WETLAND AND TERRESTRIAL BIODIVERSITY ASSESSMENT OF THE EASTERN SECTION OF THE NATIONAL ROAD R22 REALIGNMENT AROUND THE TOWN OF HLUHLUWE, KWAZULU-NATAL

September 2024

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SYNOPSIS

Wetland and terrestrial identification and assessment associated with the eastern section of a new ring road around the town of Hluhluwe, KwaZulu-Natal

KEY WORDS:

Wetland, Terrestrial Biodiversity, Flora, Fauna Hluhluwe

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882

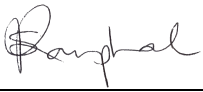
Verification	Capacity	Name	Signature	Date
By Author	Specialist Ecologist	J. Alletson		11 September 2024
Reviewed & Authorised by	Executive Associate	S Ramphal		11 November 2024

TABLE OF CONTENTS

List of Figures

List of Tables

List of Plates

WETLAND AND TERRESTRIAL ASSESSMENT ASSOCIATED WITH THE REALIGNMENT OF THE EASTERN SECTION OF NATIONAL ROAD R22 AROUND THE TOWN OF HLUHLUWE, KWAZULU-NATAL

1. INTRODUCTION

Terratest (Pty) Ltd has been appointed by Hatch South Africa, on behalf of the South African National Roads Agency Limited SOC (SANRAL) to conduct an Application for Environmental Authorisation associated with the realignment of the National Road R22 in the town of Hluhluwe in KwaZulu-Natal. To this end an assessment of the western section of the new road was undertaken in April 2022 (Terratest, 2022) but the assessment of the eastern section was delayed.

This wetland and terrestrial biodiversity assessment is conducted in support of the abovementioned Application for Environmental Authorisation in accordance with the National Environmental Management Act (Act No. 107 of 1998) (NEMA): Environmental Impact Assessment (EIA) Regulations (2014) as well as the Water Use Authorisation in accordance with the National Water Act (Act No. 36 of 1998) (NWA).

1.1 Project Background

SANRAL has embarked on a project to upgrade Road R22 to bypass the town of Hluhluwe on the northern side of the town. The route includes a road-over-rail bridge over Road P2-8 and the adjacent railway line. The upgrade of the western section of the road has been authorised in an existing Environmental Authorisation, and is under construction, but the assessment of the eastern section was delay by administrative problems.

Three realignment options were put forward by the design engineers for the western section of the route and a preferred option has been selected and is under construction but only one route for the eastern section was considered. The final new road will allow traffic that is not destined for the town to move past the town and onward, either towards the Mbazwana area in the north or to the National Route 2 (N2) in the west.

1.2 Project Description

Hluhluwe is located in the northern part of KwaZulu-Natal, approximately 250km north of Durban. Road R22 extends from its intersection with the N2 eastwards and northwards to the Mozambican border at the Fazela Border Post near the town of Manguzi. The portion of the R22 that is proposed for realignment extends from approximately 1km to the west of the town of Hluhluwe to the road-over-rail crossing on the outskirts of the town and then back on to the original route of the road. The locality of the sections of road subject to realignment are shown in Figure 1 below. In addition to the primary bypass road will be three small link roads to ease traffic flows between the old and new roads.

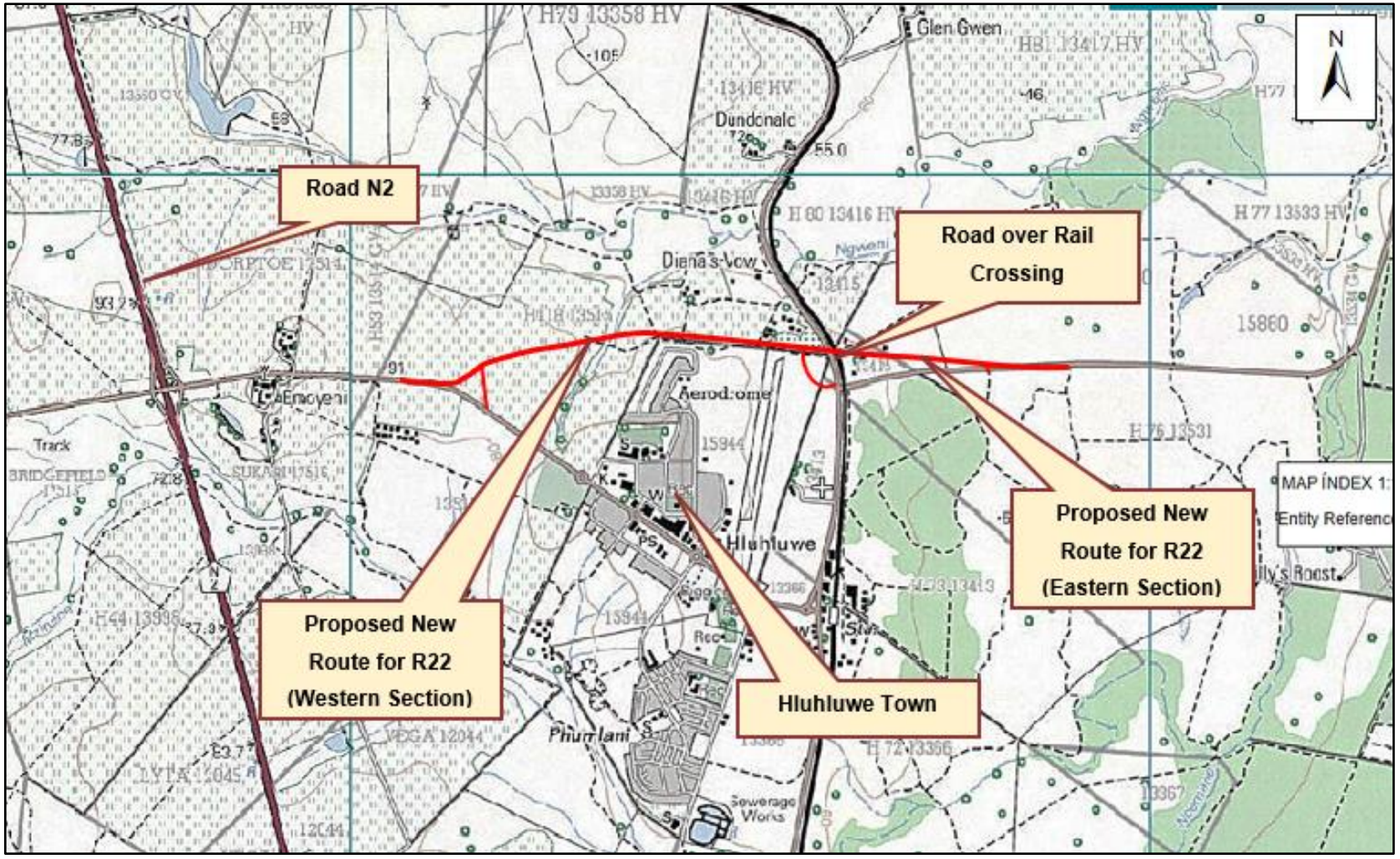


Figure 1: Locality map showing the route of the proposed bypass road

In Figure 2 below, the eastern section of the new road is indicated in red. The section starts at a point close to the northern end of the Hluhluwe landing strip and continues on in a straight line from the western section. Thus it passes between the landing strip and some fruit tree orchards before rising to cross Road P2-8 and the adjacent railway line on a new bridge. It then continues down to ground level and on to rejoin the existing Road R22 at a point some 1.5 km from the bridge. Along the eastern section are two link roads which will join on to the R22. The total length of the eastern section is approximately 1.9 km.

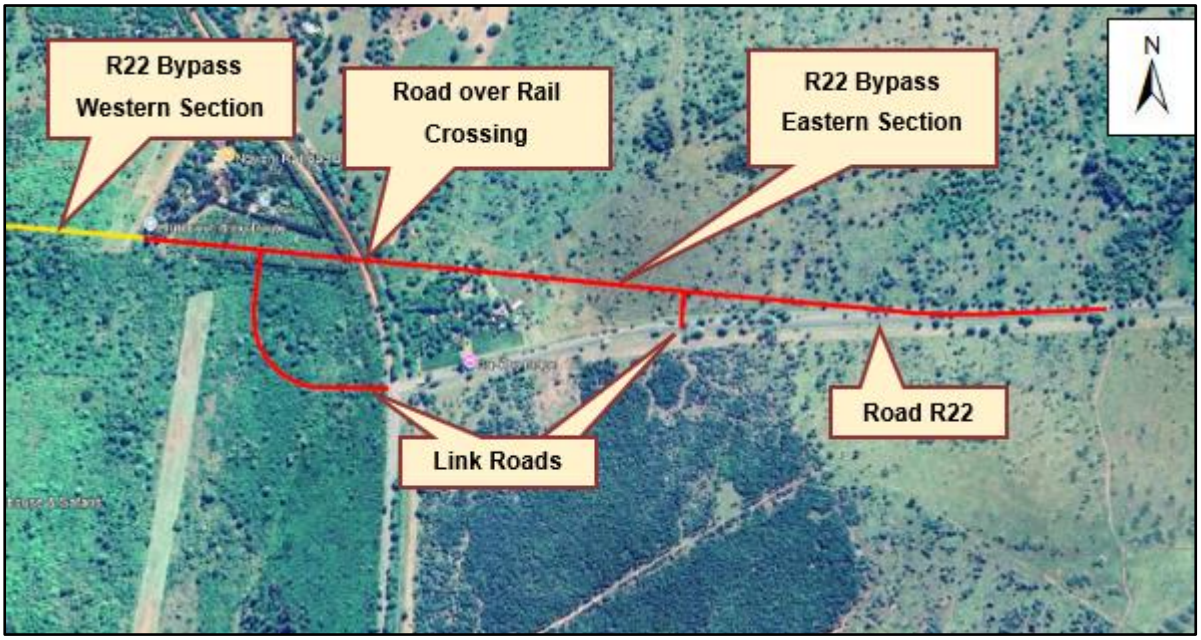


Figure 2: Details of the new R22 Eastern Section

2. TERMS OF REFERENCE

It is understood that this biodiversity and faunal assessment will be submitted as a specialist study to accompany an Application for Environmental Authorisation in accordance with the NEMA (Act No. 107 of 1998): EIA Regulations (2014).

The assessment will therefore meet the requirements of specialist studies submitted in accordance with the protocols set out in the legislation.

In brief, these requirements have as an outcome to achieve the following:

- A description of the methodology of the site visit and the techniques used to assess the specific aspect of the site;
- Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure
- A description of any assumptions made and any uncertainties or gaps in knowledge;
- A description of the findings and potential implications of such findings on the impact of the proposed activity;
- Any mitigation measures for inclusion in the Environmental Management Programme Report (EMPr);
- Any conditions for inclusion in the Environmental Authorisation;

- Any monitoring requirements for inclusion in the EMPr or Environmental Authorisation; and
- A reasoned opinion whether the activity should be authorised based on the findings of the study.

3. ASSUMPTIONS AND LIMITATIONS

No direct knowledge gaps have been identified that may influence the outcome of this assessment. The following assumptions however, have been made in the completion of the study:

- The development proposal used in this assessment is limited to the development layout as provided by the design engineers.
- The assessment is based on a site visit conducted on 13 September 2024 by Mr J. Alletson and Ms M Holder.
- Because the site visit was limited to a single visit, heavy reliance has been placed on a variety of desktop data sources as listed and discussed below.
- The study refers only to matters relating to biodiversity so any social issues are not addressed.

4. STUDY AREA

4.1 Extent of the study area

The extent of the project area was taken to be a strip of approximately 100 m in width, which exceeds the requirements of the National Environmental Management Act (Act No. 107 of 1998), on both sides of the proposed road route. It is to be noted that cognisance was also taken of the National Water Act (Act No. 36 of 1998) which states as follows:

The "*General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as defined in Section 21(c) and (i)",* Notice 509 of 2016, specifies that the "regulated area of a watercourse" is to mean:

> (a) The outer edge of the 1 in 100 year flood line and / or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
> (b) In the absence of a determined 1 in 100 year flood line or riparian area, the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or
> (c) A 500m radius from the delineated boundary (extent) of any wetland or pan.

However, since there are no wetlands or watercourses along the route of the road or within 500m of it, the study area was reduced to just the 100 m wide strip on either side of the road. Additionally, where this strip crossed the existing R22, it was cut off along the road. This decision was taken since the road is currently isolated from its surrounds by a high game fence and it was assumed that both the fence would be retained, and that the new road would be similarly enclosed. See Figure 3.

