Final Environmental Scoping Report for the Proposed New Route P166-1/2 at Mbombela, Mpumalanga Province

A Report for: SANRAL

Authority No: NEAS Reference: DEA/EIA/0001338/2012

DEA Reference: 14/12/16/3/3/2/384

Date: November 2013

THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD

Reg. No.1998/009584/06

Royal HaskoningDHV

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DOCUMENT DESCRIPTION

Client:
SANRAL

Report Name:
Final Environmental Scoping Report for the Proposed New Route P166-1/2 at Mbombela, Mpumalanga Province.

Royal HaskoningDHV Reference Number:
E02.JNB.001223

DEA Reference:
NEAS Reference: DEA/EIA/0001338/2012
DEA Reference:14/12/16/3/3/2/384

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Mbombela, Mpumalanga Province

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MAIN ACRONYMS

DEA	Department of Environmental Affairs
DMGDP	Draft Mpumalanga Growth and Development Plan
MDEDET	Mpumalanga Department of Economic Development, Environmental and Tourism
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Environmental Management Framework
ESS	Environmental Scoping Study
ESR	Environmental Scoping Report
GN	Government Notice
HGM	Hydro-geomorphology
IDP	Integrated Development Plan
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
EMPr	Environmental Management Programme
I&AP	Interested and Affected Party
NEMA	National Environmental Management Act
SADC	Southern Africa Development Community
SDF	Spatial Development Framework

1 INTRODUCTION

Endecon Ubuntu Pty Ltd has appointed Royal HaskoningDHV (RHDHV) (formerly known as SSI Engineers and Environmental Consultants) on behalf of the South African National Roads Agency Limited (SANRAL) to undertake the Environmental Impact Assessment (EIA) process for the road determination of the proposed new route P166-1/2 in the Mbombela (Nelspruit) area, Mpumalanga Province. The environmental studies to be undertaken for the project will be divided into two phases namely:

- Environmental Scoping Study (ESS) which is presented in this report; and
- Environmental Impact Assessment Study (EIA) which will include an Environmental Impact Assessment Report (EIAR) as well as an Environmental Management Programme (EMPr).

The EMPr will be compiled based on the findings of the Environmental Impact Assessment Report, providing mitigation and management measures for the planning phase of the proposed project.

This Final Environmental Scoping Report has considered submissions made by stakeholders and Interested and Affected Parties on the Draft and Final Scoping report released for public comment in March to April 2013, and in October to November 2013 respectively and has incorporated feedback from stakeholders as part of the scoping-phase public comment period.

1.1 Project Background and Description

The P166-1/2 is a proposed new road which will run roughly in parallel to the existing R40 road that passes through the town of Mbombela (Nelspruit) and which runs to White River. The section of the P166-1/2 under review starts at Maggiesdal, south of Mbombela, where an interim connection to the R40-2 (the portion of the R40 running south from Mbombela towards Barberton) needs to be defined, ending north of White River where it meets the R40-4 (the portion of the R40 running north from White River towards Hazyview, as indicated in Figure 1 below. This proposed route is approximately 32 kilometres long and follows an alignment that traverses a number of different types of land uses including residential areas planned areas of development, orchards, plantations and vacant areas of natural bushveld.

The preliminary design for the road was completed more than twenty years ago and sections of this road were proclaimed though an environmental study was never undertaken, as this was not a legal requirement at the time -this was done before the promulgation of the Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations (1989) and the subsequent National Environmental Management Act (NEMA) (No 107 of 1998, as amended) and the EIA Regulations (1997, 2006 & 2010) and therefore no RoD/Environmental Authorisation in terms of these Regulations was obtained. A short section of the route was constructed in 2010 for convenient access from the new N4 Nelspruit bypass to the Mbombela Stadium for the 2010 Soccer World Cup, for which a separate authorisation from the Department of Environmental Affairs was obtained in 2008. Some township development and planned development has also taken place in close proximity to the original servitude, posing certain environmental issues, as explored in this report.

Endecon Ubuntu, a civil engineering firm from Mbombela, has been appointed by SANRAL to review the existing preliminary design for the designated section of the P166-1/2. The purpose of the review is to test the previously defined road reserve for a cost-effective, affordable and environmentally responsible design and to make adjustments if and where necessary. Environmental Authorisation is required for route determination as defined in the 2010 EIA Regulations. Environmental Authorisation will ensure the authorised corridor obtain legal status in the planning statues of the area such as Spatial Development Framework (SDF) and Environmental Management Framework (EMF) (if any) It should be noted that SANRAL intends to conduct separate environmental assessment (basic assessment and water use licensing) processes for construction-related activities should the proposed route determination EIA be authorised. Nonetheless the current EIA has undertaken a comprehensive assessment of environmental issues associated with the proposed development.

1.1.1 *Investigation Analysis*

The section of the P166 under investigation (which includes portions of both P166-1 and P166-2) is not completely covered by Provincial Declarations. Basic Design Plans were used to create the alignment of the road to fill the gaps between declarations. The road is intersected by three National Roads, namely the N4/7 into Nelspruit, N4/7X bypass and R40/4. The road reserve varies, but is predominantly 80m wide. It is proposed that the road reserve width of the undeclared portions as mentioned above not be reduced but left as is, in order to accommodate a 6 lane dual carriageway road.

The following SANRAL typical cross sections have been used for the purposes of this project:

- TD-R-XS-001-V1: Typical cross sections for single lane ramps (refer figure 1 below);
- TD-R-XS-002-V1: Typical cross sections for dual carriageway, 6 lanes divided (refer figure 2 further below).

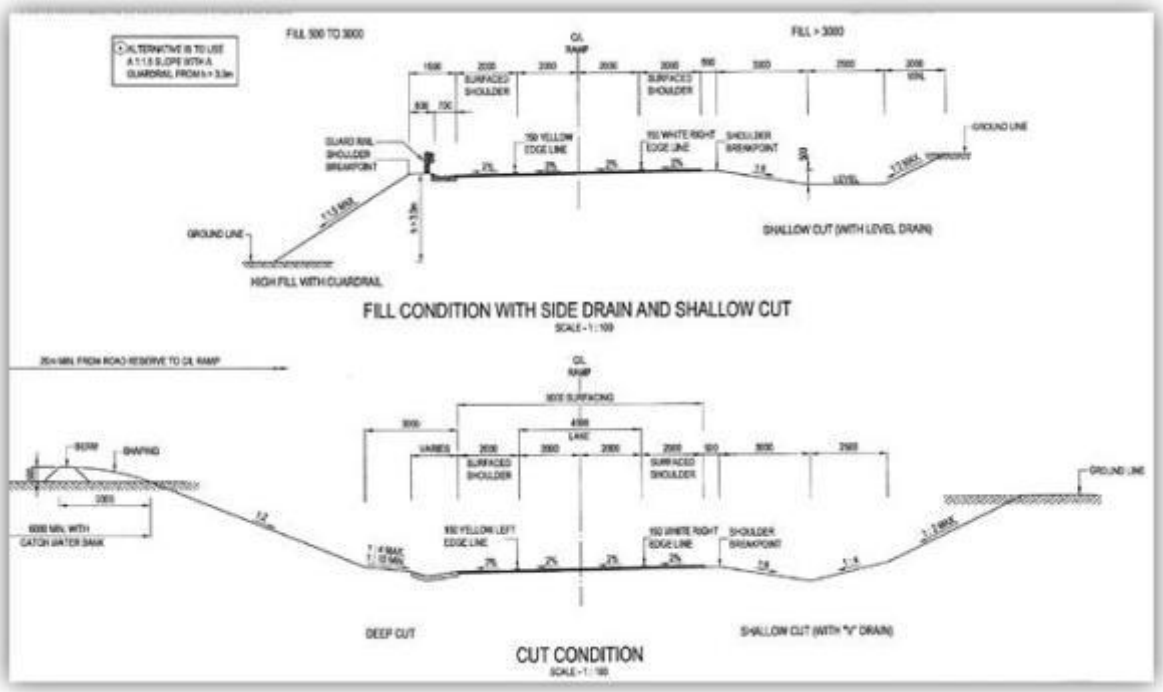

FIGURE 1: TYPICAL CROSS SECTION: SINGLE LANE RAMPS

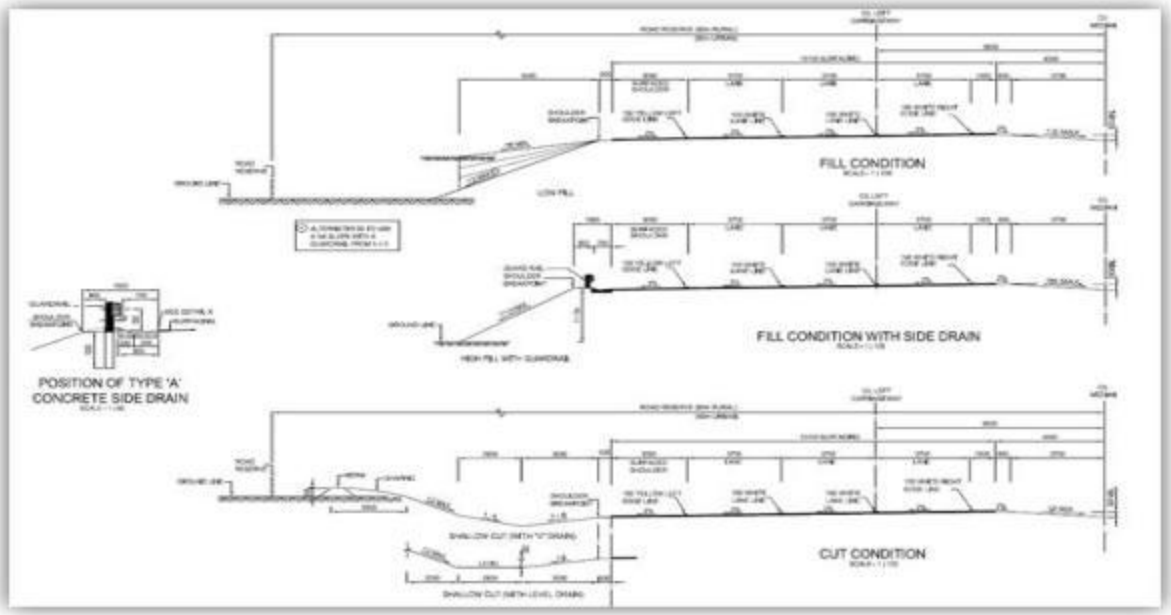

FIGURE 2: TYPICAL CROSS SECTION DUAL CARRIAGEWAY 6 LANE DIVIDED

1.2 Project Need and Desirability

SANRAL is responsible for all matters regarding national roads, national roads being those roads declared as national roads and class 1 or class 2 mobility routes serving longer distance travel needs. As part of its mandate, SANRAL has been continuously monitoring the traffic growth patterns on the National Road 4 (N4) route and other national roads including the R40.In the Mbombela region, mobility at a regional level is served by the N4 in an east-west direction, and by the R40 in a north-south direction. The R40 runs from Barberton in the south up to Mica (south of Phalaborwa) in the north, and connects at both ends with other national roads with similar functional classification for wider connectivity. The R40 is the main route providing access between the N4 corridor (linking Gauteng and the Lowveld) with the tourist hub of Hazyview and the southern part of the Kruger National Park. SANRAL's jurisdiction over the R40 however excludes the section from the southern limits of Nelspruit up to White River. This is because a large part of the function of the R40 between Nelspruit and White River is servicing local needs, i.e. having to serve shorter regional and local trips than a type of road typically operated by SANRAL as detailed below.

Traffic forward planning undertaken by both SANRAL and the Mbombela Local Municipality appears to indicate that as a result of strong growth in traffic volumes on these routes and due to the exceptional economic growth of the Mbombela Region, the N4 and R40 routes through Mbombela will become oversaturated in the long term. Such over-saturation will have an international impact (the N4 is the main link between South Africa and Mozambique), a regional impact (due to the important regional linkages described above), and a local impact. Currently the R40 serves a dual purpose, serving shorter regional and local trips, as well as wider scale regional mobility, and increasingly commuter traffic between White River and Nelspruit. Local demand on the route is growing disproportionably as a result of continuing extensive residential, commercial and industrial development in this area. The Mbombela Local Municipality has acknowledged the fact that the existing R40 between Nelspruit and White River forms an important element of the local road network to unlock the area for development and thus needing to accommodate more localised travel and access demands. As stated in the "Executive Summary: MTSM and LUTS Models and the Need for the Implementation of the Proposed P166 Parallel Route" dated February 2011 (Appendix 1), the R40 is required to accommodate the growing demand for access of existing and planned developments in the area, with traffic forecast to more than double in this corridor in the foreseeable future. A Land Use Transportation study (LUTS) conducted by the Mbombela municipality has confirmed that the R40 can therefore over the longer term not serve this combined demand, even if upgraded to six lanes, and an alternative mobility route is required for north-south traffic moving through the Mbombela Local Municipal area.

This is the primary motivation for the development of the P166 road as identified by SANRAL in their road network planning process. The need for the proposed P166 road is thus based on the alleviation of current and future traffic congestion along the R40 route and the separation of local traffic streams from regional traffic streams. This point is relevant in terms of the query raised by a number of stakeholders as part of the scoping phase public participation process as to why the R40 road cannot simply be upgraded, thus potentially alleviating the need to develop a separate road. In the context of the provision of a balanced functional road network that adequately provides for the needs of all of the

different functional road classes, it is not possible to serve the need for access and shorter vehicle trips on class 1 mobility roads; likewise roads with numerous closely-spaced accesses have very limited mobility. Upgrading of intersections along the R40 will assist with capacity demand through the upgraded intersections, but cannot mitigate the huge demand for future road capacity between intersections. In addition such a mobility route must have good connection with the N4 for convenient transfer between the main directions of travel, which is not possible with the R40. It is for these reasons that a strategic intention for the P166 as an alternative mobility route is being supported by SANRAL. The Mbombela Local Municipality has expressed its support for the P166 route and requested SANRAL to implement the road on a number of occasions. In 2006 the Mpumalanga Premier requested SANRAL to take over the P166, with a view to implementation as a national road. There is therefore consensus from all three spheres of government that a new mobility route is required between Nelspruit and White River. It should also be noted that the current Spatial Development Framework (SDF) for the Mbombela Local Municipality makes allowance for the development of the P166 route in the future spatial planning of the municipality in order to provide regional mobility as an alternative to the R40 route.

The need for improved mobility through the Mbombela region also needs to be viewed in the context of South African exports through the Maputo harbour steadily increasing, and may even grow stronger with future planned improvements of the Maputo harbour. It is essential for the Southern African Development Community (SADC) to enhance opportunities for sustained economic growth in the region. In this context it is important that the N4 and R40 links are not future stumbling blocks as a result of capacity constraints. It is therefore essential that an alternative route such as the P166-1/2 within the region be investigated to relieve future N4 and R40 traffic congestion. Acknowledging the need for a mobility corridor, a number of submissions from stakeholders and Interested and Affected Parties have questioned whether the P166 servitude is the optimal corridor / route for servicing the mobility needs between the N4 (and areas to the south) and the White River / Hazyview area. These submissions claim that the existing presence and ability of SANRAL to develop the P166 provincial servitude is preventing the most optimal route for servicing the mobility needs in this part of Mpumalanga from being developed. A number of parties have expressed the view that it would be better for SANRAL to upgrade the R538 route that runs between Karino (east of Mbombela) and the eastern outskirts of White River. They argue that the P166 servitude is outdated in the context of the development of the Kruger Mpumalanga International Airport (KMIA) which is a gateway for air travel into the Lowveld, and that mobility needs between this airport and the N4 and Mbombela as well as the tourism hubs to the north are not serviced by the P166 road. The argument has also been made that the growing amount of heavy vehicle (truck) traffic between mining areas within the Phalaborwa and Steelpoort regions and the Maputo Harbour would be better facilitated by providing a more easterly (shorter) route between White River and the N4 link to Maputo, and that the P166 as proposed would not be likely to be utilised by this traffic stream which will continue to use the R538 road.

In response to these concerns SANRAL have responded that the R538 road is similar to the R40 in that it services both local and regional traffic. Conversion of the R538 to a class 1 mobility route as proposed by certain stakeholders would require extensive elimination of regular closely spaced accesses along the route. Elimination of these local accesses would have a substantial impact on the area served by the R538, as existing access arrangements and developments dependent on the accesses would be highly disrupted, and a secondary need to provide new access road(s) to serve

the transposed need for access would arise, thus greatly increasing the cost of such an option. The upgrading of the R538 rather than the development of the P166 would necessitate a total review and amendment of the SDF for the area, which has based mobility needs on being serviced by the P166 road. In a technical context, SANRAL has responded that horizontal and vertical geometric road design standards and road reserve requirements for a mobility route are much higher than the existing R538 can provide, and this would require extensive road upgrading or possibly even reconstruction, together with substantial additional land acquisition for the road reserve as well as for the alternative access roads.. SANRAL has acknowledged that such a route might conveniently address the current specific travel desire line between mining areas like Phalaborwa and Maputo, and demand related to KMIA, but has stated that the equally strong desire lines of travel between the N4 from the west towards White River and further north are not addressed at all with this option; this latter traffic would therefore not make use of such a longer and more indirect route.

Nonetheless numerous comments having been received from a number of Interested and Affected Parties on the draft final scoping Report regarding the issue surrounding the need to develop the P166 road as opposed to upgrading the of the R358. These representations stress that the primary transport-related need in the wider Mbombela area is the upgrading of the R538 as it passes east of White River past the Kruger Mpumalanga Airport (KMIA) to Plaston (east of Nelspruit). The R537 has been damaged by ore trucks that travel between mines in the Phalaborwa and Maputo, making the requirement for the upgrading of this route in the context of the need for development of a safe route for tourists travelling to and from KMIA, finding a route for the ore trucks, and ensuring a safe route for local residents a priority. In this context the representations state that the EIA needs to comparatively assess the P166 against this requirement to upgrade the R358 and improve access to KMIA as part of the consideration of the need for development of a bypass on the wider Mbombela area. Requests have been made for traffic / transport studies as part of this comparative assessment and that this is done in the context of holistic transport planning, as well as at a more detailed level (e.g. traffic counts to support statements made in the need and desirability section of this report). In this context SANRAL will consider all comments made and a report will be made available during the EIA phase to address all maters raised with regards to transportation-related queries.

In the context of desirability, such a new road route would be desirable if it were to alleviate future congestion and to facilitate economic development and linkages between the different parts of eastern Mpumalanga by providing a bypass for people travelling between Barberton and White River as well as by facilitating mobility between the N4 corridor and the Hazyview / Kruger National Park (Skukuza) tourism hubs, thus cutting down travel time. The current trend of increasing traffic pressure on the R40 route is likely to entail that the P166 road would achieve this aim, thus being desirable in this context.

However the desirability of the proposed project also needs to be examined in the context of current land use and development patterns in the affected area, in terms of how such a major road would impact existing land uses and other aspects of the affected environment. Perceptions of desirability would relate strongly to whether the proposed road was considered to be compatible or incompatible with the land uses in the area it is proposed to traverse. The rapid economic development of the wider Mbombela area has been alluded to above. This has meant that much of the area in the vicinity of the old servitude has undergone development since the servitude was originally proclaimed, resulting in

many residential and other land uses existing in close proximity, or even within the servitude. This has implications in terms of how the development of a road may affect areas immediately adjacent to, or in proximity of the servitude in terms of a number of social environmental parameters such as noise, visual impact, and social impact. This is strongly relevant where homesteads are located close to the servitude, with another example being the White River area where the P166 servitude traverses an open area drained by a wetland. A number of submissions to the EIA team have stressed the value placed in this open space as a residual area of natural habitat in an urban context, as indicated by the creation of a bird sanctuary within part of it. The desirability of a high speed national road within this area has been questioned. Social concerns also exist with respect to the social effect of the P166 servitude on the Msholozi settlement if the servitude route were to be developed, including those impacts associated with potential relocation, the bisecting of a community with limited access across the road, and the presence of a high speed road in immediate proximity to a settlement which could raise health and safety issues. The undesirability of a road in the context of the areas of intense agricultural production in the Heidelberg valley has also been raised. The perceived high intensity impact of the proposed road on these particular parameters in these areas could arguably render the road undesirable.

However the provision of route alternatives to avoid these areas and thus mitigate these impacts has been undertaken. Alternative alignments have been provided to avoid these areas. Additionally certain alternatives, i.e. the Phumlani 1 and 3 alternatives that have been associated with potentially significant negative impacts such as agricultural potential (Phumlani 1) and social (Phumlani 1 & 3) have been deemed to be environmentally unfeasible, and have been discarded, not being further in the EIAR phase of the project due to these issues. Furthermore due to the issues associated with the P166 servitude in the White River area as identified by specialists and various stakeholders alike, a new alternative has been created (to be fully assessed in the EIAR phase of the project) in the White River area as a way of potentially mitigating environmental impacts associated with the P166 servitude in the White River area. For issues and potential impacts identified by the environmental scoping study further studies will be undertaken in the EIAR phase of the project to identify suitable mitigation measures. Accordingly due to the iterative process of the identification of route alternatives, and through the identification of mitigation measures to ameliorate identified impacts, the likelihood that the proposed road will be considered undesirable will decrease.

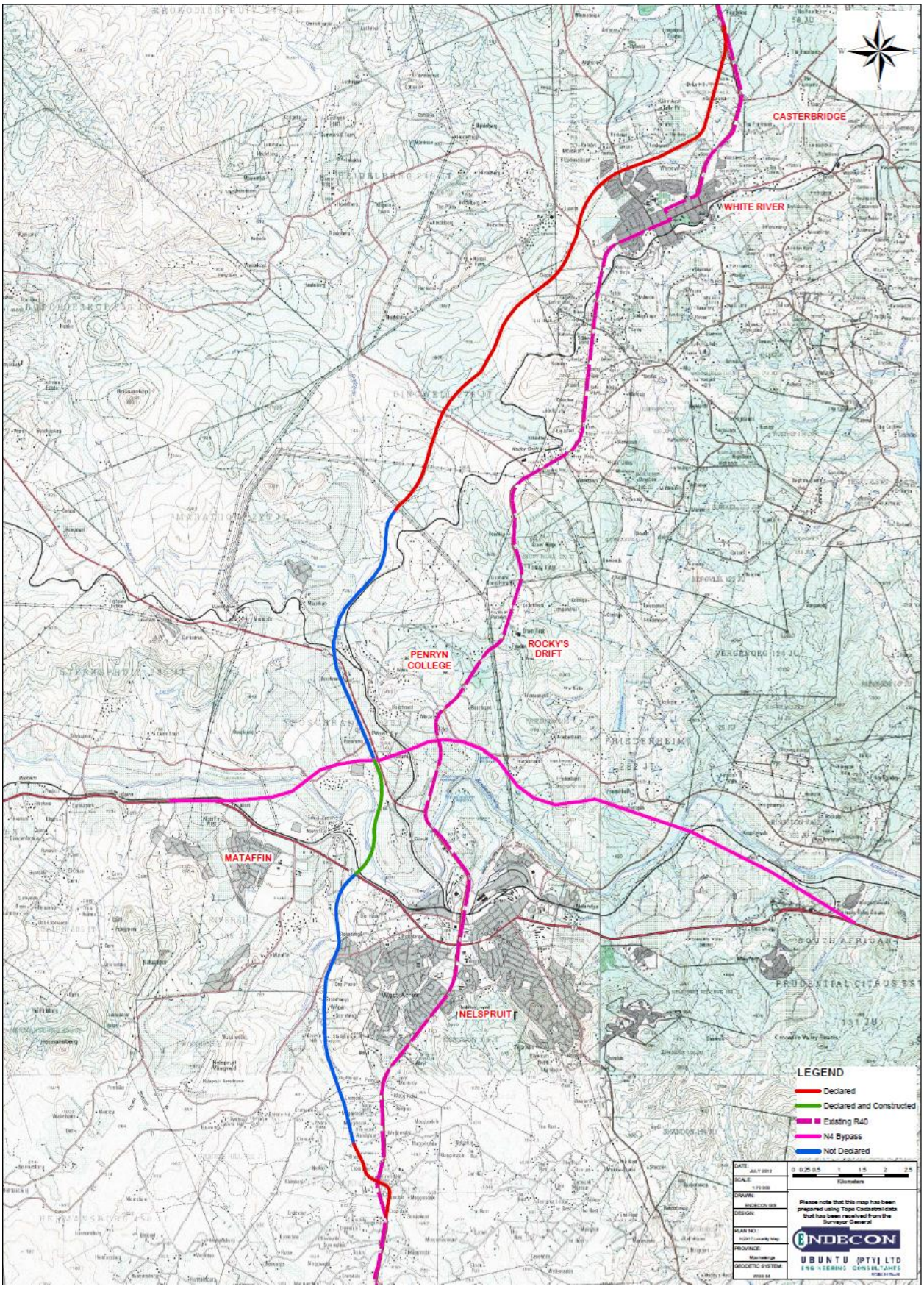

FIGURE 3: P166 SERVITUDE MAP WITHOUT PROPOSED ALTERNATIVE ALIGNMENTS

1.3 Environmental Study Requirements

The route determination of a new road and design of associated physical infrastructure is an activity which may result in detrimental environmental impacts according to Government Notice R545 of June 2010 promulgated under the National Environmental Management Act (Act 107 of 1998, as amended). SANRAL thus requires an Environmental Authorisation (EA) from the (National) Department of Environmental Affairs (DEA) to undertake the proposed project. DEA will be the lead authority subject to comments from the local authority namely the Mbombela Local Municipality and *inter alia* the following Departments:

- Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET);
- Mpumalanga Department of Public Works, Roads and Transport;
- Mpumalanga Department of Land Affairs; and
- Department of Water Affairs (Mpumalanga Regional Office)

SANRAL acknowledges the need for undertaking comprehensive environmental studies in order to identify and evaluate all potential environmental impacts (social and biophysical) associated with the proposed project which is also a legislative requirement. Accordingly RHDHV have been appointed as an Independent Assessment Practitioner (EAP) to undertake the environmental studies.

When interpreting Government Notices R544, R545 and R546 it is observed that the following activity is triggered by the proposed project:

TABLE 1: LISTED ACTIVITY

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :	Activity Description as it appears in the Regulations:	Describe each listed activity as per project description
R545, 18 June 2010 (List 2)	18-	The route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before 03 July 2006 and which have not been authorised by a competent authority in terms of the Environmental Impact Assessment Regulations, 2006 or 2009, made under section 24(5) of the Act and published in Government Notice No R 385 of 2006,- (i) it is a national road as defined in section 40 of the South African National Rods Agency Limited and National Roads Act, 1998 (Act No 7 of 1998); (ii) it is a road administered by a provincial authority; (iii) the road reserve is wider than 30 meters or The road will cater for more than one lane of traffic in both directions.	The proposed project is for the determination of a new route which will be environmentally and technically feasible for the construction phase of the P166, 1-2.

NB: It must be noted that the proposed project is for the determination of a new route which will be environmentally and technically feasible for the construction phase of the P166, thus the activities

which will be triggered and other components related to the construction of the project will be covered by separate Environmental Studies which will be conducted at a later stage.

1.4 Details of the Environmental Assessment Practitioner

As alluded above Royal HaskoningDHV has been appointed as the independent Environmental Assessment Practitioner (EAP) by Endecon Ubuntu, to undertake the appropriate environmental studies for this proposed project. The professional team of RHDHV have considerable experience in the environmental management and EIA fields. RHDHV has been involved in and/or managed several of the largest Environmental Impact Assessments undertaken in South Africa to date. A specialist area of focus is on the assessment of multi-faceted projects, including the establishment of linear developments (national and provincial roads, and power lines), bulk infrastructure and supply (e.g. wastewater treatment works, pipelines, landfills), electricity generation and transmission, the mining industry, urban, rural and township developments, environmental aspects of Local Integrated Development Plans (LIDPs), as well as general environmental planning, development and management.

TABLE 2: PARTICULARS OF THE EAP

Details	
Consultant:	Royal HaskoningDHV (formerly SSI Engineers and Environmental Consultants (Pty) Ltd)
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Expertise:	Malcolm Roods is a Principal with RHDHV specializing in Environmental Impact Assessments (EIA) for electricity supply (generation, transmission and distribution), road infrastructure, residential developments as well as water management projects. This builds on a broad government background, which has made him particularly flexible. His past experiences include 6 years public service which included policy development, environmental law reform and EIA reviews. His experience also includes 5 years of environmental consulting in the field of Impact Assessment and Authorisation Applications, with a focus on legislative requirements and sector area management. He is also a certified Environmental Assessment Practitioner with the Interim Certification Board (ICB) for EAP of South Africa.

	Details
	Ntseketsi Lerotholi is Senior Environmental Scientist (*Pr Sci Nat* 400165/12) with an MSc in Environmental Biotechnology. Her expertise includes Environmental Impact Assessment Studies, Public Participation Process, Strategic Environmental Assessments Studies, Environmental Management Plans, Mining Right and Permits applications, Environmental Monitoring and Audits, Environmental Training and Integrated Environmental Management. She has undertaken various EIA projects for linear infrastructure (such as roads, power lines etc.).
	Paul Da Cruz is an Associate with RHDHV. He has eight years of EIA experience having worked on a number of projects, including Strategic Environmental Assessments, Environmental Impact Assessments, Environmental Management Plans, and Environmental Auditing. He has performed the role the project manager for a number of large EIAs. Through his consulting work he gained experience of not only EIA project management, but through experience gained also to offer a rare multi-disciplinary package of specialist skills, including wetland assessment, visual impact assessment, tourism assessment, and avifaunal assessment.

1.5 Environmental Scoping Report Structure

The report structure is summarised in Table 3

TABLE 3: REPORT STRUCTURE

Sections	Content
Section 1	Introduction and background to the project and Environmental Study requirements.
Section 2	Legal requirements, brief Scoping of National legislation and guidelines.
Section 3	Technical description of the project
Section 4	Project alternatives, consideration of sites, route alignments and no go option for the project
Section 5	Scope of Environmental Investigations, approach to undertake the Scoping Study.
Section 6	Description of potential Environmental Impacts - Biophysical
Section 7	Description of potential Environmental Impacts - Social

Section 8	Overview of the Public Participation undertaken for the Project.
Section 9	Appraisal of Alternatives for the EIAR phase
Section 10	Conclusion and recommendations of the Environmental Scoping Study
Section 11	Plan of Study for EIA, overview of specialist's studies required for the EIA Phase of the project and timeline for the completion of the EIA Process.

2 PROJECT ALTERNATIVES

2.1 Alignment Alternatives

In terms of the Environmental Impact Assessment (EIA) Regulations as well as the National Environmental Management Act (as amended), feasible and reasonable alternatives are required to be identified and evaluated within the Environmental Impact Assessment process. The identified feasible alternatives need to be evaluated in terms of social, biophysical, economic and technical factors.

The proposed project is of linear in nature, thus five alternative alignment routes (in certain sections of the route where environmental sensitivities have been identified) have been created and will be evaluated for the project. The identification of alternatives took into consideration the terrain and the built up areas (businesses and residential) that are located within the study area.

Initially four alternative alignments were identified along two parts of the route – in the Maggiesdal area (one alternative to the existing servitude) and in the Phumlani / Msholozi area to the south of White River (three alternatives to the existing servitude). These four alternatives were presented in the draft scoping report made available for public comment. Feedback received from numerous stakeholders and I&APs, as well as from certain of the EIA Team specialists, identified a number of significant environmental issues associated with the existing servitude as it runs through the White River area. In response to these issues raised, and in order to provide mitigation measures to ameliorate these issues, a further alternative to the existing servitude has been provided for assessment in the EIAR phase of the project, as detailed below.

