7. DESCRIPTION OF THE AFFECTED ENVIRONMENT

Key features of the study area are presented in this chapter.

7.1 CLIMATE

Climate data is provided for the towns of Tsolo and Maclear, which are considered to be representative of the general study area. Both towns have sub-tropical climate with moderate rainfall.

Tsolo receives an average annual rainfall of about 749 mm, with most rainfall falling in summer. The lowest (15 mm) average rainfall is experienced in June and the highest (108 mm) in January. The coldest month is July with an average minimum temperature of 3.2°C and January being the hottest month with an average maximum temperature of 26.5°C (**Table 10**).

Table 10: Climate data for Tsolo

Tsolo	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Average monthly rainfall (mm)	108	107	107	47	26	15	17	22	42	68	89	101
Average minimum Temp (°C)	15.1	15.2	14.1	9.3	7.1	3.5	3.2	5.2	8.2	11	12.4	13.7
Average maximum Temp (°C)	26.5	26.4	25.7	22.5	21.7	19.5	19.4	21	22.5	23	24.4	25.7

Source: www.climate-data.org

Maclear receives an average annual rainfall of 786 mm, with the wettest month being January receiving an average monthly rainfall of 130 mm. The driest months are June and July with both 13 mm average rainfall. The hottest temperatures are experienced in summer with average maximum temperature of 20.1°C in January. July is the coldest month with temperatures as low as 0°C (**Table 11**).

The variations in temperature and rainfall in the two towns is due to the difference in elevation: Maclear lies at an elevation of 1 280 m above mean sea level whereas Tsolo is at an elevation of 945 m.

Table 11: Climate data for Maclear

Maclear	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Average monthly rainfall (mm)	130	121	113	46	24	13	13	21	38	64	88	115
Average minimum Temp (°C)	13.9	13.9	12.6	9.3	5.6	0.8	0	3.1	7.3	9.5	11.3	12.6
Average maximum Temp (°C)	26.3	26	24.8	22.5	20	16.4	16.3	18.8	21.7	23	24.3	25.7

Source: www.climate-data.org

7.2 GEOLOGY AND SOILS

The study area is underlain by sedimentary rocks of the Tarkastad Subgroup of the Beaufort of the Karoo Supergroup and post Karoo dolerite intrusives. The Karoo Supergroup consists of light brownish grey, fine to medium grained sandstones and subordinate thinner bluish to reddish grey mudrocks. There are also traces of mudflake congloromates. These sediments were deposited by north flowing braided river systems (**Figure 24**).

There is a low level of tectonic deformations in this region. Dolerite Sills and Dykes are found with thermally metamorphosed adjacent sediments. The dykes are only a few meters wide but stretch for long distances. Dolerite is a dark basic intrusive igneous rock consisting of plagioclase, feldspar and pyroxenes and its soils generally have high potential for both rain fed and irrigated crops and forestry. Beaufort sediments are characteristically erodible.

The bedrock is the main constituent in the study area with some thick colluvial soil deposits covering it. The upper right flank, however, has been weathered exposing hard dolerite outcrops and sub outcrops.

Alluvial sand occurs in the course of the Tsitsa River and major tributary rivers and streams. Due to the steep and incised nature of the rivers, sand is mainly confined to the river channel, with few and only localised over-bank deposits (DWA, 2013b).

The area has Hutton 2200 salm and Hutton 2100 salm soil types. Orthic topsoils overlie red apedal subsoils. Topsoil texture is sandy loam becoming sandy clay loam in the subsoil. Soils thus have luvic character as clay has moved from top to subsoil over time. Textural transition from top-to subsoil is gradual providing free root penetration. Soil structure is apedal tending to weak crumb (DWA, 2013a).