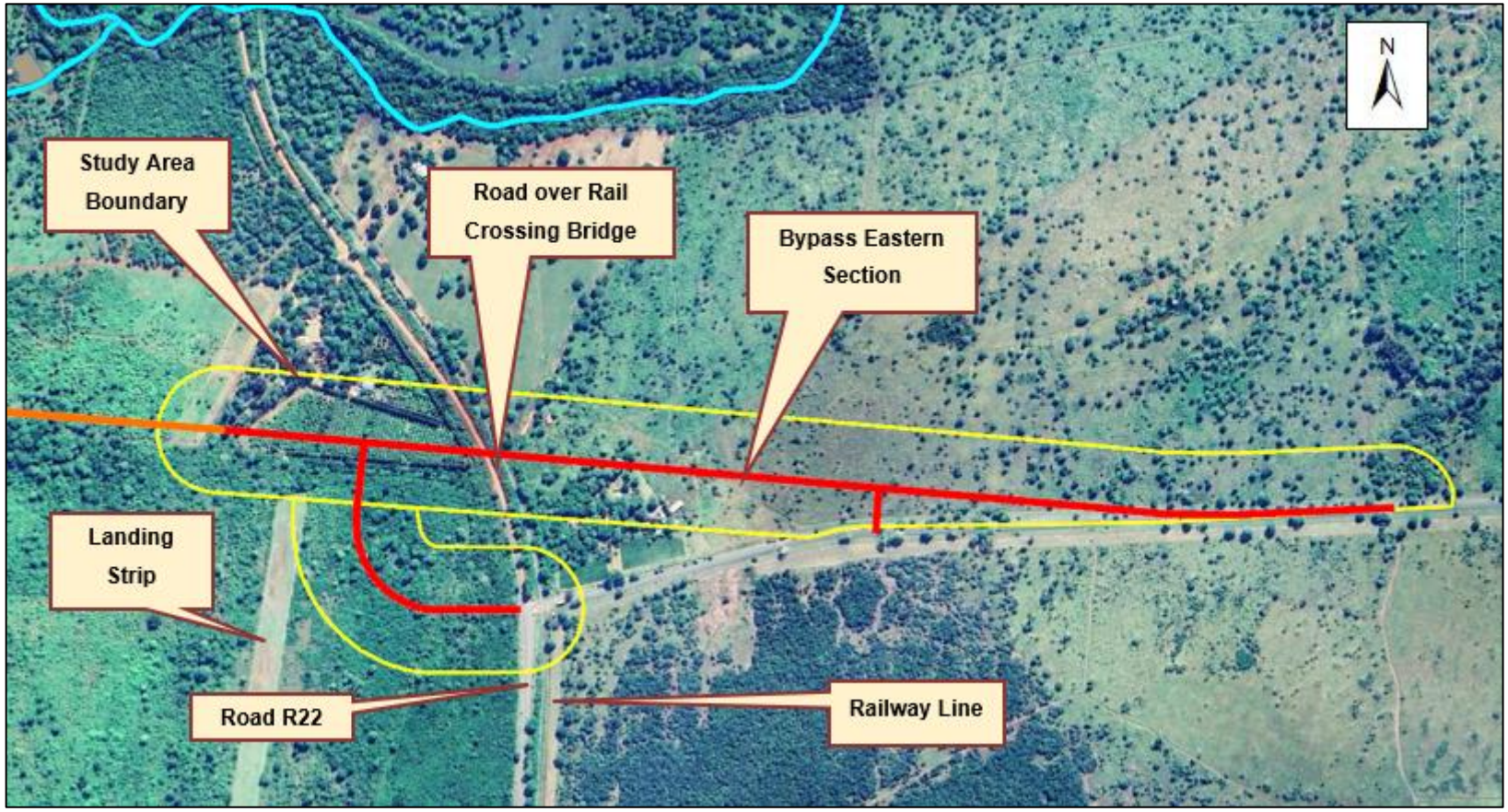


Figure 3: View of the defined 100 m study area strip

4.2 Description of the study area

Vegetation

The original vegetation at the site consists of two vegetation types and so would be transitional between them. See **Error! Reference source not found.**.

Zululand Lowveld (Type SVI 23) The original indigenous at the site is classified by the South African National Biodiversity Institute's Database, National Vegetation Types (2018), as being Zululand Lowveld (Type SVI 23). This savanna type is described (Scott-Shaw and Escott, 2011) as bushveld units ranging from dense thickets of *Dichrostachys cinerea* and *Acacia* species, through park-like savanna with flat-topped *A. tortilis* to tree dominated woodland with broadleaved open bushveld with *Sclerocarya birrea* subsp. *caffra* and *A. nigrescens.* Tall grassveld types with sparsely scattered solitary trees and shrubs form a mosaic with the typical savanna thornveld, bushveld and thicket patches.

Grassland consisting of *Eragrostis capensis* (Heart-seed Love-grass), *Eragrostis curvula* (Weeping Love-grass) and *Heteropogon contortus* (Spear Grass) is also evident.

The western portion of the study area route consists of severely transformed Zululand Lowveld vegetation. The transformation was done in the late 1960s for the establishment of crop fields.

Western Maputaland Clay Bushveld (Type SVI 20) Described as extensive flat or only slightly undulating landscapes supporting complex of various bushveld units ranging from dense thickets of *Dichrostachys cinerea* and *Acacia* species, through park-like savanna with flat-topped *A. tortilis* to tree dominated woodland with broadleaved open bushveld with *Sclerocarya birrea* subsp. *caffra* and *A. nigrescens.* Tall grassveld types with sparsely scattered solitary trees and shrubs form a mosaic with the typical savanna thornveld, bushveld and thicket patches. This vegetation type extends from the road-over-rail bridge site to the end of the eastern road section

Makatini Clay Thicket (Type SVI 21) A small patch of this vegetation type lies to the immediate south of Road R22. Thus, while it is not within the defined study area, it could possibly have some of its characteristic species blending into the Western Maputaland Clay Bushveld which surrounds it.

Although the vegetation in the study area originally consisted of the three vegetation types, it must be recognised that in the past virtually the entire area has been used for agricultural purposes. The crops that were most commonly grown in the area included sugar cane, sisal, and pineapples. As shown in Figure 5 in 1960 virtually all of the study area included natural vegetation with the exception of a small strip down the western side of the R22 close to the present day airport. The extent of the town of Hluhluwe was very much less than at present. By 1978 much of the area was under cultivation. See Figure 6. The crop actually present at that time cannot be ascertained but, by the year 2000, much of the study area lying to the east of the P2-8 road-over-rail bridge has been allowed to return to a more natural form of vegetation probably dominated by pioneer species. See Figure 7. Initially cattle were grazed in the area but now it is a part of a game farm.

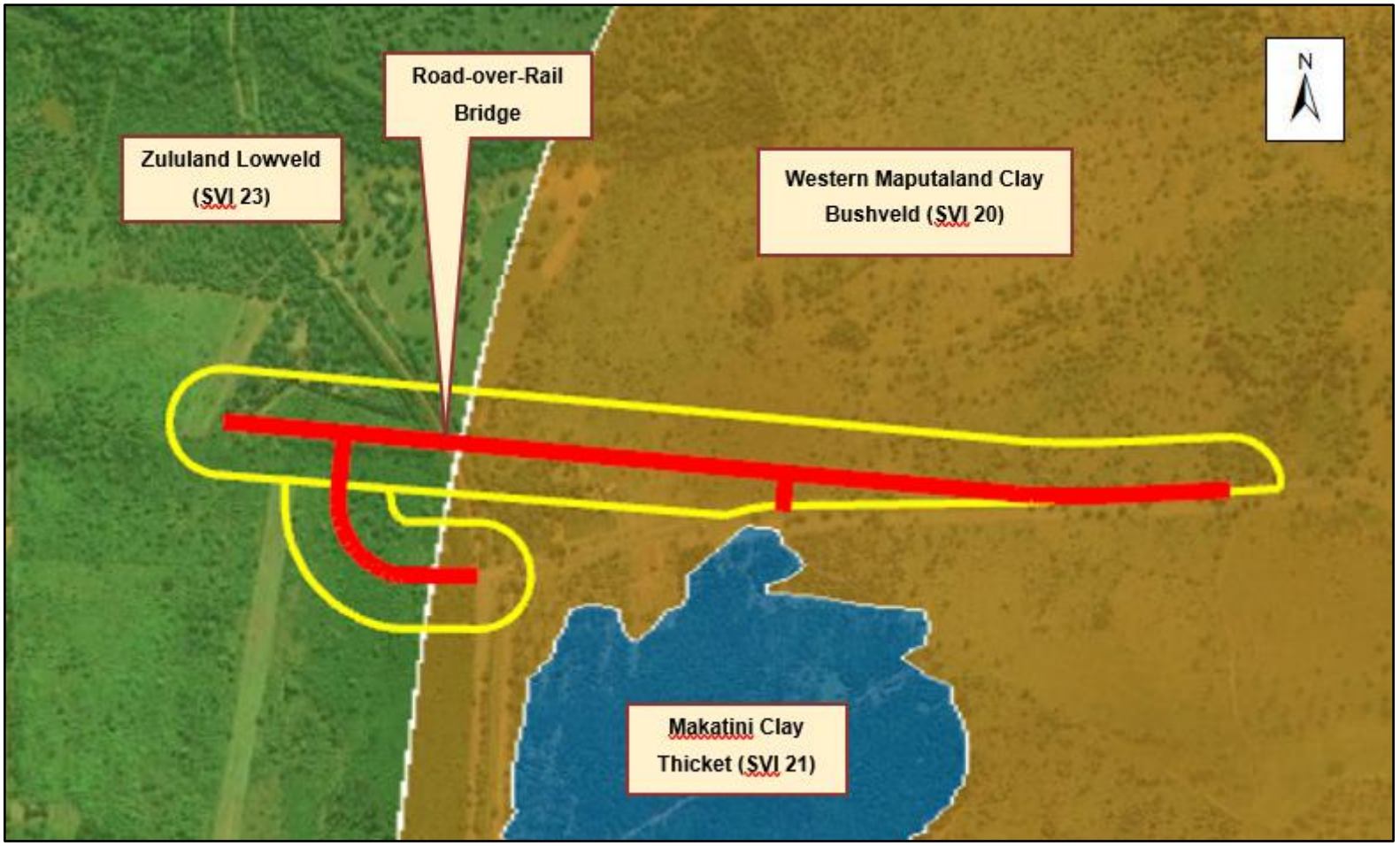


Figure 4: Vegetation types in and around the defined study area

Plate 1: Scrubby secondary vegetation close to the western end of the new road section. Vegetation is dominated by *Dichrostachys cinerea* and *Chromolaena odoratum* thicket The prominent tree is *Melia azerdarach* (Syringa)

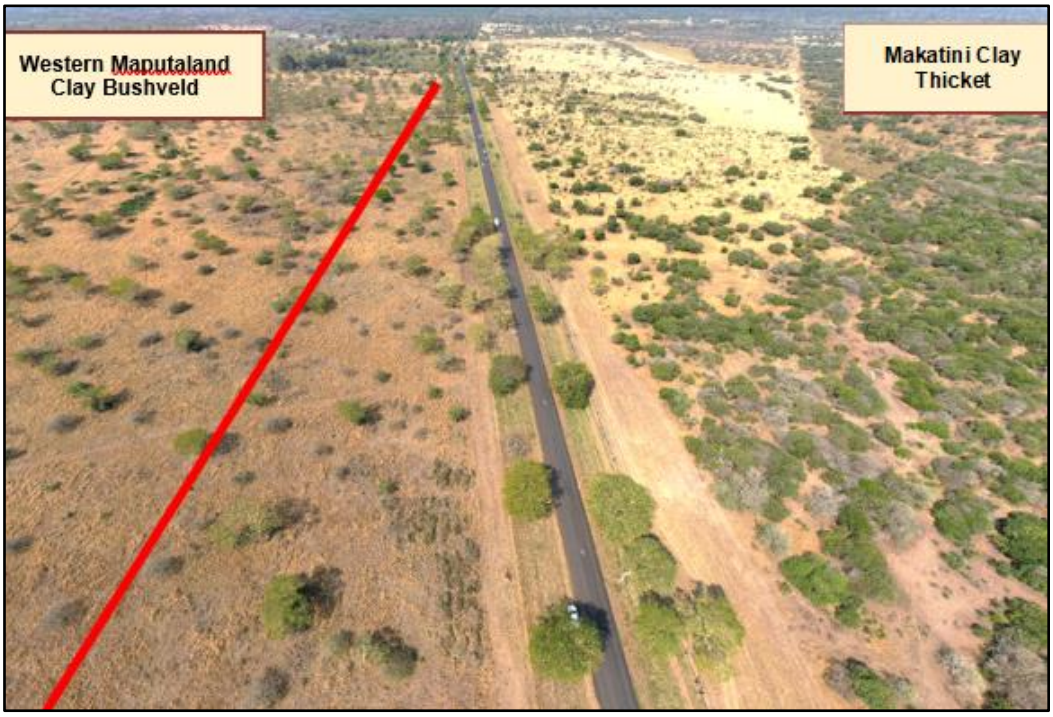


Plate 2: Eastern end of the road with the approximate new alignment indicated. Note the *Acacia tortilis* savanna along the route

To the west of the bridge the area around the road route includes plantations of nut/mango trees and secondary bush thickets, dominated by Dichrostachys cinerea and Chromolaena odoratum, which lie around the edges of the Hluhluwe landing strip.