The alternatives (to the existing servitude) alignment routes are described below:

2.1.1 *Maggiesdal Alternative*

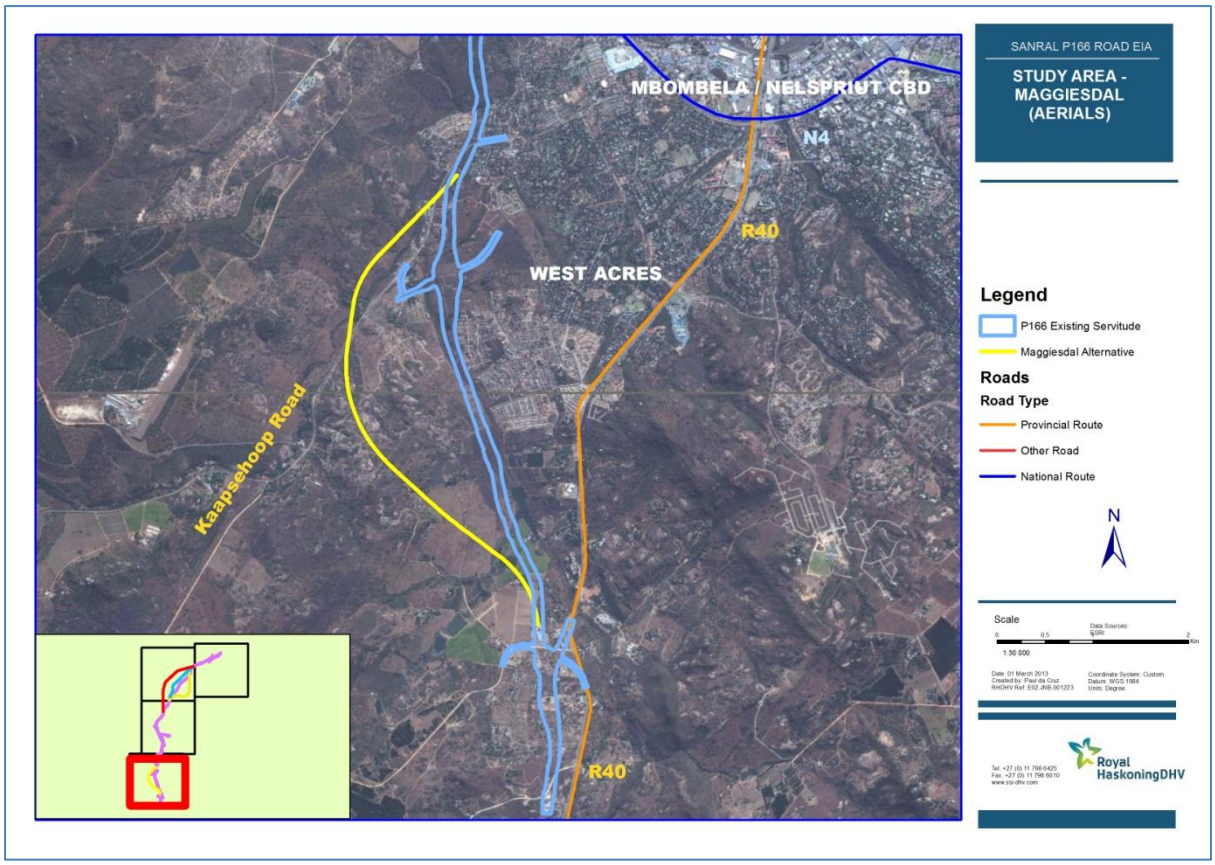


FIGURE 4 – THE MAGGIESDAL ALTERNATIVE

The Maggiesdal alternative indicated in **Yellow** on Figure 4 above starts in the area of the Cromdale smallholdings and runs northwards, west of and roughly parallel to the existing P166 servitude indicated in **Blue** on Figure 4, . It runs through more smallholdings and to the west of an eco-estate, crossing the Kaapsehoop Road until the point at which it joins the existing P166 servitude north of the Montana Nursery. The Maggiesdal alternative to the part of the existing servitude in the Maggiesdal / Stone Ridge / Stonehenge area was created in order to address mainly social issues related to the existing servitude, whereby development of new estates and housing has occurred in immediate proximity to the existing servitude, thus avoiding the resultant social impacts. However biodiversity, and surface water issues and potential impacts are associated with the Maggiesdal alternative as it traverses a number of surface water crossings and an area of largely undisturbed bushveld habitat.

2.1.2 *Phumlani Alternatives*

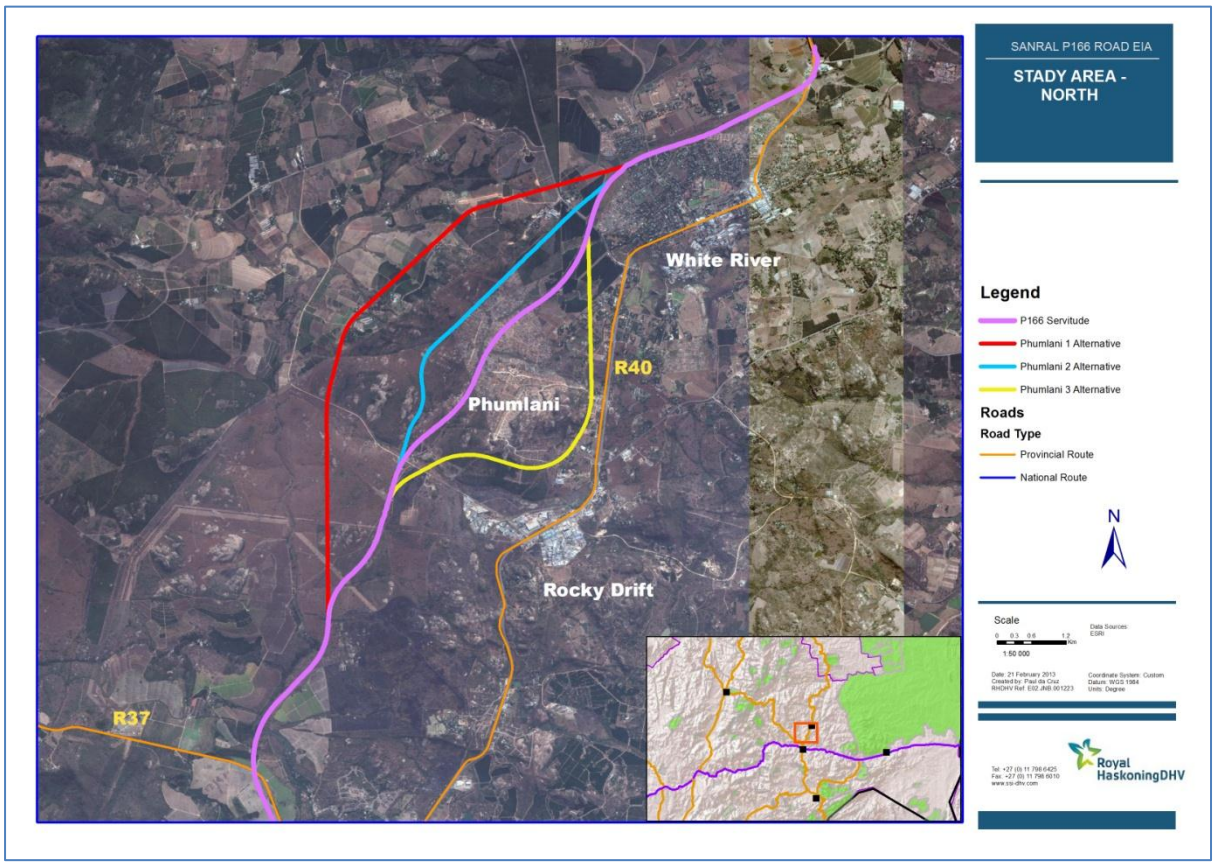


FIGURE 5 – THE PHUMLANI ALTERNATIVES

The Phumlani Alternatives were created in order to address primarily social issues relating to the Msholozi / Phumlani Informal settlement. The Msholozi settlement has been established over a long stretch of the existing servitude (approximately 1.65km) and thus a number of households would need to be relocated if the proposed road route was to be finalised along the existing servitude. Along with the social issues associated with relocation of households, a number of social issues are associated with the presence of a main arterial road running through a densely populated informal settlement. Accordingly a number of alternatives were identified in the vicinity of the informal settlement (in the area to the south of White River) to avoid the informal settlement. As described below, alternatives were identified to the east and west of the informal settlement. The alternatives are associated with a number of potential environmental issues, including impacts on existing agricultural activities in the Heidelberg area and in the area immediately south of White River and the R357 (along the Phumlani 1 and Phumlani 3 alternatives respectively), as well as social issues (impacts on smallholdings) along Phumlani Alternative 3, and both biodiversity and surface water crossing issues, in particular in the area west of Rocky Drift and south of the Heidelberg Road.

2.1.2.1 Phumlani Alternative 1

The Phumlani alternative 1 indicated in **Red** on Figure 5 above is the western-most aligned of the three Phumlani alternatives. It starts on the Farm Marathon 275 JT to the north-west of Uplands College and runs roughly parallel to the proposed P166 servitude, crossing the Heidelberg Dust Road

and running through forestry compartments before traversing the Heidelberg Valley. It ends at the edge of White River and Colts Hill where it joins /connects to the existing P166 servitude.

2.1.2.2 Phumlani Alternative 2

The Phumlani alternative 2 indicated in **Blue** on Figure 5 above starts at the middle of the farm Dingwell 276 JT near the model airfield south of the Heidelberg Road and runs west of and roughly parallel to the existing P166 servitude. It runs on the western edge of the Msholozi Settlement, running close to the sawmill south of White River before crossing the White River-Sabie Road where it connects with the existing P166 servitude.

2.1.2.3 Phumlani Alternative 3

The Phumlani alternative 3 indicated in **Yellow** on Figure 5 above starts in the middle of the farm Dingwell 276 JT near the model airfield south of the Heidelberg Road and runs south and east of the Phumlani township, before running very close to the R40 road through a light industrial area and some smallholdings, joining the existing P166 servitude south of White River.

2.1.3 White River North Alternative

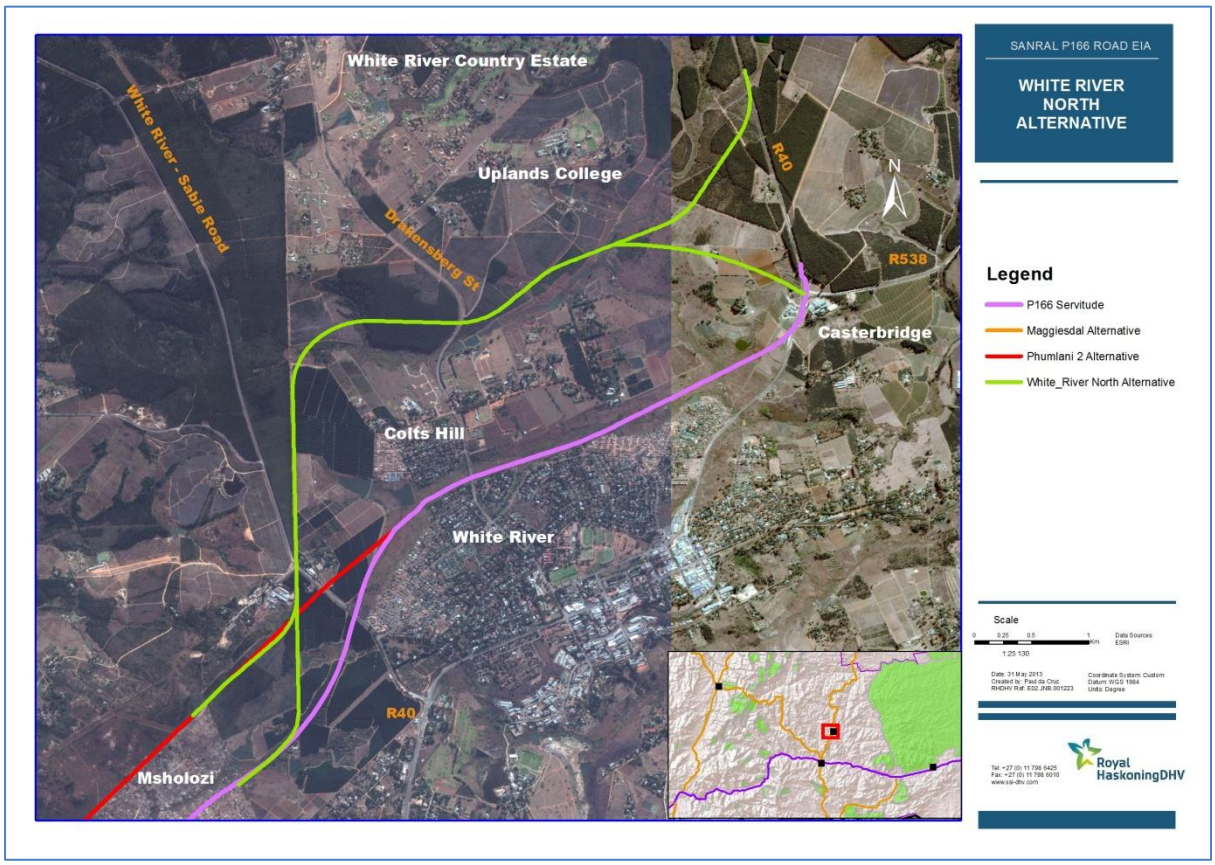


FIGURE 6 – THE WHITE RIVER NORTH ALTERNATIVE

The need for an alternative to the existing servitude in the White River area arose from issues raised by numerous stakeholders as part of the scoping-phase public participation process, as well as from feedback from certain of the specialists on the EIA project team including the biodiversity, wetland and social specialists. A number of potential environmental issues have been identified as being associated with the development of a road along the existing servitude in the White River area; the existing servitude runs between the residential areas on the northern side of White River and Colts Hill through a vacant area that is drained by a wetland. The alignment of the servitude in relation to the wetland that entails that a large area of the wetland could be impacted, the presence of floral and faunal species within this open area as well as the proximity of the servitude to residential properties that could result in a number of socio-economic issues including visual and noise-related issues has necessitated the identification of an alternative to this section in order to mitigate these potentially significant issues.

The alternative links to both the P166 servitude and the Phumlani Alternative 2 in the area to the south-west of White River. It runs north past the sawmill, crossing the White River –Sabie Road and running northwards through plantations to the west of Colts Hill. It turns eastwards, running through plantations between Colts Hill and the smallholdings along the Coolmore dirt Road, crossing Drakensberg Street / Danie Joubert Street near the Uplands College turnoff. It runs north-eastward through plantations to join the R40 to the north Casterbridge. The alternative contains a link to the R538 intersection at Casterbridge that may be developed based on network planning.

The alternative will be assessed in the EIAR phase of this project. Project team specialists will be asked to scope all potential issues and impacts associated with this new alternative, and will then undertake a detailed investigation of issues relating to this alternative, as will be done for all other sections of the route.

Please refer to Section 9 below for an assessment of the scoping-phase alternatives in terms of which of these alternatives have been ruled out, and which will be taken forward to the EIAR phase.

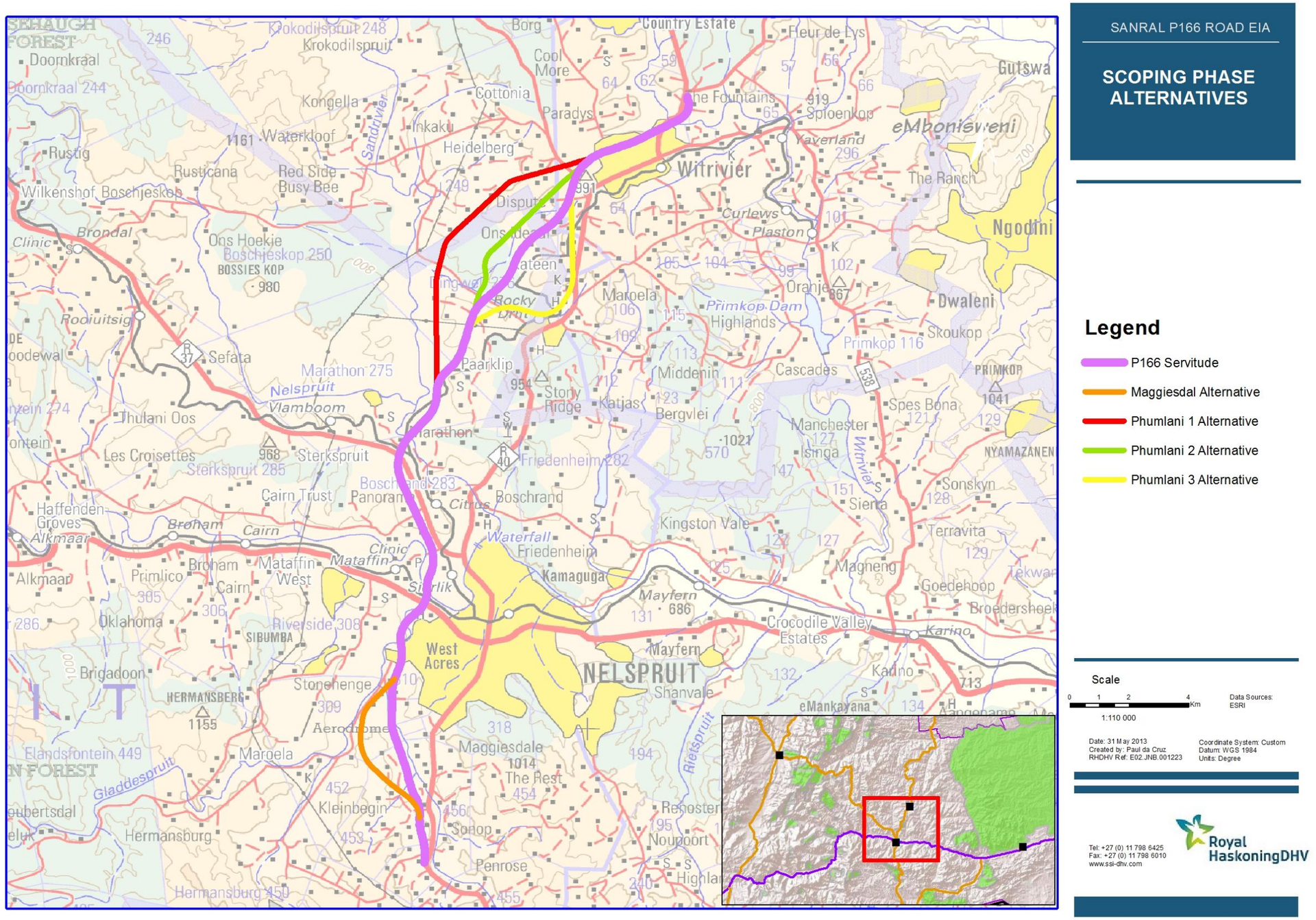


FIGURE 7: LOCALITY MAP WITH SCOPING PHASE ALTERNATIVES

2.2 Design and Technology Alternatives

As the current EIA is for route determination, with construction-related aspects to be applied for as part of separate environmental studies, design and technology alternatives are not able to be fully assessed in this EIA, and will be considered in the Basic Assessments undertaken for construction-related listed activities.

2.3 No go Alternative

According to NEMA guidelines, the no go alternative is the option of not undertaking the proposed activity or any of its alternatives. The no go alternative also provides the baseline against which impacts of other alternatives should be compared.

If the proposed project does not proceed as planned the status quo will remain the same; i.e. the existing R40 road that passes through the centre of Mbombela and along its current alignment towards White River will provide the route for travel between Mbombela and White River. The benefits provided by a new bypass of ease of access and reduction of travel time as well as the creation of a road to handle the anticipated increase in traffic along the N4 and R40 corridors will not materialise. In the context of this anticipated increase in traffic this would entail that the concomitant increase in congestion on the existing roads would not be mitigated unless another solution to alleviate congestion was found. Not finding a solution to alleviate increasing congestion may have an impact on travel time and 'lifestyle quality' thus potentially having knock on effects in terms of economic development.

Conversely none of the negative impacts that have been identified as potentially occurring due to the proposed road are likely to materialise should the project go ahead. Most importantly the following impacts would be unlikely to occur:

- Impacts on biodiversity (e.g. fragmentation)
- Impacts on surface water bodies (especially in terms of altered aquatic ecology and hydrology)
- Impacts on the social environment (especially relating to potential relocation and potential loss of property value)

In ruling out certain of the project alternatives assessed in the Environmental Scoping Study due to potentially significant impacts identified to be associated with those alternatives, the no go alternative principle has been applied. By ruling these alternatives out, the particular environmental issues associated with these alternatives in the areas affected will not materialise.

3 LEGAL REQUIREMENTS

A preliminary review of the relevant legislation was undertaken in order to identify any legal issues related to the proposed project. Below is the applicable environmental and transportation legislation, which must be considered by SANRAL during the implementation of the proposed project.

TABLE 4: LEGAL REQUIREMENTS

Legislation	Sections	Relates To
The Constitution Republic of South Africa (1996)	Chapter 2	Bill of Rights.
	Section 24	Environmental Right
National Environmental Management Act (No 107 of 1998)(as amended)	Chapter 2	Defines the strategic environmental management goals and objectives of the government. Applies throughout the Republic and to the actions of all organs of state that may significantly affect the environment.
	Chapter 5	Integrated Environmental Management
	Section 24(a) &(d) &24(5)	Listed activities and Regulations
	Chapter 7	Compliance Enforcement and Protection
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care.
National Heritage Resources Act (No 25 of 1999) and regulations	Section 34	No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.
	Section 35	No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site.
	Section 36	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
	Section 38	This section provides for Heritage Impact Assessments (HIAs), which are not already covered under the ECA. Where they are covered under the ECA the provincial heritage resources authorities

Legislation	Sections	Relates To
		must be notified of a proposed project and must be consulted during the HIA process. The Heritage Impact Assessment (HIA) will be approved by the authorising body of the provincial directorate of environmental affairs, which is required to take the provincial heritage resources authorities' comments into account prior to making a decision on the HIA.
National Environmental Management: Air Quality Act (No 39 of 2004)	Sections 26-27	Control of fuels.
	Section 32	Control of dust.
	Section 34	Control of noise.
	Section 35	Control of odours
National Water Act (36 of 1998)	Section 4	Provides Principles that govern the distribution, use and management of water resources in the Republic South Africa.
	Section 19	Prevention and remedying the effects of pollution
	Section 20	Control of emergency incidents
	Section 21	Control of Water Use
	Section 22	Permissible Water Use
National Environmental Management: Biodiversity Act (10 of 2004)		Provides management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act107 of 1998; the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.
National Forest Act (Act No 84 of 1998)		This Act provides for the protection, management and utilisation of forests; the protection of certain plant and animal life; the regulation of trade in forest produce; the prevention and combating of veld, forest and mountain fires. The Act also enforces the necessity for a permit to be obtained prior to any clearing of indigenous vegetation.
National Road Traffic Act (No 93 of 1996)		Road safety
Minerals and Petroleum Development Act (No 28 of 2002)	Section 39	Environmental Management Plan for establishing borrows pits.
	Section 41	Finalise provision for construction.
The South African National Road Agency Limited & National Roads Act No 7 of 1998	Chapter 1	The section of the Act makes provision for the establishment of the South African National Roads Agency.
	Chapter 3	Powers Function and Responsibilities of the Agency are outlined.
	Section 25(1)	The Agency is given responsibility to perform all strategically planning with regards to national roads

Legislation	Sections	Relates To
		system planning, design, construction, operation, management, control, maintenance and rehabilitation of national roads for the Republic, and is responsible for the financing of all those functions in accordance with its business and financial plan, so as to ensure that government's goals and policy objectives concerning national roads are achieved.
Mpumalanga Biodiversity Conservation Plan (2007)		
Road Transportation Act (No 74 of 1977)		
Mpumalanga Roads Act (No 1 of 2008)		
Mbombela Local Municipality Standard traffic by-laws		
Mbombela Local Municipality Spatial Development Framework 2007 and Draft (2011-2030)		
Mbombela Local Municipality Integrated Development Plan 2012 to 2017		
Other Local Municipality Bylaws		

3.1 Mpumalanga Biodiversity Conservation Plan (2006)

The Mpumalanga Biodiversity Conservation Plan (MBCP) contains data that maps out areas of biodiversity importance within the Mpumalanga Province, based on a biodiversity database compiled over the last 21 years by the Province's conservation biologists (http://bgis.sanbi.org). The MBCP uses the Systematic Biodiversity Planning approach from which two principal maps were produced including the Terrestrial Biodiversity Assessment map (which indicates where the overall terrestrial biodiversity priorities are located) and the Aquatic Biodiversity Sub-catchments map (which indicates where aquatic biodiversity targets will best be met and at the same time, the location of the most important sub-catchments for water production) (http://bgis.sanbi.org). The Mpumalanga BCP can be used to determine the ecological and conservation significance of the area in the proposed development is located. Please refer to section 5.1 below for an assessment of the conservation importance of the site as determined by the MBCP.

4 SCOPE OF ENVIRONMENTAL INVESTIGATIONS

4.1 Approach in Undertaking the Study

An issues based Environmental Scoping Study (ESS) for the proposed new route P166-1/2 at Mbombela in the Mbombela Local Municipality has been undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations published in Government Notice R543(18 June 2010) in terms of the National Environmental Management Act (NEMA; No 107 of 1998)(as amended).

4.2 Authority Consultation

The relevant authorities, that are required to provide input to the proposed project, were consulted from the outset of this study, and will be engaged throughout the project process. The required application for environmental authorisation form was submitted to the Department of Environmental Affairs (DEA) on the **05th of July 2012** and was acknowledged on **23rd July 2012.** The Department of Environmental Affairs is the Competent Authority mandated to process and approve all applications belonging to the State Owned Companies (SOC) and the South African National Roads Agency Limited (SANRAL), a state owned company, is the applicant for this project. DEA is required to provide a decision regarding the proposed project pending comments from provincial Departments which *inter alia* includes the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET).

4.3 Environmental Scoping Study

The Environmental Scoping Study is aimed to address the following:

- Identification of potential positive and negative environmental impacts (biophysical and social);
- Identification of environmental "hotspots" which should be avoided where possible due to potentially significant impacts or sensitive environments;
- Description of project alternatives that was identified;
- Evaluation of the identified feasible route alternatives;
- Optimisation of positive impacts to the benefit of the local environment and community;
- To enable I&APs to verify that their contributions have been captured, understood and interpreted; and
- To afford I&APs and stakeholders an opportunity to raise more issues if there are any.

Impacts on, *inter alia,* climate, topography, biodiversity, sites of archaeological, cultural and historical interest, as well as the social environment were identified by means of site inspections , a desk-top review of available information and relevant literature for the study area, consultation with specialists and key stakeholders.

5 DESRIPTION OF THE RECEIVING BIOPHYSICAL ENVIRONMENT

5.1 Environmental Significance of the Study Area as determined by the Mpumalanga Biodiversity Conservation Plan

The Mpumalanga Biodiversity Conservation Plan (MBCP) contains data that maps out areas of biodiversity importance within the Mpumalanga Province, based on a biodiversity database compiled over the last 21 years by the Province's conservation biologists (http://bgis.sanbi.org). The MBCP uses the Systematic Biodiversity Planning approach from which two principal maps were produced including the Terrestrial Biodiversity Assessment map (which indicates where the overall terrestrial biodiversity priorities are located) and the Aquatic Biodiversity Sub-catchments map (which indicates where aquatic biodiversity targets will best be met and at the same time, the location of the most important sub-catchments for water production) (http://bgis.sanbi.org). The Mpumalanga BCP can be used to determine the ecological and conservation significance of the area traversed by the P166 road and its associated alternatives.

Two of the layers of the MBCP relate to the presence of corridors for ecological processes – an aquatic biodiversity corridor, and an ecological corridor. Set at 7km in width, the purpose of the corridors is to cater for long-term, landscape-scale movement of plants and animals, and to provide links following high-value biodiversity areas (Ferrar and Lotter, 2007). There are no defined aquatic biodiversity corridors with the closest one being along the Crocodile River, ending just to the east of Nelspruit. However a wider ecological corridor runs along the wider Crocodile River valley. This ecological corridor is traversed by the P166 route, although it should be noted that the P166 traverses an area mostly transformed land (including a section of already developed road) in this part of the route. The route traverses no conservancies (including planned conservancies) or protected areas.

In terms of agricultural potential, the route traverses areas of medium agricultural potential, mainly suitable for grazing.

5.1.1 Aquatic Biodiversity Assessment

The MBCP also includes an assessment of aquatic biodiversity sensitivity. Sub-catchments (at a finer scale than quaternary catchments) have been allocated an 'irreplaceability value' of each sub catchment. This refers to the likelihood of any sub catchment being required to meet aquatic biodiversity targets and indicates the options for meeting these targets (http://bgis.sanbi.org/MBCP/aquaticBiodiversity.asp). The most valuable catchments will always be required and this assessment thus serves to help prioritise conservation actions. In the context of the study area the route passes through six main sub catchments – the Gladdespruit and Brinkspruit catchments in the southern-most part of the route, a stretch of the Crocodile River and another that includes the lower-most reach of the Nels River. In the northern part of the study area the route traverses the Sand River catchment and

that of the Blinkwaterspruit (White River). The Sand River catchment is classified as being "Important and Necessary" while all of the other catchments (with the exception of the Blinkwaterspruit catchment which is classified as being "Not Required") are classified as being "Irreplaceable". This has implications for the potential impacting of rivers and wetlands by the proposed road as discussed below.

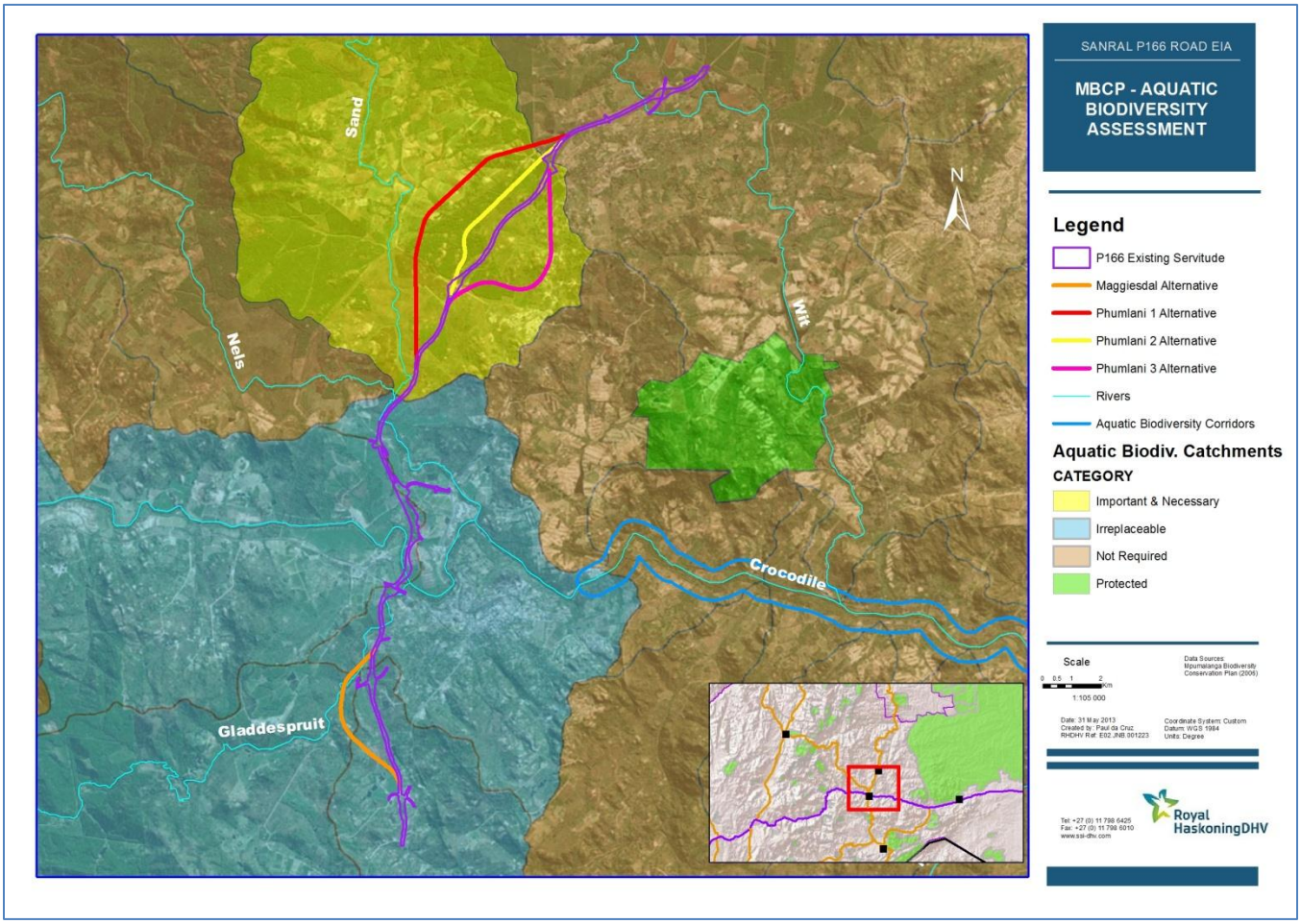


FIGURE 8 – MPUMALANGA BIODIVERSITY CONSERVATION PLAN – AQUATIC BIODIVERSITY ASSESSMENT

5.1.2 Terrestrial Biodiversity Assessment

Analysis of the MBCP terrestrial biodiversity assessment, which classifies all parts of the province in terms of their conservation importance and associated restrictions on different types of development reveals that the route of the proposed P166 road traverses a number of different classes in terms of conservation importance, as revealed in figure * below. Most of the area traversed by the P166 servitude is classed as either "No Natural Habitat Remaining" – i.e. urban areas such as Nelspruit and the areas of intensive agricultural production to the north of

Riverside Park or “Least Concern”. In the case of the study area, areas of least concern are the outskirts of Nelspruit along the Kaapsehoop Road (as traversed by the Maggiesdal Alternative), as well as the open area to the south of the Heidelberg Road west of Rocky Drift. In areas of no natural remnant habitat, most types of development are permitted, including urban development and importantly in the context of the proposed development; linear engineering structures (including hard road surfaces) are permitted to be developed. In areas of “Least Concern” linear engineering structures are restricted, and would be subject to further detailed assessment.