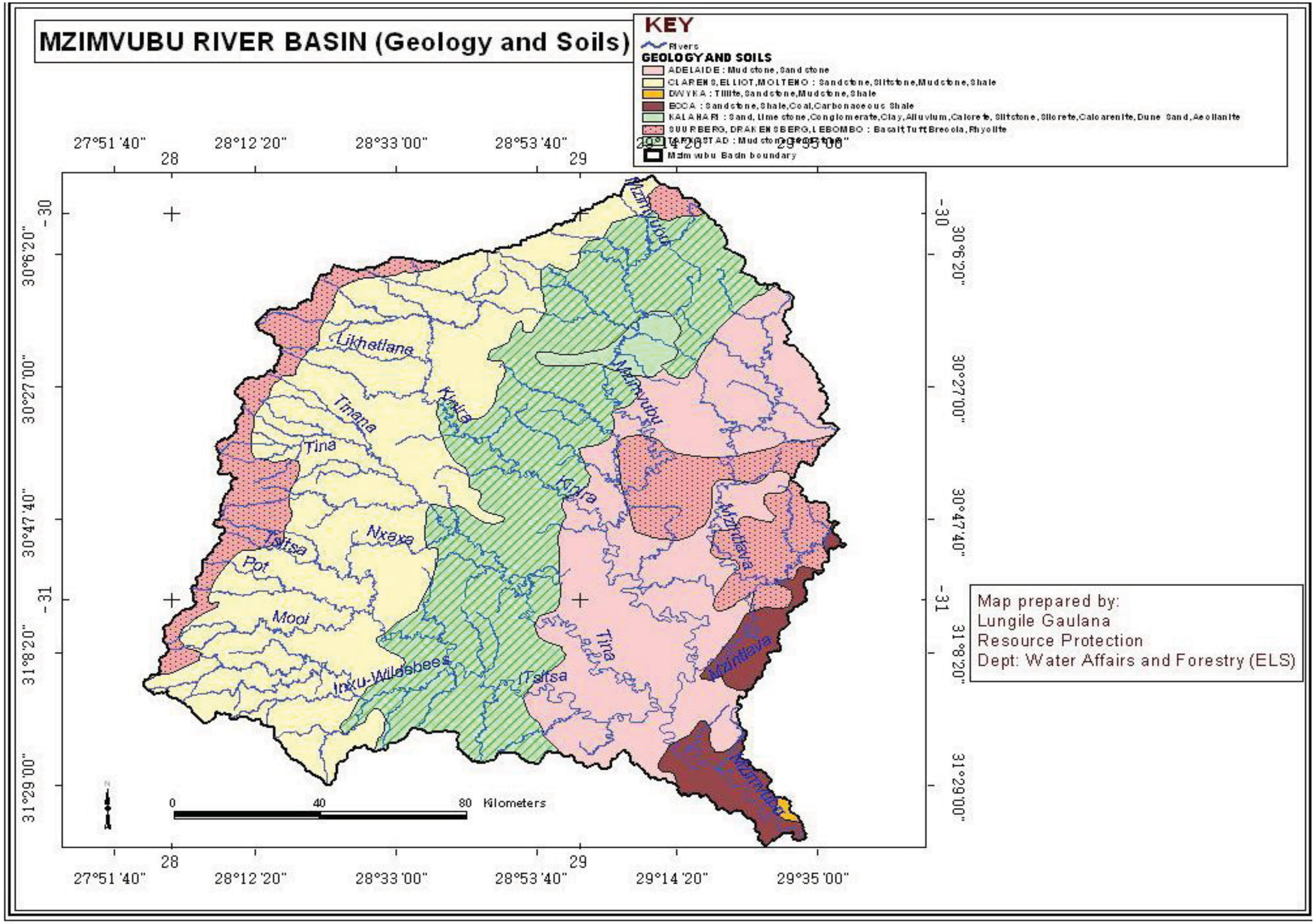

Figure 24: Geology and soils in the Mzimvubu catchment (DWAF, 2008)

Soil erosion

There are extensive areas of severe gulley erosion on the inter-fluvial areas adjacent to stream channels (**Figure 25**). The erosional and piping characteristics are suggestive of the presence of dispersive soils (DWA, 2013b).

In the Mzimvubu and Tsitsa River catchments, soil erosion is an outcome of high rainfall intensities, steep slopes, erodible soils and land use practices that are conducive to erosion. The latter include overgrazing and cultivation on unsuitable thin soils with sloping terrain, which causes grass to not recover, a loss of root structure and sheet erosion.

Figure 25: Donga in the Ntabelanga Dam area

Structures placed in the way of water flow paths have caused the interception of flood paths and springs, cutting off recharge to wetlands and the formation of artificial flood barriers, thereby also causing erosion, as well as sedimentation, and damage to the structures themselves.

Erosion and land degradation affect ecosystem health and negatively impact on the majority of downstream rivers, which are characterised by high turbidity and increased siltation. The high sediment loads in rivers will increase water treatment costs and decreases the lifespan of any dams or hydropower schemes.

Good care and management of the way a catchment is used will reduce soil loss due to erosion, improve water quality and quantity in the river, and also increase the efficiency and sustainability of land use in the catchment, which will have environmental and economic benefits. Water treatment costs will be reduced and the lifespan of dams and hydropower infrastructure increased.