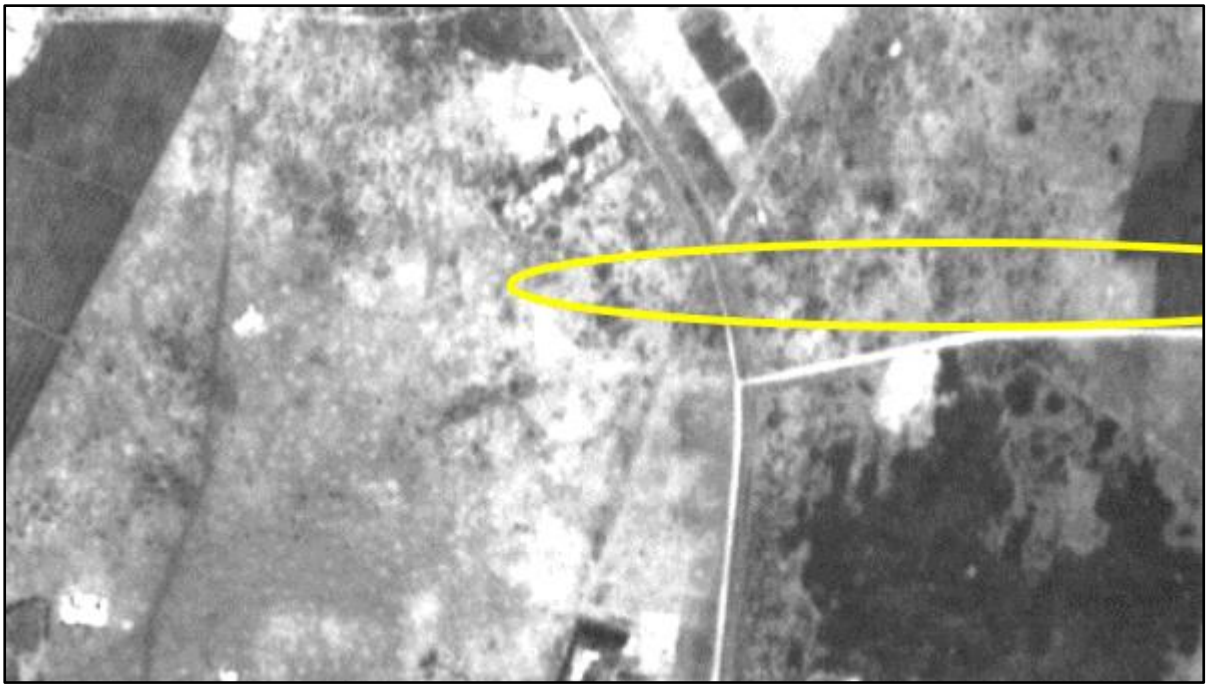


Figure 5: Aerial survey photograph dated 1960 showing predominantly natural vegetation

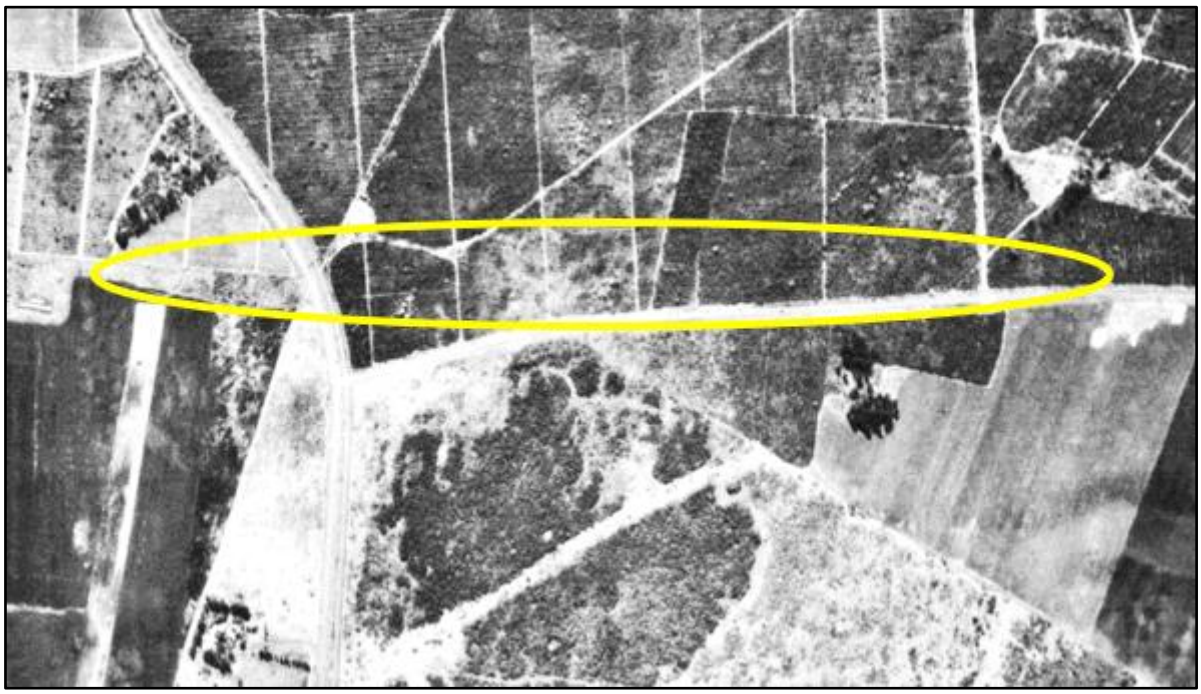


Figure 6: Aerial survey photograph dated 1978 showing cultivation in the study area.

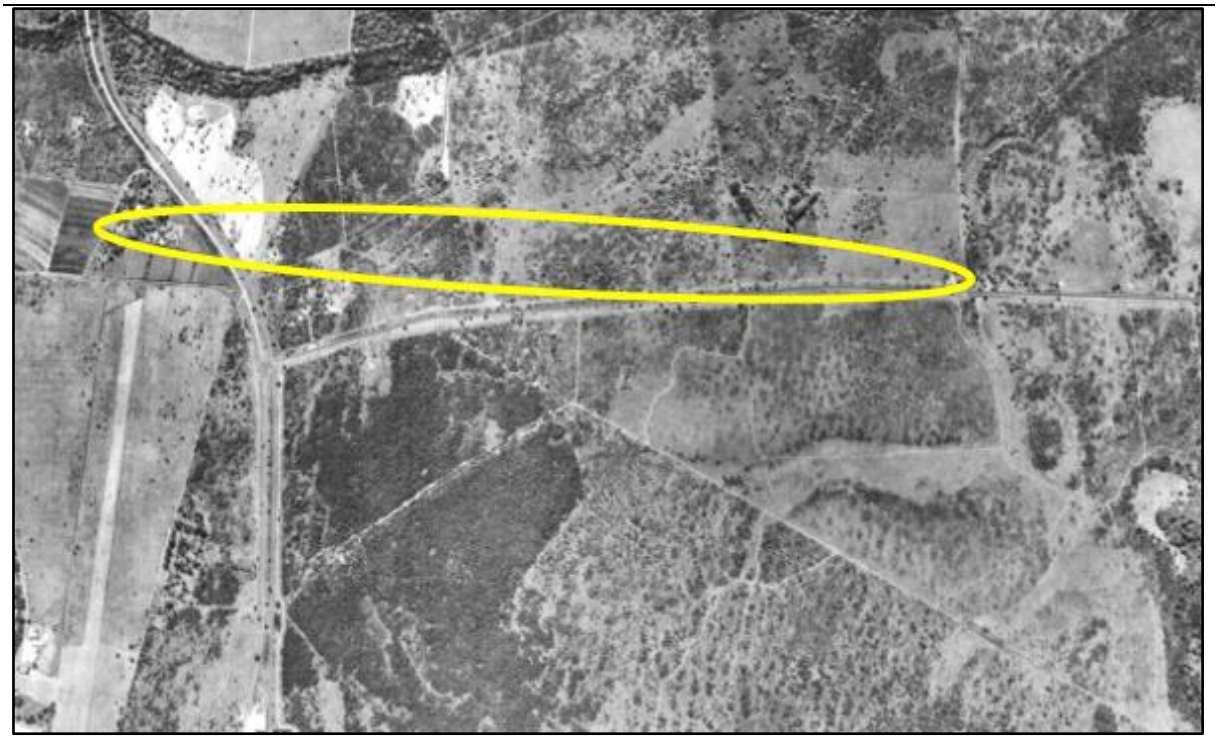


Figure 7: Aerial survey photograph dated 2006 showing recovery of bushveld vegetation

Topography

The eastern section of the new road crosses relatively flat terrain. The altitude ranges from approximately 79 masl in the west to approximately 49 m asl in the east.

Landuse

The current landuses along the road section include some fruit orchards at the western end with the Hluhluwe landing strip being nearby. Further to the east the past agriculture has been discontinued and a semi-natural vegetation is developing. The area has been grazed by cattle but is now used more as a wildlife farm.

Drainage

The new road section travels in the watershed of the Ngweni River which lies to the north. The river is some 550 m away at its closest point to the road and is flowing north-east to join the Mzinene River which discharges into False Bay of Lake St. Lucia.

There are seasonal pans in the Makatini Clay Thicket to the south of the existing R22. These are upslope of the new road and will not be affected by it.

5. EXPERTISE OF THE SPECIALISTS

The *curriculum vitae* of the specialist, Mr Jake Alletson is attached. Mr Alletson is a registered ecologist with SACNASP (No.125697) and is a member if IAIASA (No. 035). He holds a BSc degree in Biological Sciences from the University of Natal and a BSc Honours degree in Zoology from Rhodes University. He served as the aquatic ecologist in the (then) Natal Parks Board and has been an environmental consultant since 1997. Mr Alletson has in excess of 45 years' experience in the field of aquatic and terrestrial ecological studies in Southern Africa.

In the course of this study, Mr Alletson was assisted by Ms M. Holder who undertook the plant survey. She is a member of CREW (Conservation of Rare and Endangered Wildflowers) and has received training at the John Bews Herbarium. She has 25 years of experience in such studies.

6. AIMS AND OBJECTIVES

The following aims and objectives were set out for this study:

- Identification and classification of any wetlands within the boundaries of the road route and a 500 m surrounding buffer strip;
- Identification and classification of any wetland and other aquatic features that are located within a 500m radius from the boundaries of the project;
- Assessment of the identified wetlands within the boundaries of the project;
- Modelling of the identified wetland and other aquatic features that may be directly impacted by the road upgrade project and related activities;
- Identification of potential impacts on the wetlands and aquatic features;
- Provision of applicable buffers around each of the wetlands that have been identified as being directly impacted upon by the development proposal;
- Investigation of the terrestrial biodiversity within a 100 m wide (Total width) along the road route;
- Identification of impacts on the terrestrial biodiversity along the road route strip; and
- Management and mitigation measures to implemented to limit or mitigate these impacts.

7. METHODOLOGY - WETLANDS

The methodology that was followed in completing this study is in line with the requirements and specifications of the Department of Water and Sanitation and includes the following aspects.

7.1 Wetland Identification and Mapping

The initial wetland identification process was conducted at a desktop level during which available GIS databases were interrogated to determine the presence of any wetland areas that have been formally mapped. The key databases that were interrogated were the National Freshwater Ecosystem Priority Area (NFEPA) Wetland Map 4 and the South African Inventory of Inland Aquatic Ecosystems (SAIIAE)Wetland Map 5. Reference was also made to historic aerial survey photographs of the area and to Google Earth mapping.

7.2 Wetland Delineation

Wetland delineation was to be done in accordance with the procedures set out in DWAF (2005), and DWAF (2008). These two documents are based on the identification of four indicators which are as follows:

- ***Terrain Unit Indicator*** – Identification of the part of the landscape where wetlands are more likely to occur;
- ***Soil Form Indicator*** – Identification of the soil types which are associated with prolonged and frequent saturation;
- ***Soil Wetness Indicator*** – Identification of the morphological signatures that develop in soil profiles as a result of prolonged and frequent saturation; and
- ***Vegetation Indicator*** – Identification of the hydrophilic vegetation associated with frequently saturated soil.

