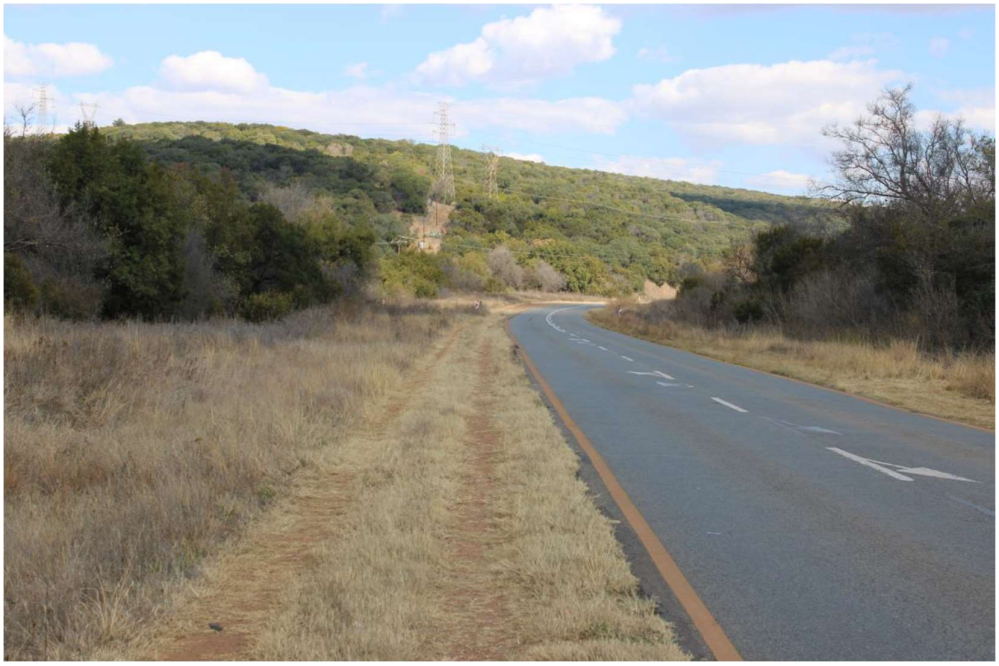
DRAFT BASIC ASSESSMENT FOR THE PROPOSED UPGRADE OF NATIONAL ROAD R30 SECTION 9 FROM (GOEDGEVONDEN) KM 29 TO R24 (OLIFANTSNEK) KM 76.6, THREE BRIDGES AND SEVEN MAJOR CULVERTS, IN THE NORTHWEST PROVINCE WITHIN THE BOJANALA MUNICIPALITY, IN KGETLENGRIVIER LOCAL MUNICIPALITY AND RUSTENBURG LOCAL MUNICIPALITY.



Report prepared by: Consultants: Earthlink Environmental Services Tel: 071 878 8295 Email: kgakile@earthlinkenvironmental.co.za	**Report Prepared for:** Zutari (Pty) Ltd **On Behalf of:** The South African National Roads Agency SOC Ltd
Earthlink Environmental Services In rhythm with nature	ZUTARI IMPACT. ENGINEERED. SANRAL SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD

January 2026

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ABBREVIATIONS:

BA	Basic Assessment
BAR	Basic Assessment Report
DFFE	Department of Forestry, Fisheries & Environment
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EMPR	Environmental Management Programme
GA	General Authorisation
Ha	Hectare
HIA	Heritage Impact Assessment
I&AP	Interested and/or Affected Party
NEMA	National Environmental Management Act (1998)
NEMWA	National Environmental Management: Waste Act (2008)
NWA	National Water Act (1998)
WUL	Water Use Licence
WULA	Water Use Licence Application

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CHAPTER 1: PROJECT INTRODUCTION AND BACKGROUND

1.1. Introduction

South African National Road Agency SOC Limited (SANRAL) proposes to upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6). The starting position is near the intersection of the R30 and Road D826 at Goedgevonden in the Kgetlengrivier Local Municipality. The end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality. Road R30 is currently a single-carriageway road with one (1) lane per direction. The road cross-section varies considerably, with gravel shoulders provided up to km 63.000 and surfaced shoulders predominantly thereafter.

The project is aimed at improving the road geometry by adding surfaced shoulders and rehabilitating the existing pavement structure to enable it to carry a 20 year design traffic load.

The major aspects of this project include the following:

- Increasing road reserve width from 32 m to 50m
- Strengthening the existing pavement
- General widening of the existing road cross section for climbing lanes and 2.5m surfaced shoulders
- Substantial vertical and horizontal geometric improvements
- Widening of river bridge and some major and minor culverts
- Widening of the existing agricultural underpass
- Possible horizontal re-alignment of the road between Km 77 to 78 and Km 95 to 97
- Possible 6.5m wide temporary deviation to accommodate two-way traffic during construction.
- Opening of one hard-rock quarry and re-entry into 6 potential borrow pits
- Stockpile areas and vegetation clearance outside road reserve in excess of one hectare.

Table 1: Coordinates of the road

Start Point	Middle Point	End Point
26^0 05' 31.47" S; 26^0 57' 43.55" E	25^0 54' 21.10"S; 27^0 2' 44.12"E	25^0 48' 07.38"S; 27^0 14' 16.14"E

Structures Along the National Road R30 to be upgraded:

Three Bridges Along the R30 Road:

- Bridge B2230 Jameson underpass (km 51.281): Length= 30.4m
- Bridge B2920 (km 51.433) Derby Road over rail bridge: Length=22.8m

- Bridge B2147 (Km 71.89) over the commissiedrift Tributary: Length=15.2m

Bridge B2230 and Bridge B2920 will be widened to accommodate the new cross section, while Bridge B2147 will have to be replaced due to its hydraulic capacity.

Table 2: Coordinates of Bridges

Bridge Name	**Coordinates**
Bridge B2230 Jameson underpass (km 51.281): Length= 30.4m	25^0 54' 44.98"S; 27^0 2' 44.10"E
Bridge B2920 (km 51.433) Derby Road over rail bridge: Length=22.8m	25^0 54' 39.29"S; 27^0 2' 44.15"E
Bridge B2147 (Km 71.89) over the commissiedrift Tributary: Length=15.2m	25^0 49' 13.88"S; 27^0 12' 1.13"E

There are also seven (7) major drainage culverts located at regular intervals along the route. Six (6) structures will be widened to accommodate the new cross section while one structure will have to be replaced.

Table 3: Coordinates of Culverts

Culverts	**Coordinates**
C0451	25^0 58' 9.44"S; 27^0 2' 28.96"E
C0428	26^0 3' 14.91"S; 26^0 59' 0.06"E
C02903	26^0 3' 11.94"S; 26^0 59' 2.44"E
C0452	25^0 55' 22.07"S; 27^0 2' 46.12"E
C0453	25^0 51' 51.44"S; 27^0 7' 12.06"E
C0454	25^0 49' 57.09"S; 27^0 11' 12.10"E
C0455	25^0 48' 55.25"S; 27^0 12' 51.84"E

1.2. Project Location

South African National Road Agency SOC Limited (SANRAL) Proposed to upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6). The starting position is near the intersection of the R30 and Road

D826 at Goedgevonden in the Kgetlengrivier Local Municipality. The end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality.

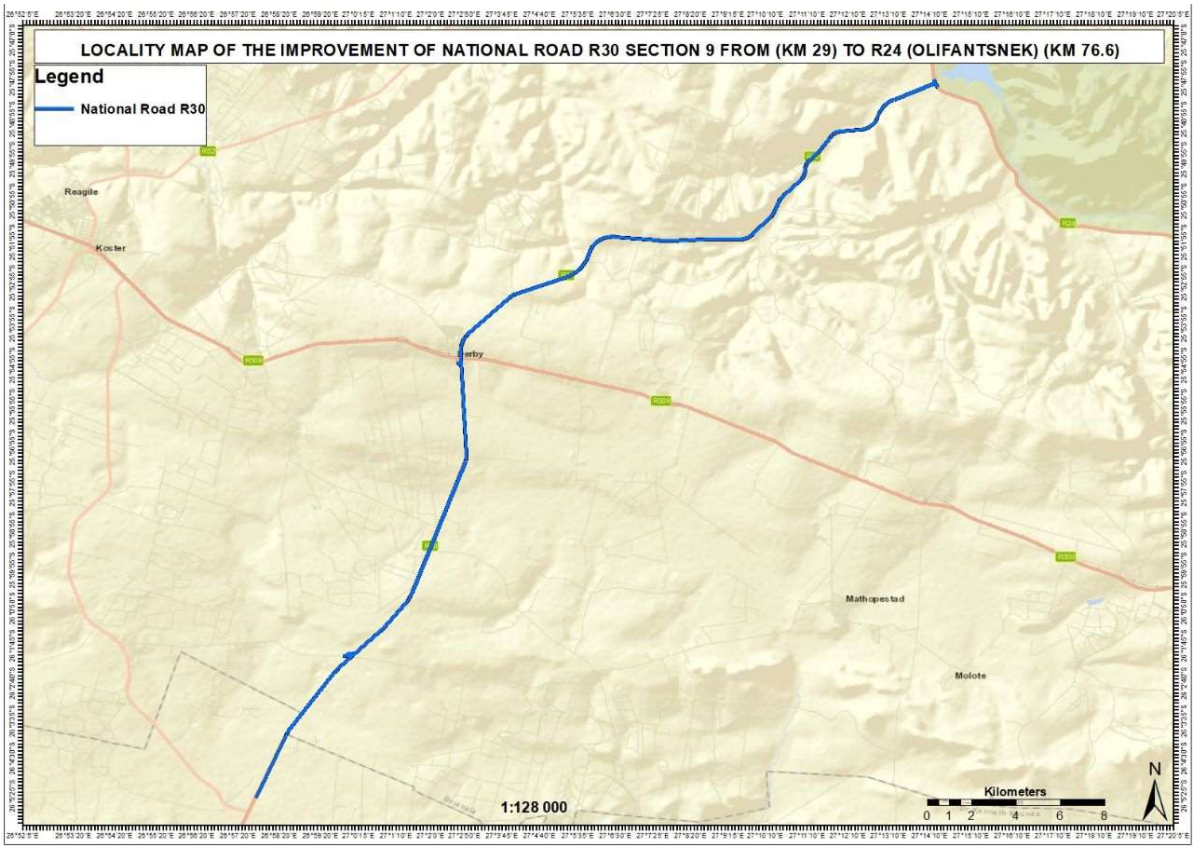


Figure 1: Locality Map of the proposed R30 road to be upgraded.

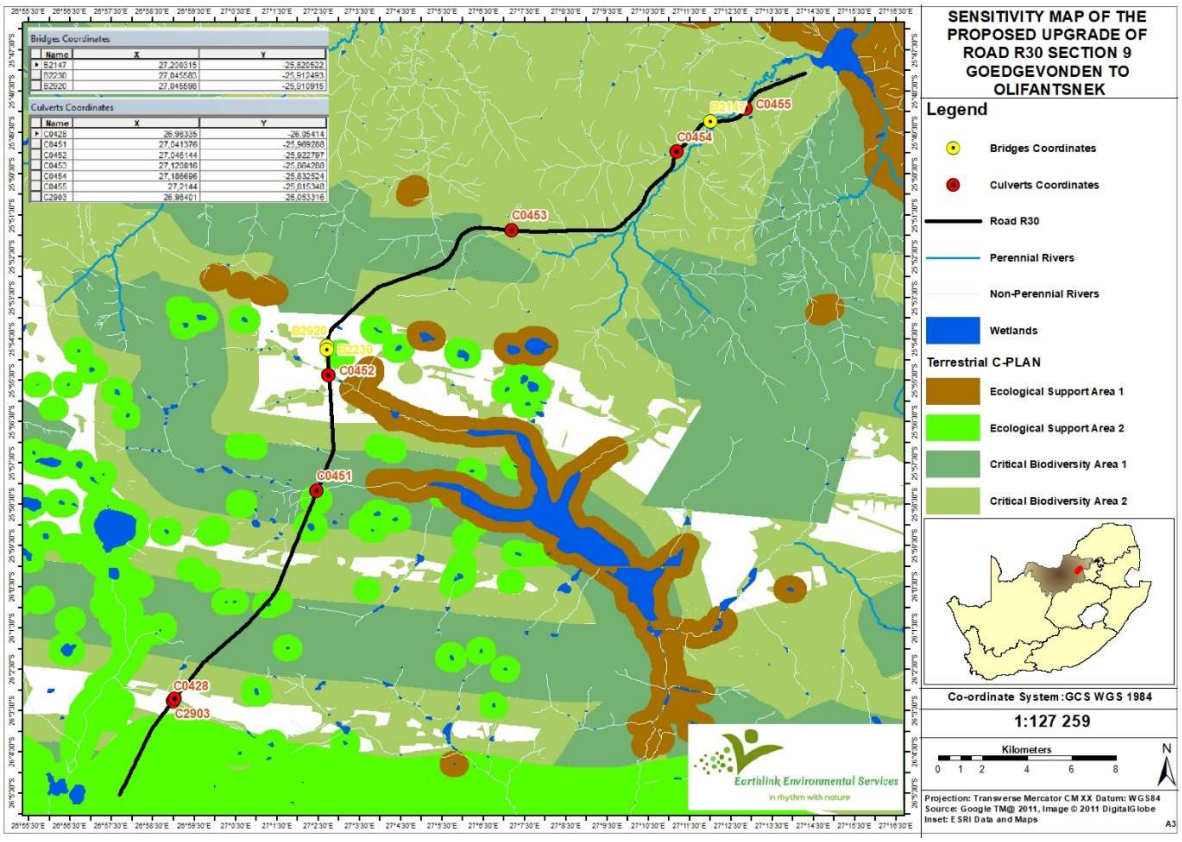


Figure 2: Sensitivity Map including Structures along the R30 road.