A catchment rehabilitation and management programme, aimed at restoring eroded land and thereby reducing the levels of sedimentation that are expected to impact on the yield of the dams, has been initiated in the Mzimvubu River catchment. A budget of R 450 million over the next 10 years has been allocated to the programme. The work has begun in the Tsitsa River catchment in order to synchronise with the proposed new dams currently under investigation. The programme is being implemented by the Department of Environmental Affairs. It will include alien vegetation eradication, the phased restoration of eroded areas and future erosion preventative measures such as sediment trapping and reuse, planting of erosion reducing vegetation, improving land-use practices by rotational usage regime including rotational fencing of grazing areas for protection purposes.

The benefits of the programme include the restoration of wetlands and productive land, reduction of future erosion and land loss, and the reduction of sediment released into the river resulting in improved water quality, reduced water treatment costs and longer operational lifespan of proposed dams and hydropower plants. Improved runoff and river flow regulation via wetlands will improve base flow and reduce peak flood events. The programme will create temporary and permanent jobs.

While this project will impact positively on the Mzimvubu Water Project, it is conducted as an independent project and its activities are not a part of this EIA.

7.3 SURFACE AND GROUND WATER RESOURCES

The study area falls within the South Eastern Uplands Aquatic Ecoregion and the Mzimvubu to Kieskamma Management Area (WMA). The subWMA is the Mzimvubu.

The Mzimvubu River is one of South Africa’s largest rivers (accounting for 5.5% of total river flow in the country). It has four major tributaries, namely the Mzintlava, Kinira, Tina and Tsitsa Rivers. Rivers in this catchment possess water surpluses.

The proposed Ntabelanga and Laleni Dams are both situated on the Tsitsa River, a perennial river classified as a Category C (Moderately modified).

The pipelines in the northern part of the project area cross the Tina River which is classified as being in Category C condition (moderately modified). The Tina River is regarded as an important fish sanctuary, translocation and relocation zone and is classified as being a fish support area according to the National Freshwater Ecosystem Priority Areas (FEPA) Database (2011).

The mountain/highland grasslands in the area maintain high water quality and yield, which is critical for the neighbouring rural communities and also for downstream consumption.

The Mzimvubu subWMA is indicated as an upstream management area; effective management of activities near resources are therefore of upmost importance.

The wetland vegetation group in the Laleni and Ntabelanga Dams' footprint are identified as Sub-escarpment Grassland Group 6 and Sub-escarpment Savanna respectively.

The wetland in the Laleni Dam footprint is classified as a channelled-valley bottom wetland in Category Z1 condition (critically modified).

According to the FEPA Database (2011), the wetland is classified as a FEPA system, with a rank of 2 indicating that the majority of its area is within a sub-quaternary catchment that has sightings or breeding areas for threatened *Bugeranus carunculatus (*Wattle Crane), *Balearica regulorum (*Grey Crowned Crane) and *Anthropoides paradiseus (*Blue Crane).

The Mzimvubu subWMA is not considered to be a high groundwater recharge area.

7.4 VEGETATION

The study area falls within the Sub-escarpment Grassland and Sub-escarpment Savanna Bioregions (Mucina and Rutherford, 2006) (**Figure 26**).

The study area falls within several vegetation types (Mucina and Rutherford, 2006). These include the *Bisho Thornveld, Drakensberg Foothill Moist Grasslands, Eastern Valley Bushveld, Eastern Griqualand Grassland, Mthata Moist Grassland* and *Southern Mistbelt Forest* (**Figure 27**). These vegetation types are discussed below.

The *Bisho Thornveld* vegetation is found at altitude spanning 200-700 m. It is formally classified as a 'Least Threatened' vegetation type (provincial conservation target is 25%). Up to 20% has been transformed for cultivation, urban development or plantations. Erosion in this vegetation type ranges from low to moderate.

The *Drakensberg Foothill Moist Grassland* is found at altitudes spanning 880-1860 m. It is formally classified as a 'Least Threatened' vegetation type (provincial conservation target is 23%). Almost 20% has already been transformed for cultivation, plantations and urban sprawl. Alien woody species of *Rubus*, *Acacia dealbata* and *Solanum mauritianum* are potential invasive species in certain areas. Erosion is very low in 28% of the vegetation type, low in 49% and moderate in 17%. Biogeographically important taxa include *Schizochilus bulbinella* and *Schoenoxiphium burttii*.

The *Eastern Valley Bushveld* vegetation is found at altitudes spanning 100-1 000 m. It is formally classified as 'Least Threatened' (provincial conservation target is 25%).