These indicators are used to not only identify wetland margins but also the pattern of zonation of saturated conditions within a wetland site as summarised in Figure 8.

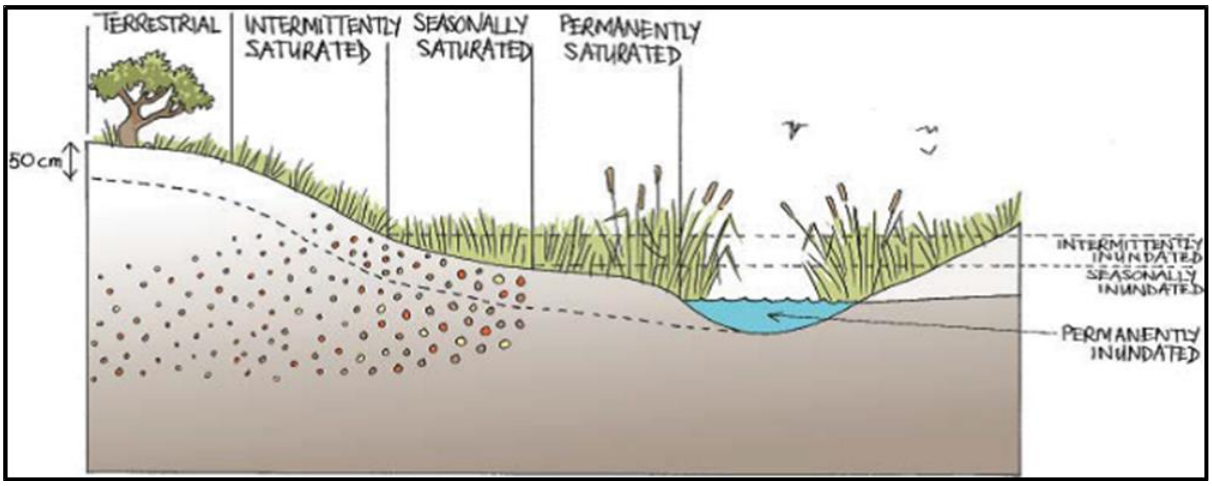
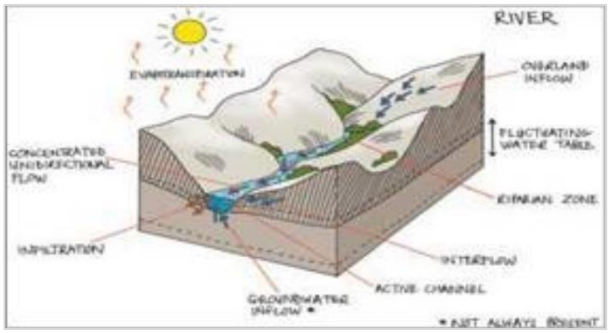
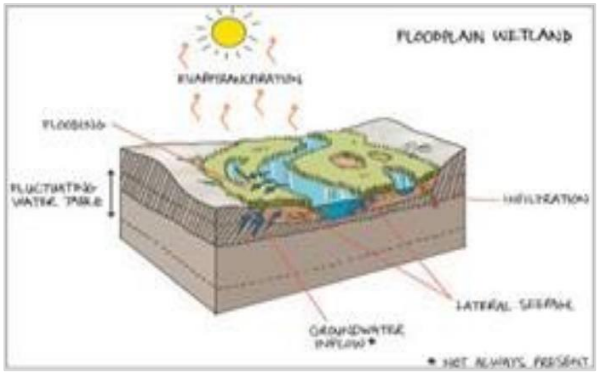
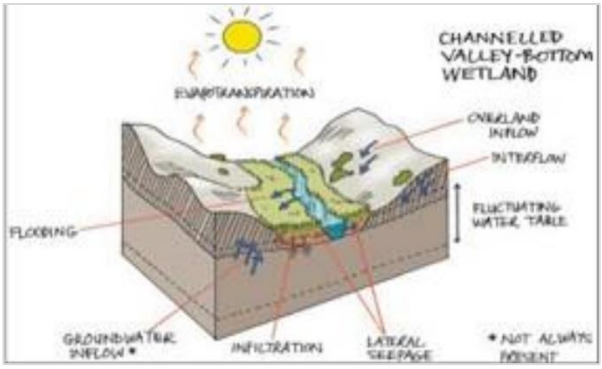
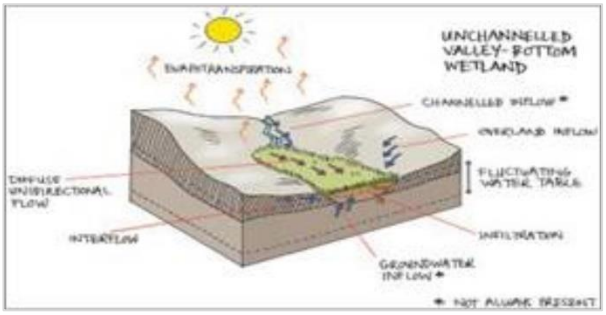
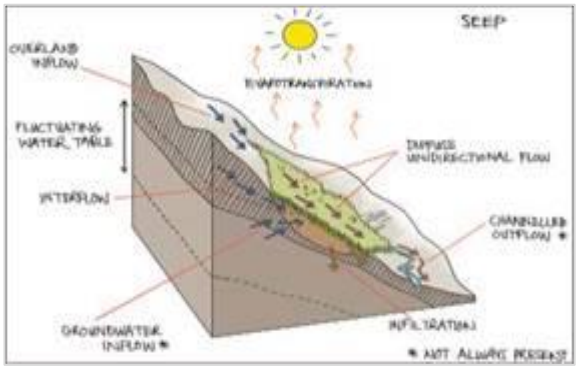
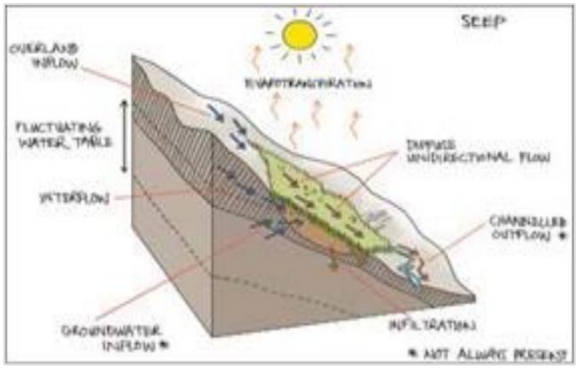


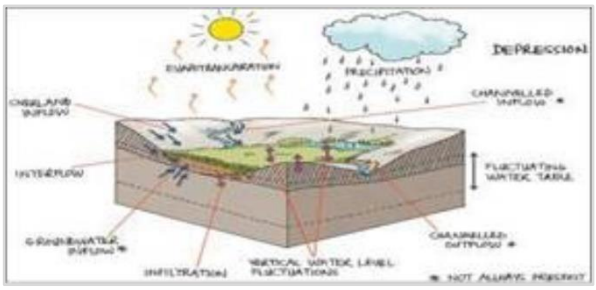
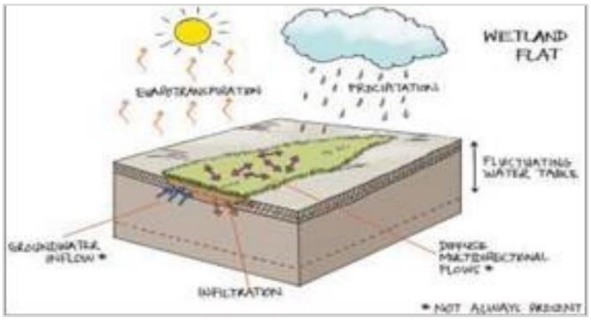
Figure 8: Cross section through a wetland, indicating the interaction between the soil condition and inundation frequency

Further refinement of the wetland delineation is then undertaken by dividing the wetland into one or more hydrogeomorphic units as defined by Ollis *et al* (2013) and shown in Table 1.

Table 1: Wetland hydrogeomorphic (HGM) defined by Ollis *et al*, 2013.

Hydrogeomorphic types		Description
River		Rivers are linear landforms with clearly discernible banks and a channel, which permanently or periodically, carries a contained and defined flow of water. A river is taken to include both the active channel and the riparian zone.
Floodplain		Valley bottom areas with a well-defined stream channel, gently sloped and characterised by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.
Valley bottom with channel		Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterised by the net accumulation of alluvial deposits or may have steeper slopes and be characterised by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.

Hydrogeomorphic types		Description
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterised by alluvial sediment deposition generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterised by the colluvial (transported by gravity) movement of materials. Water inputs are mainly sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.
Isolated Hillslope seepage		Similar to other hillslope seeps but with no direct surface water connection to a stream channel. Slopes on hillsides, which are characterised by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow primarily by diffuse sub-surface and/or limited surface flow.

Hydrogeomorphic types		Description
Depression (includes Pans)		A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.
Wetland Flat		A flat wetland with no apparent inlet or outlet points. Water is obtained from surface or near surface flows and is lost either by downward percolation or evapotranspiration. May be only seasonal in terms of its wetness and hydromorphic soils may be only weakly developed or else be absent. Vegetation may be the strongest indicator.

7.3 Wetland Functional Assessment

The functionality and the Ecological Importance and Sensitivity EIS of the wetland(s) were to be determined through use of the WET-Ecoservices model. Two versions of the model (Kotze et al, 2008 and Kotze et al, 2020) are in use with Version 2 giving consideration to both ecosystem services currently available, and to future service demand. The model considers the biophysical and social conditions around a wetland and converts these considerations into a fixed score for a series of defined ecosystem services that the wetland delivers. The services include the following:

- Flood Attenuation
- Streamflow regulation
- Sediment trapping
- Phosphate assimilation
- Nitrate Assimilation
- Toxicant Assimilation
- Erosion control
- Carbon storage (sequestration)
- Maintenance of biodiversity
- Provision of water for human use

- Provision of harvestable resources
- Provision of cultivated food
- Cultural significance
- Tourism and recreation
- Education and research

The maximum score for any service is a value of 4 and the rating of the probable extent of the service is shown in Table 2 below.

Table 2: Ecoservices rating of the probable extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

7.4 Determining the Present Ecological State of Wetlands

The WET-Health model which produces values for PES was used and also for inputs into the EIS considers the integrity of the site in terms of its hydrology, geomorphology, and vegetation cover. Anthropogenic changes or impacts are assessed along with the relevant role of the site in its catchment and the extent of the impacts on the three criteria is determined. The results are then combined in a weighted formula to give a value for the PES of that site. The formula used to combine the impacts into the PES score is shown below:

Health = ((Hydrology value x 3) + (Geomorphology value x 2) + (Vegetation value x 2))/7

The impact score ratings are shown in Table 3 and the PES Categories are shown in Table 3.

The level of impacts on the three parameters (hydrology, geomorphology or vegetation) is a direct indication of the PES of the wetland as well as the functioning of the wetland. A wetland area that has undergone severe impacts on one or more of the three will reflect a low present ecological state while the converse is also true for pristine wetlands.

Table 3: The magnitude of impacts on wetland functionality (Macfarlane et al, 2008)

Impact Category	Description	Score
None	No Discernible modification or the modification is such that it has no impacts on the wetland integrity	**0 to 0.9**
Small	Although identifiable, the impact of this modification on the wetland integrity is small.	**1.0 to 1.9**
Moderate	The impact of this modification on the wetland integrity is clearly identifiable, but limited.	**2.0 to 3.9**
Large	The modification has a clearly detrimental impact on the wetland integrity. Approximately 50% of wetland integrity has been lost.	**4.0 to 5.9**
Serious	The modification has a highly detrimental effect on the wetland integrity. More than 50% of the wetland integrity has been lost.	**6.0 to 7.9**
Critical	The modification is so great that the ecosystem process of the wetland integrity is almost totally destroyed, and 80% or more of the integrity has been lost.	**8.0 to 10**

Table 4: Definitions of the PES categories (Macfarlane *et al*, 2008)

Impact Category	Description	Impact Score Range	Present State Category
None	**Unmodified, natural**	**0 to 0.9**	**A**
Small	**Largely Natural** with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	**1.0 to 1.9**	**B**
Moderate	**Moderately Modified.** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	**2.0 to 3.9**	**C**
Large	**Largely Modified.** A large change in ecosystem processes and loss of natural habitat and biota has occurred.	**4.0 to 5.9**	**D**
Serious	**Seriously Modified.** The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	**6.0 to 7.9**	**E**
Critical	**Critical Modification.** The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	**8.0 to 10**	**F**

7.5 Determining the Ecological Integrity of the Wetlands

The ecological integrity (EI) of a wetland is determined by a combining the findings of the WET-EcoServices and WET-Health tool as both these tools provide considerations in this regard. For instance, a wetland that makes very little ecosystem services contribution to the hydraulic system that it is linked to and has a low PES score will consequently have a low ecological integrity. The converse is also therefore true for wetlands making a large ecological contribution to the hydraulic system it is linked to as well as a high PES score.