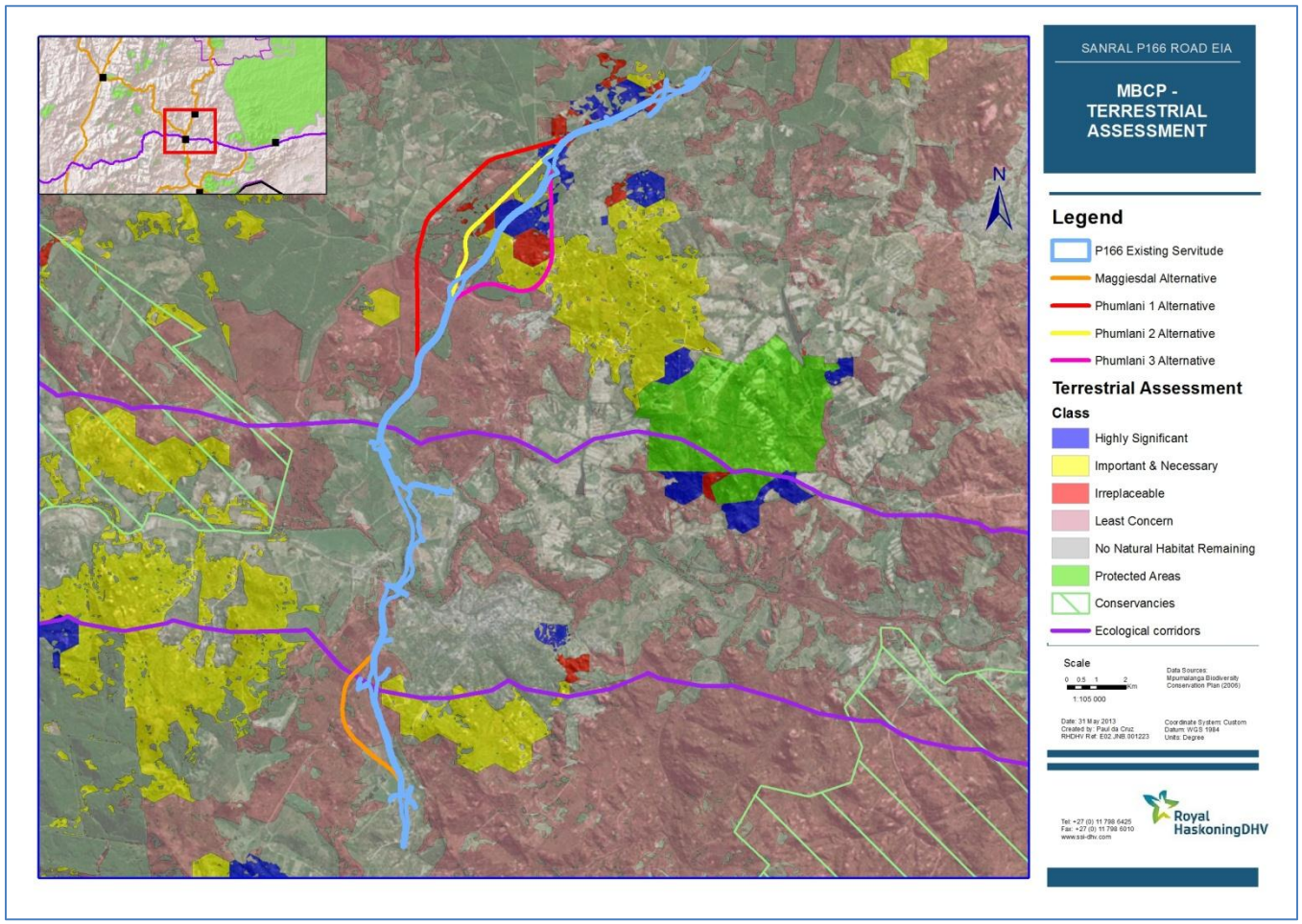


FIGURE 9 – MPUMALANGA BIODIVERSITY CONSERVATION PLAN – TERRESTRIAL BIODIVERSITY ASSESSMENT

The proposed road and its alternatives traverse some areas classified as more important and sensitive in the area around, and to the south of White River. The P166 servitude and Phumlani Alternative 3 traverse an area near Drum Rock marked as “Important and Necessary”. The P166 servitude runs through an area marked as “Highly Significant”, while the Phumlani 3 Alternative runs on the boundary of an area marked as irreplaceable near Drum Rock. Under these three categories linear engineering structures are restricted. It is important to note however

that much of this area classified under these categories in the Phumlani / Msholozi area has been subsequently completely transformed by the development of the Msholozi informal settlement, and as such these areas would no longer display such a high level of ecological sensitivity. The Phumlani 1 and 2 alternatives run through areas mostly classified as having no natural habitat remaining.

In the White River area the P166 servitude runs through an area classified as being “Highly Significant”, with a small area to the west of Danie Joubert Street classified as being irreplaceable. This corresponds with the open area between White River and Colts Hill along which the servitude runs, and which is drained by a wetland. This is important in the context of the potential impacts of the road in this area as raised by a number of stakeholders and I&APs, in terms of impacts on the wetland and impacts on certain protected floral species which are known to occur in this area.

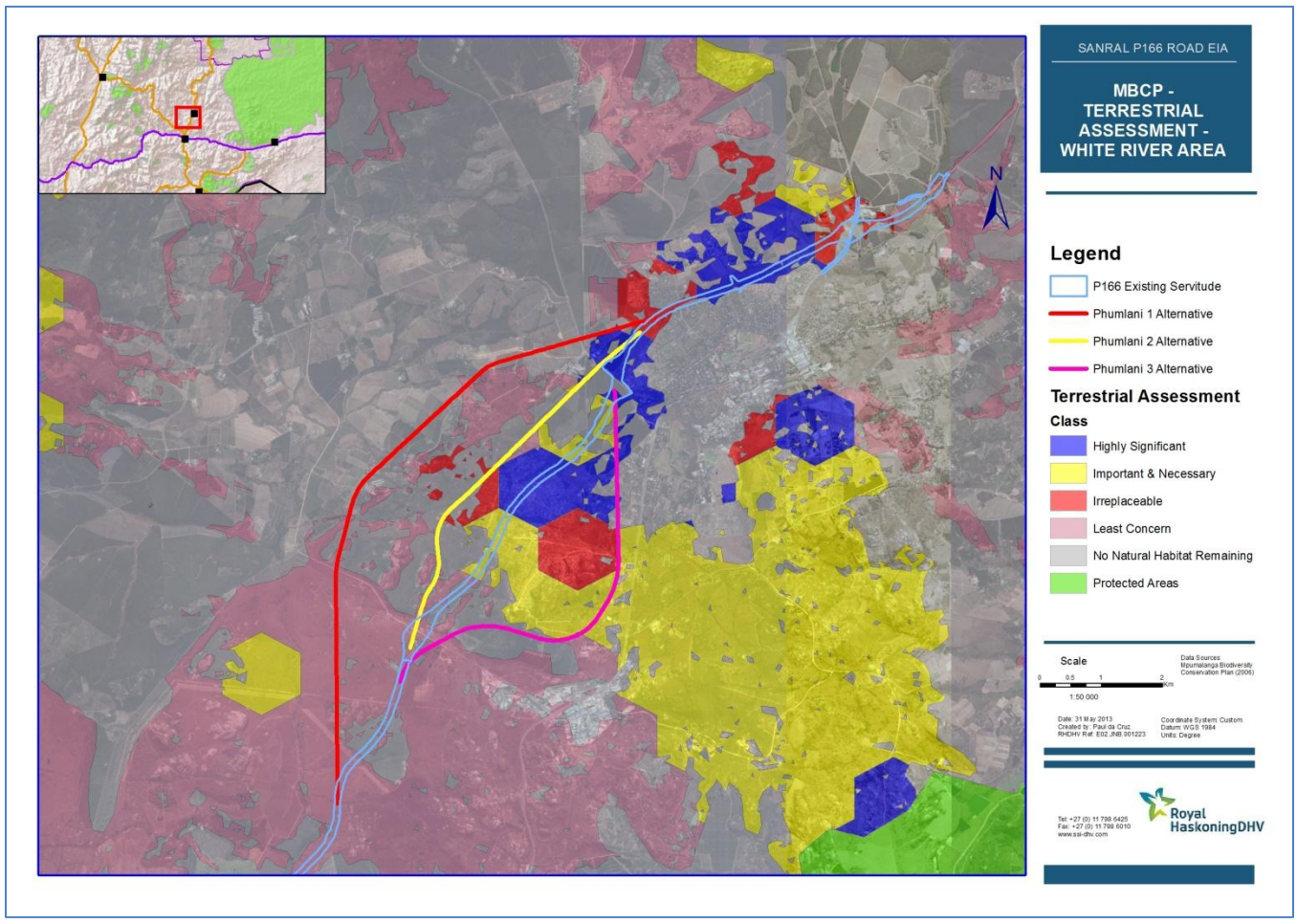


FIGURE 10 – MBCP – TERRESTRIAL BIODIVERSITY ASSESSMENT – WHITE RIVER AREA

5.1.3 Implications for Development

The majority of the route of the P166 and its alternatives cross two of the less sensitive classes of terrestrial biodiversity sensitivity, “No Natural Habitat Remaining” and “Least Concern”. From a terrestrial biodiversity perspective, developing a road through this area would be unlikely to be associated with significant impacts, although this would need to be confirmed through more detailed environmental assessment. The traversing of areas of much greater biodiversity significance in the area to the south of, and within White River is significant, although much of the area marked as being “Highly Significant” and “Important and Necessary” has been transformed by the development of the Msholozi Informal Settlement. The traversing of an area of “Highly Significant” and “Irreplaceable” habitat is potential very significant. In this context, and in the context of the issues identified by a number of the EIA team specialists and stakeholders, a new alternative to the servitude through this area has thus been developed.

In terms of aquatic health and conservation priority, most of the route falls within sub catchments that are designated as being required to be conserved, thus the potential impacts of the project on rivers and wetlands are important. It is important that the road does not result in impacts that will cause degradation of surface water systems crossed as this will contravene aquatic conservation requirements.

5.2 Terrain

The terrain of the area is moderately undulating, with slopes of around 2-5% occurring in certain areas, with terrain which becomes steeper (10-30%) in certain parts, especially in the north and closer to White River. The altitude varies from around 700 m above sea level at the river to over 900 m above sea level at the highest points. As most of the study area is underlain by granite geology, prominent granite exfoliation domes occur across much of the study area. The terrain generally rises in elevation as the route moves from the town centre of Mbombela into the hilly terrain to the south of the city along the Barberton Road, and as one moves north towards White River.

5.3 Climate

This section describes the general prevailing climatic conditions within the study area during the four seasons of the years which are autumn, winter, summer and spring.

5.3.1 *Temperature*

The mean daily maximum temperature for the study area is approximately 21°C - 28°C in January and with the coldest 6°C - 15.0°C in July.

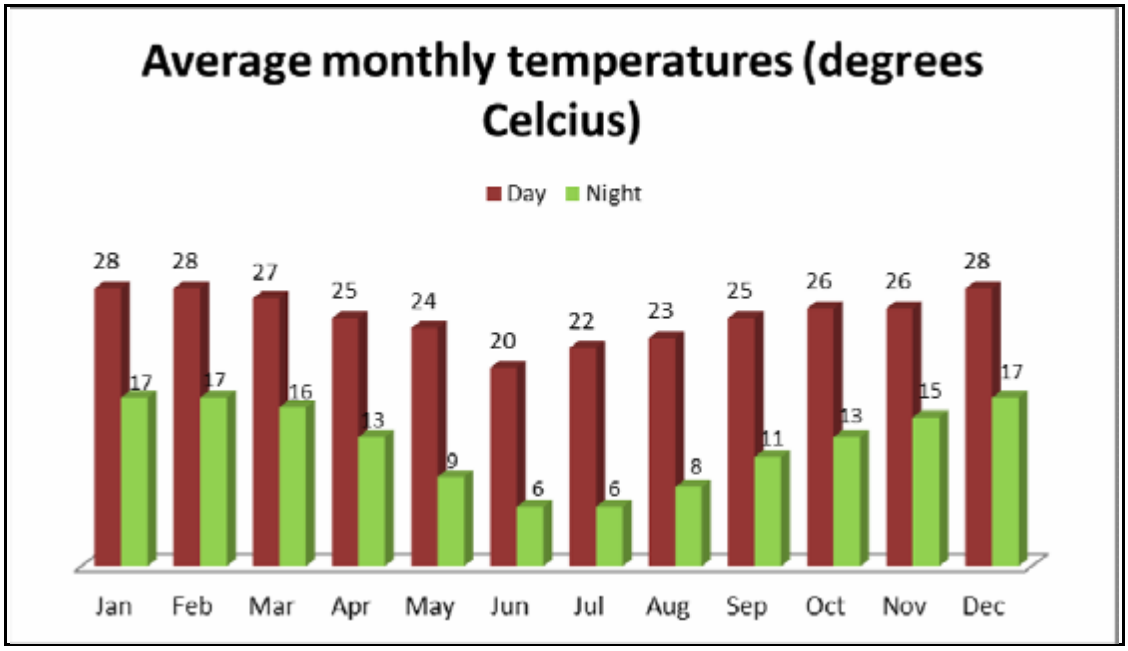


FIGURE 11: AVERAGE MONTHLY TEMPERATURES

5.3.2 *Rainfall*

The study area experiences summer rainfall with dry winters with mean annual precipitation of approximately 667 mm of rain. The highest monthly rainfall in summer is 120 mm in December and the lowest rainfall during June (2 mm). Rainstorms are often violent with severe lightning and strong westerly or easterly winds and sometimes accompanied by hail. The winter months of June, July and August are dry and their combined rainfall comprises approximately 3.8% of the total annual precipitation.

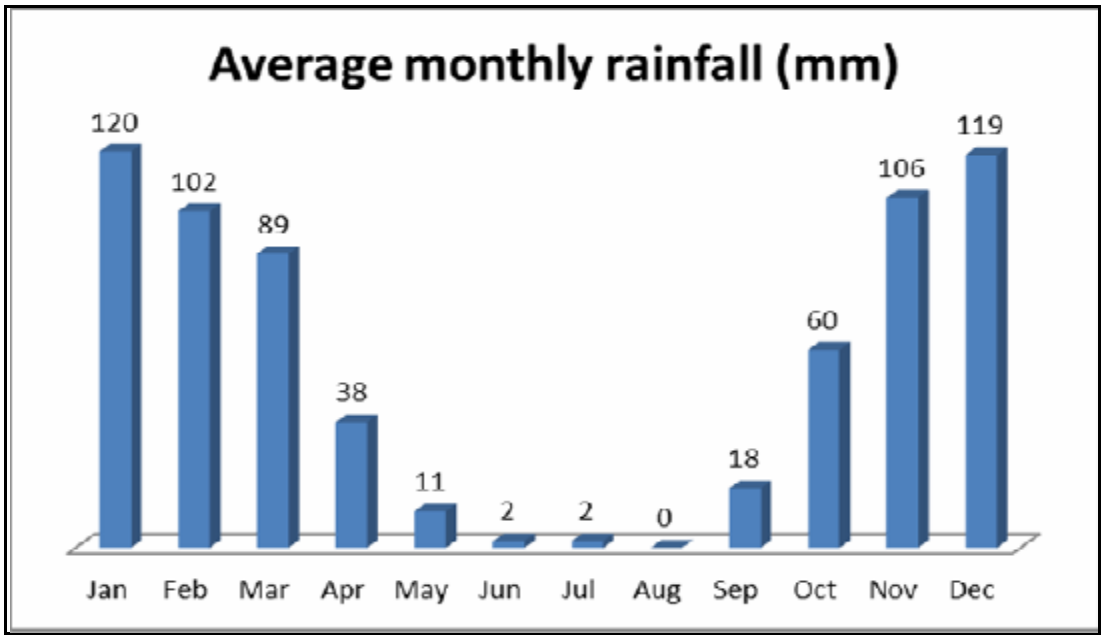


FIGURE 12: AVERAGE MONTHLY RAINFALL

5.3.3 *Wind*

The wind direction in the area frequently moves towards the north-east at an average speed of 4.65 m/s. No extreme wind speed cases have been recorded in the area.

5.4 Agriculture, Geology and Soils

The Agriculture, Soils and Geology study was conducted by Gary Paterson from ARC through a desktop study. This section describes the soils of the study area and its characteristics.

5.4.1 *Geology and Soils*

The geology underlying the study area is gneiss and migmatite of the Nelspruit Granite Suite (Geological Survey, 1986). The study area is characterised by three land types, namely Ab42, Ab43 (Red, structureless, highly weathered soils) and Ba67 (Red, structureless, highly weathered soils, some with underlying plinthite). The distribution of these land types is shown in Figure 7 below. The soils were classified according to MacVicar *et al*, 1977), with the dominant agricultural potential class within each land type indicated in **bold type**. The main characteristics of each of the land types are given in Table 5 below. The various proposed alternatives for the P166 route do not involve significantly different soils or terrain than the main proposed route. Table 5 indicates that within land types Ab42 and Ab43, most of the soils occurring can be regarded as high potential agricultural soils. Phumlani Alternative 1 was identified as traversing areas under cultivation (citrus fruits) from the desktop study; however this will be verified during the site survey.

Land type	Dominant soils	Sub-dominant soils	Slopes	Agricultural Potential (%)
Ab42	Hu16/17; 600-1200 mm; SaCl-Cl 53%	Hu18; 900-1200 mm; Cl 12% Rock & shallow soils 10%	10-30%	H: 75.7 M: 11.2 L: 13.1
Ab43	Hu16/17; 900-1200 mm; SaCl-Cl 54%	Hu18; 900-1200 mm; Cl 31%	8-20%	H: 92.0 M: 1.5 L: 6.5
Ba67	Rock & shallow soils 31%	Hu25/26/35/36; 900-1200 mm; SaLm-SaClLm 27%	2-5%	H: 42.0 M: 24.0 L: 34.0

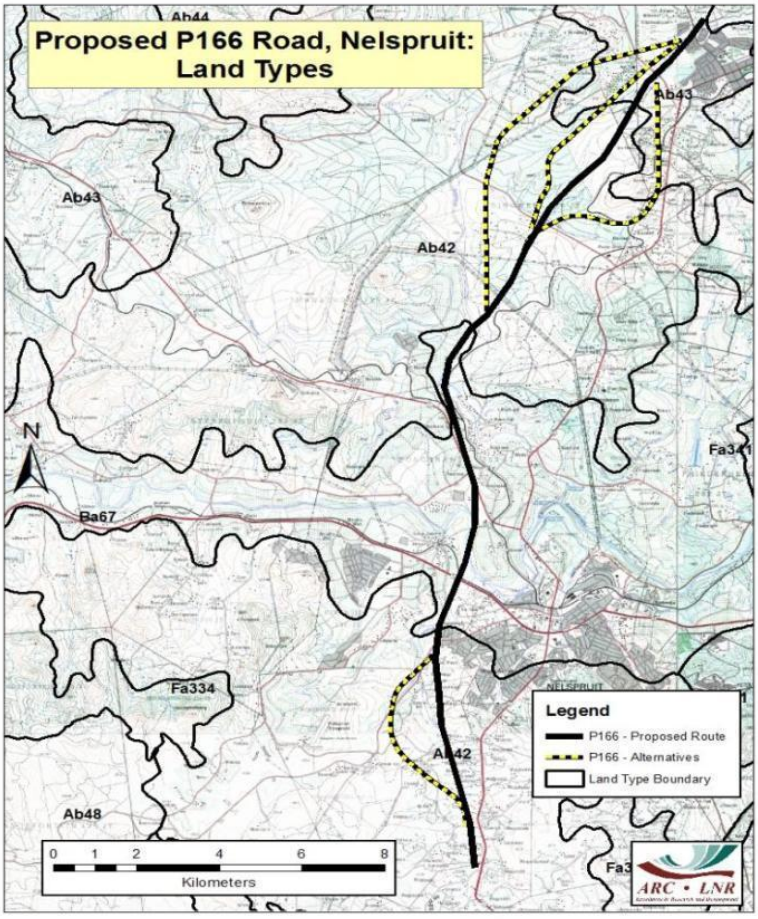


FIGURE 13: LANDTYPES OF THE STUDY AREA

5.4.2 *Agriculture Potential and Erodibility*

The proposed P166 and its associated alternatives will traverse through land types Ab42, Ba67 in the vicinity of the Crocodile River. The soils of the two land types are similar, with Ba67 containing a higher percentage of shallow soils, but both land types are dominated by red, moderately deep to deep, medium- to heavy-textured soils of the Hutton form, which are generally very favourable for cultivation, despite the high clay content (35-55%) in places within Ab42. The main limiting factor is terrain. Land type Ba67 occurs in the foot slopes and river plain area of the Crocodile River, where cultivation is relatively easy on the flatter slopes. This is evidenced by the extensive citrus, sugar cane and other cultivation along the river. Land type Ab42, on the other hand, especially closer to the Marathon substation, has significantly steeper slopes, up to 30% in places, so that cultivation is difficult, if not impossible. Large parts of the eastern Mpumalanga escarpment have similar soils and terrain, and the only possible land use is forestry. The soils in the study area, due largely to their kaolinitic mineralogy, are inherently stable soils not prone to erosion. However erosion can occur on disturbed steep slopes when they are not rehabilitated.

5.5 Hydrology (Wetlands)

The Hydrology study was conducted by Paul da Cruz from Royal HaskoningDHV through a desktop and preliminary site inspection. This section describes the general water resources occurring in the study area, their characteristics and potential impacts in relation to the proposed P166.

5.5.1 *Surface Water and Wetlands Hydro-geomorphic Forms*

The study area is characterised by a number of surface water features; the main rivers draining through the study area are the Crocodile River which runs from an east to westerly direction and the Nels River that drains in a southerly direction, with a number of other smaller perennial (such as the Sandspruit and Gladdespruit) and non-perennial streams bisecting the proposed route and its alternatives.

There are a number of different types of surface water features in the study area, including a number of different wetland hydro-geomorphic forms. It is important to note that not all surface water features found in the study area can be classified as wetlands. There are likely to be certain drainage lines / rivers that occur along the proposed road in which no hydric soils are likely to occur, due mainly to the presence of outcropping / very shallow bedrock at the surface which precludes the occurrence of soils, or where recent alluvial deposits have not developed signs of hydromorphism. Although these areas are not strictly wetlands if hydric soils are not found within them, they are protected under the National Water Act in the same way as wetlands are protected.

Many of the surface water features encountered in the study area contain a distinct riparian zone. Under the National Water Act (No 36 of 1998) a riparian zone is defined as the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas. The natural vegetation in the study area consists of savannah-type vegetation – i.e. very open woodland with a grassy understorey. Conversely

dense thickets and large trees occur along drainage lines, wetlands and rivers in the study area, with a typical tree and shrub species composition of species that tolerate or thrive in moist or even inundated conditions. Thus many riparian zones are wooded. In certain situations, the riparian zone is synonymous with hydric soils. Riparian zones are ecologically very important as they contain high species diversity and provide important food and refuge areas for biota, often forming linear natural habitats in an otherwise transformed context.

The wetland hydro-geomorphic (HGM) approach to wetland classification which uses hydrological and geomorphological characteristics to distinguish primary wetland units has been used to classify wetland types in South Africa (Kotze et al, 2005; SANBI, 2009). This approach has been used, and the classification system has been recently updated as part of the National Wetland Classification System for South Africa (SANBI, 2009). Under this classification system there are a number of different types of terrestrial (as opposed to marine) wetlands, certain of which are likely to occur in the study area:

- Channel
- Channelled Valley-Bottom Wetland
- Un-channelled Valley-Bottom Wetland
- Valley head Seep
- Hill slope Seep

A few HGM forms do not occur within the study area; including pans / depressions, true floodplains, and flats. The primary type of surface water feature occurring across the study area is the valley bottom wetland. Due to the undulating nature of the terrain, most wetlands occur within valley bottoms, and drain into the three major rivers (the Sand, Nels and Crocodile) that drain across the study area. Although valley bottoms are typically not very incised, the valley bottom wetlands are often relatively narrow, and no wide floodplain systems where depositional processes would predominate occur within the study area. The primary reason for the predominance of narrow valley bottom wetlands in the study area is due to the outcropping of granite bedrock in many parts of the study area that precludes the formation of wider depression systems. In the southern parts of the study area, the Crocodile River has cut a relatively deep, steep-sided valley into the underlying granitic bedrock.

FIGURE 14: NARROW VALLEY BOTTOM WETLAND TO THE SOUTH OF WHITE RIVER IN THE PHUMLANI INFORMAL SETTLEMENT

Where they occur, hill slope seepage and wetlands are hydrologically connected to the drainage network, and typically become valley bottom wetlands in their lower reaches. Hill slope seepage wetlands are found where groundwater discharges to the surface; groundwater outflow is the primary hydrological input to these wetlands. Where hill slope seepage wetlands were encountered in the study area, these were more often than not associated with bedrock outcropping of granite, especially in the form of lower outcrops at surface level. Groundwater in granite bedrock settings typically occurs within fractures within the bedrock. A study for a another project by the author in the same area (da Cruz, 2009) found that in a number of cases hill slope seepage wetlands were located immediately adjacent to, or downslope of these outcrops, suggesting that the granite outcrops are significant determinants of groundwater flow within the granite bedrock matrix, with groundwater discharge to the surface typically occurring at the boundary of these outcrops.

5.5.2 *Wetland Vegetative Characteristics*

Most wetlands in the study area are valley bottom systems, many of which are narrow features. The most commonly occurring vegetative form in these wetlands is *Phragmites mautitianus* reedbeds. The reeds occur across the channel or bed of the wetland, often with a very narrow vegetative transitional area to the surrounding non-wetland area. As described above, many of the wetlands display a wooded riparian component to their

vegetative structure, with a dense cover of trees and shrubs occurring on the channel banks, or even in the wetland itself. In some wetlands, particularly those in the higher-lying northern parts of the study area near White River, wetland vegetation was noted to consist of grasses rather than reedbeds.

FIGURE 15: *PHRAGMITES MAURITIANUS* REEDBEDS OCCURING IN WETLANDS

FIGURE 16: A VALLEY BOTTOM WETLAND ON THE PERIPHERY OF WHITE RIVER

5.5.3 *Water Features Crossed by the Proposed P166 and its Alternatives*

The Figures 11 to 13 below depicts all of the potential crossing points along the alternatives and the *main* alignment (including the proposed road reserve area) of the P166 road. The figures show the wetland or river type (in the context of wetlands the hydro-geomorphic wetland type is listed), as well as the name of the river, where applicable. The crossing name has been based on the quaternary catchment in which the crossing point is located. As can be seen, the vast majority of crossing points are valley bottom wetlands that are channelled. In addition to a number of larger perennial rivers crossed, the other wetland type crossed is the un-channelled valley bottom wetland. These wetlands are characterised by diffuse flow within the wetland area, which is important in the context of potential impacts on the hydrology of the wetland, as explored below.

At the present time 30 crossing points have been identified along the length of the proposed road (and within its reserve). The implications of the respective number and nature of crossings along the respective alternatives are discussed in the impacts section below.