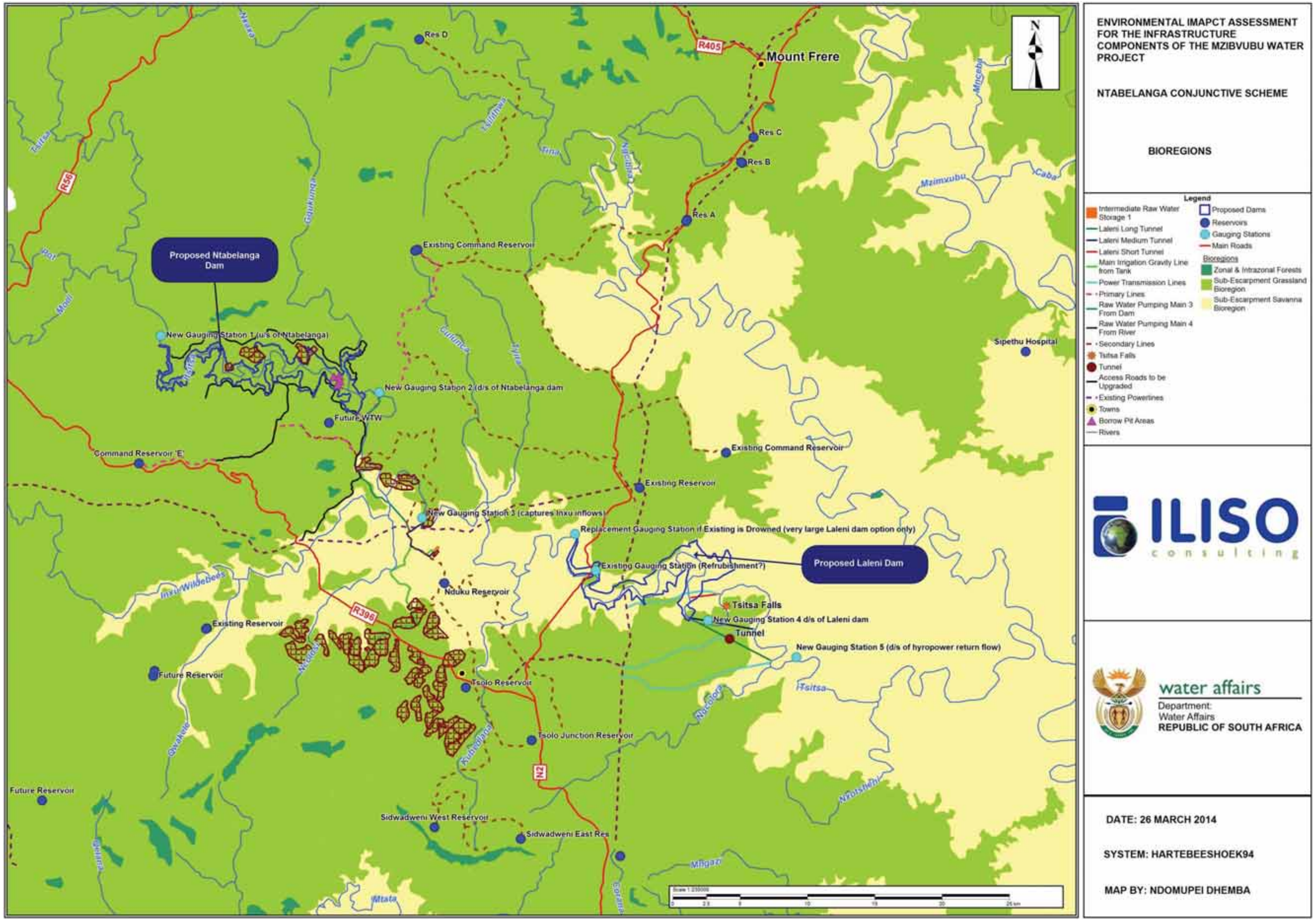

Figure 26: Bioregions

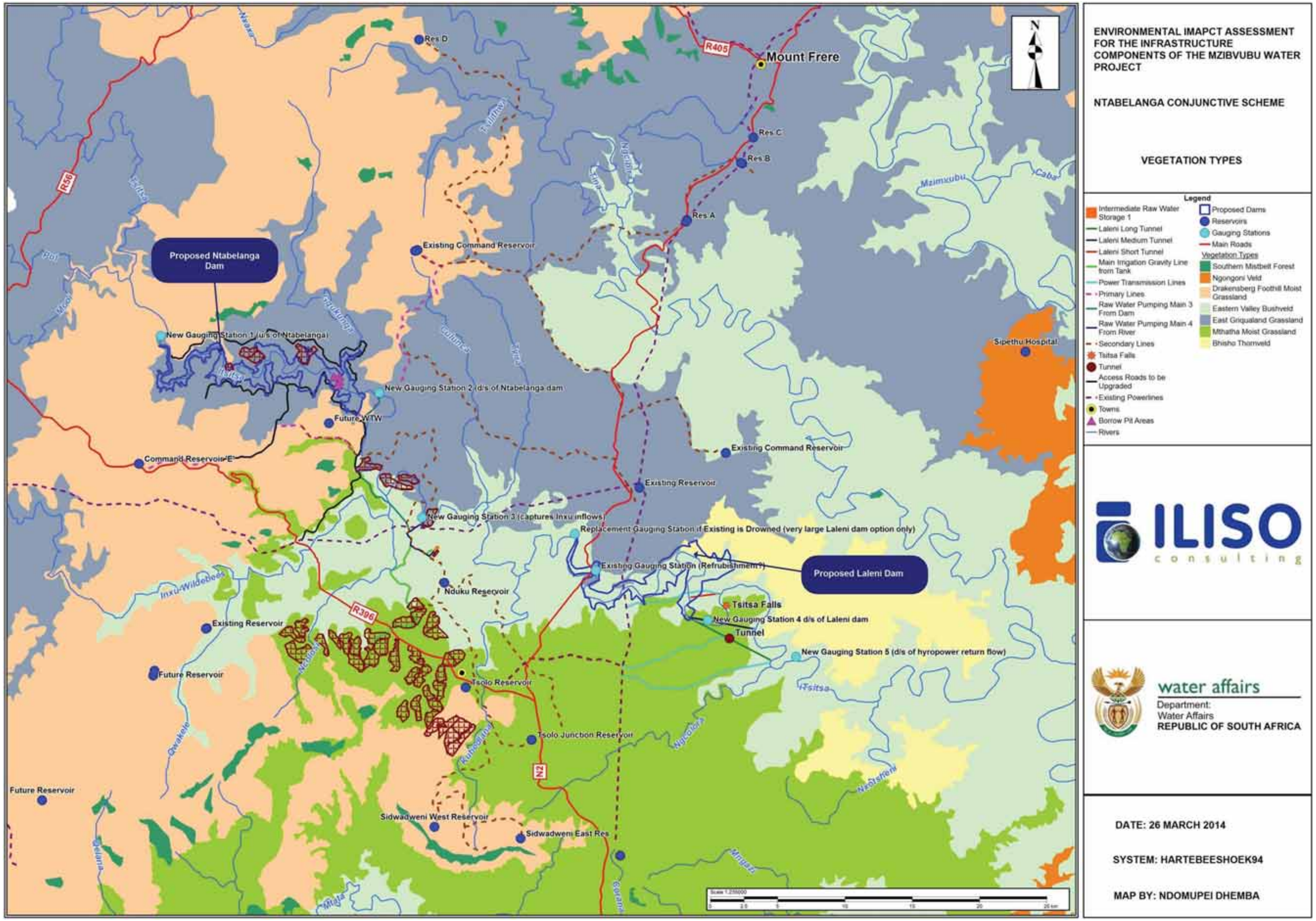

Figure 27: Vegetation types

Up to 15% has been transformed mainly by cultivation. Alien plant invasion are a serious threat with *Chromolaena odorata*, *Lantana camara* and *Caesalpinia decapetala* being the most problematic species.

The *Eastern Griqualand Grassland* vegetation is found at altitudes spanning 920-1740 m. It is formally classified as a 'Vulnerable' vegetation type (provincial conservation target is 23%). Over one quarter of the area has already undergone transformation due to cultivation of maize, plantations and urban sprawl. *Acacia dealbata* and *Acacia mearnsii* are invading these grasslands in some places. Erosion is very low in 30% of the vegetation type, low in 31% and moderate in 30%. (Mucina and Rutherford, 2006). Biogegraphically important taxa include *Encephalartos friderici-guilielmi.*

The *Mthata Moist Grassland* vegetation is found at altitudes spanning 600-1080 m. It is formally classified as an 'Endangered' vegetation type (provincial conservation target is 23%). More than 40% of the vegetation has been transformed for cultivation and plantations or by dense human settlements. *Acacia mearnsii*, *Solanum mauritianum* and *Richardia humistrata* are the most important aliens. Erosion is a serious problem with high to very high erosion levels in 34% of the vegetation type, moderate erosion in 35% and the remainder having low and very low erosion.

The *Southern Mistbelt Forest* vegetation is found at altitudes spanning 850-1600 m (most patches occur between 1000 and 1400 m). It is formally classified as a Least Threatened vegetation type (provincial conservation target is 30%). Almost 5% has already been transformed for plantations. Invasive aliens include *Solanum mauitianum, Rubus* species and several *Acacia* and *Eucalyptus* species. Uncontrolled harvesting of timber, poles and firewood, overexploitation of non-timber forest products and grasslands are considered as current major threats.