1.3. Description of the property

Table 4: General Site Information

Province/s	**Northwest Province**
District Municipality/ies	Bojanala District Municipality
Local Municipality/ies	• Rustenburg Local Municipality Kgetlengrivier Local Municipality
Nearest town/s	Rustenburg and Ventersdorp
Ward Numbers/ s	• Kgetlengrivier Ward 3 and 8 Rustenburg Ward 36
Farm name/s and number/s	• Farm Vlakfontein 977 JQ • Farm Rietfontein 372 JQ • Farm Vlakhoek 323 JQ • Farm Elandsfontein 366 JQ • Farm Koperfontein 364 JQ • Farm Middelfontein 361 JQ • Farm Roodekloof 326 JQ • Farm Commissiesdrift 327 JQ • Farm Klippan 140 IP

	• Farm Leliefontein 138 IP • Farm Groenfontein 498 JP
Portion number/s	• Portion 0 of Farm Vlakfontein 977 JQ • Portion 0 of Farm Rietfontein 372 JQ • Portion 0 of Farm Vlakhoek 323 JQ • Portion 0 of Farm Elandsfontein 366 JQ • Portion 0 of Farm Koperfontein 364 JQ • Portion 0 of Farm Middelfontein 361 JQ • Portion 0 of Farm Roodekloof 326 JQ • Portion 0 of Farm Commissiesdrift 327 JQ • Portion 0 of Farm Klippan 140 IP • Portion 0 of Farm Leliefontein 138 IP • Portion 0 of Farm Groenfontein 498 JP

1.4. Approach of the study

1.4.1. Pre-Application Consultation

A pre-application meeting was held with the Department of Environment, Forestry and Fisheries on **Thursday, 30 October 2025**, attached as **Appendix I** of this BAR.

1.4.2. Basic Assessment Study

A Basic Assessment (BA) study is the level of environmental assessment applied to activities listed in Listing Notices 1 and 3. This study is applied to activities that are considered less likely to have significant environmental impacts and, therefore, unlikely to require a detailed Environmental Impact Assessment (EIA) study. The Basic Assessment Report (BAR) is a more concise analysis of the environmental impacts of the proposed activity/development than a Scoping and EIA Report. The BAR aims to achieve the following:

- Determine the policy and legislative context within which the proposed activity is undertaken and how the activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed project;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Undertake an impact and risk assessment process inclusive of cumulative impacts (where applicable).

The focus being; determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the project and the risk of impact of the proposed activity on these aspects to determine the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and the degree to which these impacts:

- Can be reversed;
- May cause irreplaceable loss of resources; and

- Can be avoided, managed or mitigated.

This BAR has been compiled in accordance with the stipulated requirements in Appendix 1 of GNR 982 of the EIA Regulations 2014 (as amended in 2017), which outlines the legislative BA process and requirements for assessment of outcomes, impacts and residual risks of the proposed development.

An Environmental Management Programme (EMPr) has been compiled according to Appendix 4 of GNR the EIA Regulations 2014 (as amended in 2017) for the construction and operational phases of the project. The EMPr has been compiled as a stand-alone document from the BAR and will be submitted to the DFFE along with the BAR. The EMPr provides the actions for the management of identified environmental impacts emanating from the project and a detailed outline of the implementation programme to minimise and/or eliminate any anticipated negative environmental impacts and to enhance positive impacts. The EMPr provides strategies to be used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring.

1.4.3. Structure of the BAR

Section	Description
1	Introduction – Provides the background to the project as well as details of the specialist studies conducted and contact details for the project proponent and EAP.
2	Environmental Legislative Context – Details the pertinent environmental legislation and the applicability to the project
3	Description of Project activities & Motivation – Provides the site locality, project description and need and desirability of the project
4	Project Alternatives – Describes the alternatives considered, including the 'no-go' option
5	Description of the Baseline Environment – Describes the pre-development context of the site
6	Public Participation Process – Explains the public consultation undertaken
7	Impact Assessment – Details the impact assessment methodology and quantifies the impacts anticipated
8	Conclusion & Recommendations – Provides the EAP opinion and summarises the impact assessment as well as the recommendations.
9	EAP Declaration

1.5. Specialist Assessment

The BAR further incorporates the findings and recommendations of the following specialist studies.

- Biodiversity Impact Assessment
- Wetland Delineation and Impact Assessment report
- Heritage Impact Assessment including Desktop Palaeontological Impact Assessment
- Agricultural Assessment Compliance Statement
- Geotechnical Study
- Traffic Assessment

1.5.1. Screening tool results

The following environmental themes and their associated sensitivities were identified in the Screening Tool Report generated from the Department of Forestry, Fisheries, and the Environment (DFFE) national web.

According to the screening tool report, various specialist studies were identified and recommended to be undertaken as part of the environmental process.

Table 5: DFFE Screening tool Results

Theme	Very high sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Palaeontology Theme	X			
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Table 6: Themes and associated sensitivity as per the DFFE Screening Tool

Theme	DFFE Screening	EAP Rating (Agree/ Disagree)	Motivation
Agriculture Theme	Very high Sensitivity	High (Agree to compliance statement to be undertaken)	The screening report has been generated on the DFFE website. The Agricultural Theme received very high sensitivity. The area is located on high agricultural land, and it is characterised by mixed used farming. The farms are in the close proximity of the R30 road to be upgraded. The roads upgrade may have the potential to impact the agricultural activities around the area. The agricultural assessment is deemed necessary to be undertaken for the proposed project. **The Agricultural Compliance Statement is attached on the BAR.**
Animal Species Theme	High Sensitivity	Medium (Agree for study to be included in the terrestrial study)	The screening report has been generated on the DFFE website. The Animal Theme received high sensitivity. Animals were spotted on site during the onsite inspection. Terrestrial Biodiversity Assessment has been undertaken which includes both the fauna and flora. **Terrestrial Assessment Report has been attached to the Basic Assessment Report.**
Aquatic Biodiversity Theme	Very high Sensitivity	High (Agree for the study to be undertaken, the road passes through rivers and wetlands)	The screening report has been generated on the DFFE website. The Aquatic Biodiversity Theme received very high sensitivity The R30 National Road to be upgraded crosses Rooikloofspruit (river crossing) and there are also associated wetlands which may be impacted by the proposed. The upgrade of the road may have potential to impact aquatic biodiversity. The area is also located within the Critical Biodiversity Area (CBA) and Ecological Support Area (ESA).

			The aquatic Biodiversity assessment is therefore deemed necessary for the proposed upgrade.
Archaeological and Cultural Heritage Theme	Low Sensitivity	Low (Disagree but the report is required in terms of Section 38(1) of the National Heritage Resources Act of 1999, since the proposed development will exceed 5000m^2 in extent)	The screening report has been generated on the Department of Forestry, Fisheries and the Environment (DFFE) website. The Archaeological and Cultural Heritage Theme received Low sensitivity. A Heritage Impact Report is still required in terms of Section 38(1) of the National Heritage Resources Act of 1999, since the proposed development will exceed 5000m2 in extent. Due to the size of the proposed development, the potential for impacts on heritage resources exists. **A Heritage Impact Assessment is attached to the BAR.**
Civil Aviation Theme	High Sensitivity	Low (Disagree, not necessary to be undertaken upgrades will not impact Civil aviation)	The screening report has been generated form the DFFE website. The civil aviation theme received high sensitivity. There are airports identified, Rustenburg airfield, Linchenburg Airport, zeerust airport and Potchefstroom airport which are far from the proposed road to be upgraded. The proposed development is not expected to have any impact on (or be impact by) any nearby civil aviation aerodromes, the EAP is of the opinion that the sensitivity associated with this theme should be reduced to 'low'. **No further investigation of this theme is deemed necessary during the EIA process, However the Civil aviation compliance statement will be compiled by the EAP.**

Defence Theme	Low Sensitivity	Low (Disagree, upgrades will not impact any defence activities)	The screening report has been generated from the DFFE website. The Defence Theme received Low sensitivity. Since the nature of the proposed development., the upgrade of an existing National Road R30, it is not expected to have any impact on (or be impact by) any aspects associated with the Defence Theme, the EAP is of the opinion that no further investigation of this theme is deemed necessary during the EIA process.
Palaeontology Theme	Very high Sensitivity	High (Agree, rocks identified which could be signs of paleontology remains)	The screening report has been generated from the DFFE website. The palaeontology theme was identified as having a very High sensitivity according to the Screening Tool Report. Due to the possibility of paleontological finds (e.g. fossils) being present within the proposed development area, it was deemed necessary by the EAP that a paleontological specialist be consulted to provide input into the BAR. **The paleontological specialist compiled a desktop Palaeontological Assessment. The report has been attached to the BAR.**
Plant Species Theme	Medium Sensitivity	Low (Agree, to be included in the terrestrial impact assessment)	The screening report has been generated on the DFFE website. The Plant Theme received medium sensitivity. Terrestrial biodiversity will be conducted at the high level. The flora study was also included as part of the terrestrial biodiversity report. **Terrestrial Assessment Report has been attached to the Basic Assessment Report**
Terrestrial Biodiversity Theme	Very High Sensitivity	High (Agree, terrestrial biodiversity is deemed necessary to be undertaken)	The screening report has been generated on the DFFE website. The Terrestrial Biodiversity Theme received high sensitivity. The area is characterized by the indigenous vegetation. Animals were

			spotted on site during the onsite inspection. The area is also characterized by mixed-use farming, where there are animals and plants. The majority of the site is classified as Moderately modified, with certain sections of the Road falling under Critical Biodiversity Areas and Ecological Support Areas. The full study of the Terrestrial Assessment (Flora and Fauna) is deemed necessary to be undertaken for the proposed project. **Terrestrial Assessment Report has been attached to the Basic Assessment Report**.

In addition to the above themes and related specialist studies, the screening tool report also identified and recommended the following specialist assessments:

1. Landscape/Visual Impact Assessment
2. Noise Impact Assessment
3. Traffic Impact Assessment
4. Geotechnical Assessment
5. Socio-Economic Assessment
6. Ambient Air Quality Impact Assessment

A motivation is provided in the table below, detailing why these additional studies will or will not be conducted as part of the Basic Assessment Process.

Table 7:Specialist assessments identified as per the DFFE Screening Tool.

No	**Proposed Specialist**	**Verification of Site Sensitivity and Motivation on The Need for**	**Specialist to be**

	Assessment	**Specialist Investigation**	**conducted (Yes or No)**
1	Landscape/Visual Impact Assessment	The project consists of upgrade of an already road there will not be any significant change to the landscape and visuals of the surroundings. The level of landscape and visual impact is expected to be so low that the landscape and visual assessment is deemed unnecessary. Any potential landscape or visual impacts and corresponding mitigation measures will be outlined in the Environmental Management Programme (EMPr).	No
2	Noise Impact Assessment	During the construction phase, noise impacts from construction activities, including heavy machinery, bridge widening, and temporary deviations, are anticipated in the short term. Any potential noise impacts and corresponding mitigation measures will be outlined in the Environmental Management Programme (EMPr) and will be short term limited to the construction phase. The project area is far from residential areas, schools, hospitals. Construction will also be restricted working hours. A noise impact assessment will not be required **A noise impact assessment is deemed unnecessary.**	No
3	Traffic Impact Assessment	A traffic assessment was undertaken by the engineering team to inform the preliminary design of the project. The proposed is for the existing	Yes

		road which requires upgrading and maintenance. SANRAL have already identified the need to this project upgrade. Traffic was discussed in the Preliminary Design report. A traffic impact assessment is extracted from the Preliminary Design report and is attached to this BAR.	
4	Geotechnical Assessment	The project includes road widening and widening of river bridge and some major and minor culverts. A geotechnical assessment is attached to the BAR	Yes
5	Socio-Economic Assessment	Due to the scale and nature of the project a socio-economic impact assessment is not required. The socio-economic impacts will be assessed further in the Basic Assessment Report. Any negative socio-economic impacts envisaged will be addressed in the EMPr. The proposed road improvement has the potential to benefit the society on a socio-economic level. Lastly, as part of the Public Participation Process Interested and Affected parties (I&APs) will have the right to comment on the Draft Basic Assessment Report raising any concerns they might have in this regard, and their comments will be incorporated into the Final BAR by the Environmental Assessment Practitioner.	No
6	Ambient Air Quality Impact Assessment	It is unnecessary to conduct an ambient air quality impact assessment for the proposed R30 project, as it will only result in minimal dust and vehicle emissions being released into the atmosphere. Any air quality or dust issues during	No

		construction will be addressed by effectively implementing the relevant provisions of the EMPr. **No additional input is deemed necessary.**	

1.5.2. Other environmental authorisations, licences and permits.

According to the National Water Act (NWA), 1998 (Act No.36 of 1998), the proposed development requires a General Authorisation application as per the following regulations:

- Section 21(c): Impeding or diverting the flow of water in a watercourse; and
- Section 21 (i): Altering the bed, banks, course or characteristics of a watercourse.

1.6. Details and Expertise of the EAP

Below are the details of the EAP, For the expertise of the EAP, please refer to **Appendix H** for a CV.

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CHAPTER 2: LEGISLATIVE FRAMEWORK

This Chapter gives a general overview of the policy and legal framework in which the proposed upgrade to R30 and related infrastructure would take place. It lists environmental laws and regulations that are relevant to this activity and that must be taken into account during the process of assessment. These laws and regulations may also be relevant to or have an impact on the proposed project.

2.1. The Constitution of South Africa (Act No. 108 of 1996)

Section 24 of the Constitution of South Africa No. 108 of 1996 states that "…everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that (c) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development.