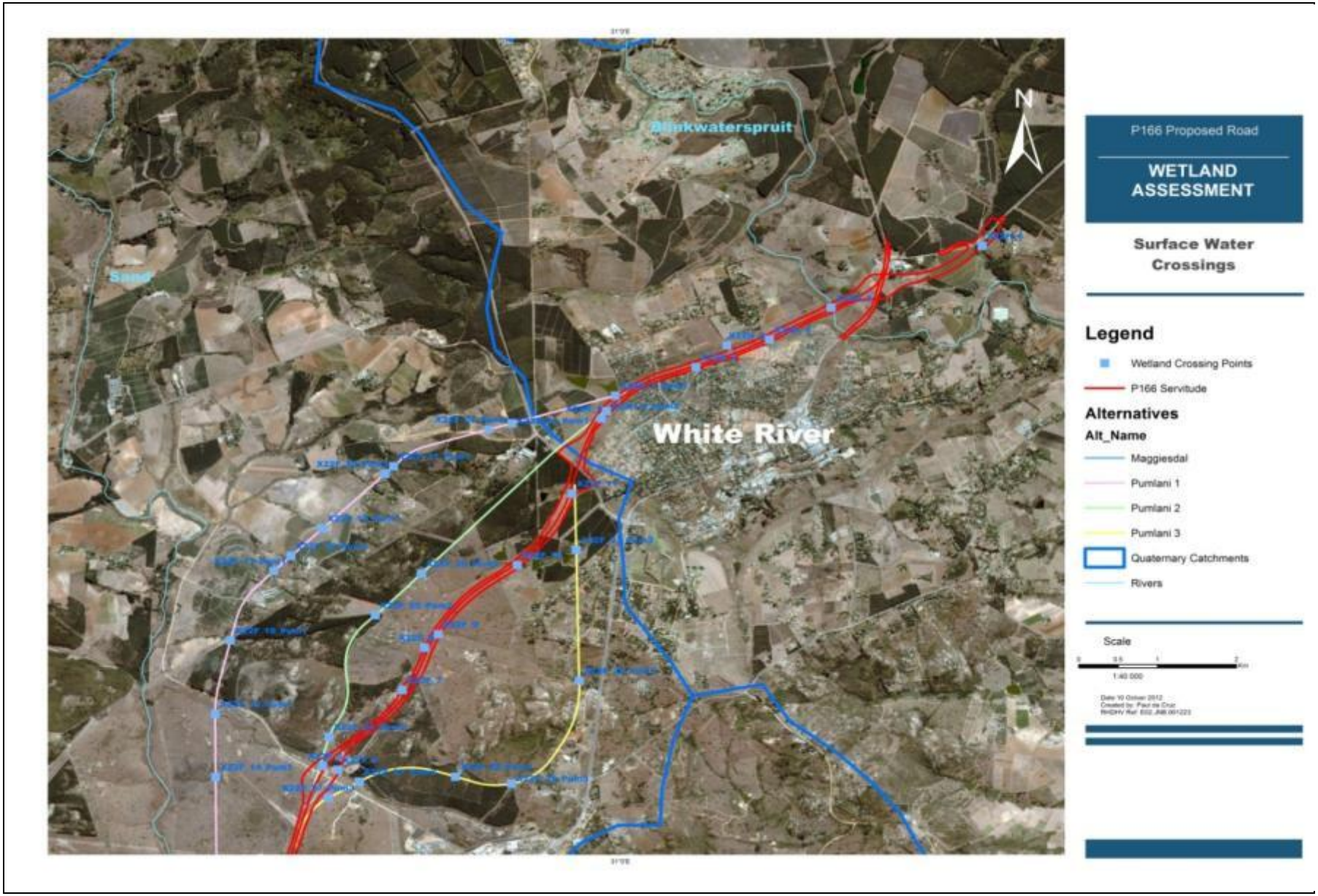


FIGURE 17: SURFACE WATER CROSSING POINTS IN THE WHITE RIVER AREA

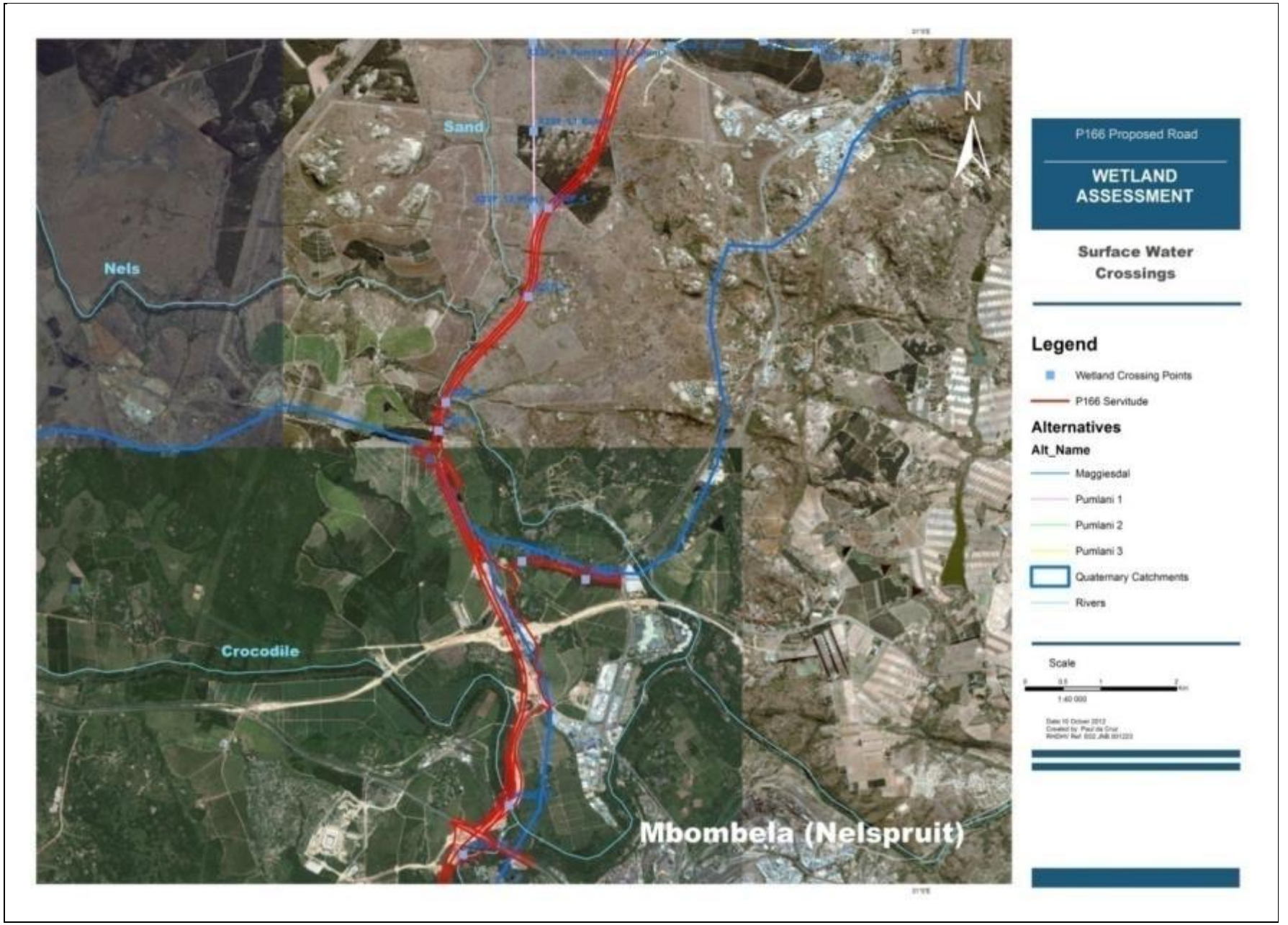


FIGURE 18: SURFACE WATER CROSSING POINTS IN NORTH OF MBOMBELA

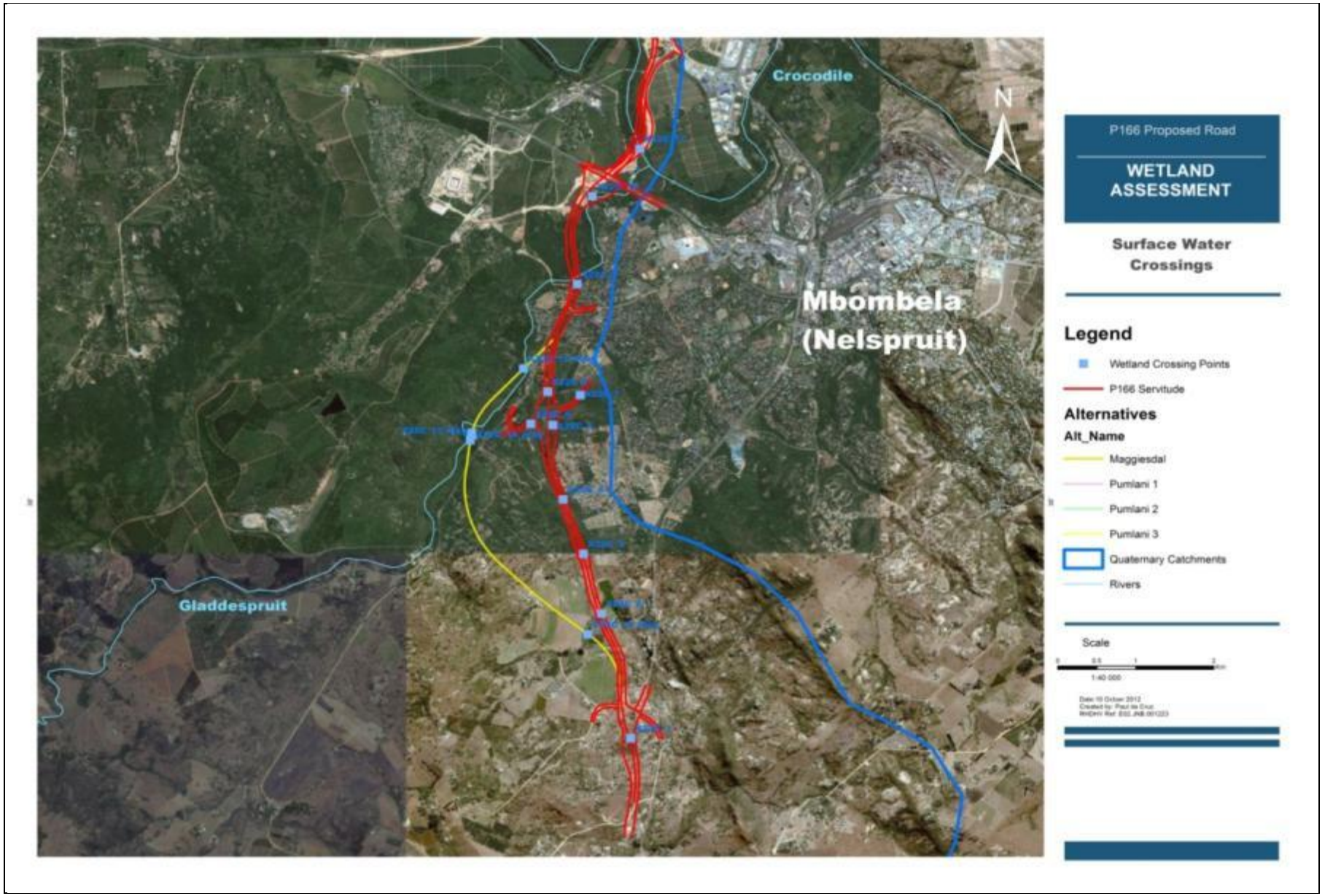


FIGURE 19: SURFACE WATER CROSSING POINTS IN SOUTH OF MBOMBELA

5.6 Biodiversity

The Biodiversity study was conducted by Clayton Cook. This section describes the flora and fauna occurring in the study area.

5.6.1 *Vegetation*

The study area falls within the savannah biome of South Africa and specifically in the Central Bushveld Bioregion (SVcb) (Mucina & Rutherford, 2006). This bioregion has the highest number of vegetation types of the savannah bioregions. On a smaller scale the study area is located within Legogote Sour Bushveld (SVI 9) with a small section of the Pretoriuskop Sour Bushveld (SVI 10) (Mucina & Rutherford, 2006) also present.

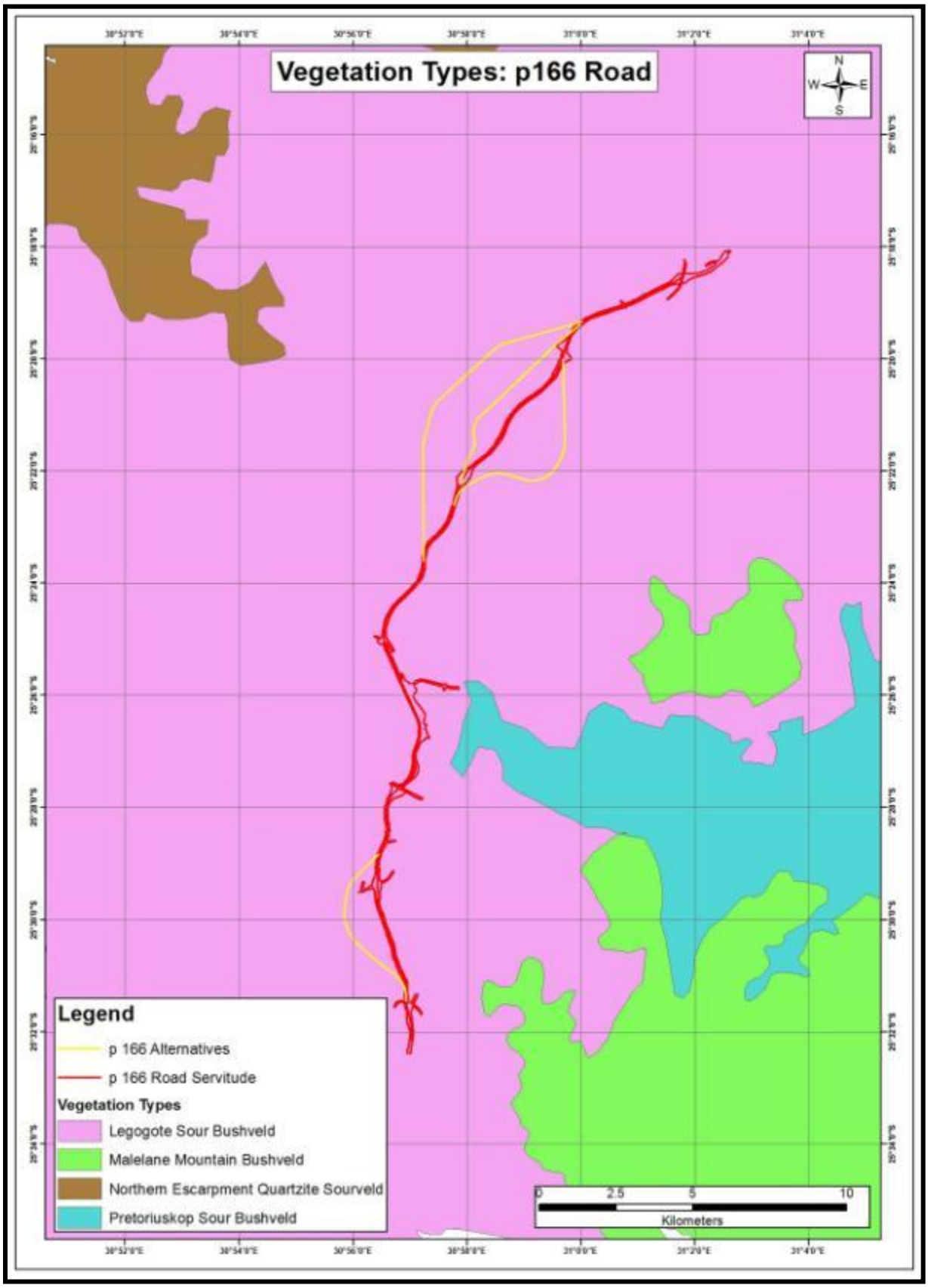


FIGURE 20: VEGETATION TYPE OF THE STUDY AREA

5.6.2 *Landscape Features*

The landscape along the route consists of gently to moderately sloping upper pediment slopes with dense woodlands including many medium to large shrubs often dominated by *Parinari curatelifolia* and *Bauhinia galpinii* with the grasses *Hyperthelia dissoluta* and *Panicum maximum* in the undergrowth. Short thicket dominated by *Acacia ataxacantha* occurs on rocky sites. Exposed granite outcrops have low vegetation cover, typically with *Englerophytum magaliesmontanum, Aloe perticola* and *Myrothamnus falbellifolia* (Mucina & Rutherford, 2006).

The vegetation is characterised by the presence of medium to large shrubs that form dense woodland areas on the slopes, while various acacia species are present in the lower-lying areas with *Dichrostachys cinerea* prominent in some localities. The large granite outcrops do not have much vegetation cover though smaller forb species do grow in the crevices where soil and litter have collected. Large areas have been transformed due to mainly forest plantations, with some areas transformed due to cultivation of crops. The soil ranges from deep Hutton to shallow but well-drained Mispah.

FIGURE 21: LEGOGOTE SOUR BUSHVELD (SVI 9) IN DENSE WOODLANDS

TABLE 5: SPECIES WITHIN THE LEGOGOTE SOUR BUSHVELD

Dominant taxa in this vegetation type	**Woody species**	*Pterocarpus angolensis, Sclerocarrya birrea, Acacia sieberiana, Acacia caffra, Ximenia caffra, Ficus thonningii, Combretum zeyheri, Schotia brachypetala, Diospyros lycioides, Gymnosporia buxifolia, Terminalia sericea, Englerophytum magalismontanum*
	Grasses	*Cymbopogon excavatus, Hyparrhenia hirta, Setaria sphacelata, Hypethelia dissoluta, Andropogon shirensis, Scizachyrium sanguineum, Heteropogon contortus*
	Forbes	*Gerbera viridifolia, Waltheria indica, Hypoxis rigidula, Xerophyta retinervis*
Endemic Species to Legogote		*Aloe simii*
Alien species to Legogote		*Lantana camara, Solanum mauritianum, Melia azedarach, Psidium guajava*
Conservation Status		Endangered with target of 19%. Only about 2% statutorily conserved in the Bosbokrand and Barbeton Nature Reserves, and a further 2% in private reserves including the Mbessan and Kaapsehoop Reserves and the Mondi Cycad Reserve. It has been greatly transformed (50%), mainly by plantations and also by cultivated areas and urban developments.

FIGURE 22: PRETORIUSKOP SOUR BUSHVELD (SVI 10)

The vegetation type is similar to the Legogote Sour Bushveld (SVI 9) but is drier and occurs mostly as open tree savannah that is characterised by the prominence of *Dichrostachys cinerea* and *Terminalia sericea* (Mucina &

Rutherford, 2006). The area is classified as open savannah with various *Acacia* species present and occurs on the upland areas. The geology is mainly granite from the Nelspruit Suite and the soil is shallow to medium deep. Large areas have been transformed due to cultivation and the development of settlements (Mucina & Rutherford, 2006).

5.6.3 *Vegetation Classification*

A classification of vegetation data was done to identify, describe and map vegetation types. The descriptions of the plant communities include the tree, shrub and herbaceous layers. The conservation priority of each vegetation unit was assessed by evaluating the plant species composition in terms of the present knowledge of the vegetation of the Savannah Biome of South Africa. Seven distinct vegetation units could be identified namely wetland, sour bushveld, riverine areas, bushveld and afforested plantations **(Figure 17-.21).**

- **Wetland Unit**

This vegetation unit is located on northern part of the study area in the town of White River. The soil is dark grey clay. Few woody species occur, covering less than 1% of the area. The herbaceous component is dominant with the forbs covering between 35 and 60% of the area with the grasses between 25-35%. Except for single large rocks in the stream no other rocks were observed. The vegetation is characterised by typical wetland species such as the grasses *Phragmites mauritianus, Imperata cylindrica, Agrostis lachnantha,* and the forbs *Typha capensis, Kyllinga alba, Monopsis decipens* and various *Cyperus* spp. The declining red data plant *Gunnera perpensa* is also present. The grass and forb layers are dominant and cover up to 80% of the area. Single individual trees such as the exotic *Eucalyptus camaldulensis* are present in this unit. The vegetation is typical wetland with the permanently wet and seasonal zones present with development on the temporary wet zone in the form of housing developments. The development within the wetland zone due to houses has also resulted in local people planting small crops and other plants directly in the seasonal wet zone of the wetland. It is also in these areas where the natural vegetation has been cleared and the soil worked and the water channelled. Various pioneer plant species such as *Tagetes minuta* and *Bidens pilosa* are present in these areas. Two declining red data species *Gunnera perpensa* and *Eucomis autumnalis* was found to be present in the wetland. The habitat is also suitable for various orchid species that were not flowering during the time of the survey.

There are known endangered Aloe simmii populations (possibly destroyed) in the Phumlani and Impala Road area which was identified by the I&APs and this will need to be verified during the EIA phase.

- **Sour Bushveld**

This woodland is occurs on rocky terrain that varies from level to mildly steep rocky outcrops. The soil is shallow on the higher-lying rocky areas and varies from shallow to medium deep in the lower-lying more level areas. Soil texture is sandy to loam with some clay present. The woody layer covers between 10 and 50% of the area. The grasses cover between 55 and 65% and the forbs up to 12% of the area. The vegetation consists of open to closed woodland with smaller open grassland patches in-between. The trees *Acacia sieberiana* and *Pterocarpus angolensis* dominate the vegetation. Various grass and forb species are present and include *Tristachya rehmannii*, *Brachiaria serrata, Eragrostis superba, Fuirena pubescens, Monopsis decipiens, Hypoxis iridifolia, H. rigudula* and

Gerbera jamesonii. Two declining species *Crinum macowanii* and *Eucomis atumnnalis* was found to be present in this unit. Suitable habitat exists for other red data species also.

- **Riverine**

Various riverine areas are present within the proposed route. These areas vary from slightly degraded to heavily degraded due to natural and human impacts. The more natural rivers along the route are characterised by the prominence of various hydrophilic plant species such as *Phragmites, Schoenoplectus corymbosus, Paspalum dilatatum, Cyperus textilis,* while the woody species include *Acacia sieberiana,* and *Acacia ataxacantha*. Unfortunately the category 1 declared alien invader shrub *Lantana camara* has infested large areas thereby displacing large amounts of the indigenous vegetation and together with it animal life. The riverine systems mostly support a diversity of plant and animal life and are important in the transport and channelling of water. They also provide water to underground systems on which many plant communities depend for their survival especially during the dry months of the year. From a vegetation point of view large areas are degraded while others have a more natural species composition. No red data species were found within this unit.

- **Bushveld**

This woodland is occurs on undulating rocky hills and slopes. The soil is shallow and leached though patches that are slightly deeper with loamy soil are present. The woody layer covers between 5 and 35% of the area, the grasses between 55 and 65%, and the forbs up to 12% of the area. The vegetation consists of open woodland with smaller dense patches on the rocky crests. Large open grassland areas occur between the sparsely spread trees. The tree *Acacia sieberiana* is dominant on the slopes and lower-lying areas while *Englerophtytum magalismontanum* is prominent in the crests. Other species present and include *Eragrostis curvula, Urochloa panicoides, Cephalaria zeyheriana, Eulophia petersii, Selaginella dregei and Vernonia natalensis*. No red data species were found within this unit.

- **Afforested Plantation**

This vegetation unit occurs on loamy soil with low rock cover all along the proposed P-166 route. The largest areas have been planted with various *Eucalyptus spp.* and *Pinus spp*. for commercial properties or have been developed due to human settlements. The vegetation is completely transformed due to more than 80% thereof being developed with roads, houses, and plantations. Very little of the natural vegetation of the area has remained. In the areas along the roads of the various human settlements the vegetation is transformed with the grass *Eragrostis curvula* and the anthropogenic grass *Hyparrhenia hirta* present in many areas. No red data species were found within this unit.

FIGURE 23: VEGETATION UNITS OF STUDY AREA (A)

WETLAND UNIT = BLUE; SOUR BUSHVELD UNIT = GREEN; PLANTATION UNIT = YELLOW

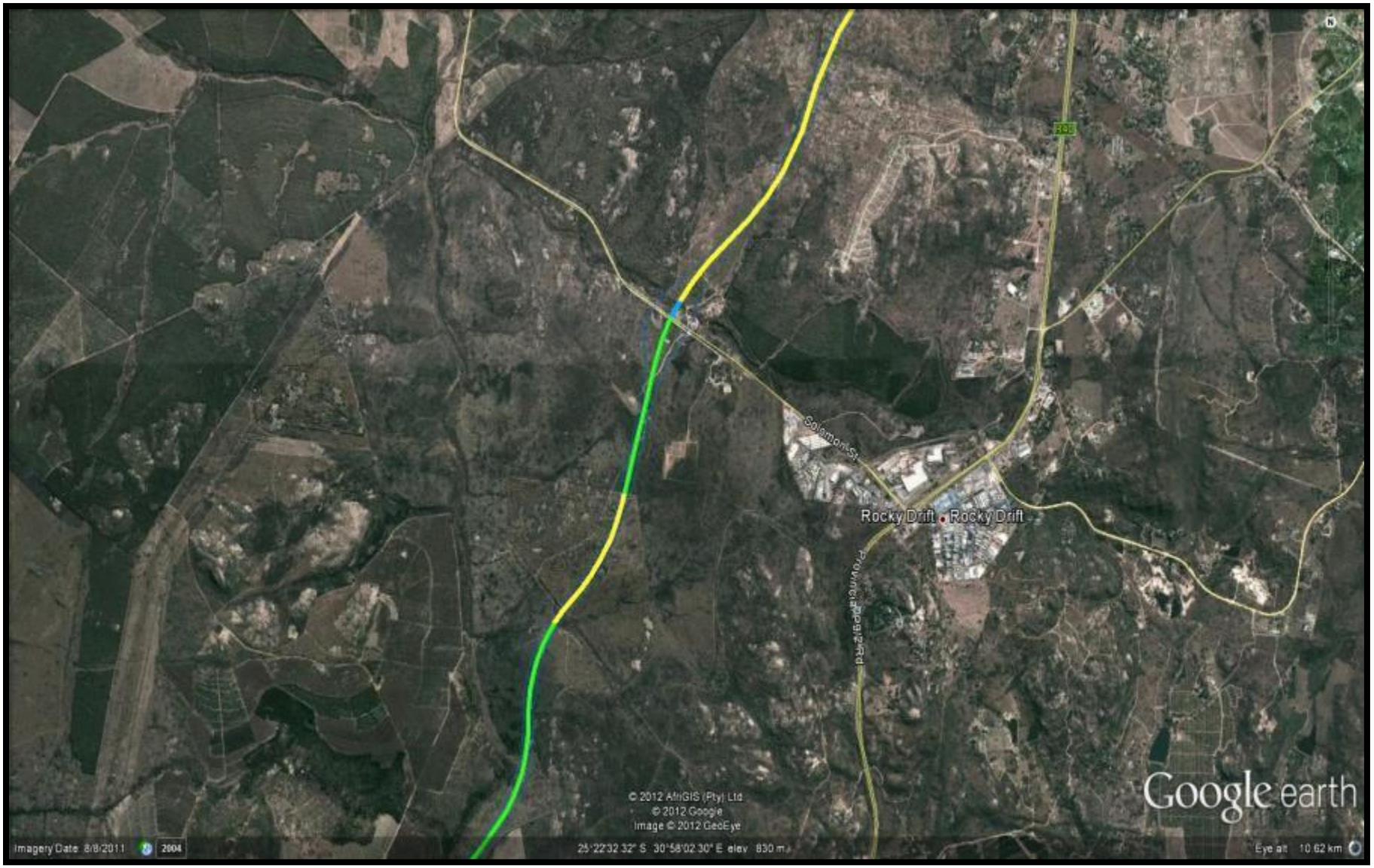


FIGURE 24: VEGETATION UNITS OF STUDY AREA (B)

WETLAND UNIT = BLUE; SOUR BUSHVELD UNIT = GREEN; PLANTATION UNIT = YELLOW

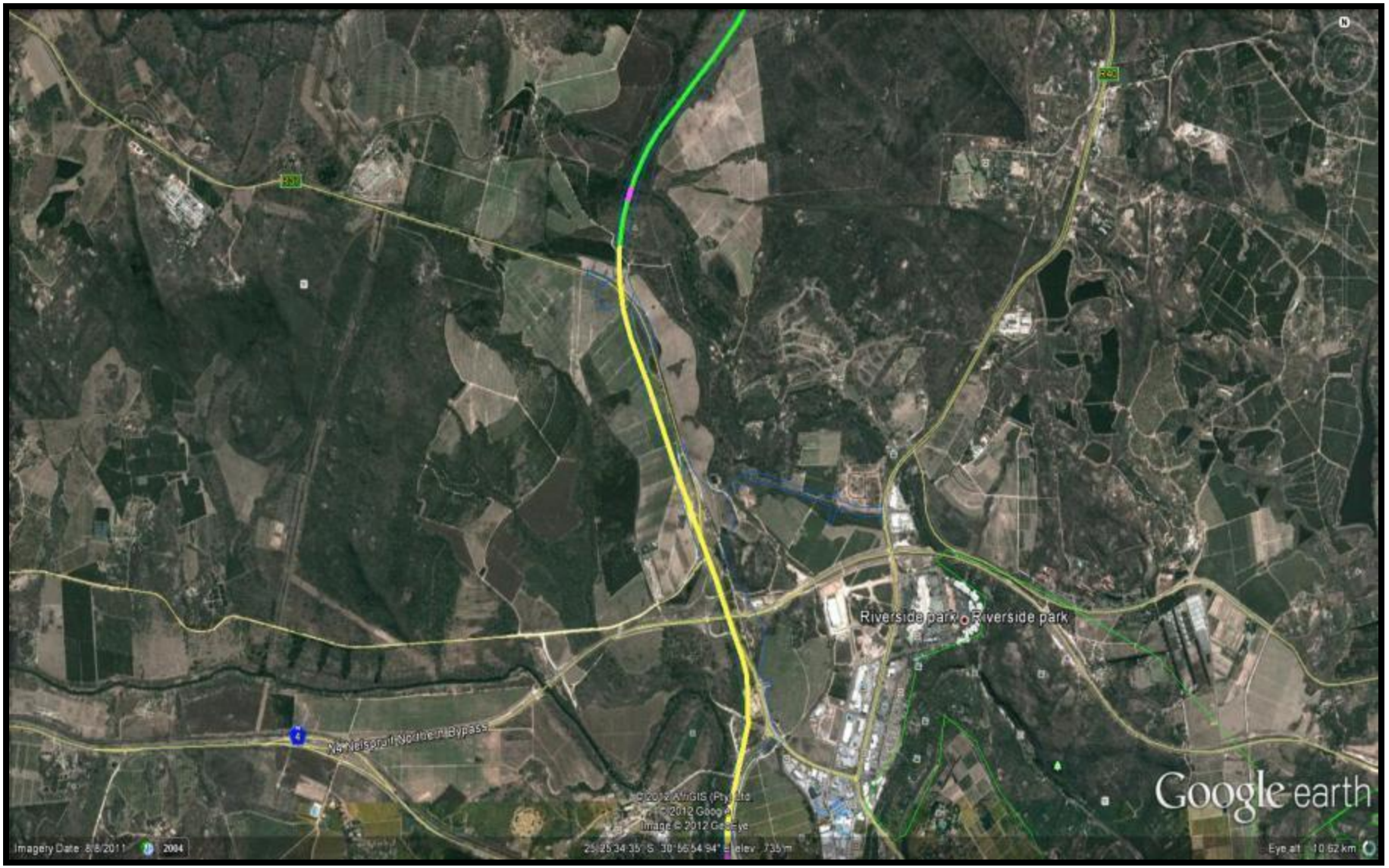


FIGURE 25: VEGETATION UNITS OF STUDY AREA (C)

WETLAND UNIT = BLUE; SOUR BUSHVELD UNIT = GREEN; PLANTATION UNIT = YELLOW, RIVERINE UNIT = PINK

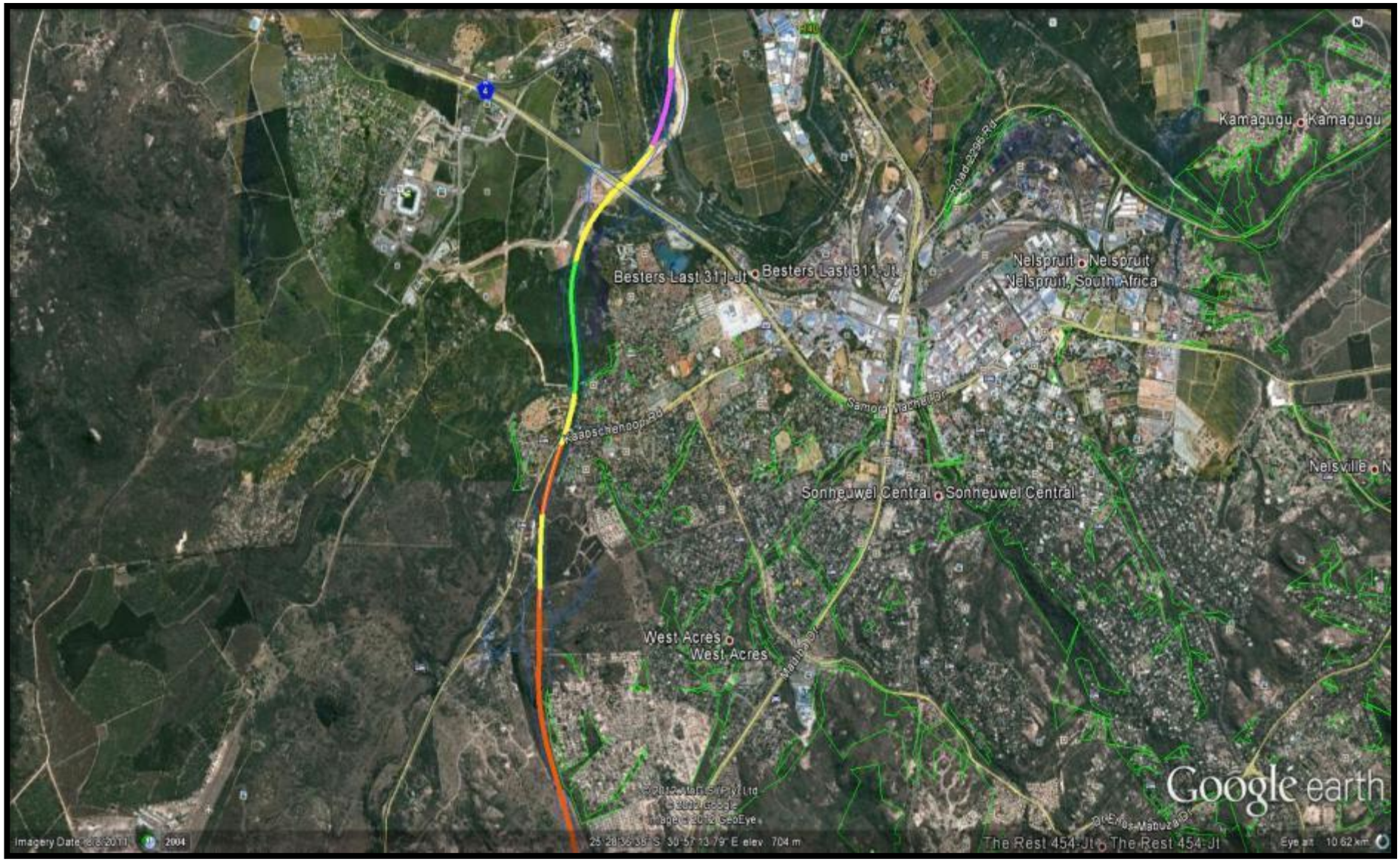


FIGURE 26: VEGETATION UNITS OF STUDY AREA (D)