7.4.1 Threatened ecosystems

According to the National List of Threatened Terrestrial Ecosystems (2011), sections of the proposed infrastructure (e.g. road upgrades, pipelines and power lines) fall into a vulnerable ecosystem in terms of the original and remaining extent of the associated vegetation types (**Figure 28**).

Vulnerable ecosystems have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention.

7.4.2 Conservation importance

The environment in much of the catchment, particularly in the riverine areas, is considered to merit particular protection.

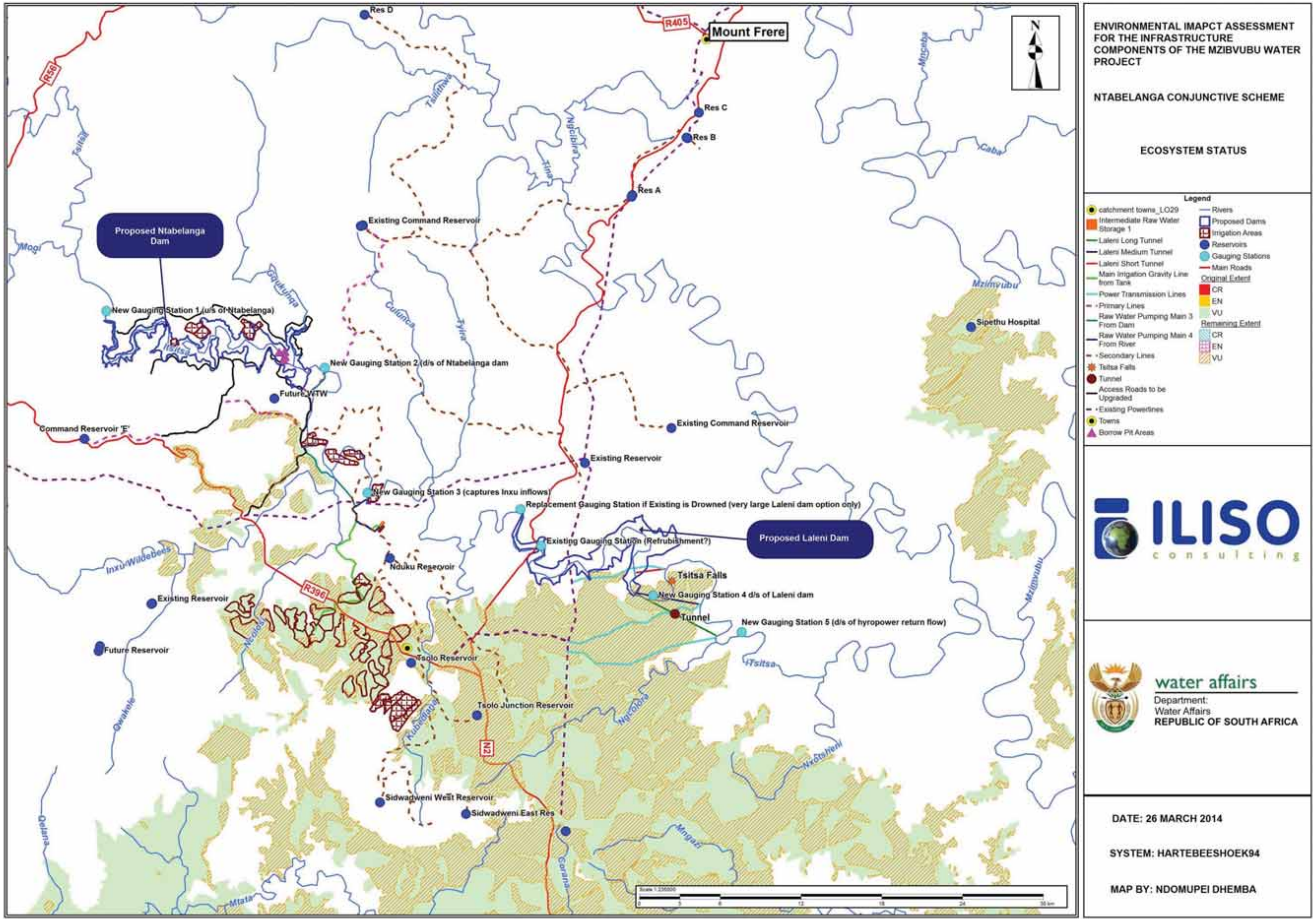

Figure 28: Threatened ecosystems

The Eastern Cape Biodiversity Conservation Plan (ECBCP) (2007) is a broad scale-biodiversity plan based on identifying Critical Biodiversity Areas (CBAs) and associated land use guidelines. It recommends limits to the total amount of land transformation that should be allowed if biodiversity is to be conserved. The approach rests on the concept of Biodiversity Land Management Classes (BLMCs). Each BLMC sets out the desired ecological state that an area should be kept in to ensure biodiversity persistence. Only land use types that are compatible with maintaining this desired state should be allowed.