7.6 Determining the Ecological Importance and Sensitivity of Wetlands

The outcomes of the implementation of the WET-EcoServices tool discussed in Section 7.3, above, is key in the determination of the ecological importance and sensitivity of wetlands as the results is a direct indication of the contribution that the wetland is making to the hydraulic system with which it is linked. This contribution is linked to the sensitivity of this wetland to any possible change and how this will impact on the hydraulic system it is linked to.

7.7 Ecological Classification and Description

The ecological classification and description are direct results of the implementation of the methodology and tools described in Section 7.1 to 7.6 as the results of these determinations contribute to the understanding of the ecology of the wetland. The description of the wetland will therefore make provision for a description of the physical attributes of the wetland (location, size, etc.), the ecosystem services that the wetland provides, the current ecological state of the wetland and the importance of the wetland as well as its sensitivity.

8. METHODOLOGY – TERRESTRIAL BIODIVERSITY

The methodology that was followed in completing this study is primarily in line with the requirements and specifications of the National Environmental Management Act (Act No. 107 of 1998) and includes the following aspects.

8.1 Desktop Study

A desktop study was undertaken prior to visiting the site and the following data sources were interrogated:

- The DFFE Screening Report generated on 11/01/2022
- KZN Biodiversity Sector Plan
- The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 119. Mucina and Rutherford (2006)
- Historic aerial survey photographs
- Google Earth imagery
- Relevant taxon-specific reference works

Consideration was also given to the Virtual Museum databases but it was found that they could not be usefully restricted to the habitat types along the road route. The fauna of the area was also discussed at a meeting with the local anti-poaching and game management unit.

8.2 Site Study

A visit was made to the site of the new road in September 2024. It was possible to visit and walk over almost all of the route except for the final section where it rejoins the existing R22. However, this section of the road could be easily observed from the road and so the observations made are considered to be reliable. It was also possible to use a drone to fly over much of the new route.

9. METHODOLOGY – IMPACT ASSESSMENT

The impact assessment was done by means of a tool developed by Alletson Ecologicals. This model takes into account the parameters specifically list in the EIA regulations of 2014 (as amended) and which are as follows:

- Consequences (Magnitude / Intensity) of the impact
- Extent of the impact
- Duration of the impact
- Reversibility of the impact
- Irreplaceable loss of resources due to the impact
- Probability of the impact
- Significance of the impact

However, the tool recognises both that the manner in which “Probability of the impact” is used in calculating the Significance of the impact is often confusing or misleading, and that it has little to do with the environmental impact itself. The tool therefore calculates two outputs which are:

- A value for Ecological Impact which considers only environmental parameters, and
- A value for Managerial Impact which considers a combination of the ecological impact and the probability of the impact. This result is intended to indicate the relative demand of the impact for mitigatory or other managerial interventions. For the sake of convenience, it is optionally linked to the mitigation hierarchy.

Inputs to the model are more thorough than are commonly used and include the following categories each of which has five score classes within it:

- Landscape Class. A measure of the extent to which the landscape around the development site is already transformed. Values range from pristine and untouched through to totally transformed and built over.
- Site Biodiversity Values. These include faunal and floral species diversity, Habitat type diversity, invasion by alien weed species, presence of rare species, presence of red data listed species, and other unique or special features.
- Site Integrity Values. These include presence of buffer areas, connectivity with other similar areas, extent of alteration (linked to landscape class), provincial conservation status, and presence or otherwise of a threatened terrestrial ecosystem.

- Site Ecoservice Delivery. Attention is given to ecoservice delivery for biological functionality, and for delivery of human benefits. Notably, soil functionality is taken into consideration.
- Site Importance. Attention is given to the DFFE screening report, the provincial conservation plan, the provincial biodiversity sector plan, and any special or unusual benefits such as municipal spatial conservation and development plans. Also brought into this category are the results of the previous site and functionality surveys.
- Threats and Vulnerability. The presence of any threats or vulnerabilities in the landscape around the development site are noted.
- Specific questions on features of high biodiversity importance or value.

The results of all the above inputs are worked into a Site Aggregate Modifier which is a simple value of between 1 and 5.

The user is then asked to asses each of the identified impacts in relation to the extent, reversibility, duration, consequences, potential resource losses, and existing threats in the surrounding landscape. A descriptive score sheet is provided. The scores are averaged and are combined with the site aggregate modifier with the result being the Final Ecological Score of the impact. This score is then taken, along with an estimate of probability, and by means of a non-numeric matrix is combined into the Managerial Priority (Significance) Score of the impact. The results are presented in both tabular and graphic form.

A further output, if so desired, is an estimate of the cumulative effect of each identified impact.

It is to be noted that scores are not allocated in a rectilinear manner but that the given values are spaced along a sigmoidal curve. The same scoring system is used for both ecological values and for impacts and is designed to mimic natural environmental processes and the classes are shown below.

Table 5: Class scores and descriptions used in the impact assessment model

Scores:	0 - 0,5	0,6 - 2,8	2,9 - 5,8	5,9 - 8.4	8,5 - 10,0
Descriptions:	Low	Moderately Low	Intermediate	Moderately High	High

10. RESULTS

The results presented below are based on the findings of the desktop assessment as well as the field investigations conducted for the study.

10.1 History of the Site

The history of the site was investigated since the information gained can contribute to an understanding of observations made and so in setting out guidelines for future management interventions. The oldest aerial survey photograph that could be found for the study area is

dated 1960 and information gained from it and more recent images is discussed in Paragraph 4.2 (Vegetation).

10.2 Wetlands

There are no palustrine wetlands within 500 m of the new road section. The Makatini Clay Thicket (SVI 21) to the south of the present Road R22 does have some small occasional (episodic) wet areas. These are more than 400 m away from the road and lie at a higher elevation than the road route. The new road project will have no effect on them.

10.3 Terrestrial Biodiversity

10.3.1 DFFE Screening Report

The DFFE Screening Report for the new road area indicates the biodiversity sensitivities shown in Table 6.

Table 6: Biodiversity-related sensitivities indicated in the DFFE Screening Report

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Animal Species Theme		X		
Aquatic Biodiversity Theme				X
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

- Animal Species Theme Sensitivity

The animal species sensitivities are shown and discussed in Figure 9 and Table 7.

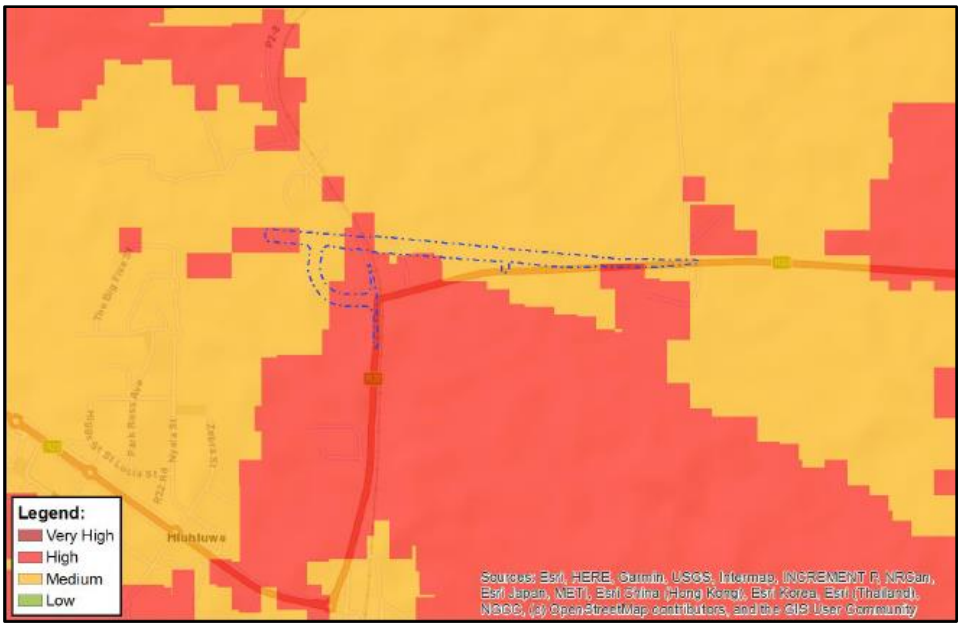


Figure 9: Animal Species Sensitivity

It is to be noted that only very small portions of the Sensitive Animal Species theme reach into the road study area. However, in making the assessments, attention was actually given to a wider area which roughly included a block of land bounded by Hluhluwe town, False Bay Park, and between the Ngweni and Mzinene Rivers.

- Aquatic Biodiversity Theme

The Relative Aquatic Biodiversity Theme sensitivity is shown in Figure 10 below.

Figure 10: Relative Aquatic Theme Sensitivity

However, since there are no wetlands, the theme is not considered further.

- Plant Species Theme Sensitivity

The extent of the Plant Species Theme Sensitivity is shown in **Error! Reference source not found.** and in Table 8.

Figure 11: Plant Species Theme Sensitivity

Plant diversity at the site of the new road has been severely damaged in the past as a result of past agriculture which covered virtually the whole of the new road area and surrounds. The area has since been allowed to lie fallow and is slowly returning to a semi-natural form of vegetation. This is best seen in the area of Western Maputaland Clay Bushveld (SVl 20) where Acacia savanna is now appearing. However, the area of Zululand Lowveld has degenerated into a scrub dominated by *Dichrostachys cinerea* and *Chromolaena odoratum*. See Paragraph 10.3.2 for a list of observed plant species.

Table 7: Animal species sensitivities indicated in the DFFE Screening Report

Sensitivity	Feature (Scientific Name)	Feature (Common Name)	Comment
High	Aves-Smithornis capensis	African Broadbill	(Vulnerable) Reasonably common in the area. Preferred habitat is woodland and so only small sections of the road route area are suitable for it.
High	Aves-Circus ranivorus	African Marsh Harrier	(Endangered) Threatened by loss of preferred wetland habitat. Unlikely to present as anything other than a fly- by due to lack of wetlands in the road route area. Will not be affected by the new road.
High	Aves-Terathopius ecaudatus	Bateleur	(Endangered) In KZN Restricted to larger conservation areas. May occasionally fly over the area but will not be resident (breeding) and will not be affected by the new road.
Medium	Reptilia-Pelusios rhodesianus	Variable Hinged Terrapin	(Least Concern) Not common in the area. Restricted to pans and lakes. Will not be present in the new road area.
Medium	Invertebrate-Arytropteris basalis	Flat-necked Shieldback (katydid)	(Vulnerable) Population thought to be declining due to habitat loss. Restricted to coastal forests and thickets. Has not been found since 1982. Most unlikely to be present in the new road area.
Medium	Insecta-Deloneura millari millari	Millar's Buff (Butterfly)	(Rare) Coastal and sub-coastal forest, bushveld, savanna and thicket. Only trees harbouring certain coccids (Sternorrhyncha), with which the species is associated, contain colonies of this taxon. Most unlikely to be present in the new road area.
Medium	Mammalia-Acinonyx jubatus	Cheetah	(Vulnerable) Not present in the new road area.
Medium	Mammalia-Lycaon pictus	Wild Dog	(Endangered) Not present in the new road area.
Medium	Mammalia-Nesotragus moschatus zuluensis	Suni	(Endangered) Sand forest specialist species. Habitat lacking at the new road site and so the species will be absent from the area.

Medium	Mammalia-Ourebia ourebi ourebi	Oribi	(Endangered) Not present in the new road area.
Medium	Sensitive species 7	Name Withheld	(Vulnerable) Forest specialist species. Habitat lacking at the new road site and so the species will be absent from the area.
Medium	Reptilia-Kinixys natalensis	KZN Hinged-back Tortoise	(Near Threatened) Prefers rock and mountainous areas and is absent from the coastal plain (Boycott and Bourquin, 2000). Most unlikely to be present in the new road area.