WETLAND UNIT = BLUE; SOUR BUSHVELD UNIT = GREEN; PLANTATION UNIT = YELLOW, RIVERINE UNIT = PINK, BUSHVELD UNIT=ORANGE

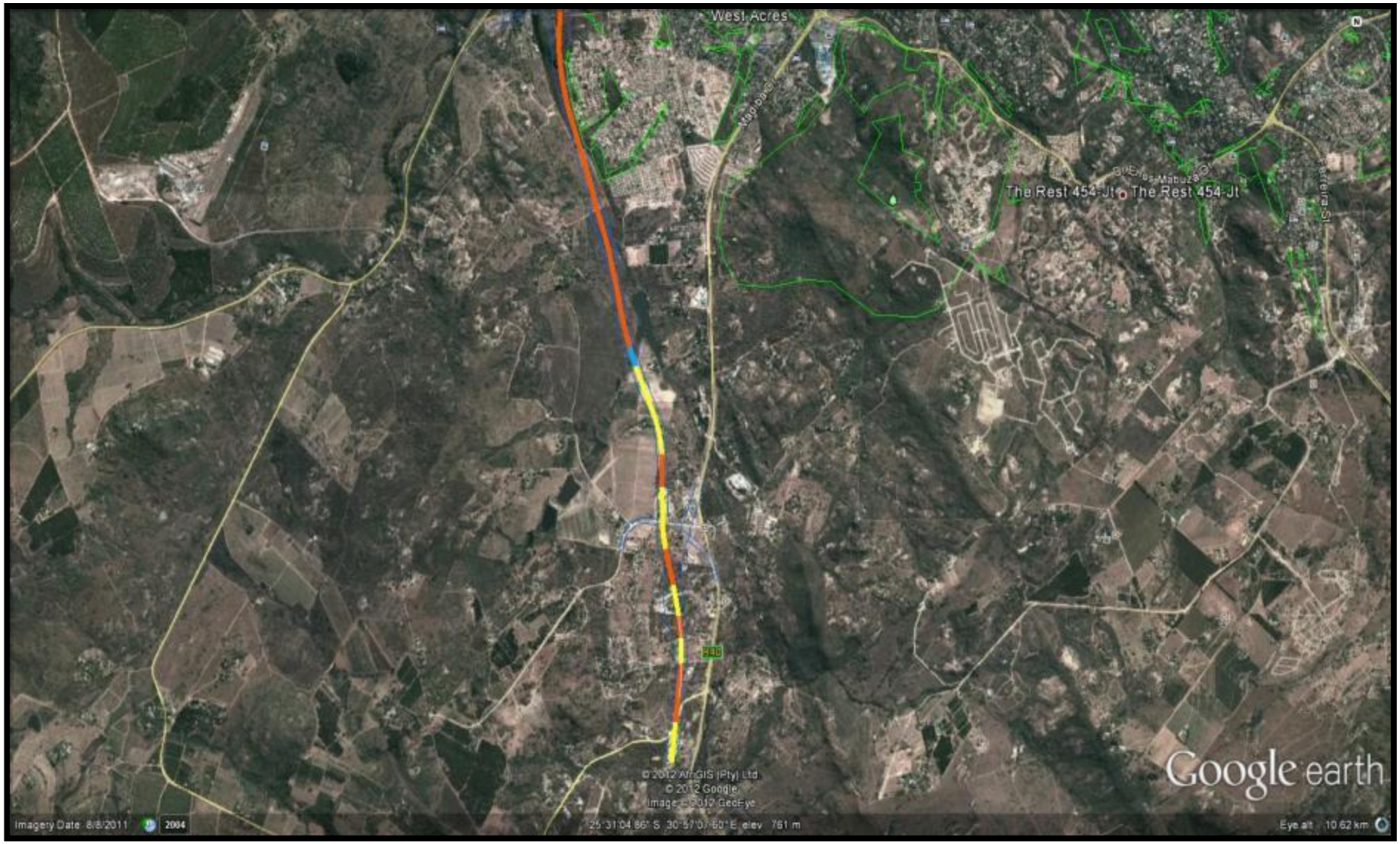


FIGURE 27: VEGETATION UNITS OF STUDY AREA (E)

WETLAND UNIT = BLUE; SOUR BUSHVELD UNIT = GREEN; PLANTATION UNIT = YELLOW, RIVERINE UNIT = PINK, BUSHVELD UNIT=ORANGE

5.6.4 *Mammals*

Mpumalanga is faunally diverse with approximately 163 mammal species consisting of 98 smaller and 64 larger species. It is the objective of Mpumalanga Parks Board (MPB) to conserve all of these species *in situ*. High mammalian species richness occurs in savannahs, which could be as a result of the wide variety of habitats available. In the Mpumalanga Province, savannah areas with the availability of sufficient cover, karstic areas, wetlands, pans and a well-managed mosaic of short and tall grassland, are habitats that significantly contribute towards the ecological requirements of certain mammal species. Certain species in Mpumalanga, towards which conservation efforts for habitat protection should be directed, have been identified. Priority species can be used to emphasise key habitats, which are of conservation concern. These species thus contribute towards identifying priority areas of conservation importance and in determining the conservation value of land. Anthropogenic land conversion and habitat degradation and fragmentation are major threats to the continued existence of endemic and threatened fauna in the province (Cohen & Gomacho 2002). The settlements surrounding the P-166 road alignment and associated illegal hunting and poaching limits the suitability of these areas for larger mammal species. The collection or harvesting of wood (stumps) and rock material as well as the frequent burning of the vegetation reduces available refuge habitat an exposes remaining smaller terrestrial mammals to increased predation levels.

The use of wire snares for high intensity poaching activities will significantly affect remaining smaller mammal species such as rabbits and mongooses. Secondary access roads and vehicles (motor cars, motor cycles, and quad bikes) increase access to the open areas as well as potential road fatalities. Major road networks with high vehicular traffic increase the risk of road fatalities (hedgehogs, hares) of mammals. Smaller mammal species are extremely vulnerable to feral cats and dogs.

Agricultural lands are in nature inhospitable environments, and only burrowing small mammals can co-exist in such situations. Rodents such as the Bushveld and Highveld gerbils can at times become pests in agricultural lands when they excavate planted seeds. The Yellow and Slender mongooses can subsist by preying on the few vertebrates managing a precarious existence due to surrounding road networks as well as hunting with dogs and wire snares.

- **Threatened Species**

According to the “South African Red Data Book of Terrestrial Mammals” (Smithers, 1986) and Skinner and Smithers (1990) updated by the IUCN Council in December 1995, the study area falls within the distribution ranges of 5 species which are placed into one of known threatened species (Endangered, Vulnerable and Rare). On the basis of the habitat descriptions provided for the above-mentioned threatened species by Skinner and Chimimba (2005), and the high level of human activity (hunting, poaching) within the study area, it is deemed highly unlikely that the study area provides critical habitat for the Endangered Wild Dog (*Lycaon pictus*) as well as the Vulnerable Lion (*Panthera leo*).

5.6.5 *Avifauna*

More than 567 bird species have been recorded in Mpumalanga. Approximately 71 Red Data species, of which 35 are threatened, occur within the area. There are no species endemic to Mpumalanga, and the province is

represented by the Grassland, Forest and Savannah biomes. Some of South Africa's endemic and most threatened terrestrial and wetland-associated bird species are significantly dependent on the wetlands, short dense and tall grasslands and woodland regions of the Mpumalanga province. A total of 12 Important Birding Areas (IBAs) occur within the province and most are of critical ornithological importance. The Masibekela wetland, near the Lebombo Mountains in the Lowveld region, holds species that are uncommon in Mpumalanga and support relative large numbers and varieties of birds.

Species richness in the Lowveld is high, due to a diversity of habitats. The presence or absence of bird species with specific habitat requirements can be indicative of the state of the environment. Bird species that can act as important savannah, grassland and wetland indicators have been selected, in order to identify priority areas of conservation importance for birds, and to determine the conservation value of land within Mpumalanga Province. Habitat loss and degradation are the primary threats that impact severely on viable populations of these sensitive species (Cohen & Gomacho 2002).

- **Sensitive or Endangered Species**

Red Data List bird species previously recorded from the 2530CD and 2531BA grid squares within which the study area is situated and that occur or could possibly within or in the vicinity of the study area according to Harrison et al. (1997) based on habitat and food availability on site are listed in the ecology specialist study which is attached. It should be noted that the near threatened species, the Broad-tailed Warbler (*Schoenicola brevirostris*) has been recorded in the tall *Hypethelia dissoluta*-dominated savannah in the area near Penryn College and importantly in one of the wetlands crossed by the P166 servitude just south of the Heidelberg Road west of Rocky Drift.

5.6.6 *Amphibians*

The majority of frog species in Mpumalanga Province are classified as explosive breeders completing their short duration reproductive cycle in the early summer months between (November-January). These frog species only emerge after the first heavy summer rainfalls and are dormant during the cold winter months. Explosive breeding frogs utilise ephemeral pans or inundated grasslands for their short duration reproductive cycles. Amphibian surveys by Jacobsen (1989), as well as recent and current surveys suggest that 51 species of amphibians currently occur in the Province of Mpumalanga. The present study concentrated mainly on Red Data species and species that are threatened or have relatively restricted distributions. Eight species are considered as important for setting conservation priorities in Mpumalanga namely Karroo toad (*Vandijkophrynus* (*Bufo*) *gariepensis nubicolus)*, Cascade Frog (*Hadromophryne* (*Heleophryne*) *natalensisis),* Spotted shovel-nosed Frog (*Hemisus guttatus*), Yellow-striped Reed Frog (*Hyperolius semidiscus),* Plain Stream Frog (*Strongylopus wageri)*, Giant Bullfrog (*Pycicephalus adspersus)*, Greater Leaf-folding Frog (*Afrixalis fornasinii*) and Whistling Rain Frog (*Breviceps sopranus*) (Theron 2002).

- **Habitat Available for Sensitive or Endangered Species**

No threatened frog species have been recorded within the2530CD and 2531BA Quarter Degree Grid Cell (QDGC) in which the proposed P166 road link is situated (Minter et al. 2004) however the Mottle Shovel-nosed Frog (*Hemisus guttatus*) was identified by an I&AP on the proposed development site in the White River area; this

is the first record of the species in White River with the nearest locality being approximately 180 km away around Piet Retief. The presence of this species will be verified during the EIA phase

5.6.7 *Reptiles*

Most current knowledge of the reptiles of Mpumalanga is based on a survey done by N.H.G. Jacobsen (1989) providing a detailed account of all reptiles in the then Transvaal province. This survey resulted in descriptions of life histories, habitat requirements and conservation status and maps of the known distributions. Jacobsen's (1989) survey revealed that 154 reptiles occur in the Mpumalanga Province and of these, 86 species are threatened. However, many of these threatened reptiles have relatively wide distributions and thus this study was restricted to Red Data species and species that are largely restricted to Mpumalanga. Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe during field surveys. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Due to the high levels of habitat destruction and degradation in the area due to agricultural and livestock grazing activities coupled with increased levels of disturbances around the villages are all causal factors in the alteration of reptile species occurring on the site and surrounding areas. The rocky crests and summits and wooded hill slopes provide favourable refuges for certain snake and lizard species (rupicolous and arboreal species). The indiscriminate killing of all snake species around the villages reduces populations drastically. The frequent burning of the limited overgrazed grassland vegetation has a high impact on remaining reptiles. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas increasing predation risks.

- **Habitat Available for Sensitive or Endangered Species**

Of the 15 reptile species considered for this study, 4 have been recorded exclusively from Mpumalanga. These are Haacke's flat gecko (*Afroedura haackei*), Mariepskop flat gecko (*Afroedura sp. nov.),* Rondavel flat gecko (*Afroedura sp. nov.)* and Wilhelm's flat lizard (Platysaurus wilhelmi). Other species considered in this study were: Abel Erasmus Pass flat gecko (*Afroedura sp. nov*.), Forest/Natal purpleglossed snake (*Amblyodipsas concolor*), Lowveld shieldnosed snake (*Aspidelaps scutatus intermedius*), Transvaal dwarf chameleon (*Bradypodion transvaalense complex*), Sungazer/ Giant girdled lizard (*Cordylus giganteus*), Barberton girdled lizard (Cordylus warreni barbertonensis), Lebombo girdled lizard (*Cordylus warren warreni*), Swazi rock snake (*Lamprophis swazicus*), Transvaal flat lizard (*Platysaurus orientalis orientalis*), Montane burrowing skink (*Scelotes mirus*), Breyer's longtailed seps/ Breyer's plated lizard (*Tetradactylus breyeri*). These species are also found in other provinces of South Africa. Of these, only four are listed in the Red Data Book (Branch 1988). The Swazi rock snake and Breyer's longtailed seps are listed as Rare, the Sungazer lizard is listed as Vulnerable and Haacke's flat gecko as Restricted

Detailed biodiversity study will be conducted during the EIA phase to verify the occurrence of endemic and threatened species occurring in the study area.

6 DESRIPTION OF THE RECEIVING SOCIAL ENVIRONMENT

6.1 Heritage

The Heritage study was conducted by Dr Johnny Schalkwyk through a Desktop study and preliminary site investigation. This section describes the potential different types of archaeological features and sites which are occurring in the study area.

- **Stone Age**

Human occupation of the region started at least during the Middle Stone Age and continued through to the Later Stone Age. Because of the high impact of agricultural development, as well as the dense vegetation cover in the undeveloped area, very few indications of Stone Age occupation were identified during the survey. What was found was a number of stone tools, flakes and cores, dating to the Middle and Later Stone Age, as surface finds. As these objects are surface finds, they are out of context and are viewed to have a very low significance.

A number of rock shelters containing San rock art are known to exist in the region. These usually occur in shelters located on the granite outcrops. It is our understanding that most of the area has been extensively surveyed (e.g. Van Schalkwyk, et al 1996), although it is always possible that new sites might be identified. However, none of the known sites occur close to the new road alignment.

- **Iron Age**

Iron Age people moved into southern Africa by c. AD 200, entering the area either by moving down the coastal plains, or by using a more central route. It seems more likely that the first option was what brought people into the study area. From the coast they followed the various rivers inland. One of the earliest dated sites is located near Tzaneen (Silver Leaves). Some sites dating to this and a slightly later period, were identified at Plaston (Evers 1977) and at Vergenoeg and The Curlews (Van Schalkwyk & Teichert 2007)
Being cultivators, they preferred the rich alluvial soils close to rivers to settle on. Consequently, as the study area is in close proximity to the Crocodile River, one would expect settlement sites dating to the Early Iron Age to occur here. Unfortunately, large sections of this area has been subjected to agricultural activities, being ploughed over annually, or are used for orchards. These activities would have had a negative impact on any heritage sites that might have occurred here. Furthermore, the areas not is use for agricultural activities, are densely vegetated, which also makes the detection of sites very difficult. A few pieces of pottery were noticed in ploughed areas during the field survey. Unfortunately, all of it was non-diagnostic (i.e. it did not have any decorations), with the result that it could not be identified or dated.

- **Historic Age**

The historic period started in the 1840s. Due to the presence of malaria, few people settled here and most, being traders, hunter and miners, only passed through the area. Nelspruit as town was proclaimed only in 1905. As time went by, the area was divided into farms and more and more people settled on a permanent basis. The Pretoria – Lorenço-Marques (Maputo) railway line, also known as the NZASM line, was built through the region during the

1880s. A number of features, e.g. bridges, culverts, stations, houses, good sheds, etc. still exist and forms part of this feature. During the 1920s the old national road (now the N4) was built. Later, it was realigned in some places and upgraded. As a result some of the bridges and culverts that formed part of this road still exist, although it is not used any more.

6.1.1 *Identified Sites*

- **Stone Age**

No sites, features or objects of cultural significance dating to the Stone Age were identified in the study area.

- **Iron Age**

No sites, features or objects of cultural significance dating to the Iron Age were identified in the study area.

- **Historic period**

No sites, features or objects of cultural significance dating to the historic period were identified in the study area.

It is important to note that I&APs in one of the public meetings held at Bundu Lodge indicated that a study conducted by the University of the Witwatersrand had identified site of heritage significance along the Phumlani 1 alternative. Although the Phumlani 1 Alternative has been discarded in the EIAR phase, the study and its implications in terms of how the proposed route and alternatives may affect the heritage environment will be considered by the in the EIAR phase heritage study.

6.2 Social

The Social desktop study was conducted by Kementhree Moonsamy from Royal Haskoning DHV. This Section addresses the presentation and analysis of social and economic data for provincial, municipal and key areas in close proximity to the proposed development area.

6.2.1 *The Mpumalanga Province*

Mpumalanga lies in eastern South Africa, north of KwaZulu-Natal and bordering Swaziland and Mozambique. It constitutes 6.5% of South Africa's land area. In the north it borders on Limpopo, to the west Gauteng, to the southwest the Free State and to the south KwaZulu-Natal. The capital is Nelspruit (recently renamed to Mbombela). Mpumalanga province is divided into three municipal districts, which are further subdivided into 17 local municipalities.

- **Mpumalanga's Social and Economic Challenges**

According to the statistics provided in the Draft Mpumalanga Growth Development Plan (DMGDP 2011), the unemployment rate in Mpumalanga is standing at approximately 28%. The aim is to reduce the unemployment rate to 15% by 2020. Accordingly, the province aims to create approximately 719 000 jobs over a period of ten years, moving from 890 000 currently employed individuals to 1 609 656 employed individuals within the next ten years (DMGDP, 2011). The province further aims to increase the income level of 620 000 individuals above the poverty line by 2020 and to increase the Human Development Index[1] (HDI) from the current level of 0.50 to a higher level over the next ten years. This will be achieved by increasing the literacy level from the current 40 000 individuals per annum to 63 000 individuals per annum and increasing the percentage of life expectancy from 51 years to 62 years. In addition to this, the Province intends to reduce the Gini coefficient[2], from 0.65 to 0.55 by 2020. These broad objectives may be achieved if the provincial economy growth rate is around five and seven percent per annum, which is the target set (DMGDP, 2011).

Mpumalanga, like the rest of South Africa, continues to face the challenge of overcoming the inequalities and discrepancies created by the Apartheid regime. These challenges include the lack of basic services, continued, widespread poverty, and lack of education, increased mortality rates and HIV/AIDS, rapid urbanisation, high unemployment rates and low economic indicators. According to Statistics South Africa, the unemployment rate for the province at the end of the third quarter of 2012 was 25.3 % (Nkangala IDP, 2011-2016).

In addition to these challenges, there are noticeable variations in the distribution of the population in Mpumalanga which creates numerous challenges. The province is characterised by geographical disparities and dispersed settlement patterns which present challenges for timely and efficient service delivery. The dispersed nature of settlements further raises the costs of delivery and infrastructure provision (Nkangala IDP, 2011-2016).

- **The Provincial Economy**

  - **Mining**

    Extensive mining is done and the minerals found include: gold, platinum group metals, silica, chromite, vanadiferous magnetite, argentiferous zinc, antimony, cobalt, copper, iron, manganese, tin, coal, andalusite, chrysotile asbestos, kieselguhr, limestone, magnesite, talc and shale. Gold was first discovered in Mpumalanga province in 1883 by Auguste Roberts in the mountains surrounding what is now Barberton. Gold is still mined in the Barberton area today.

    Mpumalanga accounts for 83% of South Africa's coal production. 90% of South Africa's coal consumption is used for electricity generation and the synthetic fuel industry. Coal power stations are in proximity to the coal

[1] The Human Development Index (HDI) is a comparative measure of life expectancy, literacy, education and standards of living for countries worldwide. It is a standard means of measuring well-being, especially child welfare. It is used to distinguish whether the country is a developed, a developing or an under-developed country, and also to measure the impact of economic policies on quality of life (http://en.wikipedia.org/wiki/Human_Development_Index)

[2] The Gini coefficient is perhaps the best known inequality measure and can be derived from the Lorenz curve. Mathematically the Gini coefficient varies between zero and one, although in reality, values usually range between 0.20 and 0.30 for countries with a low degree of inequality and between 0.50 and 0.70 for countries with highly unequal income distributions

deposits. A coal liquefaction plant in Secunda (Secunda Coal to Liquid) is one of the country's two petroleum-from-coal extraction plants, which is operated by the synthetic fuel company, Sasol.

- **Agriculture**

The climatic contrasts between the drier Highveld region, with its cold winters, and the hot, humid Lowveld allow for a variety of agricultural activities. More than 68% of Mpumalanga is utilised by agriculture. Crops include maize, wheat, sorghum, barley, sunflower seed, soybeans, groundnuts, sugar cane, vegetables, coffee, tea, cotton, tobacco, citrus, subtropical and deciduous fruit. Forestry is extensive around Sabie in the far north of the province. Located near the forests, Ngodwana is the site of one of South Africa's largest paper mills (Sappi). Natural grazing covers approximately 14% of Mpumalanga. The main products are beef, mutton, wool, poultry and dairy.

- **Tourism**

Mpumalanga is also a popular tourism destination. Kruger National Park, established in 1898 for the protection of Lowveld wildlife, covering 20,000 square kilometres (7,700sqmi), is a popular destination. The other major tourist attractions include the Sudwala caves and the Blyde river canyon.

The various towns in the region have much to offer, with emphasis on both historical sites and adventure vacations. Mountain and quad biking, horse trails, river rafting and big game viewing are endemic to the region. Mpumalanga is also noted as “Big Five territory,” that is, where the famed five mammals have been given prominence (lion, African elephant, cape buffalo, leopard, and rhinoceros)[3]. The towns in the Lowveld, comprise of Barberton, Mbombela, White River, Sabie, Graskop. Hazyview, Malelane, Pilgrim's Rest, Mashishing (Lydenburg) and Nkomazi. In 2008 Haute Cuisine route was formed, trickling from Mbombela down to Hazyview.

6.2.2 *The District Municipality*

Ehlanzeni District Municipality is the most eastern district of the province of Mpumalanga. It is bordered by Swaziland and Mozambique in the east, Limpopo Province in the north, Gert Sibande District in the south and Nkangala District in the west. It consists of five local municipalities: Mbombela, Thaba Chweu, Nkomazi, Umjindi and Bushbuckridge, which became part of the district after the government decision to phase out cross-boundary municipalities in 2006.

The majority of the population lives in formal urban areas, or in villages in the tribal areas. Ehlanzeni District has the highest population density in Mpumalanga. The estimated population density varies substantially between the five municipalities with Mbombela and Bushbuckridge having the highest densities and Umjindi and Thaba Chweu the lowest.

[3] The members of the Big Five were chosen for the difficulty in hunting them and the degree of danger involved, rather than their size (http://en.wikipedia.org/wiki/Big_Five_game)

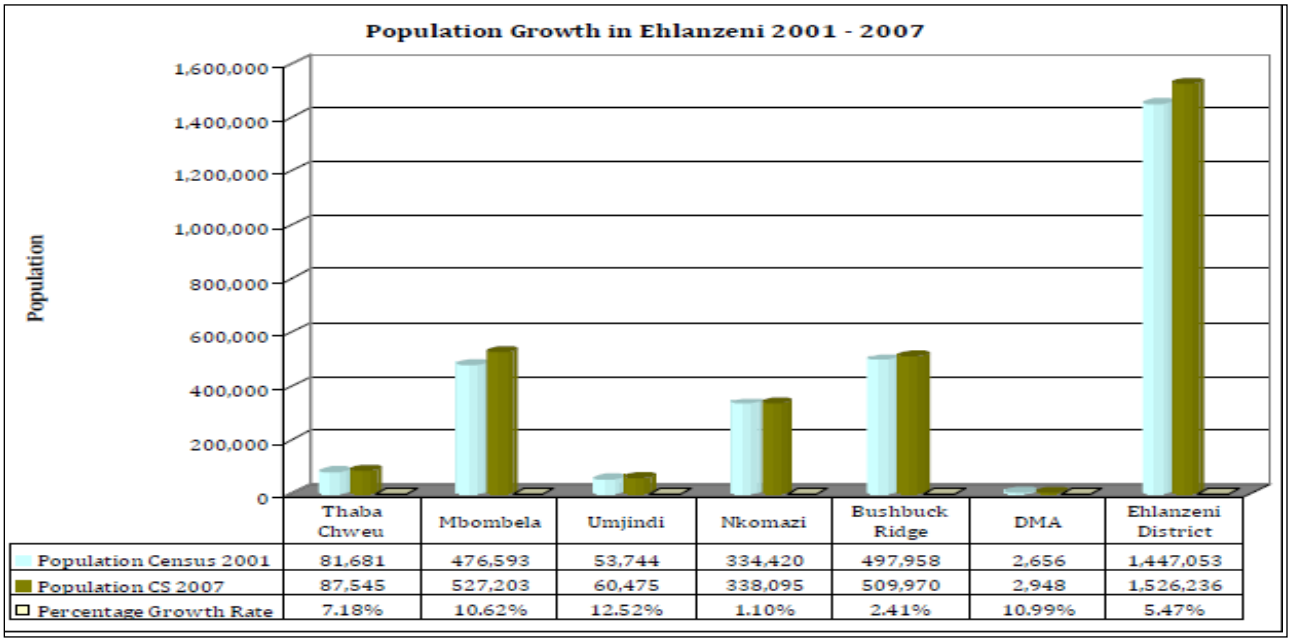
According to the Provincial Integrated Spatial Framework, Ehlanzeni area has the largest population with an urbanisation level of 17%. Mbombela, Hazyview, Barberton, White River and Malelane are the biggest urbanised areas in Ehlanzeni district. The administrative capital of the province is Mbombela, which is found in this area. Service centres in this area are Barberton, Hazyview and White River, with a diverse economic base and a strong focus on the agricultural sector. Other service centres in the Ehlanzeni area are Nkomazi, Mapulaneng and Lydenburg. The tourism and forestry centres include Sabie, Graskop, and Pilgrim's Rest (Ehlanzeni IDP 2010-2011).

The municipality consists of 9 Traditional Authorities situated in the eastern Nsikazi area. (Mbombela SDF 2009-2030). However none of these areas are within the project development area. They are:

- Gutshwa Traditional Authority
- Lomshiyo Traditional Authority
- Masoyi Traditional Authority
- Mbuyane Traditional Authority
- Mdluli Traditional Authority
- Mpakeni Traditional Authority
- Msogwaba Traditional Authority
- Nkambeni Traditional Authority
- Kgarudi Traditional Authority

- **Social and Economic Characteristics**

According to the 2007 Community Survey there are 1 526 236 people and 387 317 households in the District. 86.5 Of these households are in formal dwellings while 4.2% constitute informal housing structures (2007 Community Survey). Almost 70% (69%) of households were owned and fully paid off (2007 Community Survey). Ehlanzeni has 53% or 805,752 of its population within the female category while there is a recorded 47% (or 720,484) males in the District. The male/female ratio is 89 males for every 100 females. According to the Ehlanzeni IDP 2010-2011, the population of Ehlanzeni increased by 5.47% between 2001 and 2007, that is the population grew from 1 447 053 to 1 526 236 people.

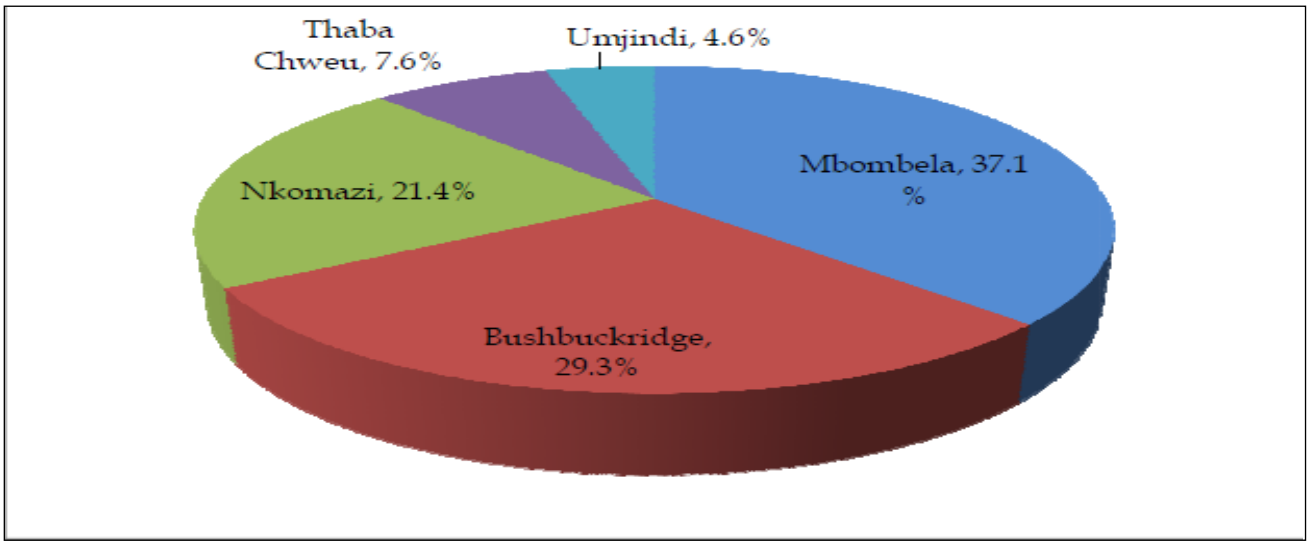


	Thaba Chweu	Mbombela	Umjindi	Nkomazi	Bushbuck Ridge	DMA	Ehlanzeni District
Population Census 2001	81,681	476,593	53,744	334,420	497,958	2,656	1,447,053
Population CS 2007	87,545	527,203	60,475	338,095	509,970	2,948	1,526,236
Percentage Growth Rate	7.18%	10.62%	12.52%	1.10%	2.41%	10.99%	5.47%

(Source: Mbombela IDP 2012)

FIGURE 28: EHLANZENI DISTRICT POPULATION GROWTH

HIV/AIDS infection rates recorded in 2008 is presented in the pie graph below. Mbombela is in a very vulnerable position due to its high infection rate, that is, 37.1% of the total Ehlanzeni District population.