2.2. National Environmental Management Act (Act 107 of 1998)

The NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by State Departments and to provide for matters connected therewith.

On 5 September 1997, the Minister of Environmental Affairs and Tourism had, under sections 26 and 28 of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (ECA), and with the concurrence of the Minister of Finance, promulgated Regulations in terms of Section 21 of the Act, GNR. 1182 GG No.18261, GNR. 1183 GG No. 8261, 1184 GG 18261 (as amended).

On 21 April 2006, the Minister of the Department of Water and Environmental Affairs [DWEA, now called the DFFE and the Department of Water and Sanitation (DWS) separately] promulgated Regulations in terms of Chapter 5 of the NEMA. When these Regulations came into effect on 3 July 2006, they replaced the EIA Regulations that were promulgated in terms of the ECA in 1997 and introduced new provisions for EIAs.
Subsequently, the National Environmental Management Amendment Act, 2008 (Act No. 62 of 2008) (NEMAA) was promulgated on 9 January 2009 and came into effect on 1 May 2009. The NEMAA made a number of significant amendments to the general provisions applicable to EIAs. On 18 June 2010, the Minister promulgated amended EIA Regulations in terms of Chapter 5 of NEMA. From the date of effect of these amended EIA Regulations, 2 August 2010, these amended EIA Regulations replaced the previous EIA Regulations that were promulgated on 21 April 2006.

In 2014 on 8 December, new EIA Regulations came into effect and replaced the previous EIA Regulations of 18 June 2010. The Regulations are as follows:

- GNR. 982 provides with the methodology and format which needs to be considered when conducting a Basic Assessment (BA) and S&EIR processes.
- GNR. 983 (Listing Notice 1) provides for activities which require a BA process to be followed.
- GNR. 984 (Listing Notice 2) provides for activities which require a S&EIR to be followed; and
- GNR. 985 (Listing Notice 3) also provides for activities which require a BA process to be followed.

The Minister of Environmental Affairs has again made amendments to the EIA Regulations, 2014, published under GNR. 982, GNR. 983, GNR. 984 and GNR. 985 of 4 December 2014, in terms of sections 24(5) and 44 of the NEMA through the promulgation of GNR. 324, GNR. 325, GNR. 326 and GNR. 327 of 07 April 2017.

The NEMA EIA Regulations define two broad processes for an EIA, namely: BA and S&EIR.

S&EIR is applicable to all projects likely to have significant environmental impacts due to their nature or extent, activities associated with potentially high levels of environmental degradation, or activities for which the impacts cannot be easily predicted.

BA is required for projects with less significant impacts or impacts that can easily be mitigated.

The project will entail the undertaking of the BA in terms of the EIA Regulations 2014, as amended; promulgated in terms of the NEMA as listed in GNR. 327 and GNR.324. These activities are identified as actions that may not commence without an EA from the relevant competent authorities, in this case, the DFFE.

2.2.1 Listed and specified activities for the R30 Road upgrade project

The listed activity associated with the project in respect of NEMA are provided in the **Table 8** and **Table 9** below whereas the listed activities associated with the project in respect of NWA are also provided. Based on the nature and extent of the listed activities, Earthlink on behalf of SANRAL will conduct separate EA and GA applications.

Table 8: Triggered activity listed under GNR.327 (Listing Notice 1)

Activity Number	Description
19	The infilling or depositing of any material of more than [5] 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than [5]10 cubic metres from [—(i)] a watercourse; [(ii) the seashore; or (iii)the littoral active zone, an estuary or a distance of 100 metres

	inland of the high-water mark of the sea or estuary, whichever distance is the greater—] but excluding where such infilling, depositing, dredging, excavation, removal or moving—
Reason: The proposed upgrade of R30 road will include the demolishing of an existing river bridge and the construction of a new river bridge as well as the widening of major and minor culverts along R30 will occur within watercourses. The proposed construction of a new river bridge and widening of culverts will involve excavations, removal and infilling and or deposition of material which exceeds 10m^3 Threshold	
27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
Reason: The proposed development will require a clearance of approximately 5 ha of vegetation, for stockpile areas.	
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre - (i) where the existing reserve is wider than 13,5 meters (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas
Reason: Increasing the existing road reserve width of 38m by 5m. General widening of the existing road cross section by an average width of 5m for wider lanes and surfaced shoulders. The road will be widened predominantly to the right-hand side (travelling direction North) to accommodate 2 x 3.7m wide lanes with 3.5m wide shoulders of which 2.5m is surfaced.	

Table 9: Triggered activity listed under GNR.324 (Listing Notice 3)

Activity Number	Description
12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan: h. **North West** iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority;
Reason: The upgrading of the roads would require clearance of 50 000 m^2 or more of indigenous vegetation. The proposed R30 road also passes through within CBA 1 and ESA 2. As such, this activity is triggered and is included for authorisation.	
14 (ii)	The development of— infrastructure or structures with a physical footprint of 10 square metres or more, where such development occurs— (a) within a watercourse

	h. Northwest iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority;
Reason: Bridge B2142 will be replaced with another bridge. Six culverts will be widened, and 1 culvert will be replaced by the new one. The proposed bridge and culvert to be replaced will have a footprint that will exceed 10 m2 physical footprint and will occur within watercourses. The proposed R30 road also passes through within CBA 1 and ESA 2. As such, this activity is triggered and is included for authorisation.	
23 (ii)	The expansion of— infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such [development] expansion occurs— (a) within a watercourse **h. Northwest** iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.
Reason: The demolition of 1 river bridge and the construction of a new river bridge and well as the widening of major and minor culverts within the watercourses which will exceed the physical footprint of 10 square metres. The proposed R30 road also passes through within CBA 1 and ESA 2. As such, this activity is triggered and is included for authorisation.	

2.3. National Water Act (1998)

Water uses listed under Section 21 of the NWA will be triggered by the proposed project. The GA Application is therefore being lodged with the relevant Regional DWS.

Water uses identified in terms of Section 21 of the NWA are as follows:

a) taking water from a water resource.
b) storing water.
c) impeding or diverting the flow of water in a watercourse.
d) engaging in a stream flow reduction activity contemplated in Section 36 of the Act.
e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).
f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.
g) disposing of waste in a manner which may detrimentally impact on a water resource.
h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.
i) altering the bed, banks, course, or characteristics of a watercourse.
j) removing, discharging, or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
k) using water for recreational purposes.

Due to water resources identified on the proposed site, the proposed development triggers Section (c) and (i) water uses listed in Section 21 of the NWA.

The NWA recognises that the entire ecosystem, and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i) of the NWA.

However, according to General Notice (GN) 509 as published in the Government Gazette No. 49833 of 8 December 2023, it must be noted that as defined by the Replacement General Authorisation (GA) in terms of Section 39 of the NWA, on account of the extremely sensitive nature of wetlands and estuaries, the section 21(c) and (i) water use GA does not apply to:

- To the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland.
- To the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High.
- In instances where an application must be made for a Water Use License (WUL) for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity.
- Where storage of water results from the impeding or diverting of flow or altering the bed, banks, course, or characteristics of a watercourse; and
- To any water use in terms of section 21 (c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

A GA Application is therefore imperative for the proposed development as the proposed use of water in terms of section 21(c) or (i) of the Act is within the regulated area of a watercourse and the Risk Class is Low.

The following definitions have been provided to give clarity on the imperativeness of the GA Application for the proposed development:

"Watercourse" means - (a) a river or spring;(b) a natural channel in which water flows regularly or intermittently;(c) a wetland, pan, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the NWA; and a reference to a watercourse includes, where relevant, its bed and banks.

"Wetland" means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

For the purpose of S21 (c) and (i) water uses, the water course encompasses the extent (i) of the riparian habitat, as delineated according to the Department of Water Affairs and Forestry (DWAF) (2005a) or the 1:100-year flood line, whichever is greatest, or (ii) within 500m radius from the boundary of any wetland.

2.4. National Heritage Resources Act (NHRA) (Act 25 of 1999)

The National Heritage Resources Act's mission is to inspire communities to protect and preserve their heritage for the benefit of present and future generations. A Heritage Impact Assessment (HIA) is the process to be followed in order to determine whether any heritage resources are located within the area of interest, in particular as per S38(1).

CHAPTER 3: NEED AND DESIRABILITY

This Chapter provides an overview of the need and desirability, and perceived benefits of the project specifically.

Currently the road R30 is a single carriageway road with one (1) lane per direction. The road cross section varies considerably, with gravel shoulders provided up to km 63.000 and surfaced shoulders predominately thereafter. Climbing/ passing lanes are currently provided along the following:

- Km 62.300 to km 63.590: RHS
- Km 63.390 to km 64.880: LHS
- Km 66.620 to km 68.080: LHS
- Km 68.080 to km 69.590: RHS

The aim of the project will be to improve the road geometry by adding surfaced shoulders and to rehabilitate the existing pavement's structure to enable it to carry a 20 year design traffic load. The road will be widened to the left-hand side (travelling direction North) to accommodate 2 x 3.7m wide lanes with 3.0m wide surfaces shoulders.

The horizontal alignment will require no improvement in terms of the required standards, but it will be offset from the existing centre line position along certain sections of the project road based on the proposed accommodation of traffic option to be adopted.

The vertical alignment of the road will require improvement along fourteen (14) sections where either crest curves are corrected, or hidden dips are improved.

To increase the pavements structural capacity, it is envisaged that the existing base and subbase will be recycled and stabilised and a crushed stone base layer and surfacing be applied to raise the existing road surface level by approximately 200mm.

Accesses along the R30 are a major concern due to the following:

- They are spaced at regular intervals and too close to each other.
- They Don't always have the required Shoulder Sight Distance (SSD)
- They Are not positioned apposite each other.

Also, it is desirable for local construction companies and associated local community enterprises to gain temporary economic benefits from the project's construction phase because the project has the potential to significantly contribute to local economic development by creating job opportunities during the project's construction phase.

CHAPTER 4: ALTERNATIVES CONSIDERED

In accordance with the requirements of Appendix 2 of the 2014 Environmental Impact Assessment (EIA) Regulations (GNR 326), reasonable and feasible alternatives including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered.

4.1. Project Alternatives

Within the scope of this EIA, no project alternatives were examined. It is crucial for SANRAL to upgrade road R30 and the associated infrastructures to improve their grade and safety for the affected communities who use the road, including the no-go alternative. The project is an upgrade of an existing road with an already proclaimed road reserve. Currently the road R30 is a single carriageway road with one (1) lane per direction. The road cross section varies considerably, with gravel shoulders provided up to km 63.000 and surfaced shoulders predominately thereafter. Climbing/ passing lanes are currently provided along the following:

- Km 62.300 to km 63.590: RHS
- Km 63.390 to km 64.880: LHS
- Km 66.620 to km 68.080: LHS
- Km 68.080 to km 69.590: RHS

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- They Don't always have the required Shoulder Sight Distance (SSD)
- They Are not positioned apposite each other.

Also, it is desirable for local construction companies and associated local community enterprises to gain temporary economic benefits from the project's construction phase because the project has the potential to significantly contribute to local economic development by creating job opportunities during the project's construction phase.

4.2. Design/ Layout Alternatives

Cross-section requirements

(a) km 29.0 to km 51.0 and km 52.2 to km 76.6

The typical cross-section proposed for the upgrading of road R30 conforms to SANRAL's typical cross-section for a single carriageway road with an annual average daily traffic (AADT) greater than 3,000 vehicles per day in 10 years (refer to Volume 3: Book of Drawings). The proposed typical cross-section is, therefore, as follows (also refer to Figure 10-1).

- 2 x 3.7m wide lanes;
- 3.5m wide shoulders (of which 3.0m is surfaced).

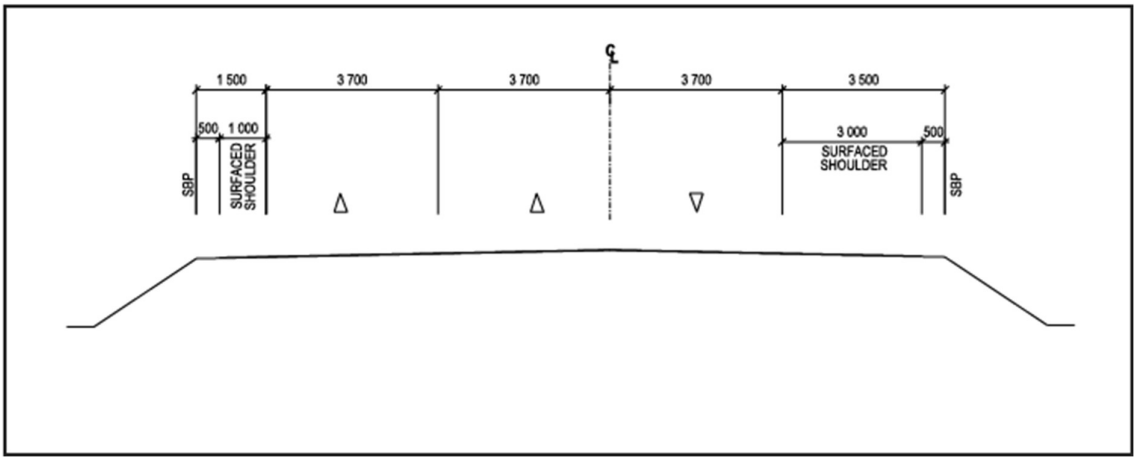


Figure 3: proposed cross-section of road R30.

Where there are currently climbing lanes, it is proposed that lane widths of 3.7m be retained and that a reduced shoulder width of 1.5m of which 1.0m is surfaced be implemented alongside the climbing lane.