Table 8: Plant species sensitivities indicated in the DFFE Screening Report

Sensitivity	Feature (Scientific Name)	Feature (Common Name)	Comment
Medium	*Salpinctium natalense*	--	(Rare) Population considered to be stable. Known from *inter alia* Zululand Lowveld where it occurs in rocky shade or the margins of Acacia scrub. Could possibly have occurred in the new road area but has probably been extirpated by past agricultural activities.
Medium	*Pristimera delagoensis var. delagoensis*	Zulu Paddle-pod	(Vulnerable) Threatened by ongoing habitat loss. Known from *inter alia* Western Maputaland Clay Bushveld and so could possibly have occurred in the new road area. However, probably extirpated by past agricultural activities.
Medium	*Oxygonum dregeanum subsp. streyi*	Starstalk	(Endangered) Threatened by ongoing habitat loss. Known from *inter alia* Zululand Lowveld and so could possibly have occurred in the new road area. However, probably extirpated by past agricultural activities.
Medium	Sensitive species 1252	Name withheld	(Vulnerable) Threatened by ongoing habitat loss and by collection for the medicinal trade. Widely distributed in a variety of vegetation types in KwaZulu-Natal but generally in moist wooded areas.

			Could possibly (but unlikely) have occurred in the new road area. However, probably extirpated by past agricultural activities.
Medium	Sensitive species1076	Name withheld	(Vulnerable) Predominantly a grassland species and known from Zululand Lowveld but threatened by ongoing habitat loss and overharvesting for the medicinal trade. Population continuing to decline. Could possibly have occurred in the new road area but probably extirpated by past agricultural activities.
Medium	Sensitive species 738	Name withheld	(Vulnerable) Known from Zululand Lowveld but restricted to evergreen forests. Severely over-exploited for the traditional medicinal trade to the extent that most known populations no longer are able to set seed by reproduce only by vegetative means. Not present in the area around the new road. Probably also affected by the past agricultural activities.

- Terrestrial Biodiversity Theme Sensitivity

The extent of the Terrestrial Biodiversity Theme Sensitivity is shown in Table 9 and in Figure 12.

Table 9: Terrestrial Biodiversity Theme Sensitivity

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Protected Areas Expansion Strategy

Approximately 1.25 ha of National Protected Areas Expansion Strategy (NPAES) space will be lost under the footprint of the new road. This area is not extensive but it does contribute

Figure 12: Terrestrial Biodiversity Theme Sensitivity

further to the fragmentation of the NPAES. It is to be noted that the existing R22 also passes through the same area. The loss of area would be unavoidable if the road is constructed.

10.3.2 Vegetation Survey

The vegetation along the new road section was surveyed by walking over as much of the site as possible. Areas that were difficult included the dense thorn scrub (primarily *Dichrostachys*

cinerea) to the west of roads R22 and P2-8 and the final section of the new road where it approaches the existing R 22. Also in the west is an area of fruit trees which is bordered by rows of Casuarina trees *Casuarina equisetifolium*. Thus there is, in effect, no Zululand Lowveld (SVl 23) remaining along the road route. Further to the east however, the indigenous vegetation is recovering after having been cleared for agricultural purposes in the late 1960s or early 1970s. This area is classified as Western Maputaland Clay Bushveld (SVl 20) and appears now to be under management for game farming purposes.

The indigenous plants found are listed in Table 10 and the alien plants in Table 11.

Table 10: Indigenous plant species observed along the new road route study area

Scientific Name	Common Name	Vegetation Type	
		SVl 23	SVl 20
Acacia xanthophloea	Fever Tree	X	X
Acacia tortilis	Umbrella Thorn		X
Acacia nigrescens	Knob Thorn		X
Abutilon sonneratianum	Forest abutilon		
Aloe cf mudenensis	Aloe	X	
Asparagus africanus	Bush asparagus		X
Commelina benghalensis	Blue commelina		X
Convolvulus farinosus	Wild bindweed	X	
Crossandra fruticosa	Shade crossandra	X	
Dichrostachys cinerea	Sickle bush	X	X
Erythrina caffra	Coastal Coral Tree	X	
Euphorbia ingens	Naboom Euphorbia		
Ficus sur	Broomcluster Fig	X	
Ficus lutea	Giant-leafed Fig		X
Hibiscus aethiopicus	Common dwarf Hibiscus	X	X
Hyphaene coriacea	Lala Palm		X
Ipomoea cf plebeia	Morning glory	X	
Justicia flava	Veld Justicia		X
Kalanchoe rotundifolia	Kalanchoe	X	X
Phoenix reclinata	Wild Date Palm		X
Ruellia cordata	Veld violet	X	
Schotia brachypetala	Weeping Boer-bean		X
Trema orientalis	Pigeonwood	X	
Viscum verrucosum	Warty mistletoe	X	

All of the above indigenous plant species are listed as “Least Concern” with the exception of the *Asparagus africanus* which is a protected species in KwaZulu-Natal. Only two specimens were found. Grasses were not identified as they were either burned or were too trampled to be recognisable.

Table 11: Alien plant species observed along the new road route study area

Scientific Name	Common Name	Invader Status
Agave sisalana	Sisal	Category 2
Argemone ochroleuca	White Mexican poppy	Category 1b
Arundo donax	Giant reed	Category 1b
Bauhinia variegata	Orchid Tree	Category 1b
Bidens pilosa	Blackjack	
Bidens pilosa	Blackjack	
Casuarina equisetifolia	Casuarina	Category 2
Chromolaena odorata	Paraffin weed	Category 1b
Ipomoea indica	Morning glory	Category 1b
Melia azerdarach	Syringa	Category 1b
Parthenium hysterophorus	Demoina bossie	Category 1b
Richardia brasiliensis	Tropical richardia	
Ricinus communis	Castor-oil plant	Category 2
Sesbania bispinosa	Spiny sesbania	
Solanum incanum	Gifappel	
Solanum mauritianum	Bugweed	Category 1b
Sonchus oleraceus	Sowthistle	
Tagetes minuta	Khaki weed	
Taraxacum officinale	Common dandelion	
Tecoma stans	Yellow bells	Category 1b

10.3.3 Faunal Survey

No animals other than some birds, domestic stock, and pets were seen in the road study area. The birds seen were all Passerines and were common species such as Fork-tailed Drongo *Dicrurus adsimilis*, Dark-capped Bulbul *Pycnonotus tricolor,* Paradise Flycatcher *Terpsiphone viridis,* Southern Fiscal *Lanius collaris,* and Kurrichane Thrush *Turdus libonyana*. These were observed primarily around the Gazebo Lodge although there are undoubtedly more in the open bush and veld areas. The day of the site visit was particularly windy and it is probable that many bird species were taking shelter.

11. OVERVIEW OF THE TERRESTRIAL BIODIVERSITY

The terrestrial biodiversity in the area which will be covered by the eastern portion of the R22 Hluhluwe town bypass is varied in terms of its condition. At the end of the road section to the west of Roads R22 and P2-8 the route passes through an area which is so highly transformed from its natural state the virtually no traces of the local veld type (Zululand Lowveld, Type SVl 23) can be found. The area was used for agricultural purposes in the past and a part of it remains under fruit tree orchards up to the present time. Elsewhere the vegetation which is adjacent to the Hluhluwe Airport consists of a dense scrub dominated by *Dichrostachys cinerea* and *Chromolaena odorata*. A link road from the new R22 section to the junction of the old R22 and the P2-8 passes through this area.

To the east of Roads R22 and P2-8 conditions change considerably. The vegetation type is Western Maputaland Clay Bushveld (SVl 20) and, although had been totally destroyed for agriculture in the past, is now recovering well. The first 250 m passes through the Gazebo Lodge complex but the road then enters an area of open savanna. The area around the lodge includes gardens with indigenous plants and is shaded by Fever Trees but thereafter the road route is through open vegetation for the final 1.25 km. This last section is the only part of the road which has any meaningful conservation value. Examination of the vegetation in the area suggests that it has not yet recovered fully from the agriculture of the past. It may be expected that more trees will develop and, if the soil is also recovering there will be an increase of forbs, graminoids, and other low/understorey plants.

On the basis of the above observations the environmental scores of the various categories used in the assessment model are shown in Table 12.

12. IMPACT ASSESSMENT

The impacts which have been identified are considered in terms of their impact potential and mitigation requirements. In doing so the process was guided by reference to the Mitigation Hierarchy which, in turn, is supported by the draft National Biodiversity Offset Policy (RSA, 2017). This concept is illustrated in Figure 13 which indicates the flow of the decision-making process. It entails iterative consideration of the impacts of a proposed development and means of reducing those impacts. It starts at the top level (“Avoid/Prevent”) and only when the options in that level are considered and exhausted, does the process move progressively down to the next lower level with the intention of limiting impacts to that extent.

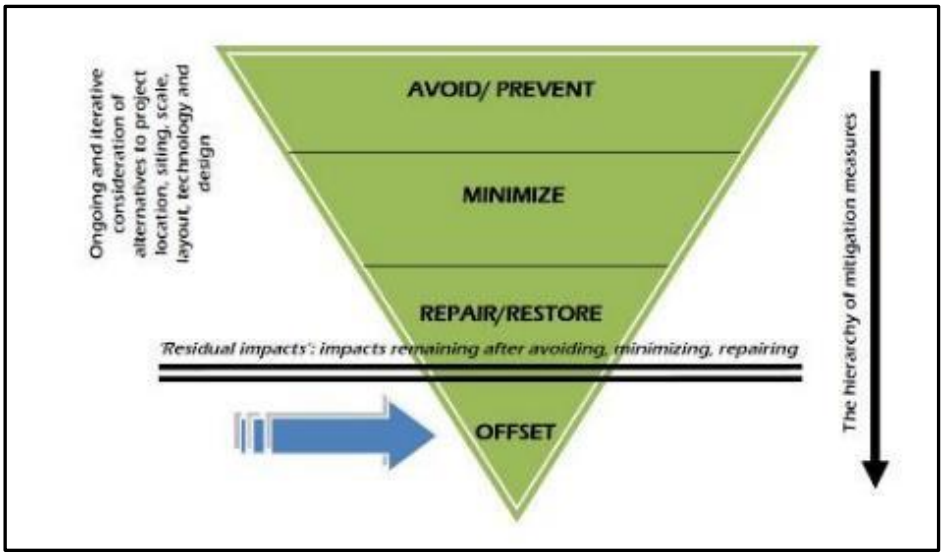


Figure 13: Components of the Mitigation Hierarchy

The foreseen potential impacts are as follows:

- Loss of savanna vegetation along the final 1.25 km of the road section route. The road reserve is expected to be approximately 50 m in width and it is taken that all woody vegetation within this strip will be lost. The loss, including that for the link road, will be approximately 4.5 ha in extent.
- Loss of lowveld vegetation to the west of Roads R22 and P2-8. The section of new road in this area, including the link road, will all be in dense scrub vegetation which has very few remnants of the original vegetation type.
- Deposition of solid wastes including steel, plastics and soil spoil heaps. Such wastes could be dangerous, unsightly, or obstructive to future activities.

These impacts are assessed by means of a new tool developed by Alletson Ecologicals. See Paragraph 9 above. The results are shown in Table 12 and Table 13 and in Figure 14.