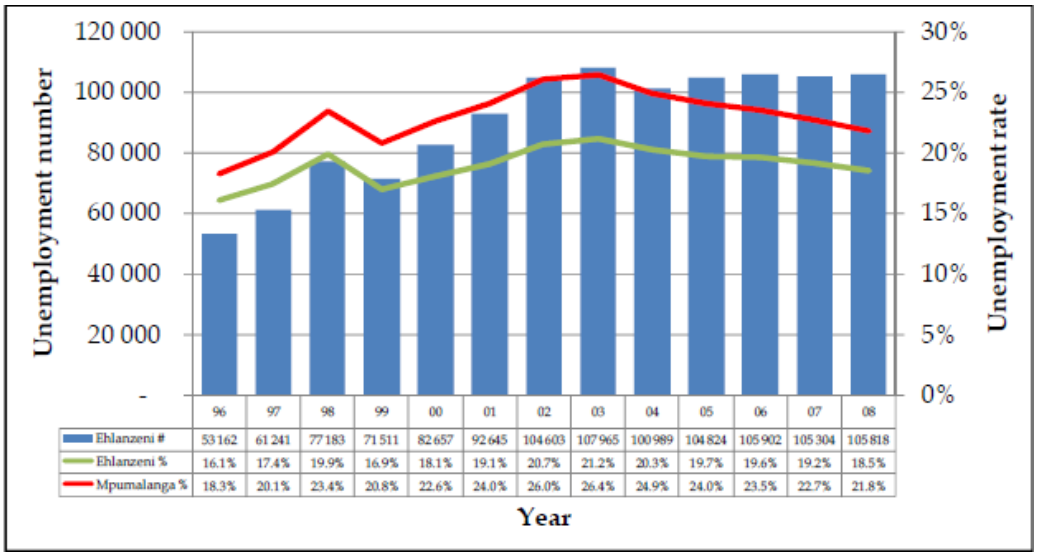


(Source: Global Insight 2009)

FIGURE 29: **EHLANZENI 2008 HIV/AIDS INFECTION RATES**

With respect to schooling in the District, 6.7% of the population has a higher education and 29.5% has secondary schooling. The Ehlanzeni IDP states that there is a need more tertiary institutions in the District in the attempt that this would improve access to tertiary education and will draw scarce skills into the province through research and other development initiatives. (Ehlanzeni District IDP 2010-2011).

According to the 2007 Community Survey 49.2% of households did not record having an income, 23.9% earned incomes between R1 – R1400 and 10% earned between R801 to R1,600 per month. The Figure below shows that the District has within its jurisdiction 44.4% of 'not economically active' participants in the economy. Unemployment rates in the District have remained on par with the Province's rates. Both experienced a peak in unemployment in the 2002/ 2003 years. Unemployment rates in 2008 in the District remained at least 3.3% below the provincial rate (Ehlanzeni District IDP 2010-2011).



	96	97	98	99	00	01	02	03	04	05	06	07	08
Ehlanzeni #	53 162	61 241	77 183	71 511	82 657	92 645	104 603	107 965	100 989	104 824	105 902	105 304	105 818
Ehlanzeni %	16.1%	17.4%	19.9%	16.9%	18.1%	19.1%	20.7%	21.2%	20.3%	19.7%	19.6%	19.2%	18.5%
Mpumalanga %	18.3%	20.1%	23.4%	20.8%	22.6%	24.0%	26.0%	26.4%	24.9%	24.0%	23.5%	22.7%	21.8%

FIGURE 30: UNEMPLOYMENT IN EHLANZENI DISTRICT

The figure below presents the occupational categories prevalent in the Ehlanzeni District. Most employed individuals occupy elementary positions (19.0% of the employed population, or 65 969 individuals), while the two other largest occupations are 'unspecified[4]' (over 14% or 46 654 individuals) and craft and related trade work (over 13% or 44 948 individuals).

[4] Unspecified may refer to informal work

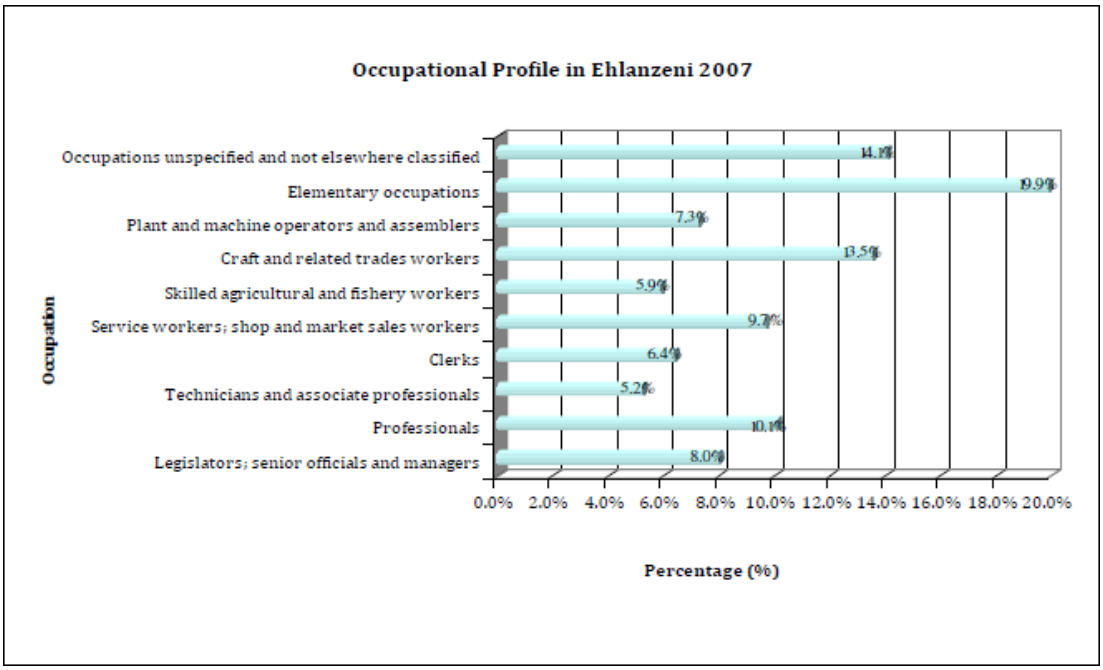


FIGURE 31: OCCUPATIONAL PROFILE OF EHLANZENI'S POPULATION

- **Key Strengths in the Ehlanzeni District**

Ehlanzeni District includes both Lowveld and escarpment country. Agriculturally, the area has much to offer. An abundance of citrus fruit and other subtropical fruits - mangoes, avocados, guavas, paw-paws, litchis, bananas and granadillas as well as sugar cane, pecan and macadamia nuts and many types of vegetables are cultivated. Mbombela, the Provincial capital, is the second largest citrus-producing area of South Africa and is responsible for a third of the country's export of oranges (South African LED Network).

The Ehlanzeni SMME Development and Support Plan 2009- 2014 shows the number of SMME's within Ehlanzeni District along with the sectors they are found in, this is found in the Table 7 below.

TABLE 6: PERCENTAGE SMME SECTORAL REPRESENTATION

SMME Scope	Total No of SMMEs within the Sector	Sectoral Representation
Agriculture	88	4.24%
Mining	4	0.19%
Manufacturing	105	5.06%
Construction	156	7.52%
Trade	1236	59.60%
Transport	55	2.65%
Electricity	23	1.11%
Finance Services	102	4.90%
Community Services	305	14.71%
Total	**2078**	**100%**

6.2.3 *The Mbombela Local Municipality*

Mbombela is one of 5 local municipalities situated within the Ehlanzeni District Municipality, which also includes part of the Kruger National Park. The municipality is divided into 5 zones namely, Nelspruit A, Nelspruit B, Nelspruit C, Hazyview and Nsikazi. These municipal zones are based on the latest ward delineation which came into effect on 18 May 2011. The municipal wards increased from 36 to 39 and part of Kruger National Park fall within the municipal area as Ward 39 (Mbombela SDF 2012). The project study areas (extent of the proposed road) fall within Ward 14 and Ward 30 of the Mbombela LM.

The Mbombela LM records a 2007 population of 137 353 out of a total District population of 387 317 (2007 Community Survey). MLM has the largest population size within the Ehlanzeni District. It constitutes 35% of the total District's population, with the rest of the municipalities constituting 65%.

Mbombela Local Municipality is generally not affected by the illegal occupation of land near towns and therefore there are no slums in the main towns. In 2005 there was an attempt by communities living in the periphery to invade a privately owned piece of land (Dingwell farm) situated close to White River. This may well be an indication that there is a need to embark on interventions that will integrate these communities with urban centres. The Mbombela Local Municipality is comprised of non-formalised settlements (Tribal land or R118 towns), townships (R293 towns), formalised towns around town centres and farm land (Manikela, Research Report 2008).

Social Characteristics

- **Demographics**

The population of the municipality is growing rapidly. The census count of 2001 revealed that the total population was 476,593 and has increased to 527,203 during the census count of 2007 (Stats SA, 2007). This implies that there was an increase of 10, 6 % from 2001 and 2007. According to the Stats SA, 2007, the household size has increased by 25,127, from 112,226 in 2006 to 137,353 household in 2007 respectively. The average household number in recorded as 3.84 members per household (Mbombela IDP 2012-2017).

- **Service Provision**

According to the household survey of 2007, 86.8% of households were recorded as formal households, with 4.3% falling into the 'informal' household category. 59.4% of houses are owned and fully paid off, with 13.2% rented, and 18.6% occupied rent free (2007 Community Survey). With regards to basic service provision; 53.3% of households utilise a pit latrine with 8.7% recorded as having no toilet and over 35% have flush toilets. Of the 91.5% of households that have some form of piped water, 40.9% have water piped into the dwelling, 29.2% utilise water from pipes within the property and 21.4% access water via pipes (standpipes) found outside the property 85,2% of households in the LM use electricity for lighting, as compared to a provincial average of 61.1%. 73, 6% of households utilise electricity for cooking with 61, 8% using electricity for heating purposes. Only 29.2% of households responded positively to having refuse removal services whether private or government provided (2007 Community Survey).

- **Education and Health Levels and Facilities**

According to Stats SA (2007), the level of education in the municipality is very low. Approximately 11.32% of the sampled population of 527 204 have no schooling, 27.67% completed primary education, 6.11% completed primary education (Grade 1-7), 13.22% completed secondary education and 8.71% completed higher education. The Mbombela IDP reports that it has within its LM the following educational facilities:

- 151 public primary schools
- 59 public secondary schools
- 25 independent (private) schools
- 5 tertiary institutions

TABLE 7: NUMBER AND TYPE OF MBOMBELA'S PUBLIC FACILITIES

Amenities	Total amenities	Hazyview	Nelspruit A	Nelspruit B	Nsikazi
Community Halls	24	2	5	8	9
Cultural centres	1	0	0	1	0
Theatres/ Amphitheatre	2	0	2	0	0
Libraries	10	2	3	2	3
Sports Fields	9	1	4	2	2
Swimming Pools	5	2	3	0	0
Multi-purpose sports courts	9	2	2	3	0
TOTAL		**9**	**19**	**16**	**14**

Mbombela has two district hospitals (Rob Ferreira and Themba), one TB hospital (Bongani) and three private hospitals. There is at least one government health care facility every 5- 10 kms. However the level of services provided is limited. Facilities are under-resourced, with insufficient health education programmes. The recording of vital information such as births and deaths is lacking, making it more difficult for basic services provision (Mbombela IDP 2012-2017).

HIV/AIDS still remains the biggest challenge. According to a Department of Health Survey (2009) in the Mbombela IDP 2012-2017, Mbombela has an HIV prevalence rate of 43%. It is the second highest in the Ehlanzeni District. There are 29 clinics providing health services, two being accredited. The municipality has a HIV/AIDS strategy in the review process. (Mbombela IDP 2012-2017).

- **Security and Safety**

The highest recorded crimes are property related, at 17.3% followed by social crimes at 7.4% (theft, muggings) and violent crimes at 2.3%. An average of 41 102 people are served by one police station in the District. There is an average of 6 581 accidents per annum and most of these accidents happen during peak hours and after hours. Feedback from Interested and Affected People (IAPs) into the IDP process showed that there is a need for visible traffic policing, and a need for pedestrian and overhead bridges to assist in the reduction of accidents within

Mbombela. Poor road infrastructure and street lighting have been pinned as contributing factors to accidents. (Mbombela IDP 2012-2017).

- **Vulnerable populations**

A Department of Health Survey (2009) in the Mbombela IDP 2012-2017 accounts for 3000 orphans and 2000 vulnerable children in the municipality that need assistance. The IDP states that as a mitigation measure, the LM is involved in 32 home-based care projects, of which 16 are funded by the Department of Social Services, 15 funded by the Department of Health and 1 is funded by the Expanded Public Works Programme conditional grant (Mbombela IDP 2012-2017).

- **Economic Characteristics**

Mbombela Local Municipality (MLM) has a well-established economy consistently achieving growth rates higher than the South African and Mpumalanga economies in most sectors. Mbombela is the seat of the Mpumalanga provincial government and the foremost industrial, commercial, retail and services centre for the region, including Mozambique and Swaziland (South Africa LED Network, Mbombela LM).

MLM is endowed with areas like Mbombela which is the capital of the Mpumalanga province. Hazyview is an important banana producing and eco and adventure tourism area, White River, which is an important tourist and farming area. MLM is currently involved in the following big projects: the development of the Maputo Development Corridor project, the Mpumalanga Investment initiative, the Transfronteir Park, the Mpumalanga International Airport and hosted the 2010 FIFA World Cup. (South Africa LED Network, Mbombela LM).

Development in Mbombela is concentrated along three corridors. The western development axis, along the R40 road includes Mbombela, Rocky Drift, White River and Hazyview. It has a well-developed municipal infrastructure, and provision of services is of high standard. There is steady growth of commercial and industrial activity, as well as in the provision of services to the high income residential areas (South Africa LED Network, Mbombela LM).

In the south the second axis, along the N4, runs east/west through the area. It gives access to Mbombela and Ngodwana Sappi, one of the largest pulp and paper manufacturing centres in the southern hemisphere, and in the east reaches the Mozambique border and provides access to Maputo. Together these axes account for more than 85% of all industrial, commercial and retail development, and there is good potential for further growth (South Africa LED Network, Mbombela LM).

To the east, a secondary development axis extends along the D363, D1411 and other roads. The area is characterised by mainly low income urban development and rural villages which are supported by subsistence crop production and livestock farming on communal land. These services infrastructure is poorly developed; accessibility is limited due to the poor condition of the roads; and there is little retail or industrial development (South Africa LED Network, Mbombela LM).

- **Employment**

The municipality's eligible employed work force is estimated to be 165,594 (50.19%). The number of unemployed residents is estimated to be 52,290 (15.85%). The highest unemployment rates are recorded in Nelspruit B, Hazyview and Nsikazi zones (Mbombela IDP 2012-2017). The figure below shows that the two occupational categories that employ the most labour is in elementary occupations (19.08%) and Craft and related trade works (13.51%) of the total 32.03% employed. The number of employed individuals with an income of less than R1 600 per month constitutes 41.3% and those without an income constitute 42.6 % of the total LM population.

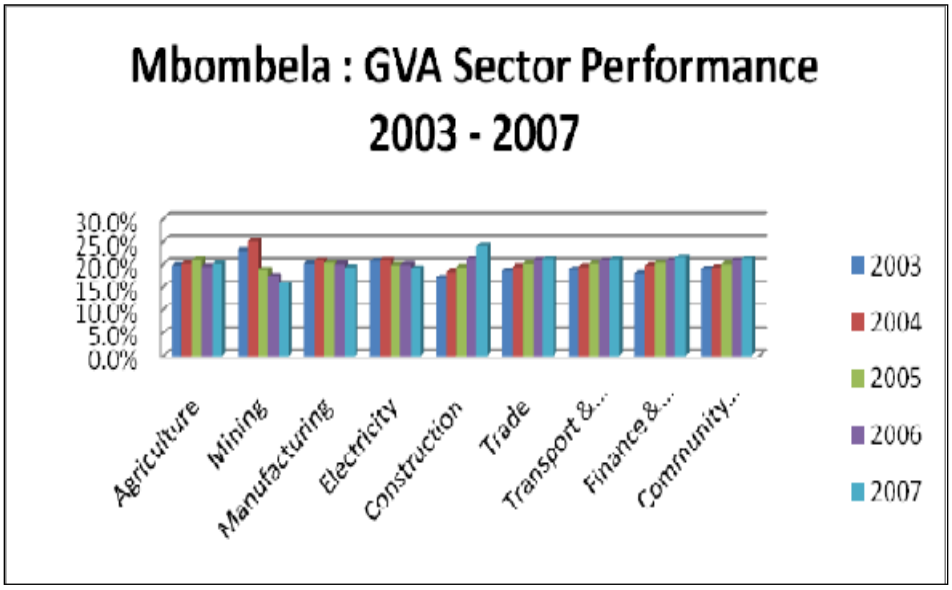
TABLE 8: PERCENTAGE OCCUPATION PER CATEGORY IN MBOMBELA

Category of Occupation	Number	Percentage
Legislation, senior officials and managers	15 234	9.02%
Professionals	16 037	9.50%
Technical and Associate Professionals	10,882	6.44%
Clerks	12,509	7.41%
Service workers, ship and market sales workers	16,424	9.73%
Skilled agricultural and fishery workers	9,437	5.59%
Craft and related trades workers	22,807	13.51%
Plant and machine operators and assemblers	11,816	7.00%
Elementary occupations	32,225	19.08%
Occupation unspecified and not elsewhere classified	21,496	12.73%
Total	168,867	32.03%

Source: Mbombela IDP 2012-2017 (2007 Community Survey)

Industry Performance

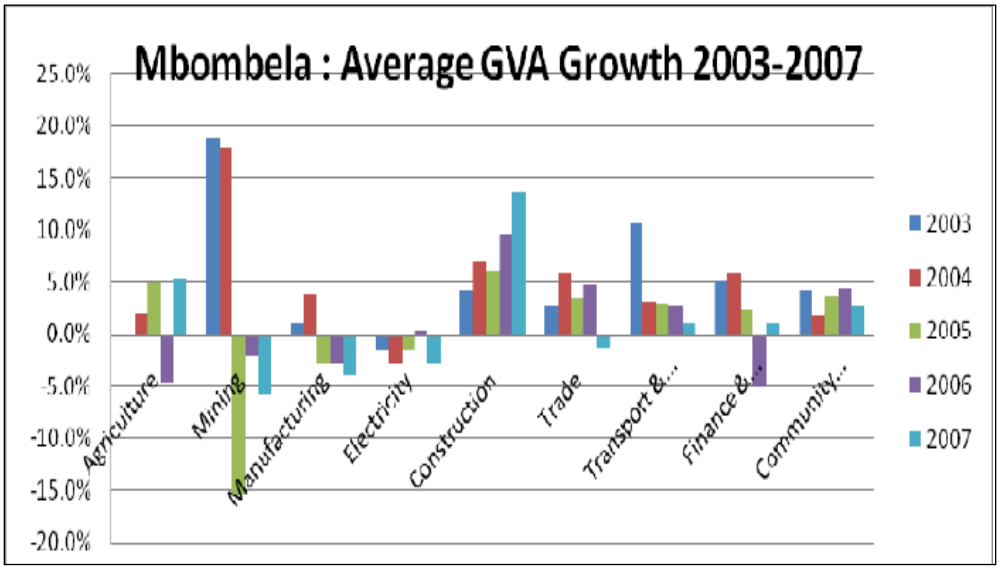
Data gleaned from Global Insight research (2007) shows that the agriculture, manufacturing, electricity, transport and communication sectors experienced fluctuations in performance over the 2003-2007 years. During the period 2005 to 2007, the mining sector declined from 25%to 15.7% (Ehlanzeni SMME Development and Support Plan 2009-2030).



Source: (Ehlanzeni SMME Development and Support Plan 2009-2030)

FIGURE 32: MBOMBELA'S GVA SECTOR PERFORMANCE (2003-2007)

Sectors like construction and community services experienced positive growth over the years. Mining, agriculture and manufacturing experienced a mixed growth over the years, along with finance and business services sectors (Ehlanzeni SMME Development and Support Plan 2009-2030).



Source: (Ehlanzeni SMME Development and Support Plan 2009-2030)

FIGURE 33: MBOMBELA'S AVERAGE GVA GROWTH (2003-2007)

- SMME Development Challenges and Opportunities

  - The SMME sector within EDM faces a number of challenges and opportunities. Key challenges are among others: Access to information on SMME development and support, as well as the uncoordinated

nature of the support; Access to funding, markets, as well as delayed payments, especially by Government departments;
- Lack of entrepreneurial, business management and technical skills required to ensure operational efficiency of the SMMEs; and
- Absence of body co-ordinating SMME activities within the district, thereby depriving SMME's of a platform to network and be exposed to economic opportunities.

However, opportunities that could be exploited include agriculture and agro-processing potential, tourism development, trade related opportunities, and opportunities in other related sectors (Ehlanzeni SMME Development and Support Plan 2009-2030).

- **Key Strengths in the Mbombela Local Municipality**

MLM's key strategic objectives are to provide water and sanitation and other basic services to its communities. The municipality's competitive advantage is its location which enables it to take advantage of the strong international, regional and national linkages to become an active regional economic player.

Between the eastern and western axes is an area of rich agricultural land along Crocodile and White Rivers. Fertile soils and the subtropical climate provide perfect conditions for the production of citrus and tropical fruits, such as mango, banana, avocado, macadamia and pecan nuts. Hazyview is an important banana-producing area. It is also the centre of the major agricultural area producing coffee, nuts, spices, and vegetables. It is the gateway to private reserves that form the western conservation extension to the Kruger National Park.

White River is an important farming and tourism centre. The chief agricultural products are tropical fruits, vegetables, flowers and timber. With three irrigations dams and a number of nearby forests, it is a popular holiday destination (Ehlanzeni SMME Development and Support Plan 2009-2030).

- **Key Weaknesses in the Mbombela Local Municipality**

The primary and secondary sector contribution to the GDP of Mbombela is dependent on investment in value adding processing of the raw agricultural and forestry products. There is therefore a need to invest in research and development to diversify the economy. This will entail expansion in the industries of food and beverage, wood and wood products, paper and paper products (Ehlanzeni SMME Development and Support Plan 2009-2030).

6.3 Noise

The Noise study was conducted by Barend van Der Merwe from DBAcoustics through a desktop study and preliminary site visit. This section describes, analyses the prevailing noise activities, the receiving environment and potential impacts within the study area.

6.3.1 *The Noise Receiving Environment*

The proposed P166 route and its alternatives will run in the vicinity of other main feeder roads and noise sensitive areas which include residential areas, businesses and informal settlements (Figure 28).

The prevailing ambient noise levels along this proposed road vary between built-up areas with high prevailing ambient noise levels to areas where there are low prevailing ambient noise levels because of the rural type district of the area. The prevailing ambient noise levels are made up out of traffic noise, domestic noise, built-up area noise, industrial type noises and residential type noises. This road will be a linear type noise source with high noise levels during peak periods and low noise levels during periods with less to little traffic. This is a phenomenon along all feeder roads.

The levels of noise emissions from road traffic as given in SANS 10210 for the prediction of road traffic noise are a function of:

- The number of vehicles passing in a time period (determined for each hour);
- The mean speed of the vehicles;
- The percentage heavy-duty vehicles;
- The road surface texture;
- The road gradient;
- The road worthiness of the vehicles;
- Distance between road and receiver;
- Intervening topography and structures that may shield the noise from the receiver; and
- Meteorological effects.

Current Noise Sources

Traffic noise, wind noise, domestic type noise and farming activity noise are the main contributors to the prevailing ambient noise level of the different areas within the study area. A road becomes a linear noise source and when it is a major road there will be noise levels of up to 65.0dBA at 20m from the road (not knowing the service level of this road, we can assume that this will be the noise levels along this road). There is a decrease in the noise level during the night time period but that is according to the volume of traffic during the night time period. There will be periods when there is no noise but the intermittent nature of night time traffic becomes at times more intrusive than the daytime continuous noise level.

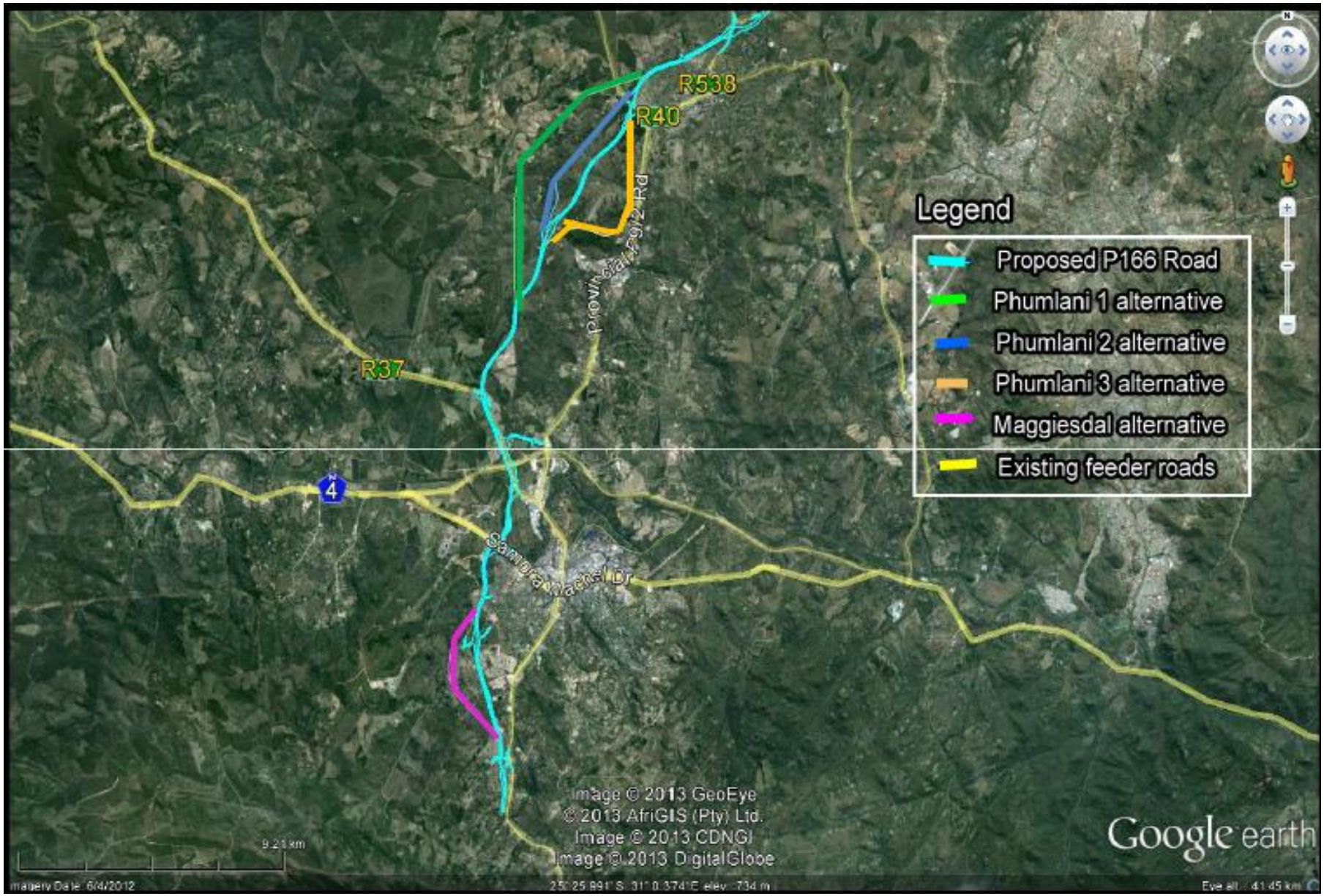


FIGURE 34: EXISTING FEEDER ROADS AND NOISE SENSITIVE AREAS

7 POTENTIAL ENVIRONMENTAL IMPACTS - BIOPHYSICAL

7.1 Wetlands

7.1.1 *Wetland Impacts from Roads*

Roads can have a significant impact on surface water features, as depending on the design of the road crossing the surface water feature may be physically affected as the footprint of the road will affect the hydrology and habitat of the surface water feature to varying degrees. The degree of impact depends to a large degree on the type of the road crossing. Spanning a water feature by building a bridge or similar structure typically has much less of an impact than if the road structure is constructed into the wetland – i.e. the substrate of the road is constructed into and across the surface water feature and culvert structures are used to allow flow to underpass the road. A bridge structure typically has a much lesser physical footprint in the bed of the river or wetland, thus resulting in a lower loss of vegetation and disturbance of physical habitat. Conversely roads will tend to have a much greater physical footprint within a surface water feature in the latter case as foreign substrate will need to be laid and imported into the bed and banks of the feature.

The alignment of the road in relation to the wetland or watercourse is also very important in the context of the nature and intensity of the impact of the road on a wetland. The wetlands and watercourses encountered in the study area are mostly linear narrow features, and thus if they were crossed at a perpendicular angle to the direction in which the feature drains, the physical footprint of the road would be limited. However if the road were to cross the river at a longitudinal angle, or at worst parallel to the course of the feature, a much greater area of the surface water feature would be physically affected, thus being likely to increase the intensity of the impact. This is a very important factor in the context of certain of the wetlands potentially crossed in the study area, as discussed below.

FIGURE 35: A WETLAND IMPACTED BY RECENT ROAD CONSTRUCTION ACTIVITIES ALONG THE PORTION OF THE EXISTING SERVITUDE THAT WOULD LINK THE P166 WITH THE R40 TO THE NORTH OF THE RIVERSIDE MALL AND N4 BYPASS IN MBOMBELA

The two most important types of impacts that would relate to new roads constructed into and across surface water features relates to the destruction of riparian / wetland habitat and vegetation and the alteration of the hydrological regime. Depending on the nature of the design roads constructed into a surface water feature could involve the placing of imported substrate into the bed of the watercourse or wetland. This would cause a certain area of vegetation on the banks and in the channel to be lost. The presence of the raised road and its substrate typically acts as hydrological barrier to flow in the system. This would typically alter the hydrology of the surface water feature by effectively 'damming' water on the upstream side of the road (making this wetter than the pre-construction situation) and by allowing water to bypass or underpass the road to the downstream section of the wetland more slowly or in lesser volumes. The impounding effect can also have an important effect on the morphology of the watercourse as sediment that is transported down the watercourse during flow periods would be trapped behind the structure. This can alter the natural sediment balance of the downstream watercourse, and by depriving the downstream stretches of sediment, can induce erosion in these stretches as the natural sediment balance is re-established.

Culverts are often constructed under road crossings of watercourses. The number and size of the culverts is an important factor in determining the degree and nature of the impact on the hydro-morphological regime of the feature; too few culverts can exacerbate the impounding function of the road, also concentrating flow downstream of the crossing which can result in channelisation of a wetland. This is very important in the context of wetlands,

where diffuse flow would naturally occur within the bed of the valley bottom; the reduction in diffuse flow and channelisation of the downstream part of the wetland can have an important impact on the resource quality in the wetland and could negatively affect its level of functionality. In this context the alteration of the hydrology of a surface water feature can alter the vegetative composition of a wetland, by allowing pioneer non-wetland plant species to establish themselves in an area where the wetland has been channelised and the water table has been lowered, thus desiccating the wetland.

