes), more than half of households have a tap in the yard, and one-third of households have access to water inside their dwelling. In Ward 3 and the town of Lephalale, approximately 75% of households have access to water inside their dwelling, while 20% have a tap in the yard. The remainder make use of community standpipes.

A similar pattern emerges with regard to sanitation services. In Lephalale Local Municipality, 20% of households have no access to sanitation services, 50% make use of pit latrines, while 30% have flush toilets. In Maropong and the town of Lephalale, virtually all households have flush toilets. In Ward 3, 85% of households have flush toilets, 5% make use of pit latrines, and slightly less than 10% have no access to sanitation services.