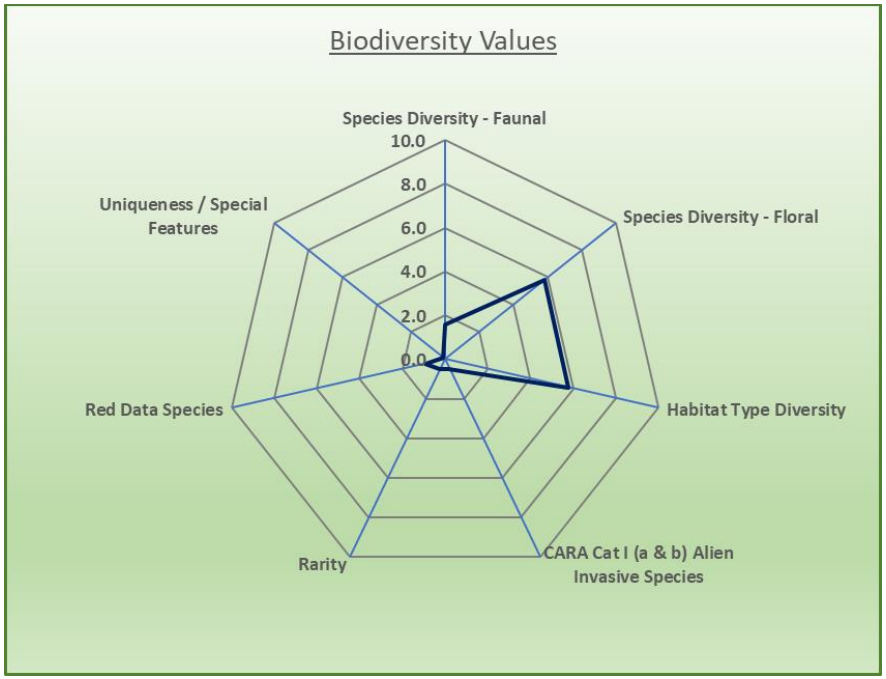
The following points are to be noted:

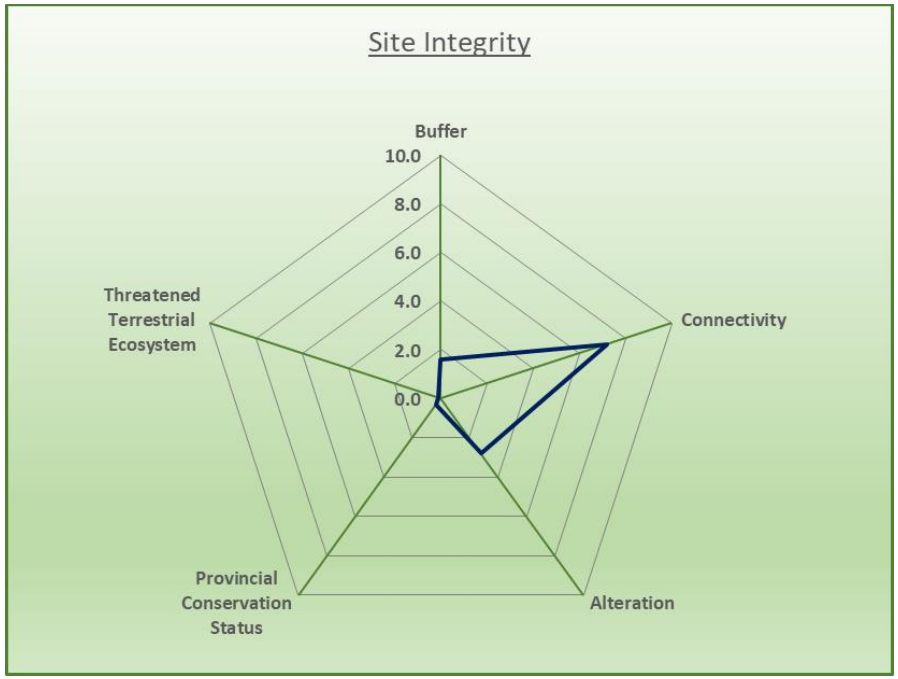
- Impacts related to the construction contractors' site camp are ignored as the camp is already in existence and is several kilometres away from the road area.
- No assessment of possible operational impacts is done since their nature cannot be foreseen and circumstances will dictate their severity and treatment.

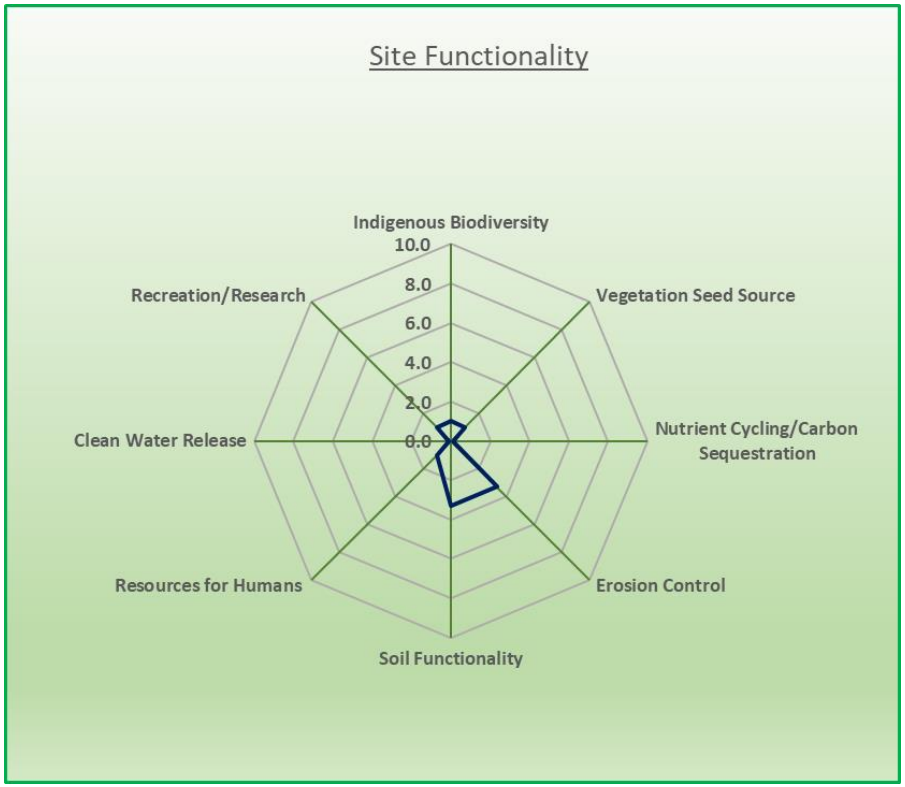
Table 12: Assessment of biodiversity features around the road site

Category	Sub-category	Highest scoring component (Out of 10)	Lowest Scoring component (Out of 10)	Average Score (Out of 10)	Description
Landscape Condition	—	4.0	—	4.0	Intermediate Condition
Biodiversity Values	—	5.8 Floral Species Diversity	0.1	2.2	Moderately Low Value
Site Integrity	—	7.2 Site Connectivity	0.1	2.4	Moderately Low Value
Ecoservices	Biodiversity	3.3 Erosion Control	0.1 Nutrient Cycling	1.7	Moderately Low Service
	Human	1.0 Livestock Grazing Tourism Lodge	0.1	0.7	Moderately Low Service
Site Importance	DFFE Screening Report	9.7 NPAES	0.3 Aquatic Biodiversity	5.8	Intermediate Importance
	Provincial C Plan (Minset)	4.0 2 Vegetation Types	1.6 Fauna/Flora	2.4	Moderately Low Importance
	Biodiversity Sector Plan	9.7	0.3	5.0	Intermediate Importance
	Unusual Benefits	—	—	—	—
Threats		9.5 Loss of Fauna	0.9 Uncontrolled Social Development	—	—

Figure 14: Graphic presentation of key biodiversity criteria






Site Functionality
Indigenous Biodiversity
10.0
8.0
6.0
4.0
2.0
0.0
Vegetation Seed Source
Nutrient Cycling/Carbon Sequestration
Erosion Control
Soil Functionality
Resources for Humans
Clean Water Release
Recreation/Research

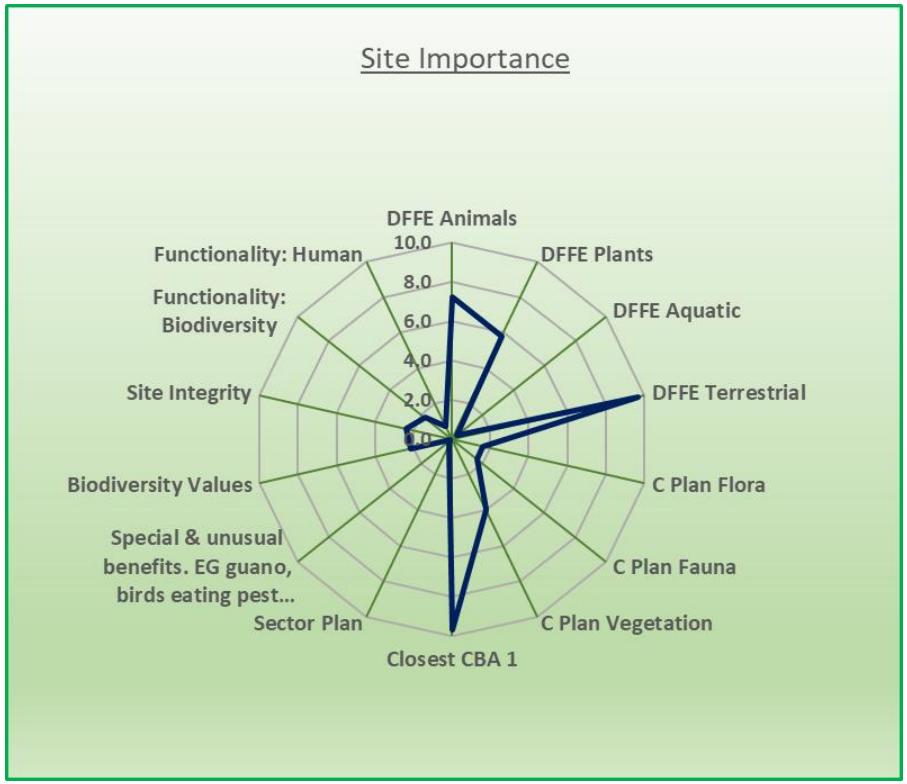

Site Importance
DFFE Animals
10.0
8.0
6.0
4.0
2.0
0.0
DFFE Plants
DFFE Aquatic
DFFE Terrestrial
C Plan Flora
C Plan Fauna
C Plan Vegetation
Closest CBA 1
Sector Plan
Special & unusual benefits. EG guano, birds eating pest...
Biodiversity Values
Site Integrity
Functionality: Biodiversity
Functionality: Human

Table 13: Assessment of impacts on the vegetation within the road reserve (Scores out of 10)

Mitigation	Environmental Impact	Consequences of the impact	Spatial extent	Reversibility	Resource Loss	Duration	Intensity / Magnitude	Exacerbation of Existing Threats	Ecological Significance	Percent Probability	Managerial Significance
Without Mitigation	Loss of Western Maputaland Clay Bushveld along the final 1.25 km of the road section route.	This vegetation is recovering but the area under the road, bridge, and embankments, would be permanently lost.	3.3	10.0	6.3	10.0	8.0	6.3	6.9	100	MH
With Mitigation			3.3	8.0	6.3	10.0	8.0	6.3	6.7	80	MH
Without Mitigation	Loss of Zululand Lowveld to the west of Roads R22 and P2-8. The section of new road in this area, including the link road, will all be in dense scrub vegetation which has very few remnants of the original vegetation type.	This vegetation was destroyed by past agriculture and has failed to recover. the area under the road, bridge, and embankments, would be permanently lost but weed control in the remainder of the road reserve could lead to some improvement.	3.3	10.0	3.3	10.0	6.3	1.0	5.8	80	I
With Mitigation			3.3	8.0	1.0	10.0	3.3	1.0	5.0	40	I

Mitigation	Environmental Impact	Consequences of the impact	Spatial extent	Reversibility	Resource Loss	Duration	Intensity / Magnitude	Exacerbation of Existing Threats	Ecological Significance	Percent Probability	Managerial Significance
Without Mitigation	Deposition of solid wastes including steel, plastics and soil spoil heaps.	Such wastes could be dangerous, unsightly, or obstructive to future activities.	1.0	3.3	3.3	3.3	3.3	6.3	3.4	40	I
With Mitigation			1.0	1.0	1.0	1.0	3.3	1.0	1.4	5	L

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KEY: MH Moderately High Impact

I Intermediate Impact

L Low Impact

13. MANAGEMENT MEASURES

The final 1.25 km of the R22 bypass around the town of Hluhluwe passes through an area of Western Maputaland Clay Bushveld which was entirely transformed for agricultural purposes. However, the vegetation is now recovering and is well advanced to appearing the same as areas that were previously not transformed. As the vegetation type is considered to be typical of the region it is important that it be protected as far as possible.

The section of the new R22 and the associated link road lie within an area of Zululand Lowveld which has not recovered from the past agricultural activities and so it is now almost completely overgrown with weeds and some common indigenous pioneer plant species. For this reason, the area has very low biodiversity conservation value but the construction of the new road does provide opportunities to improve conditions.

13.1 Monitoring

The construction of the eastern section of Road R22 must be subject to monitoring. The following conditions must be met in this regard:

- An independent, external Environmental Control Officer (ECO) must audit the site during the construction and rehabilitation phases of the project, unless otherwise specified by the DFFE;
- Monitoring is to be done through site walk-overs and photographic recording of progress. It is recommended that fixed point photography be done and that, if possible, drone photography is used.
- After each visit an Environmental Audit Report is to be drafted by the ECO and submitted to the Developer for review and implementation prior to the following site audit; and
- The relevant party (i.e., ECO or Developer, as designated by the Environmental Authorisation) has the responsibility to submit the site audit report to the DFFE: Compliance and Monitoring Department for the duration of the construction period.

The steps presented in Table 14 should be implemented although more actions may be added as circumstances demand.