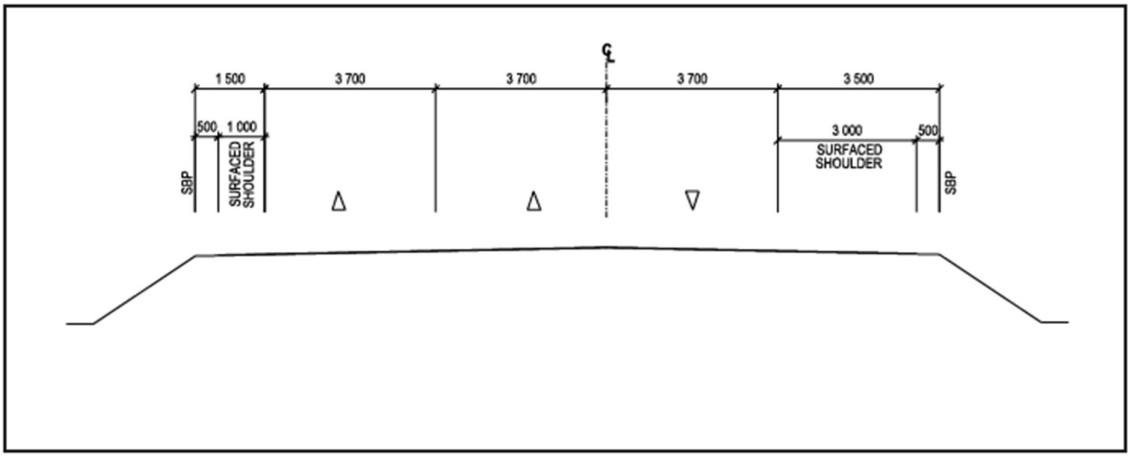


Figure 4: Proposed cross-section of road R30 with a climbing lane.

(b) km 51.0 to km 52.2: Derby

A pedestrian needs assessment was conducted along the road section in the vicinity of Derby, between km 51.0 and km 52.2. From the assessment it is proposed that pedestrian crossings and yield control for vehicles be provided at the intersection between the R30 and North Street (road D1616). It is also proposed that sidewalks be provided along the R30 between the intersection with road D47/2 on the southern side of Derby (km 50.980) and the intersection with North Street on the northern side of Derby (km 52.030).

The typical cross-section proposed in the vicinity of Derby should therefore provide for sidewalks between the intersection with road D47/2, on the southern side of Derby, at km 50.980 (hereafter referred to as the 'jug handle') and the intersection with North Street, on the northern side of Derby, at km 52.030 (hereafter referred to as 'North Street'). The provision of sidewalks along this section will not only accommodate pedestrians alongside the road, but also enhance the feel of an urban environment for all road users and assist in the traffic automatically reducing speed to the required 60km/h.

The positions of the two mentioned intersections and existing bridges are shown schematically in

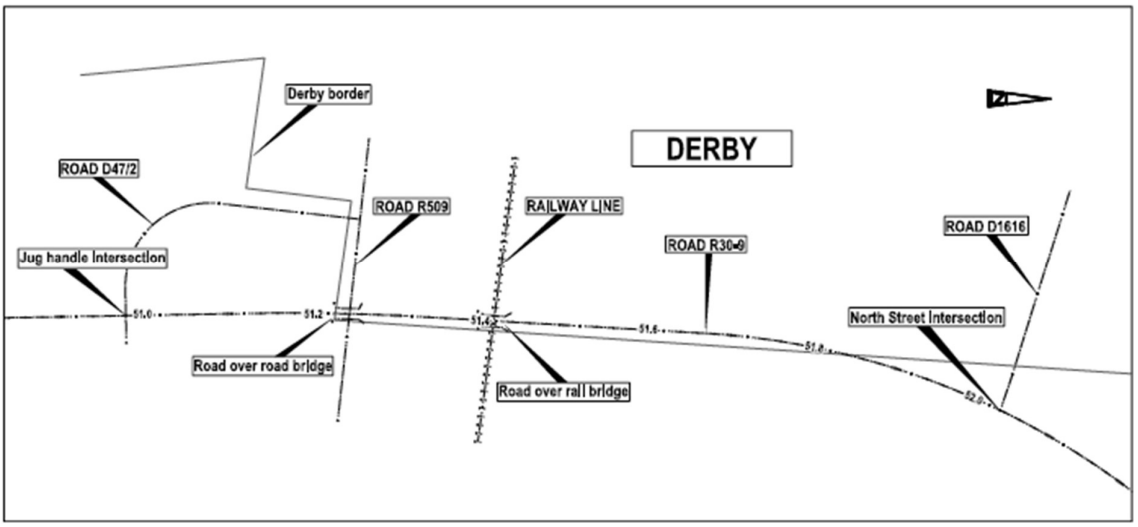


Figure 5: Schematic layout of road infrastructure at Derby.

Three (3) typical cross-section options were investigated as well as four (4) alternatives along this applicable section. The cross-section options and alternatives are mainly as a result of the road-over-road bridge (located at ±km 51.245) and the road-over-rail bridge (located at ±km 51.415), where various options exist.

Two typical cross-section options (Option 1 and 2) entail widening of the bridges to the one side. The third option (Option 3) requires no widening to the bridges.

Cross-section Option 1 is the widest of the three (3) cross-section options and allows for a raised median (see Figure 6.). The roadway width for Option 2 is similar to the typical cross-section proposed for the rest of road R30 albeit that the 3.0m surfaced shoulder is reduced to 1.5m combined with a 1.5m wide sidewalk (see Figure 7.). The roadway width for Option 3 is determined by utilising the total available width of the existing bridges (no widening required – see Figure 8). From the road survey an indicative total bridge deck width of approximately 12.3m, with approximately 11.180m between the parapets, is available.

The following four (4) alternatives were considered with regards to the cross-section options between the Jug handle intersection and North Street intersection:

ALTERNATIVE 1: OPTION 1 CROSS-SECTION FOR THE ENTIRE SECTION.

- Option 1 cross-section (raised median)

- 2 x 3.5m wide lanes;
- 1.5m wide outside shoulder and 0.8m wide inside shoulder;
- 2.8m wide raised median;
- 1.5m wide sidewalk;
- 0.5m wide gravel rounding (0.89m where guardrails are required).

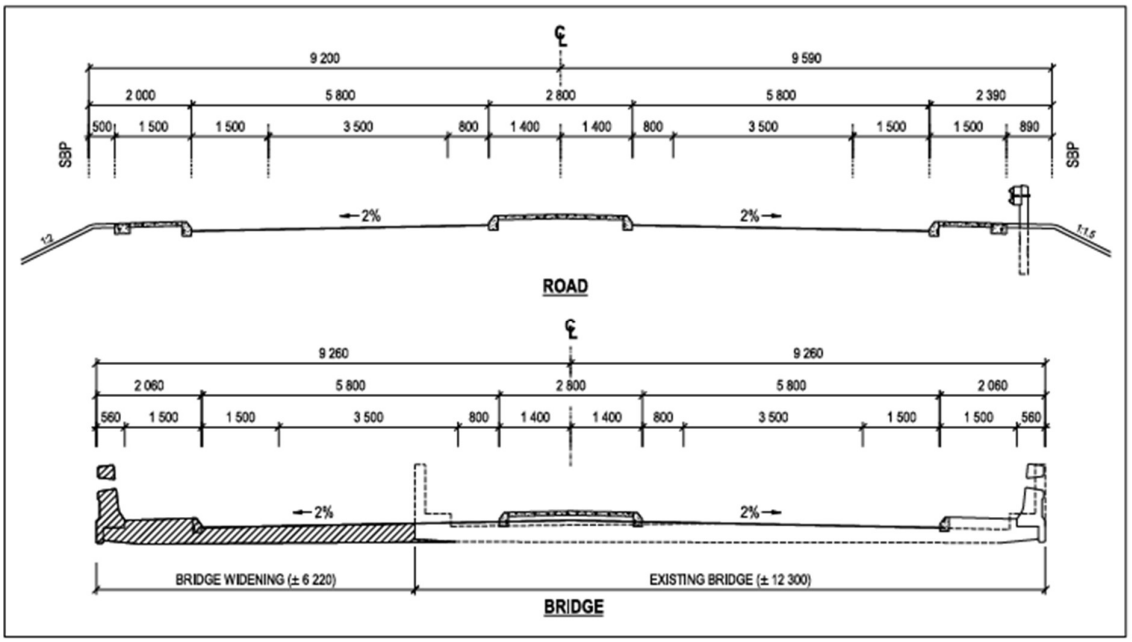


Figure 6: Typical cross-section: Option 1 (raised median).

- This alternative entails a horizontal shift of approximately 3.11m from the existing centre line and the widening of both bridges (on one side only). As a result of the horizontal shift an asphalt correction layer is required on the bridges to keep the camber position on the centre-line. The added weight of the asphalt and raised median may result in additional strengthening of the existing bridges being required.
- The lane widths are reduced from 3.7m to 3.5m whilst the preceeding 3.0m surfaced shoulder is reduced to 1.5m with a 1.5m wide sidewalk.
- The bridge will have to be widened by approximately 6.22m.
- The raised island will be provided between the Jug handle- and North Street intersection.

Advantages

- The Option 1 cross-section has a wider outside shoulder than the Option 3 cross-section (1.5m versus 0.5m) which provides more capacity in terms of storm-water run-off.
- The raised median gives the road an urban feel which will encourage traffic to slow down intuitively.
- The “contectual design” is more appropriate for a 60 km/h posted speed.
- The 1.5m shoulder provides better drainage and safety than the 0.5m shoulder of the Option 3 cross-section.

Disadvantages

- Widening of both bridges required versus no widening for Alternatives 3 and 4.
- Requires more widening (6.22m versus 2.22m) than Alternative 2.
- Additional asphalt to be laid on the bridges to keep the camber position on the centre lane.
- Drainage infrastructure will be required for surface run-off against the raised median.
- The wider cross-section is more expensive to construct.

ALTERNATIVE 2: OPTION 2 CROSS-SECTION FOR THE ENTIRE SECTION.

- Option 2 cross-section (same roadway width as approaching cross-section)
- 2 x 3.7m wide lanes;
- 1.5m wide shoulder;
- 1.5m wide sidewalk;
- 0.5m wide gravel rounding (0.89m where guardrails are required).

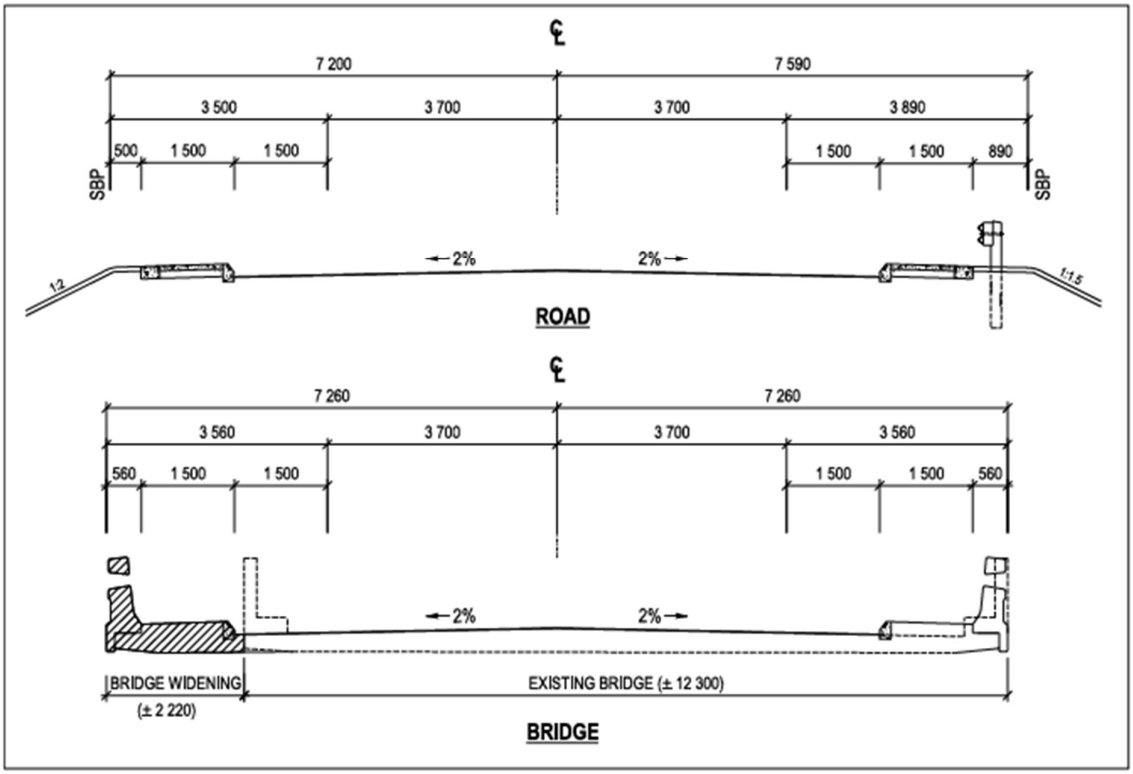


Figure 7: Typical cross-section: Option 2 (same roadway width as approaching cross-section).

- This alternative entails a horizontal shift of approximately 1.11m and the widening of both bridges (on one side only). As a result of the horizontal shift an asphalt correction layer is required on the bridges to keep the camber position on the centre-line. The added weight of the asphalt may result in additional strengthening of the existing bridges being required.
- 3.7m lane widths are retained whilst the preceding 3.0m surfaced shoulder is reduced to 1.5m with a 1.5m wide sidewalk.
- The bridge will have to be widened by approximately 2.22m.
- A raised island will only be provided in the vicinity of North Street intersection to assist in the safe crossing of pedestrians.