Large areas within the project area have been identified as Critical Biodiversity Areas (CBAs) in terms of the ECBCP (**Figures 29** and **30**). These areas are of conservation importance due to the presence of Red Data species, endemic species and potential habitat for these species to occur.

The bulk of the project area falls within a Terrestrial CBA 2 (BLMC 2 - *Near Natural landscape)* while sections of the pipelines traverse terrestrial and aquatic CBAs 1 (BLMC 1- *Natural Landscape*).

According to the ECBCP's land use guidelines, while the conversion of virgin land to irrigated agriculture is not permissible in areas identified as CBAs 2, irrigated agriculture on existing and fallow cultivated land is allowed, on condition that an Environmental Authorisation is granted. Most of the areas earmarked for irrigated agriculture are cultivated, although many fields have not been planted in the recent past (DWA, 2013a).

The Mzimvubu subWMA is important with regards to fish corridors for movement of threatened fish between habitats. Effective management of activities near and between corridors is therefore of upmost importance. The subWMA is also important for the conservation of crane species

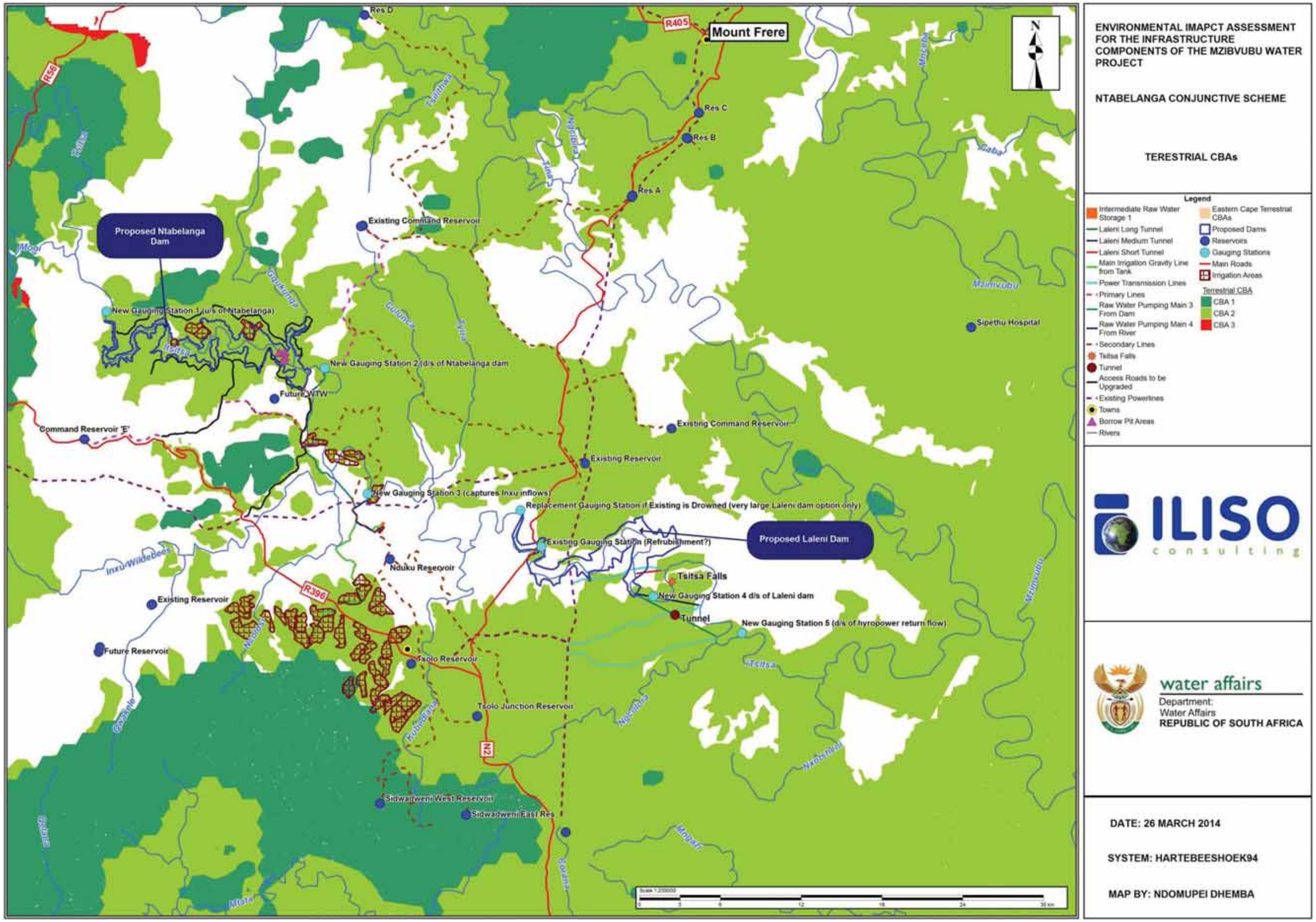

Figure 29: Terrestrial Critical Biodiversity Areas (CBAs)