Table 14: Monitoring requirements, objectives, and responsibilities

Location	Actions	Responsibility and Timing
Eastern section of the Road R22 Hluhluwe Bypass	i Undertake a pre-construction visit in order to gain familiarity with the site and to mark out boundaries and mark trees which are to be protected. Record positions with a GPS. ii Establish an ongoing photographic record of the site and its surrounds. The working	i Contractor. ii Environmental Manager. ECO **vii** Monthly visits for the duration of

Location	Actions	Responsibility and Timing
	area should be restricted as far as is practical. iii Ensure that soil erosion is kept to a minimum through management of stormwater. iv Ensure that stockpiles, spoil heaps and various material lay-downs are not creating any impacts. v Ensure that there is a weed control programme. vi Ensure that the road reserve is covered with well-established grass before the project may be signed off.	the construction phase and then quarterly visits during the sign off period.

13.2 Construction Contractor

The construction contractor(s) for the project will be appointed by the developer (SANRAL). A lead contractor is to be nominated and will be responsible for complying with the EMPr commitments and any other legislative requirements, as applicable to the contractors' appointment for the project. The lead contractor will appoint or nominate an Environmental Manager who will conduct daily inspections of the site to identify potential non-compliances and potential negative impacts to the environment. The inspections will take the form of an inspection sheet and will be kept as a record of site conditions. Findings thereof will be made available to the ECO and raised in construction meetings for mitigation or avoidance measures. Each contractor will be responsible for drafting method statements appropriate to activities under his direct control.

The contractor(s) or the Environmental Manager must ensure that all employees under their appointment receive appropriate safety, accident, and environmental instruction and training prior to the commencement of construction, taking cognisance of this EMPr and the Conditions of the Environmental Authorisation. Such training is to be undertaken when the work is commenced, on a weekly basis, and for any new employee starting work on the site. All personnel must be aware of the locations of the first aid facilities, fuel stores, fire extinguishers, and cleanup kits.

The management measures for the three impacts are presented in Table 15.

Table 15: Mitigatory measures for the identified impacts along the road construction site

Identified Impact	Mitigatory Measures to prevent or minimise Construction Phase Impacts	Intended Management Outcomes	Personnel Responsible	Monitoring Frequency and Objectives
Loss of Western Maputaland Clay Bushveld along the final 1.25 km of the road section route.	i. All construction work, including laydown areas and soil stock/spoil piles must be within the future road reserve. ii. The footprint of the layout needs to be strictly adhered to with minimal clearance outside of the actual road and its embankments being cleared of vegetation. iii. Where possible, indigenous vegetation needs to be retained. iv. Clearance for construction should be done in a phased approach, and rehabilitation should be commenced as soon as work has ceased adjacent to the expansion. v. Where possible, manual clearance of the vegetation should be done so as to prevent the unnecessary movement of machinery in the area outside the road footprint. vi. The contractor should implement an alien invasive weed control programme, particularly in areas where soil disturbance occurs outside of the road footprint.	i. To reduce the potential loss of indigenous vegetation in an area where it is already damaged as a result of past agricultural and social activities. ii. No rare or protected species have been noted but if any are found they are to be protected until such time as an appropriate specialist can advise on the required actions. iii. To re-establish a vegetation cover in all areas that are not covered by the road surface.	i. Construction contractor together with the Environmental Manager and the ECO. ii. Environmental Manager. iii. Inspection and final verification to be done by the appointed ECO.	i. Prior to commencement of any further construction activities. ii. Daily. iii. Monthly intervals during the Construction Phase. iv. Quarterly repeat inspections until such time as the ground is fully covered with suitable vegetation.

Identified Impact	Mitigatory Measures to prevent or minimise Construction Phase Impacts	Intended Management Outcomes	Personnel Responsible	Monitoring Frequency and Objectives
	vii. In order to prevent soil loss through wind and water erosion, soil stockpiles need to be grassed with an indigenous mix or covered with shadecloth if they are to stand unused for more than 3 weeks viii. Strictly no trapping or hunting of fauna is allowed. ix. All open excavations need to be checked on a daily basis and any fauna that may be stranded will have to be caught and released by a qualified person. x. Strictly no littering. The contractor should highlight this at daily toolbox talks and site clean-ups should occur on a daily occasion. xi. Revegetation must be started by establishing a robust grass cover in all of the road reserve area that is not under the actual road. Thus the various embankments are to be included in the revegetation plan. It is recommended that Guinea Grass (*Panicum maximum*), Finger Grass (*Digitaria eriantha),* Heartseed Love Grass (*Eragrostis capensis*), and Weeping Love Grass (*Eragrostis curvula*) be used for this purpose. xii. The above species are all indigenous and may be purchased as seed.			

Identified Impact	Mitigatory Measures to prevent or minimise Construction Phase Impacts	Intended Management Outcomes	Personnel Responsible	Monitoring Frequency and Objectives
Loss of Zululand Lowveld to the west of Roads R22 and P2-8. The section of new road in this area, including the link road, will all be in dense scrub vegetation which has very few remnants of the original vegetation type.	i. All construction work, including laydown areas and soil stock/spoil piles must be within the future road reserve. ii. The footprint of the layout should be strictly adhered to but the clearance of the vegetation of the entire road reserve strip is acceptable. iii. Where possible, indigenous vegetation in the form of trees needs to be retained. Such trees will mostly be Fever Trees but any other indigenous species will also be acceptable. It is to be noted that such trees are commonplace elsewhere within the road reserve of the R22. iv. Clearance for construction need not be done in a phased approach, but rehabilitation should be commenced as soon as work has ceased adjacent to the expansion. v. Where possible, manual clearance of the vegetation should be done so as to prevent the unnecessary movement of machinery in the area outside the road footprint. vi. The contractor should implement an alien invasive weed control programme, particularly in areas where soil disturbance occurs outside of the road footprint.	i. To reduce the potential loss of indigenous vegetation in an area where it is already damaged as a result of past agricultural and social activities. ii. No rare or protected species have been noted but if any are found they are to be protected until such time as an appropriate specialist can advise on the required actions. iii. To re-establish a vegetation cover in all areas that are not covered by the road surface. iv.	i. Construction contractor together with the Environmental Manager and the ECO. ii. Environmental Manager. iii. Inspection and final verification to be done by the appointed ECO. iv.	i. Prior to commencement of any further construction activities. ii. Daily. iii. Monthly intervals during the Construction Phase. iv. Quarterly repeat inspections until such time as the ground is fully covered with suitable vegetation.

Identified Impact	Mitigatory Measures to prevent or minimise Construction Phase Impacts	Intended Management Outcomes	Personnel Responsible	Monitoring Frequency and Objectives
	vii. In order to prevent soil loss through wind and water erosion, soil stockpiles need to be grassed with an indigenous mix or covered with shadecloth if they are to stand unused for more than 3 weeks viii. Strictly no trapping or hunting of fauna is allowed. ix. All open excavations need to be checked on a daily basis and any fauna that may be stranded will have to be caught and released by a qualified person. x. Strictly no littering. The contractor should highlight this at daily toolbox talks and site clean-ups should occur on a daily occasion.			
Deposition of solid wastes including steel, plastics and soil spoil heaps.	i. No litter or waste of any may be deposited outside the road reserve area. ii. A strict anti-dumping and anti-littering rule must be established for all construction areas. iii. Areas where bulk waste items, such as steel offcuts and shuttering boards, must be held prior to further use or disposal must be strictly confined to a minimum. iv. The contractor must provide appropriate skips or bins for disposal of smaller wastes. Those which are likely to contain paper or plastic wastes should have lids	i. To prevent unsightly and potentially dangerous materials from being abandoned in the open environment.	i. Construction contractors and the Environmental Manager.	i. ECO to inspect the site for any waste materials which should have been collected and placed into containers. ii. ECO to check that the disposal containers are not over-filled.

Identified Impact	Mitigatory Measures to prevent or minimise Construction Phase Impacts	Intended Management Outcomes	Personnel Responsible	Monitoring Frequency and Objectives
	to prevent items being removed by wind or by wild animals. v. The waste containers must be timeously emptied with the waste being taken to an appropriate and approved landfill site. vi. All workers to be regularly reminded of the need to keep the site tidy.			

14. CONCLUSION

The wetland and terrestrial biodiversity study which has been undertaken in regard to the eastern section of the Road R22 Hluhluwe town bypass has found that there are no wetlands which will be affected by the road but that two veld types are present and that the boundary between them is through the site of the proposed road-over-rail bridge (See Figure 3 and **Error! Reference source not found.**). These are Zululand Lowveld (Type SVI 23) and Western Maputaland Clay Bushveld (Type SVI 21). The whole of the project footprint area was severely transformed in the late 1960s for agricultural purposes but that such activity was given up in about the 1990s (see Figure 6 and Figure 7). However, the recovery of the two vegetation types was uneven and while the Western Maputaland Clay Bushveld has developed a semi-natural cover which is *Acacia tortilis* savanna, the Zululand Lowveld became overrun by weeds such as *Chromolaena odorata*, and pioneer species such as *Dichrostachys cinerea*. The reason for the different recovery rates is not known but it is surmised that the former area was simply abandoned and not managed in any way, while the latter was developed into a grazing area and then later as a game farm.

The differences in the quality of the two vegetation types is reflected in that the pre-miitigation impact on the Western Maputaland Clay Bushveld is rated as 6.9 while that on the Zululand Lowveld is rated as 5.8. Mitigation of these reduces the impacts to 6.7 and 5.0 respectively but the ratings remain unchanged as shown below:

Impact	Mitigation	Ecological Impact	Impact Rating
Loss of Western Maputaland Clay Bushveld	Pre-mitigation	6.9	Medium High
	Post-mitigation	6.7	Medium High
Loss of Zululand Lowveld	Pre-mitigation	5.8	Intermediate
	Post-mitigation	5.0	Intermediate

The reason for the lack of change in the ratings is that much of the vegetation will be lost under the road irrespective of mitigation in the road reserve areas.

The pre-mitigation impact associated with solid wastes is 3.4 (Intermediate) and post-mitigation is 1.4 (Low)

All these risks can be mitigated and managed by the implementation of site-specific management and mitigation measures. These measures are set out in Table 15 and can be easily implemented.

Considering the above assessment of the terrestrial biodiversity in relation to the proposed road alignment, it is the Specialists' opinion that there are no fatal flaws associated with the proposed new road section. This opinion is only valid if the management and mitigation measures as provided in this assessment report is applied and monitored. It is therefore suggested that this monitoring is conducted by an independent Environmental Control Officer (ECO) on a monthly basis during the implementation phase of the project. Measure for such monitoring are provided in Table 14.

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APPENDIX A: DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

Private Bag X447, Pretoria, 0001, Environment House, 473 Steve Biko Road, Pretoria, 0002 Tel: +27 12 399 9000, Fax: +27 86 625 1042

SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

REPORT TITLE
WETLAND AND VEGETATION ASSESSMENT ASSOCIATED NATIONAL ROAD R22 REALIGNMENT IN THE TOWN OF HLUHLUWE, KWAZULU-NATAL

Kindly note the following:

1. This form must always be used for assessment that are in support of applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting, where this Department is the Competent Authority.
2. This form is current as of August 2023. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.dffe.gov.za/documents/forms.
3. An electronic copy of the signed declaration form must be appended to all Draft and Final Reports submitted to the department for consideration.
4. The specialist must be aware of and comply with '*the Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the act, when applying for environmental authorisation - GN 320/2020)*', where applicable.

1. SPECIALIST INFORMATION

Title of Specialist Assessment	Wetland and Vegetation Assessment
Specialist Company Name	Terratest (Pty) Ltd
Specialist Name	Dacre James Alletson
Specialist Identity Number	4804105091087
Specialist Qualifications:	BSc – Biological Sciences, B.Sc Honours – Zoology
Professional affiliation/registration:	South African Council for Natural Scientific Professionals (Pr. Sci.Nat. 125697) IAIASA (035)
Physical address:	6 Pin Oak Avenue, Hilton, 3245
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Postal address	Click or tap here to enter text.
Telephone	033 343 6700
Cell phone	083 787 1584
E-mail	alletsonj@terratest.co.za

2. DECLARATION BY THE SPECIALIST

I, Dacre James Alletson declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols") and in Government Notice No. 1150 of 30 October 2020.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
    - any decision to be taken with respect to the application by the competent authority; and;
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the NEMA Act.

Signature of the Specialist

Terratest (Pty) Ltd

Name of Company:

09 Jul 2025

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _ Dacre James Alletson_____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

Terratest (Pty) Ltd

Name of Company

09 July 2025

Date

COMMISSIONER OF OATHS
DAWN JANET BURGIN
9/1/8/2 (R/O) KZN (PIETERMARITZBURG)
6 PIN OAK AVENUE, HILTON

Signature of the Commissioner of Oaths

09 Jul 2025

Date