Advantages

- The Option 2 cross-section has a wider shoulder than the Option 3 cross-section (1.5m versus 0.5m) which provides more capacity in terms of storm-water run-off.
- Lane widths of 3.7m are retained.

- Requires less widening (2.22m versus 6.22m) than Alternative 1.
- The 1.5m shoulder provides better drainage and safety than the 0.5m shoulder of the Option 3 cross-section.

Disadvantages

- Widening of both bridges is required versus no widening for Alternatives 3 and 4.
- Additional asphalt to be laid on the bridges to keep the camber position on the centre lane.
- The Option 2 cross-section may not reflect the same "contextual design" as that of both the Option 1 and Option 3 cross-sections, which are more appropriate for a 60 km/h design speed

ALTERNATIVE 3: OPTION 3 CROSS-SECTION FOR THE ENTIRE SECTION.

Option 3 cross-section (do not widen existing bridges)

- 2 x 3.5m wide lanes;
- 0.5m wide shoulder;
- 1.5m wide sidewalk;
- 0.5m wide gravel rounding (0.89m where guardrails are required).

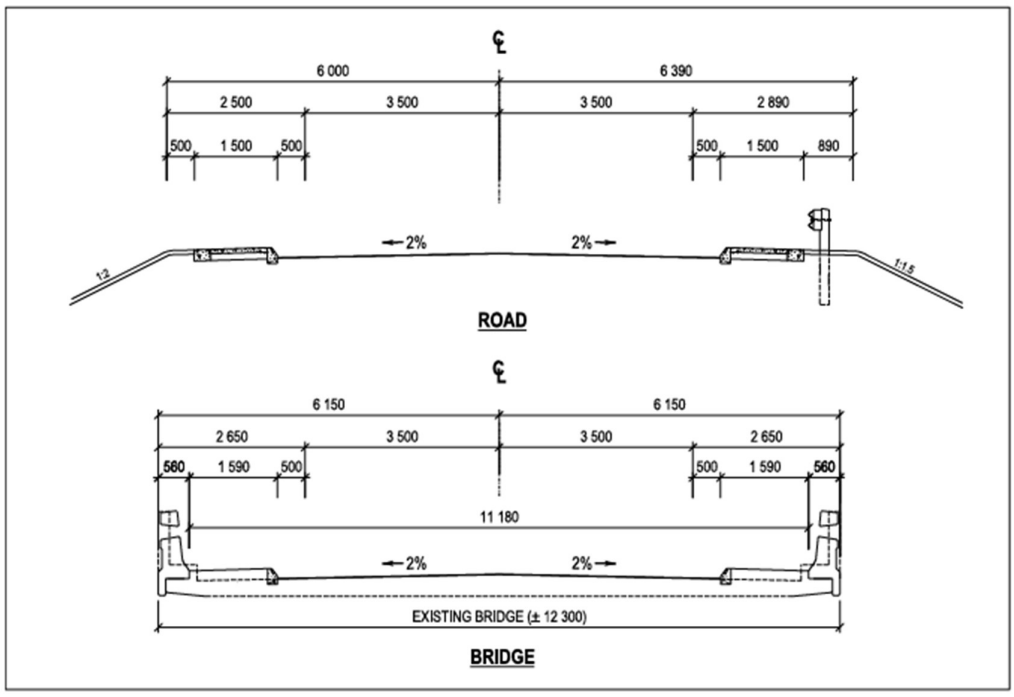


Figure 8: Typical cross-section: Option 3 (do not widen existing bridges)

- The horizontal alignment remains on the existing centre-line and requires no widening to the bridges.
- The lane widths are reduced from 3.7m to 3.5m whilst the preceding 3.0m surfaced shoulder is reduced to 0.5m with a 1.5m wide sidewalk.

- A raised island will only be provided in the vicinity of the North Street intersection to assist in the safe crossing of pedestrians.

Advantages

- No bridge widening is required.
- Existing centre-line position is retained and therefore no additional asphalt to be laid on the bridges (to keep camber position on the centre line).
- The “contextual design” is more appropriate for a 60km/h design speed.

Disadvantages

- The 0.5m wide shoulder has limited (less than Options 1 and 2) capacity in terms of storm-water run-off.
- Vehicular traffic is significantly closer to the sidewalk which results in a inherent risk to pedestrians.

Alternative 4: Option 3 cross-section (0.5m shoulder) up to ±km51.460, then transition to Option 2 cross-section (1.5m shoulder) for the remainder of the section.

- This alternative uses the Option 3 cross-section (0.5m shoulder) initially to avoid widening of the bridges and then transitions to the Option 2 cross-section (1.5m shoulder) to improve drainage and safety.
- The horizontal alignment remains on the exiting centre line.
- The lane widths are reduced from 3.7m to 3.5m initially and are then widened again to 3.7m after the second bridge.
- A raised island will only be provided in the vicinity of North Street intersection to assist in the safe crossing of pedestrians.

Advantages

- No bridge widening is required.
- Existing centre-line position is retained initially and therefore, no additional asphalt to be laid on the bridges (to keep camber position on the centre line).

Disadvantages

- From km 51.0 to km 51.460, the 0.5m wide shoulder has limited capacity in terms of storm-water run-off.
- From km 51.0 to km 51.460, the vehicular traffic is significantly closer to the sidewalk which results in a inherent risk to pedestrians.
- The “contextual design” element is achieved to some extent but a continuous cross-section is preferred to one that varies.

Table 10: The four (4) alternatives are summarised.

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Option 1 cross-section	Option 2 cross-section	Option 3 cross-section	Option 3 cross-section (from Jug handle intersection to just beyond bridges) Option 2 cross-section (from beyond

			bridges to North Street intersection)
3.5m wide lanes	3.7m wide lanes	3.5m wide lanes	3.5m wide lanes (from Jug handle intersection to just beyond bridges) 3.7m wide lanes (from beyond bridges to North Street intersection)
Raised median throughout	No median	No median	No median
1.5m outside shoulders	1.5m shoulders	0.5m shoulders	0.5m shoulders (from Jug handle intersection to just beyond bridges) 1.5m shoulders (from beyond bridges to North Street intersection)
Widen bridges	Widen bridges	No widening of bridges	No widening of bridges
Raised island throughout	Raised island only at North Street intersection	Raised island only at North Street intersection	Raised island only at North Street intersection
Cost: R15.312 millio	Cost: R7.347 million	Cost: R2.997 million	Cost: R3.684 million

RECOMMENDATIONS

After evaluation of the advantages and disadvantages between the four alternatives it is recommended that Alternative 3 (Option 3 cross-section for the entire section) be adopted due to the following reasons:

- The “contextual design” i.e. narrowing the lanes and providing side-walks enhances the feeling of an urban environment for the road user and is more appropriate for a 60km/h design speed. It will also motivate road users to reduce speed when approaching the town.
- Indications are that the town development, currently situated only on the western side (LHS) of road R30, will extend to the opposite side (RHS) of road R30 which will change the function of road R30 at Derby from a bypass to an urban road.
- Alternative 1 (Option 1 cross-section with a raised island) is also applicable to urban roads but will require a wider cross-section and widening of the existing bridges which will be more expensive (approximately R12 million) than Alternative 3.

4.3. No-Go Alternative

The "no-go" alternative refers to the potential outcome where the proposed improvement of R30 and the related bridges and culverts is not implemented. The impacts that can be

expected to result from the proposed road and related infrastructure upgrade would not materialize if this option is chosen, and the conditions and trends on the road and in the affected properties can be expected to continue as is.

CHAPTER 5: DESCRIPTION OF BASELINE ENVIRONMENT

5.1. Geology and Soils, Climate and Vegetation

5.1.1. Geology & Soils

A large section of the R30 Road earmarked to be upgraded consist of the Clastic sediments and minor carbonates and volcanics of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west, all of the Transvaal Supergroup (Vaalian). There is also some contribution from mafic Bushveld intrusives. Soils often stony with colluvial clay-loam but varied, including red-yellow apedal freely drained, dystrophic and eutrophic plinthic catenas, vertic and melanic clays, and some less typical Glenrosa and Mispah forms. Land types Ae, Ba, Ea, Bc, Ac and less typically Fb.

5.1.2. climate

The study site experiences strong seasonal summer-rainfall, warm-temperate region, with very dry winters. The Mean Annual Precipitation (MAP) is 654 mm, ranging between 570 mm and 730 mm, slightly lower in the western regions. The coefficient of variation of MAP is 28% in the west and 26–27% in the east and varies only slightly from 25% to 29% across the unit. The incidence of frost is higher in the west (30–40 days) than in the east (10–35 days).

5.1.3. Vegetation types along R30 National Road

Gh 15 Carletonville Dolomite Grassland

The area where the National R30 Starts is dominated by the Gh 15 Carletonville Dolomite Grassland (Figure 5). This vegetation unit features Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species. It is distributed in the North-West (mainly) and Gauteng and marginally into the Free State Province. In the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province. The vegetation unit is found in altitudes ranging between 1 360–1 620 m, but largely 1 500–1 560 m.

The Carletonville Dolomite Grassland is classified as Vulnerable. A Conservation Target of 24% has been set, while a small extent of the Carletonville dolomite is statutory conserved in the (Sterkfontein Caves—part of the Cradle of Humankind World Heritage Site, Oog Van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas. Almost a quarter already transformed for cultivation, by urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams. Erosion very low (84%) and low (15%).

Gm 11 Rand Highveld Grassland

The R30 Road consist of the Gm 11 Rand Highveld Grassland vegetation (Figure 5) type which is characterized by Highly variable landscape with extensive sloping plains and a

series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera Themeda, Eragrostis, Heteropogon and Elionurus. High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with Protea caffra subsp. caffra, P. welwitschii, Acacia caffra and Celtis africana, accompanied by a rich suite of shrubs among which the genus Rhus (especially R. magalismonata) is most prominent.

The Gm 11 Rand Highveld Grassland is distributed in the Gauteng, North-West, Free State and Mpumalanga Provinces: In areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugersdorp centred in the vicinity of Derby and Potchefstroom, extending southwards and northeastwards from there. Altitude 1 300–1 635 m, but reaches 1 760 m in places.

The Gm 11 Rand Highveld Grassland is classified as Endangered. A conservation target of 24% has been set? however this vegetation unit is poorly conserved (only 1%). Small patches protected in statutory reserves (Kwaggavoetpad, Van Riebeeck Park, Bronkhorstspruit, Boskop Dam Nature Reserves) and in private conservation areas (e.g. Doornkop, Zemvelo, Rhenosterpoort and Mpopomeni). Almost half has been transformed mostly by cultivation, plantations, urbanisation or dam-building. Cultivation may also have had an impact on an additional portion of the surface area of the unit where old lands are currently classified as grasslands in land-cover classifications and poor land management has led to degradation of significant portions of the remainder of this unit (D.B. Hoare, personal observation). Scattered aliens (most prominently Acacia mearnsii) occur in about 7% of this unit. Only about 7% has been subjected to moderate to high erosion levels.

SVcb 8 Moot Plains Bushveld

A significant section of the R30 Road consists of the SVcb 8 Moot Plains Bushveld vegetation type (Figure *9*). This vegetation type consists of Open to closed, low, often thorny savanna dominated by various species of Acacia in the bottomlands and plains as well as woodlands of varying height and density on the lower hillsides. Herbaceous layer is dominated by grasses.

The SVcb 8 Moot Plains Bushveld vegetation is distributed in the North-West and Gauteng Provinces: Main belt occurs immediately south of the Magaliesberg from the Selons River Valley in the west through Maanhaarrand, filling the valley bottom of the Magalies River, proceeding east of the Hartebeestpoort Dam between the Magaliesberg and Daspoort mountain ranges to Pretoria. It also occurs as a narrow belt immediately north of the Magaliesberg from Rustenburg in the west to just east of the Crocodile River in the east: also south of the Swartruggens–Zeerust line. Altitude typically about 1 050–1 450 m.

The SVcb 8 Moot Plains Bushveld is classified as Vulnerable. A conservation Target of 19% has been set. An estimated 13% is statutorily conserved mainly in the Magaliesberg Nature Area. About 28% is transformed mainly by cultivation and urban and built-up areas. Very

scattered occurrences to sometimes dense patches in places of various alien plants including Cereus jamacaru, Eucalyptus species, Jacaranda mimosifolia, Lantana camara, Melia azedarach and Schinus species. Erosion is mainly very low to low, moderate in some areas.

SVcb 9 Gold Reef Mountain Bushveld

In addition to the above-mentioned vegetation units, the study site consists of the **SVcb 9 Gold Reef Mountain Bushveld (**Figure *9***).**

This vegetation is characterized by Rocky hills and ridges often west-east trending with more dense woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of Acacia caffra on the southern slopes). Tree cover elsewhere is variable. Tree and shrub layers are often continuous. Herbaceous layer is dominated by grasses. This vegetation unit is North-West, Gauteng, Free State and Mpumalanga Provinces: Occurs along rocky quartzite ridges of the Magaliesberg and the parallel ridge to the south, from around Boshoek and Koster in the west to near Bronkhorstspruit in the east. The west-east-trending ridge of the Witwatersrand from around Krugersdorp in the west, through Roodepoort and Johannesburg to Bedfordview (Germiston District). Inner ridges (e.g. Dwarsberg and Witkop) of the Vredefort Dome on the Vaal River northwest of Parys and part of the Suikerbosrand and some other hills around Heidelberg. Altitude 1 200–1 750 m.

The SVcb 9 Gold Reef Mountain Bushveld is classified as Least threatened. A conservation target of 24% has been set, with Some 22% statutorily conserved mainly in the Magaliesberg Nature Area and much smaller proportions in the Rustenburg, Wonderboom and Suikerbosrand Nature Reserves. At least an additional 1% conserved in other reserves brings the total conserved very close to target. About 15% transformed mainly by cultivation and urban and built-up areas. Some areas with dense stands of the alien Melia azedarach but which is often associated with drainage lines or alluvia (i.e. azonal vegetation) embedded within this unit. Erosion is very low to low.