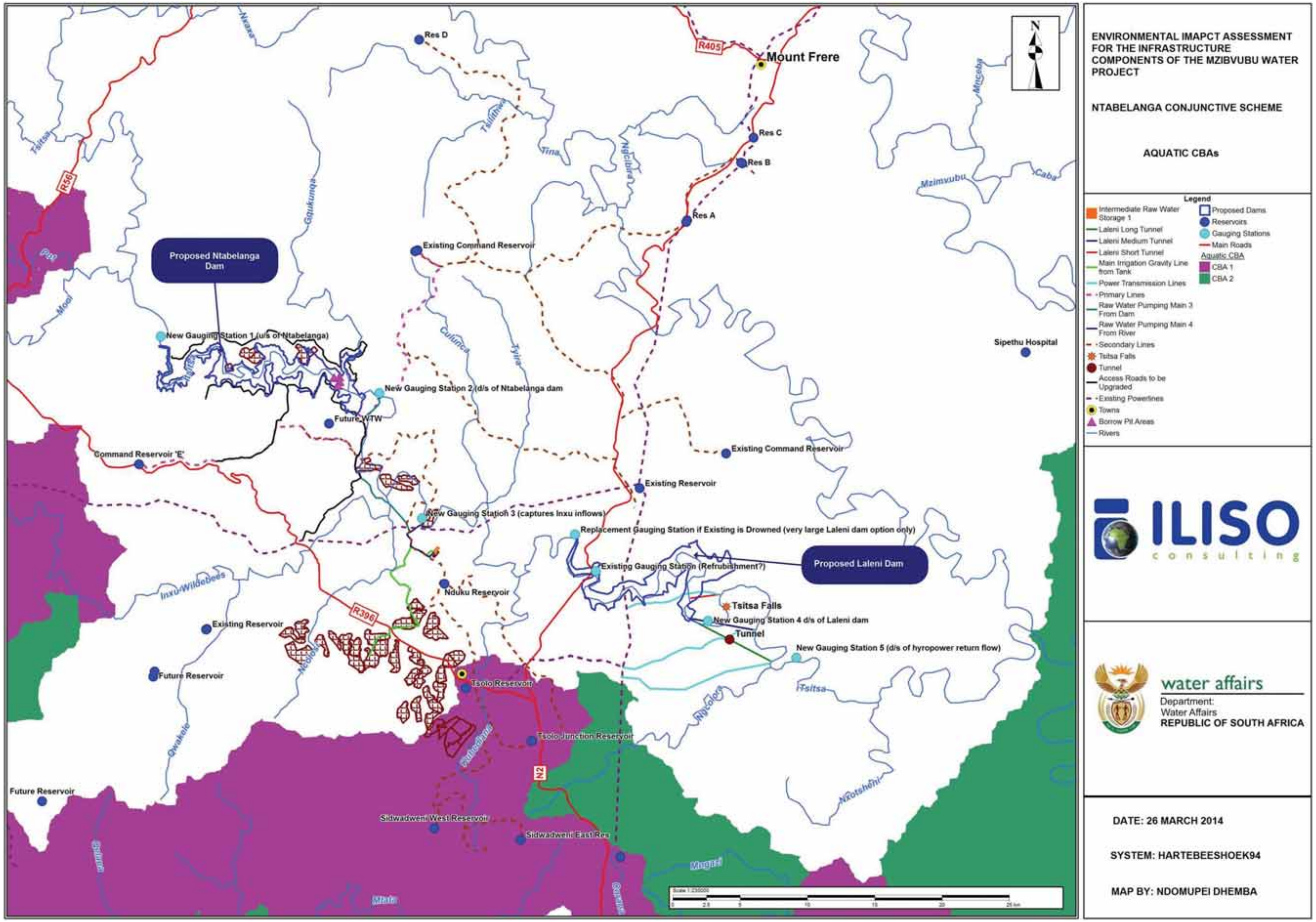

Figure 30: Aquatic Critical Biodiversity Areas (CBAs)