7.1.2 *Ecological Impacts in the Context of Surface Water Features*

Surface water features are ecologically very important for a number of reasons due to presence of aquatic and riparian habitat and the associated biota that occur within these habitats. Surface water features are typically linear in nature, and in many cases provide a last remnant of natural habitat in an otherwise transformed landscape. For these two primary reasons, surface water features often act as important movement corridors and ecological linkages between areas of residual natural habitat. The development of a road through a surface water feature such as a wetland can be associated with a number of impacts on the movement of biota through this feature. Road crossings typically create a 'hard barrier' across the surface water feature in the context of its bed and banks. The creation of this barrier is a very strong hindrance to both aquatic and terrestrial biota using the wetland or watercourse as a movement corridor. Animals moving across a road may be prone to greater mortalities and increased predation as they move across the cleared area of the road surface and reserve. Road crossing structures not designed to accommodate low water flows through the crossing may similarly be a significant hindrance to the movement of aquatic biota

As most of the surface water features in the area are associated with a riparian zone, the road crossings of surface water features will have an impact on these riparian areas. Riparian vegetation will be cleared within the road and road reserve footprint, and thus will have an impact on the structural integrity of the riparian zone. Importantly it introduces the edge effect which can have an important effect on biota within the riparian zone, and create a very convenient 'entry point' into the riparian zone and wider riverine corridor for alien invasive vegetation d such as bugweed (*Solanum mauritianum*) and *Lantana camara*. Certain of the tree / shrubs occurring within the riparian zones of rivers and watercourses in the study area are protected species, and these would be felled if they are located within the reserve. Although many of the larger trees are not subject to protection under the National Forestry Act, these larger trees are locally very important as they provide an important seasonal source of food for many animals, including many avian frugivores (fruit-eating bird species).

7.1.3 Cumulative Impacts

The loss of wetlands in the White River and Nelspruit areas has been raised through the scoping phase public participation process. Development (both legal and illegal), has been responsible for significant loss of wetlands in these areas. In this context the cumulative loss of wetlands caused by the proposed road has been raised as a potentially significant impact; i.e. the road could add to the overall loss of wetlands in these areas. Part of the cumulative impact could relate to the reduced functionality of the wetlands over this wider to provide the hydrological and water quality-related functions that are critical in the context of water supply to the growing population of the Mbombela Municipality, currently supplied by the Crocodile River. Although the scope of this

study is not a catchment-based assessment of wetland health and functionality, these impacts at a cumulative level will be further investigated in the EIAR-phase wetlands study.

7.1.4 Identification of Sensitive Areas/ Areas of potential high impact

There are a number of sensitive areas / areas of potential high impact along the road. One such part of the route of the proposed road is in the White River area. In this area the P166 servitude runs through an open space between the suburbs north of the CBD and the Colts Hill suburb. However a stream and associated wetland runs along most of the length of this open area between the White River-Sabie Road (near the Kosmos Macadamia offices) and the R40 road as it exits the town to the south of the Casterbridge complex. The wetland system forms a tributary of the White River which drains the area to the north of the town, joining the river close to where the river is crossed by the R40 south of Casterbridge. The wetland system is approximately 3.6km in length, being a valley bottom feature with suspected seepage inputs from the adjacent footslopes. The existing P166 servitude traverses the length of this open space within White River, skirting the northern edge of the residential properties to the north of Outeniqua and Maluti Streets and Impala Road, thus running to the south of the stream / wetland channel. East of where the Danie Joubert Street crosses this open space the servitude shifts to the northern side of the channel to join the R40 and R358 just to the south of Casterbridge. Due to the alignment of the road in relation to the valley bottom stream which entails that the wetland is crossed obliquely at two points (at the head of the system near Outeniqua Street and east of Danie Joubert Street), and taking into consideration the width of the servitude (c80m), a relatively large area of wetland could be affected by the proposed road servitude. This impacted area would be increased depending on how far the wetland extends to the south of the channel towards the residential properties; i.e.to what degree the seepage components on the footslopes of the valley that feed into the channel are physically traversed. The physical transformation of such an area of wetland could constitute a highly significant localised impact on this particular wetland system, and in the wider context of the catchment of the White River. This impact has been raised by a number of residents of White River and other stakeholders. The sensitivity of this wetland is enhanced by the presence of both threatened fauna and flora species. Due to its biodiversity-related sensitivities and the level of intensity of the potential impact of the road on this wetland, this wetland has been identified as a priority wetland for further investigation in the EIAR-phase wetland study.

In another part of the route, the P166 servitude and Phumlani Alternative 1 traverses an area that is highly natural in character and is relatively undisturbed. The area lies to the south of the Heidelberg dust road to the west of Rocky Drift, and is owned by Hall and Sons. Apart from a few plantation compartments, the area consists of natural savannah typical of the Legogote Sour Bushveld vegetation type. A number of wetlands drain into the Sand River that drains southwards towards the Crocodile River. In the context of the study area which is relatively highly transformed with a high degree of fragmentation of natural habitat, this residual natural area is very important not only in an ecological context, but in a wetland context as well. Due to the transformation of the catchments of most of the wetlands in the study area, this area that displays a natural ecotone between wetlands and the surrounding natural upland catchments is very important, and as such these wetlands have been prioritised for further assessment in the EIAR phase. The nature of the potential impact of the proposed road on these wetlands will need to be assessed.

7.1.5 *Recommendations*

Further studies will be conducted during the EIA phase to verify and assess the significant impacts on water resources, recommend mitigation measures and to confirm the selection of preferred alternatives. Attention will be paid to those areas of high sensitivity identified above, as well as to areas where the presence of wetlands needs to be confirmed. Wetlands along the length of the servitude and alternatives will be assessed in the EIAR-phase wetland study in order to determine the nature and intensity of the road development on the wetland.

In the context of the P166 servitude and Maggiesdal alternative there are roughly the same number of surface water crossings between the Maggiesdal alternative and the section of the P166 main servitude, thus there is no preference from this perspective. If the nature of the surface water crossings along each route is examined in more detail, the P166 servitude crosses the Brinkspruit valley bottom wetland at an oblique angle (i.e. not perpendicularly), thus potentially affecting a longer stretch of the wetland than what would ideal from a wetland impact perspective. Although the Maggiesdal Alternative crosses the Gladdespruit twice, the physical footprint of the alternative on this wetland could be reduced if the alternative alignment was shifted slightly to the west, to avoid the wetland. For this reason, the Maggiesdal Alternative is slightly preferred from a surface water perspective, although the main P166 servitude does not constitute a fatal flaw.

In the context of the Phumlani Alternatives Phumlani Alternative 1 would cross the highest number of wetlands, double the number crossed by the respective section of the main P166 servitude. In addition this alternative traverses an area that is highly natural and in which the wetlands are largely undisturbed. Due to this factor and the much higher number of crossings, Alternative 1 is least preferred from a surface water context.

In terms of the number of crossings, there is very little to separate the main P166 servitude and Phumlani Alternatives 2 and 3, as these largely traverse the same drainage systems. Alternative 3 runs partly through an area of natural character close to a granite inselberg, thus the wetlands crossed here would be more likely to be in a natural state. Conversely, the wetlands that would be crossed by the main P166 servitude in the area around the informal settlement are likely to be degraded, and thus arguably less sensitive from an ecological perspective. The same situation exists for Alternative 2 part of which is located on the boundary of the informal settlement. It is arguably better to consolidate impacts on wetlands in one place, thus it would be arguably preferable to consolidate existing impacts and impacts associated with the proposed road in one set of wetlands. In this context:

- The main P166 servitude and Alternative 2 are most preferred from a surface water perspective
- Alternative 3 is less preferred, but not a fatal flaw
- Alternative 1 is least preferred

7.2 Agriculture Geology and Soils

7.2.1 *Potential Impacts, Preliminary Assessment and Recommendations*

The main potential impact identified for the proposed P166 and its alternatives is the loss of agricultural soil in irrigated areas closer to the Crocodile River. The type of farming practiced within the study area will in all probability be a mixture of arable production (on the deeper, more productive soils) and livestock grazing. Within the wider landscape as a whole, a road will not have a significant impact if areas of irrigation are avoided as far as possible. However, any construction activity, including that involved in the establishment of a new road, will lead to disturbance of the natural soil environment, including surface and subsurface drainage processes. It is imperative that the physical extent of the construction is minimized as far as possible, so that potentially agricultural areas are not affected unnecessarily. In addition, the natural flow of water should not be impeded and the road (including its reserve and/or supporting structures) should not concentrate or increase the runoff to unacceptable levels.

Due to the fact that this study was done at Scoping level, and that there was no field investigation involved, it is difficult to quantify the soils of the various alternatives to any degree of detail. It is also therefore difficult to quantitatively assess the differences (including the different impacts) between the various alternatives. However, it is envisaged that at the next phase of the study (EIA Phase), a field investigation will be carried out, whereby the soils along each of the alternative routes will be studied at a suitable level of detail. This information, along with observed agricultural practices and activities, will enable the alternatives to be properly compared and the various impacts assessed.

7.3 Biodiversity

7.3.1 *Potential Impacts and Preliminary Assessment*

The proposed P166 road and alternatives are located within areas where various forms of land use occur and these include the Legogote Sour Bushveld (SVI 9) which is considered an endangered vegetation type, the Pretoriuskop Sour Bushveld (SVI 10) vegetation type is not threatened with large areas conserved in the Kruger National Park and areas which are transformed due to commercial agricultural activities and urban sprawl. Soil erosion is regarded low to medium with veld degradation evident in grazed and cultivated areas. The alien plants degradation is evident with large patches on the ground. Four sensitivity categories of areas were identified and shown in figure 29 below:

- **High**: Areas with high species richness and habitat diversity comprising natural indigenous plant species. These areas are ecologically valuable and important for ecosystem functioning.

- **Medium**: An area with a relatively natural species composition; not a threatened or unique ecosystem; moderate species and habitat diversity. Development could be considered under exceptional conditions with limited impact on the vegetation / ecosystem.
- **Low-medium**: Areas with relatively natural vegetation, though a common vegetation type. Could be developed with mitigation and expected low impact on ecosystem.
- **Low**: A totally degraded and transformed area with a low habitat diversity and ecosystem functioning; no viable populations of natural plants. Development could be supported with little to no impact on the natural vegetation / ecosystem.

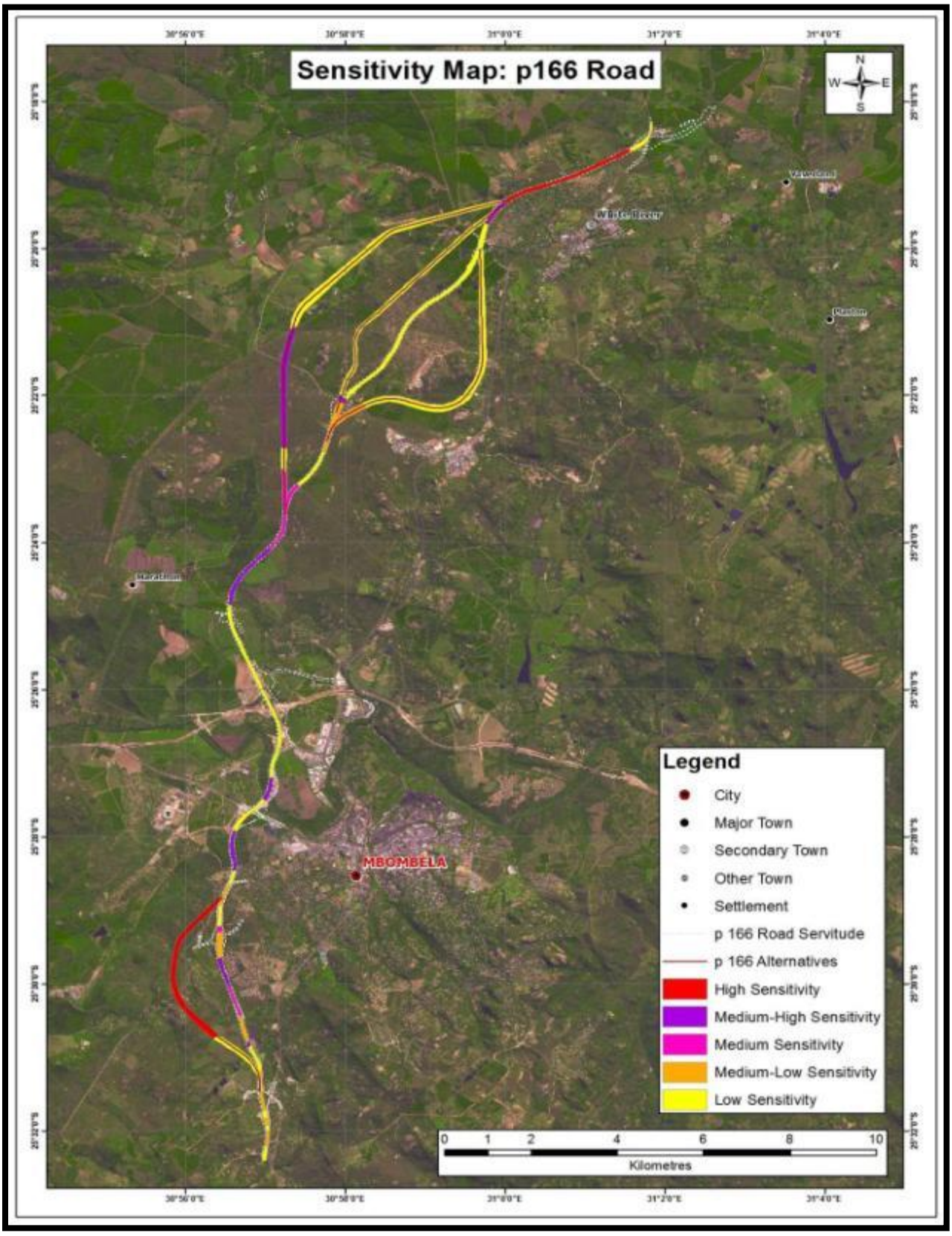


FIGURE 36: RELIMINARY SENSITIVITY MAP FOR THE PROPOSED P-166 ROAD

7.3.2 *Recommendations and implications for development of the alternatives*

From an ecological perspective the Phumlani alternative 3 is preferred as it bisects large transformed vegetation units with low conservation potential or likelihood for red listed plant or animal species. The Phumlani alternative 3 only bisects two wetland habitats.

The Phumlani alternative 1 bisects 9 wetland habitats as well as rocky slopes which could potential offer suitable habitat for several rupicolous Red Data reptile species namely Swazi rock snake (*Lamprophis swazicus*), Wilhelm's flat lizard (*Platysaurus wilhelmi*) and Haacke's flat gecko (*Afroedura haackei*). **.**

The Phumlani alternative 2 bisects a section of rocky hillslope as well as 4 wetland or river crossings which could potentially offer suitable habitat for the red listed *Gunnera perspensa* and *Eucomis autumnalis*.

The main P166 alignment is preferred over the Maggiesdal Alternative 1 as this alternative bisects natural larger areas of natural Legogote Sour Bushveld as well as indigenous riparian vegetation along a perennial river (the Gladdespruit). The P-166 alignment runs parallel to a degraded non-perennial drainage line as well as transformed vegetation units. The P-166 alignment is also situated closer to existing high density residential areas which would have resulted in the alteration of the faunal composition due to the associated high levels of anthropogenic activities.

It is recommended that a final walk through of all sensitive habitats of the preferred alignments are undertaken by faunal and floral specialists once the route is adequately marked out by a qualified land surveyor in order to determine possible rare or threatened plant or animal species that would be significantly impacted and to recommend suitable mitigation measures for any on site specific problems.

8 POTENTIAL ENVIRONMENTAL IMPACTS – SOCIAL

8.1 Heritage

8.1.1 *Preliminary Assessment and Recommendations*

As mentioned above that there were no sites of archaeological importance which were identified through a desktop study that will be impacted by the proposed project, hence from the heritage perspective, all alternatives were preferred. The road could potentially impact hitherto undiscovered heritage sites, transforming these sites or causing their destruction. Accordingly a full heritage impact assessment (i.e. detailed walkthrough) and palaeontological study of the P166 and its alternatives will be conducted during EIA phase to verify archaeological and palaeontological resources, sites and features occurring within the proposed project and to confirm the findings of the desktop study.

8.2 Noise

8.2.1 *Potential Noise Impacts*

- Sound is a wave motion, which occurs when a sound source sets the nearest particles of air in motion. The movement gradually spreads to air particles further away from the source. Sound propagates in air with a speed of approximately 340 m/s;
- The sound pressure level in free field conditions is inversely proportional to the square of the distance from the sound source – inverse square law. Expressed logarithmically as decibels, this means the sound level decrease 6 dB with the doubling of distance. This applies to a point source only. If the sound is uniform and linear then the decrease is only 3 dB per doubling of distance;
- The decibel scale is logarithmic therefore decibel levels cannot be added together in the normal arithmetic way, for example, two sound sources of 50 dB each do not produce 100 dB but 53 dB, nor does 50 dB and 30 dB equal 80 dB, but remains 50 dB;
- Air absorption is important over large distances at high frequencies, depends on the humidity but is typically about 40 dB/km @ 4000 Hz. Road Traffic noise frequencies are mainly mid/low and will be unaffected below 200m;
- When measuring the intensity of a sound, an instrument, which duplicates the ear variable sensitivity to sound of different frequency, is usually used. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called a weighting filter because it conforms to the internationally standardized A-weighting curves. Measurements of sound level made with this filter are called A-weighted sound level measurements, and the unit is dB;
- Sound propagation is affected by wind gradient rather than the wind itself. The profile of the ground causes such a gradient. Sound propagation upwind is refracted upwards creating a sound shadow and downwind refracted towards the ground producing a slight increase in sound level over calm isothermal conditions;
- The velocity of sound is inversely proportional to the temperature so a temperature gradient produces a velocity gradient and a refraction of the sound. Temperature decreases with height and the sound is refracted upwards;
- For a source and receiver close to the ground quite large attenuation can be obtained at certain frequencies over absorbing surfaces, noticeably grassland. This attenuation is caused by a change in phase when the reflected wave strikes the absorbing ground and the destructive interference of that wave with the direct wave. The reduction in sound tends to be concentrated between 250 Hz and 600 Hz;
- Noise screening can be effective when there is a barrier between the receiver and the source i.e. walls, earth mounds, cuttings and buildings. The performance of barriers is frequency dependent. To avoid sound transmission through a barrier the superficial mass should be greater than 10 Kg/m^2; and
- There is a complex relation between subjective loudness and the sound pressure level and again between annoyance due to noise and the sound pressure level. In general the ear is less sensitive at low frequencies and the ear will only detect a difference in the sound pressure level when the ambient noise level is exceeded by 3-5 dBA.

The recommended noise level for a residential area according to the General Environmental Health and Safety Guidelines is 55.0dBA during the day time period and 45.0dBA during the night time period. The South African National Standards have different recommended ambient noise levels and is illustrated in Table 10.

The reference time intervals can be specified to cover typical human activities and variations in the operation of noise sources and are for daytime between 6h00 to 22h00 and for night time between 22h00 and 6h00.

In terms of noise increases, persons exposed to an increase of 2 dBA or less would not notice the difference. Some people exposed to increases of 3-4 dBA will notice the increase in noise level, although the increase would not be considered serious. Noise increases of 5dBA and above are very noticeable, and, if these are frequent incidents, or continuous in nature, could represent a significant disturbance.

TABLE 9: RECOMMENDED NOISE LEVELS FOR DIFFERENT DISTRICTS

1	2	3	4	5	6	7
Type of district	**Equivalent continuous rating level $L_{Req.T}$ for ambient noise** dBA					
	Outdoors		**Indoors, with open windows**			
	Day-night L_{Rdn} [2]	**Daytime** L_{Rd} [1]	**Night-time** L_{Rn} [1]	***Day-night*** $LRdn$ [2]	**Day-time** L_{Rn} [1]	**Night-time** L_{Rn} [1]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with some workshops, with business premises and with main roads	60	60	50	50	50	40
e) Central business district	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

People exposed to an increase in the prevailing ambient noise level will re-act differently to the noise levels and the response is given in Table 11 below.

TABLE 10: COMMUNITY RESPONSE TO EXEEDING AMBIENT NOISE LEVELS

1	2	3
Excess $)L_{Req,T}$[1)] dB	**Estimated community/group response**	
	Category	**Description**
0	None	No observed reaction
0-10	Little	Sporadic complaints
5-15	Medium	Widespread complaints
10-20	Strong	Threats of community/group action
>15	Very strong	Vigorous community/group action

1) Calculate $)L_{Req,T}$ from the appropriate of the following:

a) $)L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation).

b) $)L_{Req,T}$ = $L_{req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise.

c) $)L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district.

8.2.2 *Preliminary Assessment of Alternatives and Recommendations*

The preliminary noise sensitivity analysis of the study area was conducted on the proposed P166 main route and its alternatives. The results of the preliminary analysis are discussed below.

The P166 main route and Phumlani alternative 1 and 3 emerged as less (medium) sensitive when compared with other alternatives which were very sensitive.

The study area is divided into different districts according to SANS 10103 of 2008 and explanation is provided from Table 9 below.

TABLE 11: RECOMMENDED NOISE LEVELS FOR DIFFERENT DISTRICTS

1	2	3	4	5	6	7
	Equivalent continuous rating level $L_{Req,T}$ for ambient noise dBA					
	Outdoors			Indoors, with open windows		
Type of district	*Day-night* L_{Rdn} [2]	Daytime L_{Rd} [1]	Night-time L_{Rn} [1]	*Day-night* L_{Rdn} [2]	Daytime L_{Rn} [1]	Night-time L_{Rn} [1]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with some workshops, with business premises and with main roads	60	60	50	50	50	40
e) Central business district	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

There are areas within the study area which comply with districts a, b and c. Once the road is built, the zones next to the roads and at the noise sensitive areas will increase to a type 2 d district. The noise increase can therefore be anything between 5.0dBA to 15.0dBA for rural areas during the day and night time periods. Some of the residential areas which are some distance from the existing road infra-structure will have prevailing ambient noise level of 45.0dBA.

The receiving environment is therefore the noise sensitive residential areas and that will be the main focus of the noise impact assessment in the EIA phase. The noise levels from the projected traffic volume will then be compared with the prevailing ambient noise level to determine the intrusion level at the different noise sensitive areas.

8.3 Social

8.3.1 *Potential Impacts and Preliminary Assessment of Alternatives*

- **Sensitive Areas along the P166 Route and Alternatives**

The preliminary social sensitivity analysis of the study area was conducted on the proposed P166 main route and its alternatives. The results of the preliminary analysis are discussed below.

P 166 Road (North end, White River)

The northern route of the proposed P 166 passes along the west side of White River, between the residential suburb of Colts Hill and the North West side of White River, also primarily being a residential area. The existing route which connects Colt Hill to White River is the R537. Stakeholders would include the applicable resident's

forums. Potential impacts may include, increased pedestrian traffic, closer proximity to high risk accidents (due to increased traffic and pedestrian volumes), and possible devaluation of adjacent properties (to the road); while also allowing for greater efficiency in time management of nearby residents – access road would increase mobility and convenience.

Phumlani Alternative 1, 2 and 3

Alternative 1: Phumlani 1

Phumalani 1 is a proposed alternative route that primarily directly affects commercial agricultural farms. There is also evidence of a chicken farm which would be directly affected. Stakeholders would include the Farmer's association and individually affected farmers and farmworkers. Potential impacts may include a decrease in economic activity directly related to farm output (due to the uptake of land for road development); and a potential labour impact (decreased land hectarage for agricultural production may be directly linked to decrease in labour need).

Alternative 2: Phumlani 2

This route alternative is proposed to pass through what is identified as commercial farm (agricultural) land continuing in a southerly direction spanning the outskirts of an informal settlement area. It has been reported (although not verified) that this land is 'sterilised5' thereby making the informal settlement and its inhabitants 'illegally residing on the land.' The length of the road that would span the west side of the informal settlement is approximately two kilometres. It is imperative that the legal status and information disclosure process that may have taken place with these inhabitants be fully understood and the repercussions of development and the possibility of impact be factored into project planning.

Stakeholders would include the Local municipality/ consultants involved in the 'sterilisation' process; local authority leaders within the informal settlement area; and the Farmer's association and individually affected farmers and farmworkers. Potential impacts include possible physical or economic relocation of residents/ assets in the informal settlement; loss in economic (agricultural) output due to land uptake, potential loss in labour numbers due to decreased farming activities, increased road (pedestrian) accidents due to proximity of settlement to the proposed road and possible increase in density of roadside informal housing and an increased number of road deaths of pets and small livestock (due to unfenced boundaries between the road and informal settlement).

Alternative 3: Phumlani 3

Alternative 3 is a proposed route that cuts through a farming area (to a lesser degree) but more so through a formal residential area constituting smallholdings. There is evidence of an informal settlement as well. Resettling inhabitants that are currently in formal/ informal housing is not recommended. Stakeholders would include the White River residents association/ ratepayers association; individually household owners; and the Farmer's association and individually affected farmers and farmworkers. Potential impacts for Phumlani 3 are a combination of those found for Phumlani 1 and 2 (as above).

[5] Sterilised refers to refers to an area that has been designated for a particular purpose and cannot be used for any other purpose.

P 166 road (South end, Nelspruit)

The southern-most portion of the P 166 passes commercial and business properties as well as residential small holdings. The potential impacts may include potential economic loss / disturbance of business due to the proposed development, follow–on impact of lost business translates into loss of labour, potential compensation claims, possible economic/ physical relocation issues, possible increase of land value of business property, but decrease in land value of residential property, and accessibility to residential areas may also increase residents' security and safety concerns.

P166 Road Southern End and Maggiesdal Alternative

The original proposed southern P 166 route skirts the large, formal residential community called 'Stonehenge' along the west side. The proposed alternative Maggiesdal straddles farm land (possibly commercial), privately catered tourist accommodation and a private events venue. Stakeholders would include the privately affected commercial/ tourist farm and the Resident's association at Stonehenge residential.

Potential impacts may include, possible increase of land value of business property, but decrease in land value of residential property; accessibility to residential areas may also increase residents' security and safety concerns; decrease in economic activity directly related to farm output (due to the uptake of land for road development); potential labour impact (decreased land hectarage for agricultural production may be directly linked to decrease in labour need); and potential economic displacement and compensation issues.

8.3.2 *Implications of Sensitive Areas for development and further study*

The presence of the above sensitive areas has implication for the routing of the proposed road, and the selection of a final proposed alignment that is associated with the least amount of environmental impacts (i.e. that is most socially and environmentally sustainable). The Maggiesdal and Phumlani Alternatives and latterly the White River North Alternative have been created primarily to address social issues; however each of the alternatives is associated with a certain level of social impact, in spite of ameliorating social impacts associated with the proposed alignment. The alternatives taken forward into the EIA study for assessment will need to be comparatively assessed in the impact phase social study based on the more detailed assessment undertaken in that study, and recommendations in terms of proposed routes will be made in the study.

In terms of the sensitive areas identified above for which no routing alternatives have been identified, the impact phase social study will examine mitigation measures to potentially ameliorate or avoid the identified social impacts.

8.3.3 *Recommendations*

Phumlani alternative 1 and P166 in the southern end emerged as the preferred alternatives from the preliminary social assessment. Detailed studies will be undertaken to assess the impacts identified in the EIA phase and nominate the preferred alternative based on further study.

9 APPRAISAL OF ALTERNATIVES FOR ASSESSMENT IN THE EIAR PHASE

As alluded to earlier in this report, a process has been undertaken as part of the finalisation of the Environmental Scoping Report whereby all alternatives presented for assessment in the scoping phase of the project were appraised by the EIA project team to determine whether they were environmentally feasible, in order to determine whether these could be further assessed in the EIAR phase of the project. Environmental feasibility (input from the EIA team and specialists) was used in the appraisal. The results of this process are presented below. The process also considered whether further alternatives were required to be added to the project scope, based on the outcomes of the scoping-phase public participation process and the findings of the scoping-phase specialist studies.

The following alternatives were presented for assessment in the scoping phase of the project:

- Maggiesdal Alternative
- Phumlani Alternative 1
- Phumlani Alternative 2
- Phumlani Alternative 3

As described elsewhere in this report, although alternatives were created as a measure to allow the mitigation of certain issues and potential impacts associated with certain sections of the P166 servitude, all alternatives are associated with impacts on the environmental parameters assessed in this environmental scoping study. Specialists were asked to comparatively assess the scoping-phase alternatives against the original servitude, and through this process (and from the outcomes of the scoping phase public participation process) it became apparent that certain alternatives were associated with potential significant environmental impacts. These factors were taken into account in determining whether it was feasible for these alternatives to be further assessed as part of the EIAR phase. The following results have emerged:

A) Maggiesdal Alternative

This alternative is associated with biodiversity-related issues as it traverses an area on largely natural mountain bushveld. The alternative also runs over the grounds of an accommodation establishment, thus being associated with potential social impacts.

B) Phumlani Alternative 1

This alternative is associated with significant agricultural potential and social issues as it traverses an area of intensive agricultural production and smallholdings in the Heidelberg Valley, and potentially affects agricultural infrastructure, in particular irrigation canals. From a wetland and biodiversity perspective, this alternative traverses an area of largely natural savannah vegetation in its southern reaches, thus potentially causing fragmentation and impacting on current wetland functionality in the context of the relative rarity in the context of the study area of occurrence of wetlands with undisturbed catchments.

C) Phumlani Alternative 2

This alternative is associated with potential social issues due to its proximity to an informal settlement.

D) Phumlani Alternative 3

This alternative is associated with a number of social issues as it runs through a light industrial area adjacent to the R40, thus potentially sterilising properties. It would also run across the main access into the Phumlani / Msholozi Township, potentially restricting the movement of residents between the township and the R40 road and limiting the development of services to the township in this area. This alternative also traverses an area of smallholdings (White River Agricultural Holdings Extension 1) to the north, thus potentially sterilising these properties and resulting in noise and visual-related issues.

From the above summary of significant potential environmental impacts associated with each alternative, it is clear that the Phumlani Alternative 1 and 3 are associated with the greatest degree of environmental impact. It is recognised that the existing P166 servitude as it traverses the Phumlani area is associated with significant potential impacts relating to the need for relocation of households and bisecting a community with a high speed road, however SANRAL is attempting to find a technically and environmentally sustainable route for the P166, hence alternatives have been identified in the Phumlani / Msholozi area.

Due to the significant environmental issues associated with these two alternatives, the EIA Team has discarded these two alternatives, meaning that they will not be considered in the EIAR phase. Thus the existing P166 servitude and Phumlani Alternative 2 will be considered in the Phumlani / Msholozi Area.

The Maggiesdal Alternative will also be assessed in the EIAR phase of the project.

As a further component of the appraisal of alternatives at the end of the Environmental Scoping Phase of the project, the EIA team and the proponent examined other parts of the proposed alignment in order to identify whether further alternatives were needed to be considered in order to potentially mitigate environmental issues and impacts identified by the environmental scoping process. As detailed in the Issues Trail (**Appendix B**) many stakeholders and I&APs have raised issues regarding the P166 servitude as it traverses White River. A number of the EIA Team specialists have also raised the potential for impacts relating to their particular specialist discipline to be associated with the P166 servitude in this area. In summary the issues raised in this area relate to:

- Wetland Impacts relating to the impacting of a large portion of a wetland that runs through this area
- Biodiversity Impacts (impacts on threatened species)
- Social impacts relating to potential loss of property value and transformation of part of an open space, a portion of which is a bird sanctuary
- Noise impacts relating to the proximity of a high speed road to a residential area
- Visual impacts relating to the proximity of a high speed road to a residential area

In response to these issues received the EIA Team and the proponent have introduced a further route alternative to the P166 servitude traversing the White River area – the White River North Alternative. As part of this consideration a screening exercise was undertaken to determine the environmental feasibility of such an alternative. The screening exercise concluded that an alignment to the north of White River would be a feasible option as a route alternative to the P166 servitude in White River. As the alternative was not considered during the scoping phase project team specialists will be asked to fully scope all potential issues and impacts associated

with this new alternative as part of their EIAR-phase studies relating to their specific disciplines, and each specialist will then undertake a detailed investigation of issues relating to this alternative, as will be done for all other sections of the route.