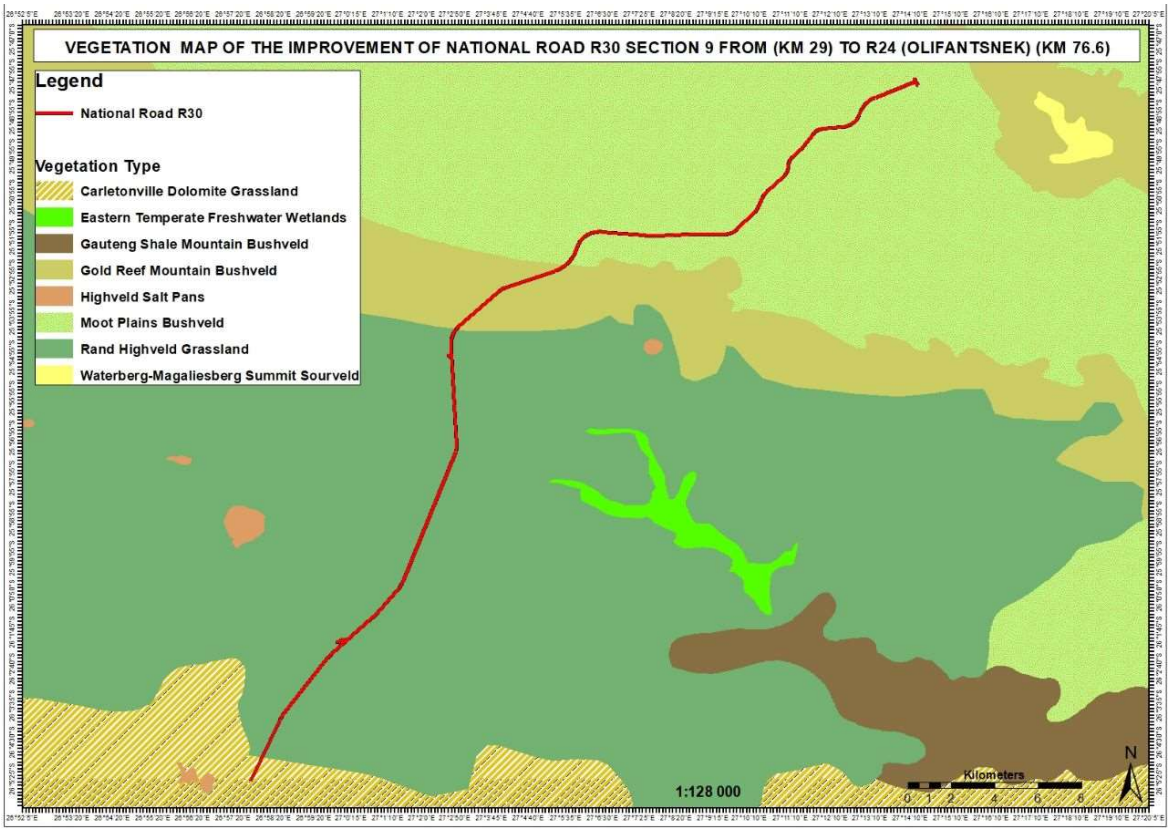


Figure 9: The vegetation type associated with the R30 National Road (2012 Vegetation Map)

5.1.4. Socio economic

The proposed upgrade of National Road R30 section 9 from km 29 to R24 (Olifantsnek) km 76.6, three bridges and seven major culverts, in the Northwest Province within the Bojanala Municipality, in Kgetlengrivier Local Municipality and Rustenburg Local Municipality.

The information presented in this section and pertaining to these aspects was obtained from StatsSA 2016 census collated by Wazimap and in the municipality IPD.

Ketlengrivier Local Municipality Under the jurisdiction of Bojanala District Municipality

Kgetlengrivier Local Municipality is located in the Northwest province, forming part of the Bojanala Platinum District Municipality. The municipality is situated on the N4 national road that runs between Pretoria and Botswana, and consists of the towns of Reagile, Borolelo and Koster.

- **Demographics**

According to the 2011 census, the population of Kgetlengrivier Local Municipality was 59 561 which is less than 10% of the fof the figure in Bojanala 1 657 149 and less than 10% of the figure in Northwest 3 748 435. Majority of the population consisted of Black African (80%), followed by white with 19% as depicted in Figure below. The median age of the

Kgetlengrivier municipality was 25 years of age, which was a little less than the figure in Bojanala (26) and about the same as the figure in North West (25). (Census, 2011).

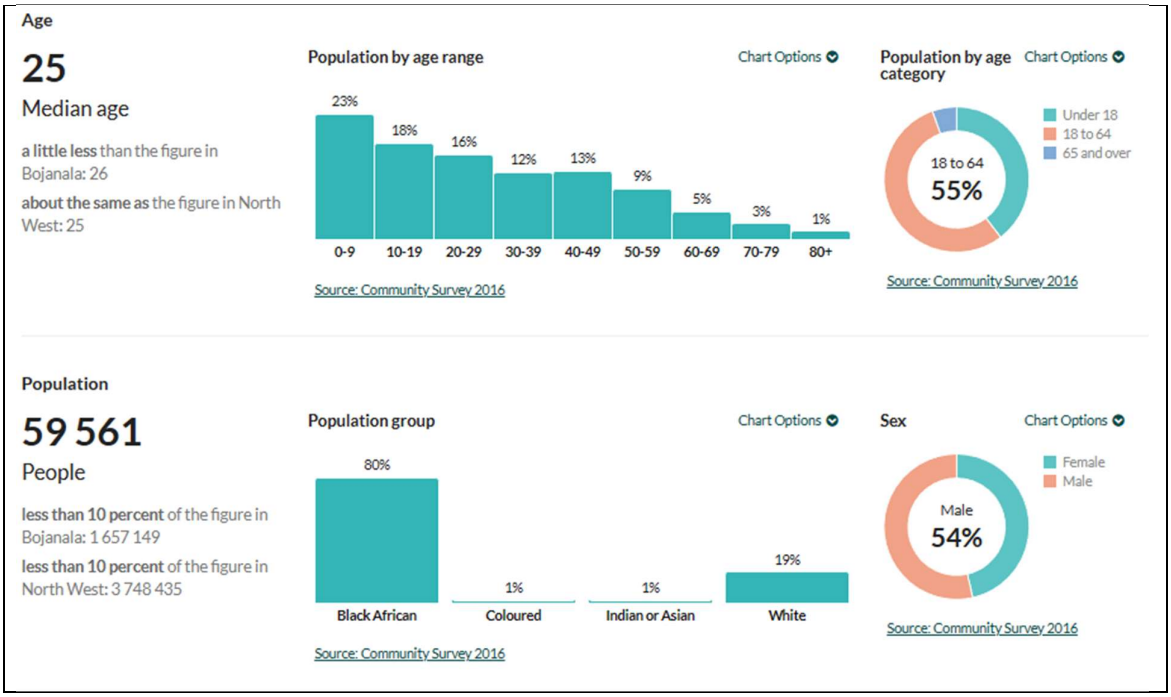


Figure 10: Kgetlengrivier Local Municipality Demographics (https://wazimap.co.za/profiles/municipality-NW374-kgetlengrivier/#demographics)

- **Employment Rate**

In 2011, only 44.8% of the community members within the Kgetlengrivier Local municipality were employed with 49% of these employed in the formal sector. Although the employment rate was a little higher than the rate in Bojanala District 42.42% and about 20% higher than the rate in Northwest 37.12%. The average annual income was R 15 000 which was about half the amount in Bojanala R30 000 and half the amount in Northwest R30 000.

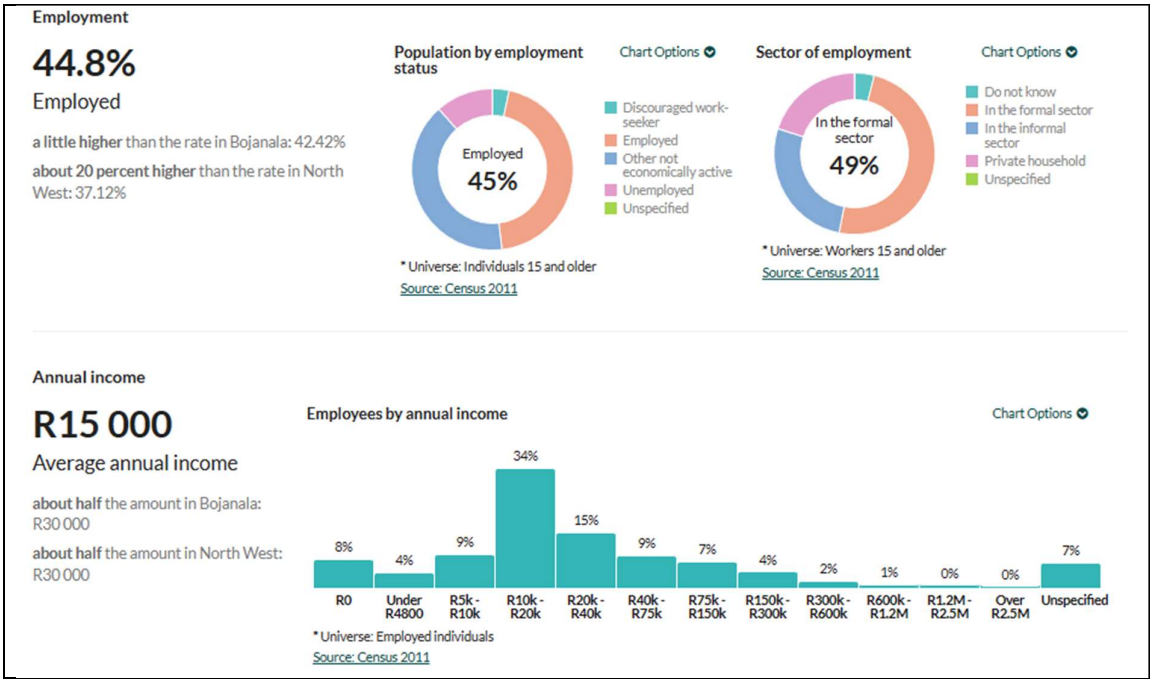


Figure 11: Kgetlengrivier Local Municipality Employment rate (https://wazimap.co.za/profiles/municipality-NW374-kgetlengrivier/#economics)

- **Service Delivery**

Overall, Rustenburg Local Municipality 76.5 % communities were getting water from a regional or local service provider which was a little less than the rate in Bojanala 80.89% and about 90% of the rate in Northwest 83.39%%. The electricity supply was at an unacceptably 6.5% of the municipality had no access to electricity, which was about 80% of the rate in Bojanala 7.61% and about 90% of the rate in Northwest 7.01%. Ablution facilities are significantly important for the health and environmental state of the community. In 2011, Kgetlengrivier Local Municipality 81,5% of the municipality had access to flush or chemical toilets which was more than double the rate in Bojanala 39.27% and about 1.5 times the rate in Northwest 47.96%.

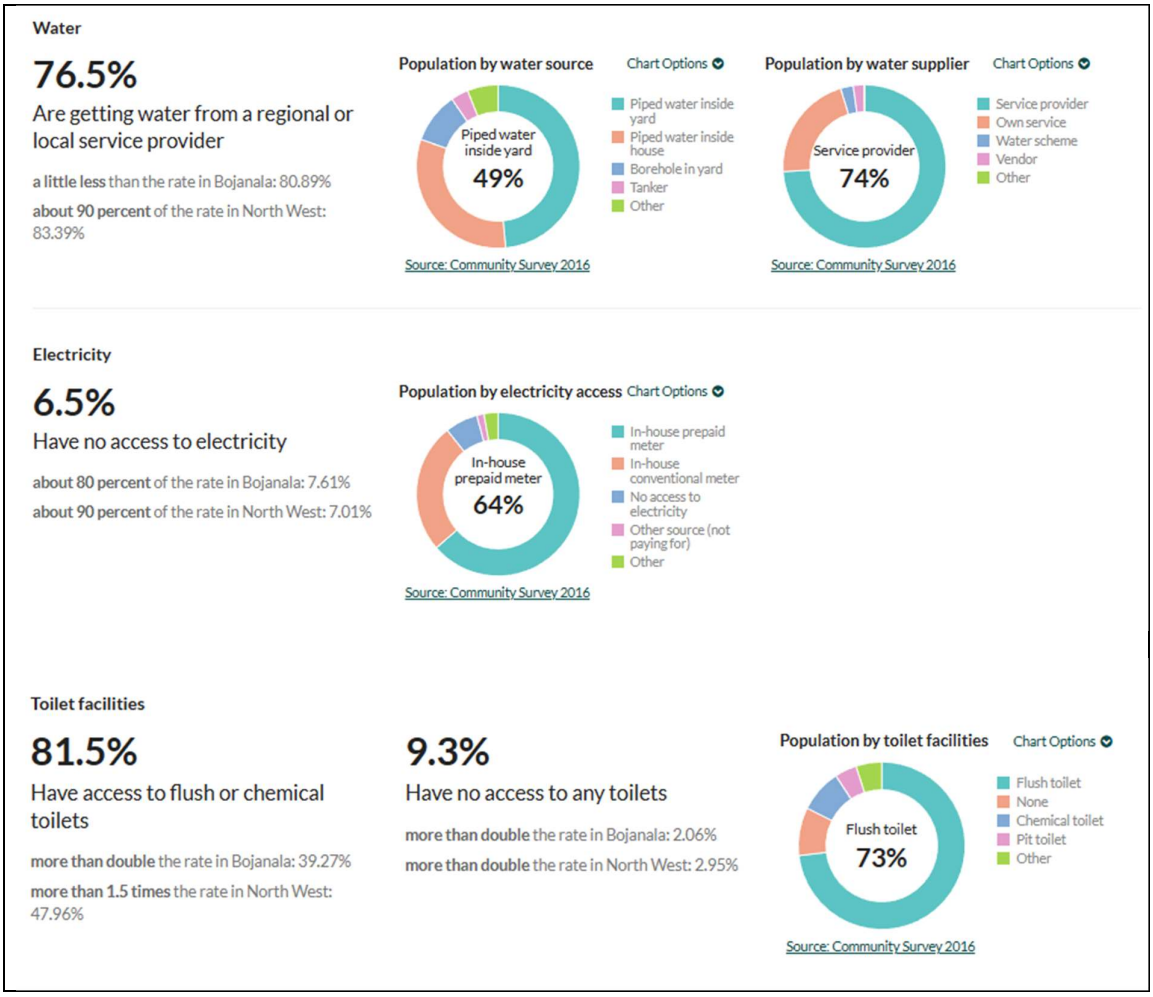


Figure 12: Kgetlengrivier Local Municipality service delivery (https://wazimap.co.za/profiles/municipality-NW374-kgetlengrivier/#service_delivery)

Rustenburg Local Municipality under the jurisdiction of Bojanala District Municipality

Rustenburg Local Municipality forms part of the Northwest Province that further forms part of the border between South Africa and Botswana. The Northwest Province consist of 4 district municipalities and 21 Local Municipalities with a geographic area 116.180 km2. Rustenburg Local Municipality is located in Bojanala District Municipality. The total geographical area is 3,423 km2.The other municipalities falling under Bojanala District Municipality are Moretele Local Municipality, Madibeng Local Municipality, Kgetlengrivier Local Municipality and Moss Kotane Local Municipality.

- **Demographics**

According to the 2011 census, the population of Rustenburg Local Municipality was **626 522** which is about two-fifth of the figure in Bojanala 1 657 149 and about one-fifth of the figure in Northwest 3 748 435. Majority of the population consisted of Black African (93%), followed by white with 6% as depicted in Figure below. The median age of the Rustenburg municipality was 27 years of age, which was a little higher than the figure in Bojanala (26) and about 10% higher than the figure in Northwest (25). (Census, 2011).

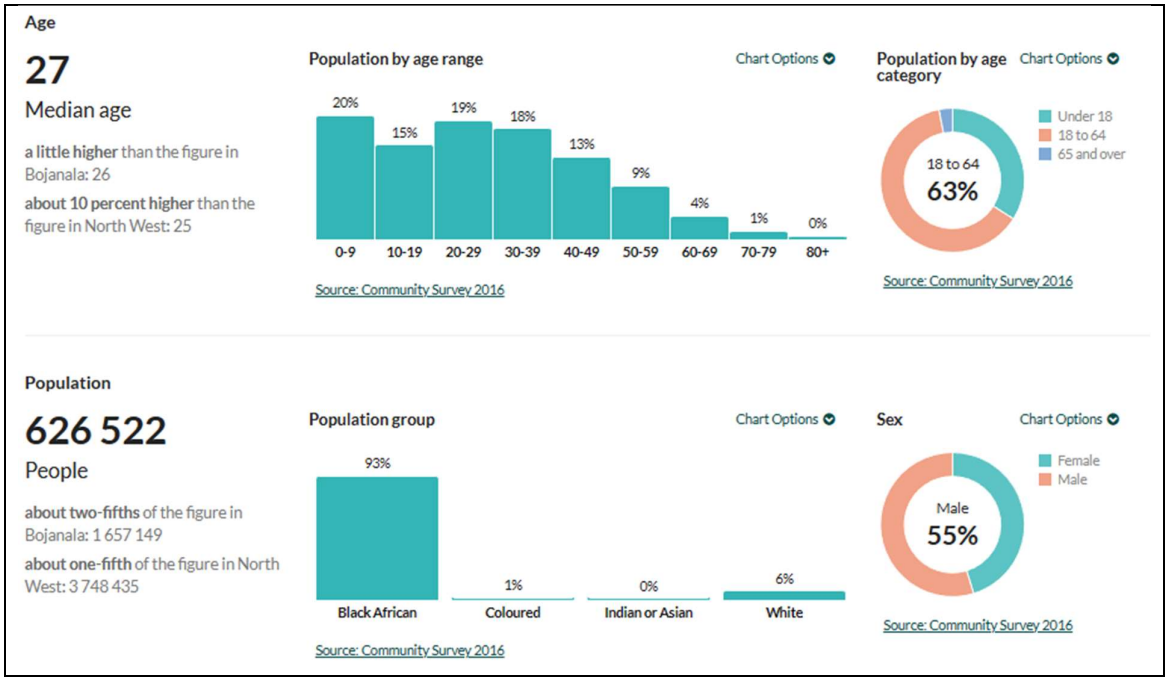


Figure 13: Rustenburg Local Municipality Demographics (https://wazimap.co.za/profiles/municipality-NW373-rustenburg/#demographics)

- **Employment Rate**

In 2011, only 49.2% of the community members within the Rustenburg Local municipality were employed with 75% of these employed in the formal sector. Although the employment rate was about 20 % higher than the rate in Bojanala District 42.42% and about 1.3 times the rate in Northwest 37.12%. The average annual income was R 57 500 which was nearly double the amount in Bojanala R30 000 and nearly double the amount in Northwest R30 000.

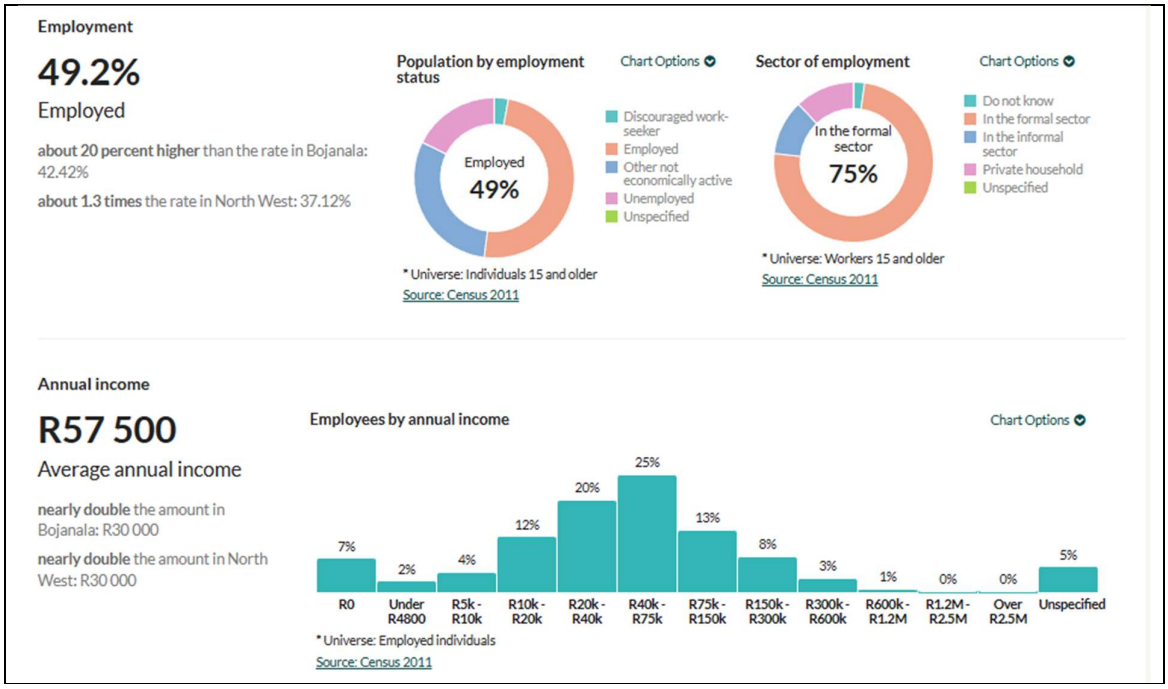


Figure 14: Rustenburg Local Municipality Employment Rate (https://wazimap.co.za/profiles/municipality-NW373 rustenburg/#economics)

- **Service Delivery**

Overall, Rustenburg Local Municipality 95.2% communities were getting water from a regional or local service provider which was about 20% higher than the rate in Bojanala and about 10% higher than the rate in Northwest 83.39%%. The electricity supply was at an unacceptably 11.2% of the municipality had no access to electricity, which was about 1.5 times the rate in Bojanala 7.61% and about 1.5 times the rate in Northwest 7.01%. Ablution facilities are significantly important for the health and environmental state of the community. In 2011, Rustenburg Local Municipality 60.1% of the municipality had access to flush or chemical toilets which was about 1.5 times the rate in Bojanala 39.27% and about 25% higher than the rate in Northwest 47.96%.



Figure 15: Rustenburg Local Municipality Service Delivery (https://wazimap.co.za/profiles/municipality-NW373-rustenburg/#service_delivery)

CHAPTER 6: SPECIALIST FINDINGS

6.1. Wetland and Delineation and Impact Assessment

Earthlink Environmental Services appointed Ntumbuluko Consulting Pty Ltd to conduct the Wetland Delineation and Impact Assessment for the proposed project, the specialist report is attached as Appendix D.

6.1.1. Results of the wetland Assessment

6.1.1.1. Wetland Delineation and Assessment

6.1.1.1.1. Desktop Assessment

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA) database were undertaken for the study site. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. They were identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (MacFarlane et al., 2009). Identification of FEPA Wetlands are based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland-dependent birds.

6.1.1.1.2. Field Survey

The study site suffered various degrees of disturbance as a result of the existing R30 National Road, and anthropogenic activities onsite. The disturbance has taken place over time. There are patches of indigenous vegetation along the road, with an abundances of Acacia species. Vegetation is observed along the edges of the road, and there is evidence of alien invasive plant species. The result has been high vegetation surface areas with moderate biodiversity sensitivity cover or topsoil in many areas adjacent the servitude of the road.

6.1.1.1.3. Wetland Features

The R30 Road is traversed by a number of perennial rivers (streams and river) (Figure *16* and Figure *17*). The road has a number of drainage lines that serve the purpose of conveying water into the perennial rivers and the existing culverts during and immediately after rainfall events. The existing watercourses service support a host of hydrophytes and avifaunal species onsite (Figure *17*).

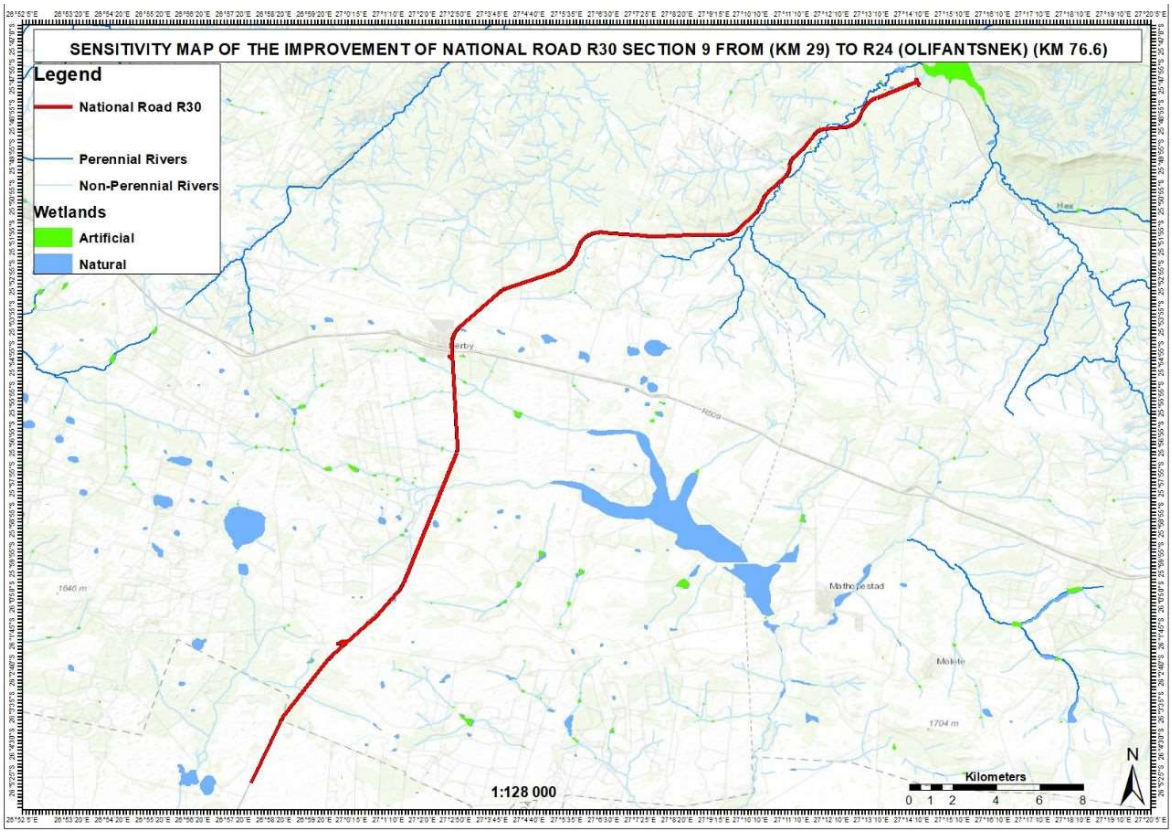


Figure 16: Map of the wetland and Watercourses within 500m of the R30 Road.





COMMENT 1: DRAINAGE LINES ALONG THE R30 NATIONAL ROAD.