To conclude, the following alternatives **in addition to the P166 servitude** will be assessed in the EIAR phase:

- The Maggiesdal Alternative
- Phumlani Alternative 2
- The White River North Alternative

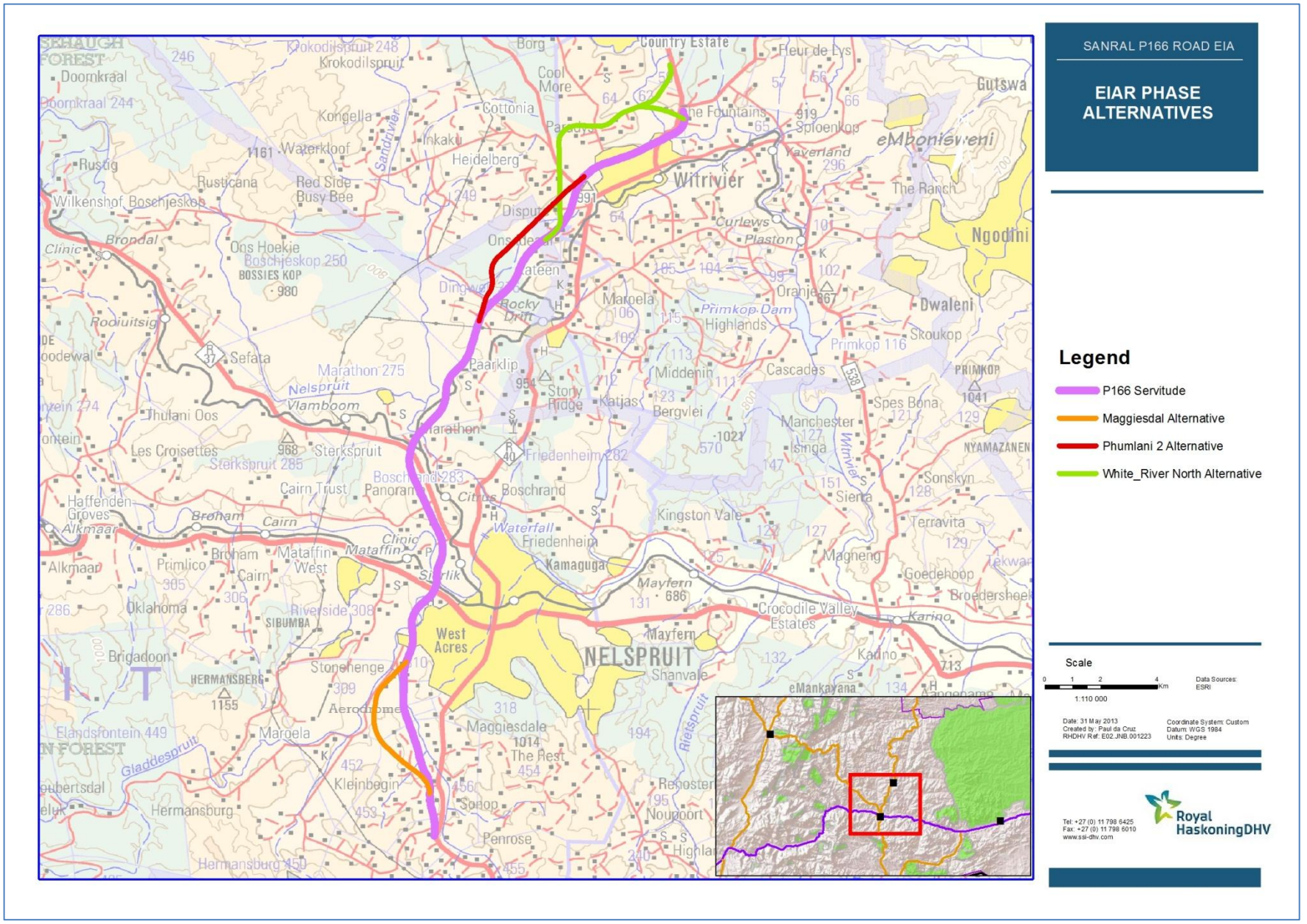


FIGURE 37 – EIAR PHASE ALTERNATIVES

10 PUBLIC PARTICIPARTION PROCESS

The primary aims of the Public Participation Process during the Environmental Scoping Study were:

- To inform Interested and Affected Parties (I&APs) of the proposed project;
- To identify issues, comments and concerns as raised by I&APs;
- To promote transparency and an understanding of the project and its consequences;
- To serve as a structure for liaison and communication with I&APs; and
- To provide local knowledge and input in identifying potential environmental (biophysical and social) impacts associated with the proposed development.

10.1 Identification of Key Stakeholders

The first step in the public participation process was to identify key stakeholders, including:

- Provincial Government Representatives;
- Local Authorities (i.e. Mbombela Municipality);
- Affected and Surrounding Landowners.
- Chiefs and Headmen/headwoman
- Environmental NGOs; and
- Community Based Organisations.

All I&AP information (including contact details), together with dates and details of consultations and a record of all issues raised have been recorded within a comprehensive project database (**Appendix B4**). This database will be updated on an on-going basis throughout the project, and will act as a record of the communication/public involvement process.

10.2 Background Information Document

A Background Information Document (BID) for the project has been compiled and the aim of this document is to provide a brief outline of the proposed project, provide preliminary details regarding the EIA process, and explain how I&APs could become involved in the project. The BID, together with a comment sheet and relevant map, were distributed to all identified stakeholders and I&APs inviting them to register for the proposed project and submit details of any issues and concerns that they may have, refer to **Appendix B10.**

10.3 Consultation and Public Involvement

Through consultations with I&APs and Stakeholders, issues for inclusion within the Final Environmental Scoping Report were identified and recorded. Consultations took the form of telephonic interviews (note the telephonic conversation was captured in the issues report as part of the public participation record), letters and emails with

key I&APs and stakeholders to inform them of the proposed project and to record their comments. In addition, a number of Focus Group Meetings were held during the public review period on the Draft Environmental Scoping Report.

Four focus group meetings and three public meetings were held during the review period (March 2013) of the Draft Environmental Scoping Report. Minutes of these meetings are recorded and available in **Appendix B5**. In accordance with the requirements of the EIA Regulations, these meetings were advertised 10 days prior to the events. Networking with I&APs continued throughout the duration of the project. The primary aim of these meetings was as follows:

- Disseminate background information regarding the proposed project to I&APs,
- Supply more information regarding the EIA process and the findings of the specialist studies undertaken;
- Answer questions regarding the project and the EIA process;
- Obtain feedback from I&APs with respect to the proposed project; and
- Receive input regarding the public participation process.

10.4 Issues and Response Report

Issues and concerns raised during the public participation process were compiled into an Issues and Response Report (**Appendix B9**). It should be noted that a column has been added to the Issues and Response Report indicating the section of the Final Scoping Report in which the issue raised has been addressed.

10.5 Public Review of the Environmental Scoping Report

The Final Environmental Scoping Report was made available for review at the following public locations within the study area, which were identified as readily accessible to I&APs:

- Mbombela Public Library;
- White River Public Library
- Mbombela Municipality Offices; and
- Royal HaskoningDHV website.

The availability of the draft and final report was advertised in the **Mpumalanga News paper.** A 40 and 21 day period were allowed for the review process, from **22 February to 30 April and 22 October to 11 November 2013 respectively**. I&APs registered on the project database (**Appendix B4**).

10.6 Final Environmental Scoping Report

The compilation of the Final Environmental Scoping Assessment Report entails the consideration and inclusion of all relevant comments received from the public on the Final Environmental Scoping Report and Plan of Study for EIA. The public were afforded an opportunity of 21 days to comment on this report to ascertain whether all issues

and comments raised during the review of the draft Scoping Report have been adequately addressed. All comments have been addressed and included in the issues trail report to be submitted with this report to DEA.

11 CONCLUSION AND RECOMMENDATIONS

The Environmental Scoping Study has assessed the biophysical and social environment of the proposed P166 Road (the P166 servitude and the four alternatives identified), with an aim to classify the baseline environment of the study area and with an aim to identify all potential issues and impacts associated with the proposed development. In line with Regulation 28 (Part 3) of the EIA Regulations, this issues-based ESS aimed to identify and provide:

- A description of the proposed activity;
- A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, and economic aspects of the environment may be affected by the proposed activity;
- The identification of all legislation and guidelines applicable to the development;
- A description of environmental issues and potential impacts, including cumulative impacts, that have been identified;
- Details of the public participation process conducted to date; and

The Royal HaskoningDHV EIA Team together with the proponent have undertaken a process of appraising the alternatives presented for assessment in the environmental scoping phase as well identifying any areas in which further alternatives need to be considered. Two of the Phumlani Alternatives – Phumlani Alternatives 1 & 3 have been discarded as these two alternatives are associated with significant environmental impacts. Based on specialist inputs as well as public comment and feedback relating to areas of environmental sensitivity, a number of environmental issues were identified in the area where the P166 servitude traverses the White River area, in particular relating to where the servitude runs directly through a wetland. Accordingly a new alternative, the White River North Alternative has been created, and will be comparatively assessed against the existing servitude in the EIAR phase of the study.

An Environmental Management Programme will be compiled for the project which will contain the practical project-specific mitigation measures which will need to be implemented by SANRAL in order to minimise the identified environmental impacts and optimise the positive impacts. The methodology that will be used for assessment of potential significant impacts is contained in Plan of Study for EIA.

TABLE 12: SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS

Discipline	Potential Impacts	Recommendations	Preliminary (Scoping Phase[6]) preferred alternative
Wetlands	• Alteration of the hydrology and morphology of rivers and wetlands crossed • Alteration of the aquatic ecology and resource quality of rivers and wetlands crossed • Downstream impacts due to hydrological impact at the crossing point • Introduction of pollutants such as hydrocarbons into the drainage system from stormwater inflows • Cumulative impacts in the context of catchment-level loss and transformation of wetlands	Different alternative alignments have different implications in terms of intensity of impact on wetlands and rivers, as a different number of surface water crossings and different types of crossings will have varying levels and intensity of impacts. Through the further investigation, assessment and classification of wetlands along the respective alternatives and along the existing servitude, recommendations will be made in terms of a preferred set of alternatives. Where no alternatives exist and the main servitude is associated with significant impact on wetlands, suggestions in terms of consideration of new alternatives may be made.	The main P166 servitude and Phumlani Alternative 2 are most preferred from a surface water perspective
Soils and Agricultural Potential	• Soils on steeper slopes may be prone to erosion. • Loss of productive agricultural land, especially in the Crocodile River Valley, leading to concomitant loss of income and knock-on social impacts such as job losses, etc	A detailed assessment of the study area will be undertaken within the EIA phase in order to adequately assess the potential impacts on soils and agricultural potential as a result of the proposed project and recommend appropriate mitigation measures, where required. All alternatives will be assessed in further detail and in the context of their respective impacts on agricultural potential and production.	The P166 and its alternatives will traverse the similar terrain with high soil potential; therefore preferred route will be determined during the EIA phase.
Ecology	The following impacts were identified that could affect the floristic and faunal	A detailed assessment of the study area will be undertaken within the EIA	Phumlani alternative 3 is preferred as it bisects large transformed

[6] It should be noted that although preferred alternative sections have been identified by each respective specialist scoping phase (desktop) study, these recommendations will be refined and altered if necessary based on further detailed assessment in the EIA phase specialist study

Discipline	Potential Impacts	Recommendations	Preliminary (Scoping Phase[6]) preferred alternative
	attributes of the study area adversely: • Potential impacts on the local and regional biodiversity; • Potential impacts on sensitive/pristine habitat types; • Potential impacts on threatened/protected species and habitat; • Potential impacts on surrounding habitat and species; and • Potential impacts on fauna species. Impacts of a cumulative nature include: • Potential increase in habitat transformation (e.g. loss of habitat); • Potential increase in habitat fragmentation (e.g. loss of migratory routes); and • Potential increase in environmental degradation (e.g. loss of habitat quality).	phase in order to adequately assess the potential impacts on biodiversity as a result of the proposed project and recommend appropriate mitigation measures, where required.	vegetation units with low conservation potential or likelihood for red listed plant or animal species and only bisects two wetland habitats.
Social	The proposed development is likely to have an impact on areas with high human movement along the proposed road. Social issues and potential social impacts associated with developing a road along the existing servitude were the main driver leading to the creation of alignment alternatives. Nonetheless each alternative is associated with certain social issues and social impacts. The following are the possible generic (i.e. not related to a specific alternative	A detailed assessment of the study area will be undertaken within the EIA phase in order to adequately assess the potential impacts on the social environment as a result of the proposed project and recommend appropriate mitigation measures, where required. The social impacts associated with each alternative (including the respective section of the existing servitude) will be further assessed in the impact phase study and will thus allow the comparative assessment of	Phumlani alternative 1 and P166 in the southern end emerged as the preferred alternatives from the preliminary social assessment.

Discipline	Potential Impacts	Recommendations	Preliminary (Scoping Phase[6]) preferred alternative
	alignment) impacts: • Labour and employment; • Extent of in-migration; • Potential loss of grazing land; • Potential physical displacement and relocation; • Potential loss of livelihoods; • Potential health and safety issues for nearby communities as a result of construction labour force; • Potential health and safety issues for nearby communities as a result of increased traffic; • Changes in criminal activity; and • Spin-offs from related local procurement.	each alternative.	
Heritage	Potential destruction of or damage to hitherto undiscovered heritage sites.	It is recommended that a full heritage impact assessment be carried out during the EIA phase, in order to further identify any areas / locations of heritage sensitivity that could affect the route determination of the final proposed alignment	No sites of archaeological importance which were identified through a desktop study therefore preferred route will be determined during an EIA phase.
Noise	Noise is a social environmental issue, and the generation of noise by the proposed road was an important factor in the creation of alternatives that would potentially ameliorate or alleviate noise-related issues. Different alternatives (including the respective section of the existing servitude) have differing implications in terms of noise creation for sensitive receptors.	The field study noise data and available noise data on the study area will be evaluated and the noise impact assessment report will be compiled for the EIA process. The detailed assessment will be used to comparatively assess all alternatives and to recommend a preferred set of alternative alignments.	The P166 main route and Phumlani alternative 1 and 3 emerged as less (medium) sensitive when compared with other alternatives which were very sensitive. However it should be noted that this was a preliminary assessment further assessment will be conducted in the EIA phase.

Discipline	Potential Impacts	Recommendations	Preliminary (Scoping Phase[6]) preferred alternative
	Generic Potential noise impacts are generated from the following activities: Construction phase: • Preparation of the foot print areas; • Civil construction; • Grading and building of new roads; • Asphalt laying; • Marking of roads. Operational phase: • Traffic volumes. Maintenance Phase • Maintenance of the road surface		

12 PLAN OF STUDY FOR THE EIA PHASE

12.1 Process Phases

12.1.1 *Scoping Phase*

An issues-based Environmental Scoping Study has been undertaken for the proposed project. Existing information and input from specialists, the Authorities and Interested and Affected Parties (I&APs) were used to identify potential environmental impacts (both social and biophysical) associated with the proposed project. No environmental fatal flaws associated with the proposed project were identified through the Environmental Scoping Study, although a number of potentially significant environmental impacts have been identified as requiring further in-depth study. A number of environmental parameters have been assessed as part of the study, and will be further investigated in the next phase. Although visual impact was not investigated by the Environmental Scoping Study, potential visual impacts along certain parts of the route have been raised by a number of Interested and Affected Parties. In order to address these concerns raised, a visual impact assessment will be undertaken in the Impact Phase of the Study, in addition to the other specialist studies that have been conducted as part of this EIA.

12.1.2 *Environmental Impact Assessment*

An EIA is required to be undertaken in order to provide a comprehensive assessment of the potential impacts which have been identified in the Scoping Phase and to recommend appropriate mitigation measures where required. The EIA will also be utilised as an instrument for the evaluation of the identified alternatives. The EIA will aim to adequately investigate and address all environmental issues in order to provide DEA with sufficient information to make an informed decision regarding the proposed project.

12.2 Particulars of the Applicant and EAP

Applicant: South African National Roads Agency Limited
Contact Person: Mr Mogole Mphahlele
Telephone Number: 012 844 8080
Email: mphahlelem@nra.co.za

Environmental Assessment Practitioner: Royal HaskoningDHV
Contact Person: Malcolm Roods
Telephone number: 011 798 6442
Email: malcolm.roods@rhdhv.com

12.3 Specialist Team

The following specialist studies and specialists (Refer to **Appendix C** for CVs) are proposed to be undertaken in the EIA Phase Table 13.

TABLE 13: SPECIALIST STUDIES TO BE UNDERTAKEN IN THE EIA PHASE

Specialist Field	Specialist Name
Noise	Barend van der Merwe
Wetlands	Paul da Cruz
Soils and Agricultural Potential	Garry Paterson
Ecology	Clayton Cook
Social Study	Kementhree Moonsamy
Heritage	Johnny van Schalkwyk
Visual Impact	Paul da Cruz

The Terms of Reference for each of the specialist studies for the EIA phase is provided on Table 14 below. As a critical step in the EIA process, it is important that the public has the opportunity to comment on, and the authorities approve of, the proposed approach to the EIA Phase.

Commenting on the PoS for EIA by the public ensures that the proposed approach, including the scope of work for the specialists is informed by public and the authority feedback in order to ensure that the work produced addresses the issues of concern at the requisite level of confidence. A robust basis for informed debate and decision making is thus provided.

Key outcomes of the specialist studies would be information which will allow I&APs to engage in informed debate on the implications of the proposed project and will allow SANRAL to make an informed decision on the best alternatives. SANRAL will also gain an understanding of the range and benefits of implementing possible mitigation measures.

TABLE 14: SPECIALISTS TERMS OF REFERENCE FOR EIA STUDY

Study	Terms of Reference
Wetlands	The EIAR-phase surface water study will assess in more detail the nature of the surface water features crossed by the proposed P166 road. Surface water features will be visited in the field to validate the findings of the scoping phase study in terms of their (hydrogeomorphic) classification. As this EIA is for route determination, the study will focus on certain priority wetlands, in order to determine the likely nature and intensity of the impacts associated with the proposed road, in particular in areas where the wetland or riparian area is very wide, or where the wetland is proposed to be crossed at an oblique angle rather than at a perpendicular angle. The aim of the study will be to identify a most sustainable route from an environmental perspective. The extent of crossings assessed will be determined utilising the Department of Water Affairs' guideline for the delineation of wetland areas (DWAF, 2005). This guideline will also form the basis for the delineation of the edge of the riparian zone of the surface water features where a riparian zone is present. A wetland and riparian zone shapefile will be created. The field visit will also be used to identify all other surface water features not identified during the desktop assessment, or where uncertainty existed as to whether the area constituted a wetland or other surface water feature. A high level assessment of wetland functionality and state will be undertaken for affected wetlands in order to inform the assessment of likely impact relating to the proposed road and all alternatives. The impacts of the proposed road and river crossing structures will be assessed in detail in the EIAR-phase surface water study. This will include an assessment of cumulative impacts relating to the proposed road. All alternatives being assessed in the EIAR phase of the project will be comparatively assessed. Lastly the impacts of the proposed project on surface water features will be rated in terms of the EIA rating matrix. Based on the identification of impacts, a list of mitigation or remediation measures will be specified, and a terms of reference for a further surface water study relating to the construction-related EIA and Water Use Licensing Process (to be undertaken at a later stage as planned by SANRAL), whereby every water crossing will be delineated based on a final proposed alignment will be specified. ***Please note that the wetland study to be undertaken during the EIA phase will be independently reviewed.***
Soils and Agricultural Potential	▪ Undertake an assessment of impacts identified in the scoping report and their significance due to the proposed development on soils and agricultural potential. ▪ Propose mitigation measures to reduce or eliminate the identified impacts ▪ Sensitivity maps will be compiled to show the soil profile and agricultural potential of the sites selected. In addition, a report will be compiled to reflect the findings of the study.

Study	Terms of Reference
Ecology	The following aspects will be included as part of the EIA investigation. ▪ **Floristic investigation** - Map the location and extent of all plant communities, indicating size and ecological sensitivity, areas of disturbance, surrounding land use, etc; - Compile a list of potential Threatened Plant Species that occur in the area; - Identify plant species that may be of conservation importance down to species level; - Provide locality, date surveyed, GPS location, spatial resolution and distribution, including actual numbers, of plant species that may be of conservation importance; - Provide a list of alien plant species occurring on the property, considering eradication programmes of alien vegetation; and - Provide relocation plans for plants of conservation importance. These species may include: * Species endemic to the province; * Red Data listed plants; * Medicinal plants; and * Protected plants. • **Faunal investigation** The faunal species which were identified during the scoping report will further be assessed in terms their occurrence, habitats and sensitivities. Impacts will be assessed and rated using an EIA rating system and mitigation measures will be recommended on significant impacts identified.
Social	The following social issues will be further assessed in the EIA phase: • **Population and Politics**: this includes changes and impacts related to population structure, migration, welfare balances, and power and authority; • **Economy and Work**: this context includes changes and impacts related to national and regional economic networks, entrepreneurial opportunities, tax income, employment levels and patterns, commercial and labour organization, access to jobs and employment equity, labour exploitation and household and community livelihoods; • **Land and Resources**: this includes baseline changes and impacts related to the use of and access to natural resources such as land and water, and to location and settlements based on access to such resources; • **Infrastructure and Social Services**: the social services context includes changes and impacts related to services infrastructure (water, energy, education, roads, and communication) and demand for these services. Health is considered under this heading, particularly in relation to demand for and access to health services; • **Organisation and Community**: changes and impacts related to local government, crime, community organization, development planning, access to decision making, voluntary organizations (CBOs and NGOs), support networks, community

Study	Terms of Reference
	stability, response to change, trust in political and social institutions, barriers to access (skills, literacy), household budgeting and use of income, and cultural resources and practices; and • **Social Divisions**: this context focuses on changes and impacts around equity (for example the distribution and circulation of compensation), non-participation, unmet expectations, prevailing social tensions and divisions, the influx of newcomers, and the status of vulnerable groups such as the elderly, women, children and the disabled. ***Please note that the social study to be undertaken during the EIA phase will be independently reviewed.***
Heritage	Archaeological survey of the study area in accordance with the requirements of Section 38(3) of the National Heritage Resources Act (Act 25 of 1999) will be conducted in the EIA phase. Site-specific, detailed management and mitigation measures will furthermore be compiled for inclusion in the Environmental Management Programme (EMPr). The study should provide a map of the identified archaeological artefacts as well as a report detailing the finding of the study, and mitigation of any impacts.
Noise	A standardised impact assessment methodology will be used to evaluate the impact during the construction, operational and maintenance phases of the project on each and every noise sensitive area. The prevailing ambient noise levels of during each of these phases will differ due to the location of these areas to other point and/or linear noise sources. Assessment of route alignments and nomination of the preferred. Provision of mitigation measures for significant impacts.
Visual	The first phase of the assessment will be the characterisation of the visual environment of the study area. The visual environment of the area traversed by the proposed road will be categorised in terms of its physical characteristics (topography, vegetation cover, etc.) and land use. Based on these characteristics, areas of differing visual character (e.g. urban, rural, natural, etc.) will be identified. The assessment will then assess areas of visual sensitivity. This will take into account the presence and spatial distribution of visual receptors (areas of human habitation and occurrence) at which visual impact may be experienced. The assessment will aim to identify visual 'hotspots', i.e. areas in which there would be a strong / high degree of visual sensitivity, and areas in which a high value is placed in the aesthetic quality of the existing landscape (e.g. within nature reserves, eco-estates or areas of high natural beauty). The next phase of the assessment will aim to indentify the potential visual intrusion factor associated with the proposed road. GIS-based view shed analysis will be undertaken to determine the areas of maximum visual exposure. A slightly modified version of the visual contrast rating methodology as developed by the US Department of the Interior's Bureau of Land Management will be used as the tool by which to assess the degree of visual intrusion of the proposed road on selected potentially affected receptor locations, by assessing the level of change in landscape quality and the degree of acceptability / visual tolerance of such a development within the landscape context. A night-time assessment will be undertaken to assess the potential lighting intrusion impact associated with vehicles travelling along the road at night and associated with any proposed lighting along the road. The assessment of differing zones of visual exposure will be synthesised to gain an impression of the likely degree of visual impact within the study area. In areas where alternatives are presented for comparative assessment, the alternatives will be comparatively assessed from a visual perspective. A report, along with maps will be main deliverable of the visual study.

12.4 Approach to the Undertaking of the EIA Phase

Potential environmental impacts (biophysical and social) associated with the proposed road determination project have been identified in the Environmental Scoping Study (ESS). No environmental fatal flaws associated with the proposed project were identified through the Environmental Scoping Study, although a number of potentially significant impacts in the White River area have been identified as requiring further in-depth study within the Environmental Impact Assessment (EIA) phase of the project. Mitigation measures will be contained in the Environmental Management Programme (EMPr) to be compiled during the EIA phase. Mitigation measures recommended in the ESS will also be included in the EMPr.

Based on specialist inputs as well as public comment and feedback relating to areas of environmental sensitivity, an alignment alternative to the servitude as it traverses White River has been identified and will be considered in the EIAR phase. Two alternatives (Phumlani 1 and Phumlani 3) that were assessed in the scoping phase have been discarded based on environmental non-feasibility, as they were determined to be associated with significant environmental issues will be discarded and will not be assessed during the EIA phase. Along with the P166 servitude, Phumlani Alternative 2, the Maggiesdal Alternative and the White River North Alternative will be taken forward for further assessment in the EIAR phase of the project.

The EIA phase will aim to adequately assess and address all potentially significant environmental issues in order to provide the Department of Environmental Affairs (DEA) with sufficient information to make an informed decision regarding the proposed project.

The following points below outline the proposed approach to undertaking the EIA phase of the project. It is believed that the proposed approach will adequately fulfil the competent authority's (DEA's) requirements, the requirements of the EIA Regulations (2010) and the objectives of environmental best practice, so as to ensure transparency and to allow an informed decision regarding the project to be made.

12.4.1 *Authority Consultation*

Consultation with all relevant authorities initiated during the Scoping Phase will continue throughout the duration of the project. The representatives from the relevant Departments will be requested to formally provide input into the EIA process. The authorities to be consulted include:

- National Department of Environmental Affairs;
- Mpumalanga Department of Economic Development, Environment and Tourism;
- Department of Land Affairs;
- Department of Water Affairs;
- Department of Minerals and Resources and
- Department of Transport etc.

12.4.2 *Public Participation Process for the EIA Phase*

- **On-going Consultation with all I&APs**

On-going consultation with key stakeholders (e.g. local authorities, relevant government departments, local business), and other identified I&APs will ensure that I&APs are kept informed regarding the EIA findings and proposed mitigation measures. Networking with I&APs will effectively continue throughout the duration of the project until the closure of the EIA phase. The database and issues and response report will be continually updated throughout the process.

- **Public Involvement**

Public meetings will be held to provide the general public with feedback regarding the findings of the EIA, and to provide detail regarding mitigation measures proposed. In accordance with the requirements of the EIA Regulations, the public meetings will be advertised 10 days prior to the event. I&APs registered on the project database will be notified of this public meeting by letters, emails and newspaper advertisement. In addition, local authorities will be invited to attend focus group meetings, in order to encourage continued participation in the process. Formal minutes of the public meeting and focus group meetings will be compiled and distributed to the attendees for comments. These proceedings will also be included in the final EIA report.

- **Issues and Response Report**

Issues and concerns raised during the public participation process of the EIA phase will be compiled into an Issues and Response Report. Issues will be captured according to the nature thereof, for example technical, property/servitude comments, general, technical, health, social, etc Proceedings of meetings and comments received will also form part of the document. This record of issues will provide a consolidated list in order to ensure that all issues and concerns raised by I&APs are considered within the EIA process.

12.4.3 *Environmental Impact Assessment*

The Environmental Impact Assessment (EIA) will aim to achieve the following:

- To provide an overall assessment of the social and biophysical environments affected by the proposed project;
- To assess the study area in terms of environmental criteria;
- To identify and recommend appropriate mitigation measures for potentially significant environmental impacts within an Environmental Management Programme (EMPr); and
- To undertake a fully inclusive public participation process to ensure that I&AP issues and concerns are recorded.

12.4.4 *Environmental Impact Assessment Report*

The EIA Report will include and address the following:

- A project description (including a description of the proposed activity, plans illustrating the study area and proposed site, and detailed technical details regarding the proposed project);
- A description of the pre-construction environment;
- A description of the public participation process, including the identification of I&APs, a record of the procedures followed, and the perceptions and views of the I&APs regarding the project;

- A description of environmental (biophysical and social) issues identified and potential impacts of the proposed project on these aspects (i.e. how the environment may be affected as a result of the proposed activity)
- Assessment of impacts identified in the Scoping Study which were determined to be significant. These impacts will be assessed in terms of the nature, extent, duration, intensity, severity and probability and accumulation of the impact occurring;
- Conclusions and recommendations regarding the presence of any environmental fatal flaws and recommendations regarding the proposed project.
- The integration of the specialist studies into a consolidated report will allow for easy assessment of the potential environmental aspects. In order to evaluate the significance of the identified impacts, the following characteristics of each potential impact will be identified:
  - The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected;
  - The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional;
  - The duration, wherein it will be indicated whether the lifetime of the impact will be of a short duration (0–5 years), medium-term (5–15 years), long term (> 15 years) or permanent;
  - The probability, which shall describe the likelihood of the impact actually occurring, indicated as improbable (low likelihood), probable (distinct possibility), highly probable (most likely), or definite (impact will occur regardless of any preventative measures);
  - The significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
  - The status, which will be described as positive, negative or neutral.
  - Cumulative.
- South African National Roads Agency Limited has the responsibility to avoid or minimise impacts as described in section 28 of the National Environmental Management Act (No107 of 1998).

12.4.5 *Review of Environmental Impact Assessment Report*

- **Public Review of the draft Environmental Impact Assessment Report**

The draft Environmental Impact Assessment Report and EMPr will be made available at public places for public review and comment, in accordance with the EIA Regulations 2010. A 40-day period will be allowed for this review process. An advert indicating the availability of this report and the information regarding the public meeting will be placed in the local newspaper. In addition, all I&APs registered on the project database will be notified of the public meeting, the availability of this report and the review period by letter. All I&AP comments received during the 40-day public review period will be incorporated into a Draft Final Environmental Impact Assessment Report and this will then be made available to the public for a 21 day period. This report will be finalised and the Final Environmental Assessment Report will be submitted to the Authorities for their review and decision making.

12.4.6 *Environmental Authorisation*

On receipt of the Environmental Authorisation for the project, the I&APs registered on the project database will be informed of this Environmental Authorisation and its associated terms and conditions in writing via letters, email and advertisement in the local newspaper.

12.4.7 *Work Programme*

The environmental programme for the Environmental Impact Study is outlined in the table below:

TABLE 15: EIA SCHEDULE

Phase	SUB-PHASE	1	2	3	4	5	6	7
Project Management		■	■	■	■	■	■	■
EIAR (Phase 2)	Specialist studies	■						
	EIR	■	■	■				
	EMPr	■	■	■				
	Public Participation		■	■	■			
	Authority Review					■	■	■
	Decision							■

REFERENCES

1. National Environmental Management Act (No 107 of 2006)
2. National Environmental Management Act (No 107 of 2006) Government Notice 543,544, 545 and 546
3. Cook. C., (2012): Preliminary Ecological and Habitat Assessment for the Proposed P166-1/2
4. Da Cruz, P., (2012): Surface Water Assessment for the Proposed P166-1/2
5. Paterson, G., (2012): Soil and Agricultural Potential for the Proposed P166-1/2
6. Moonsamy, K., (2012): Baseline Social Assessment for the Proposed P166-1/2
7. Manco and Aurecon: Investigation of Provincial Road P166, Maggiesdal to White River Volume 1,June 2011
8. Van Schalkwyk, J., (2012): Heritage Assessment for the Proposed P166-1/2
9. Van der Merwe, B., (2012): Noise Assessment for the Proposed P166-1/2