COMMENTS 2: WATERCOURSE OBSERVED ALONG THE R30 ROAD



COMMENT 3: WETLAND WITHIN 500M OF THE R30 NATIONAL ROAD.

Figure 17: Delineated watercourses along the R30 National Road.

6.1.1.1.4. Terrain Indicator

The topography of an area is generally a good practical indicator for identifying those parts in the landscape where wetlands are likely to occur. Generally, wetlands occur as a valley bottom unit however wetlands can also occur on steep to mid slopes where groundwater discharge is taking place through seeps (DWAF, 2005). In order to classify a wetland system, the localised landscape setting must be taken into consideration through ground-truthing of the study site after initial desktop investigations (Ollis et al., 2014).

The study site can be characterized as Gently to moderately sloping upper pediment slopes (Figure *18*).



Figure 18: Slope of the R30 National Road.

6.1.1.1.5. Soil wetness and soil form indicator

The watercourses onsite have water and support a host of hydrophytes and alien invasive plant species. Wetland areas were identified and mainly delineated according to the presence of hydric (wetland) soil types. Hydric soils are defined as those which show characteristics (redoximorphic features) resulting from prolonged and repeated saturation. The watercourses consist mainly of sand (Figure *19*).



Figure 19: Soil Observed within one of the water courses.

6.1.1.1.6. Vegetation indicator

According to DWAF (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act, Act 36 of 1998. However, using vegetation as a primary wetland indicator requires an undisturbed condition (DWAF, 2005). Major disturbances were however noted in the wetland systems making it difficult to rely solely on vegetation as a wetland indicator. Disturbances included the presence of agricylturla activities, servitude of the road aand powerlines along the R30 National Road. There was evidence of hydrophyres as reeds (*Phragmites australis*) and in some cases *Arundo donax* (Figure *20*)



Figure 20: Phragmite species observed onsite.

The R30 Road traverses a number of vegetation units namely; the Carletonville Dolomite Grassland, Rand Higveld Grassland, Gold Reef Mountain Bushveld and lastly the Moot Plains Bushveld vegetation units. The different vegetation units were observed along the R30 Road, they all have suffered various degrees of disturbance as a result of agricultural activities along the road. The Carletonville Dolomite Grassland is characterised by Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (Figure *21*).



Figure 21: Vegetation observed along the R30 National Road.

6.1.1.1.7. Wetland Delineation

Any wetlands identified on the site were categorised according to the National Wetland Classification System for South Africa (Ollis et al., 2013). The wetland area was classified as a hydrogeomorphic (HGM) unit. An HGM unit is a recognisable physiographic wetland-unit based on the geomorphic setting, water source of the wetland and the water flow patterns (MacFarlane et al., 2009). The proposed project is located within 500m of a number watercourse (rivers), and visisble single wetland (Figure 22).

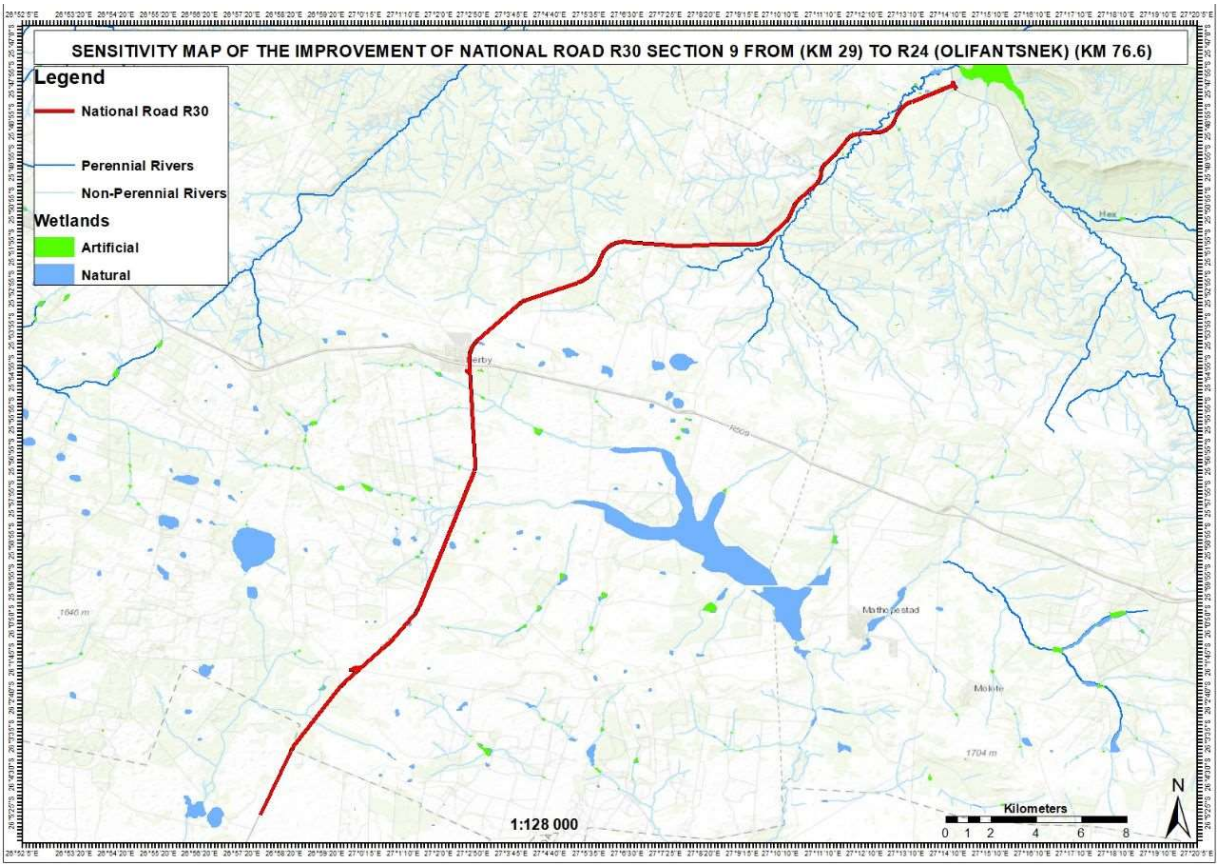


Figure 22: Wetland delineation Map

6.1.1.2. Wetland Functional and Health Assessment

6.1.1.2.1. Wetland Ecological Importance and Sensitivity

The EIS and functions were calculated using the new draft DWA guidelines and model, as developed by M. Rountree, but not yet published. Information used form the SIBIS and VEGMAP products. A mean score between 0 and 4 is obtained, with 0 as the lowest and 4 as the highest score. No classification of the scores is given.

The watercourses and wetland onsite have an Ecological Importance and Sensitivity (EIS) score of 2,55 (**Table *11***). This is a value between 0 and 4, with 0 being very low and 4 very high. The rivers, therefore, have a Medium EIS score. It is regarded as being modified.

Table 11: EIS calculation of the wetland

ECOLOGICAL IMPORTANCE AND SENSITIVITY	SCORE(0-4)	CONFIDENCE (1-5)	MOTIVATION
Biodiversity support	**3.00**	*4*	
Presence of Red Data species	**4.00**	*4.00*	No known red data or protected species observed on site.

Populations of unique species	**0.00**	*4.00*	No unique plant or animal populations were observed.
Migration/breeding/feeding sites	**2.00**	*4.00*	Though a few bird species were observed, few nests were present.
Landscape scale	**1.00**	***4.80***	
Protection status of the wetland	**4.00**	*5.00*	The wetland and surrounding area have been exposed to various industrial and housing developments surrounding the area.
Protection status of the vegetation type	**4.00**	*5.00*	The wetland is not located in an Endangered and Vulnerable vegetation types. Although dominated by *Phragmites* it is very homogeneous as a result of the polluted state of the water. The vegetation surrounding the wetland is mostly pioneer and alien invasive
ECOLOGICAL IMPORTANCE AND SENSITIVITY	**SCORE(0-4)**	***CONFIDENCE (1-5)***	**MOTIVATION**
			species with few indigenous species present.
Regional context of the ecological integrity	**2.50**	*5.00*	The wetland is in PES class E due to the large scale degradation of the surrounding areas as well as the wetland area itself.
Size and rarity of the wetland type/s present	**4.00**	*4.00*	The wetland is not particularly rare and has no vulnerable ecosystem present.
Diversity of habitat types	**1.00**	*5.00*	The wetland has a low species diversity as well as habitat diversity. The wetland is dominated by a homogeneous stand of *Phragmites* australis.

6.1.1.2.2. Wetland Health and PES

It should be noted in **Table *12*** by Kleynhans (1999) that if a score of less than 2 is attributed to any impact, the lowest rating, rather than the mean, is used to attribute PES class.

Table 12: PES classes (from Kleynhans 1999) indicating the interpretation of the mean scores to rate the PES category.

WITHIN GENERALLY ACCEPTABLE RANGE		
Category	**Score**	**Description**
A	>4	Unmodified, or approximates natural condition and/or represents a natural condition due to successful rehabilitation process/program(s) which has occurred and/or are in the process of occurring.
B	>3 and 4	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged Moderately modified.
C	>2 and 3	Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	2	Largely modified. A large loss of natural habitats and basic Ecosystem functions has occurred.
OUTSIDE GENERAL ACCEPTABLE RANGE		
E	>0 and 2	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive Critically modified.
F	0	Modifications have reached a critical level and the system has been modified completely with an almost complete lossof natural habitat

The wetland perennial rivers in the study area have EIS categories and EMC values as indicated in as indicated in **Table *13***.

Table 13: Summary of EIS onsite.

Wetland	EIS category	EMC
Perennial River	C	D
Wetland	C	C

6.1.1.2.3. Wetland Ecoservices

WET-EcoServices (Kotze et al. 2004) is a tool for evaluating the services provided by the watercourses (Rivers, allowing for more informed planning and decision-making. In general, the riverine wetland provides low-moderate ecosystem services (spider diagram right). Because of the destruction of natural vegetation and the resulting loss of habitat for insects and amphibians, it has a low species richness and biodiversity. (See Figure *23*).

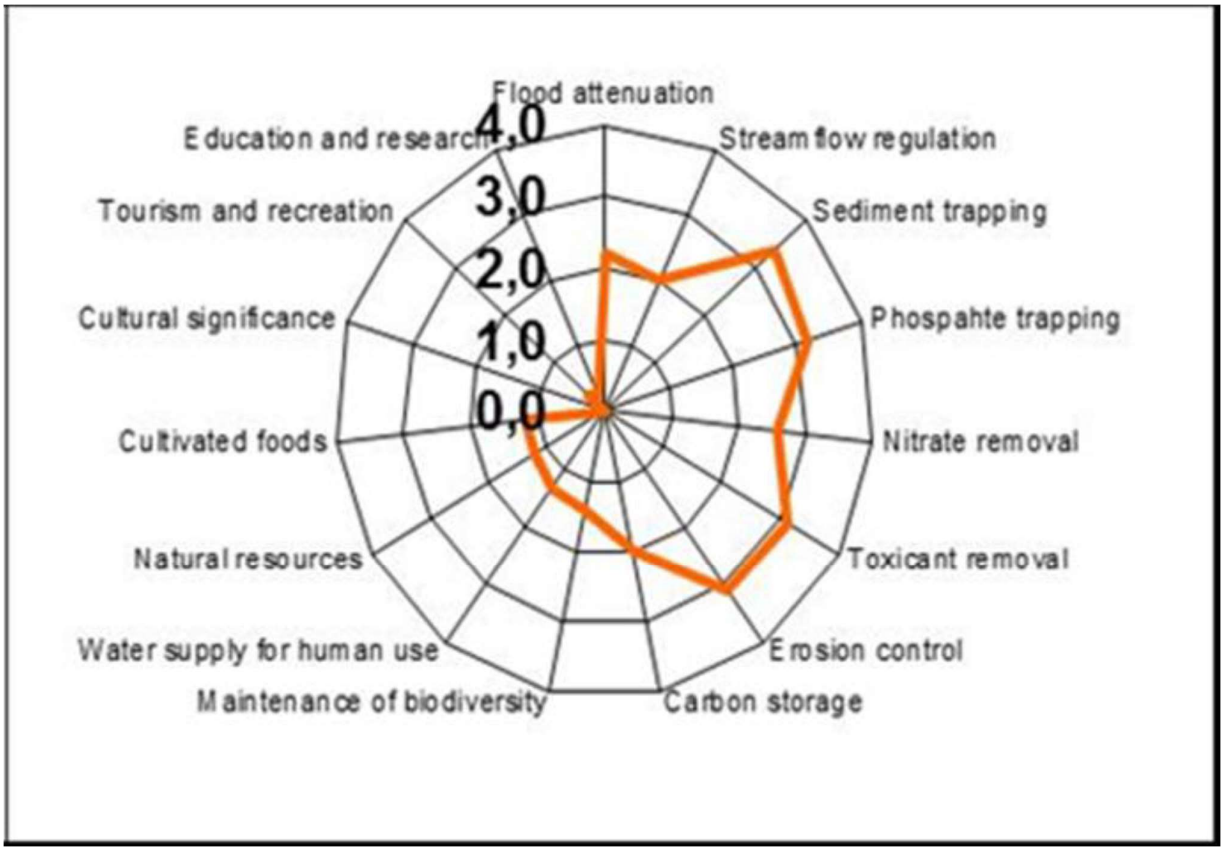


Figure 23: Eco services

6.1.1.3. Ecological Assessment

6.1.1.3.1. Critical Biodiversity Areas

According to the 2015 North West Biodiversity Sector Plan, the R30 Road traverses three Critical Biodiversity Areas (CBA), while the rest of the road is located within a Heavily or moderately modified area. There is a section of the road that is located within an Ecological Support Area (Figure *24*), Sensitivity map). Critical Biodiversity Areas are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan, while Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services.

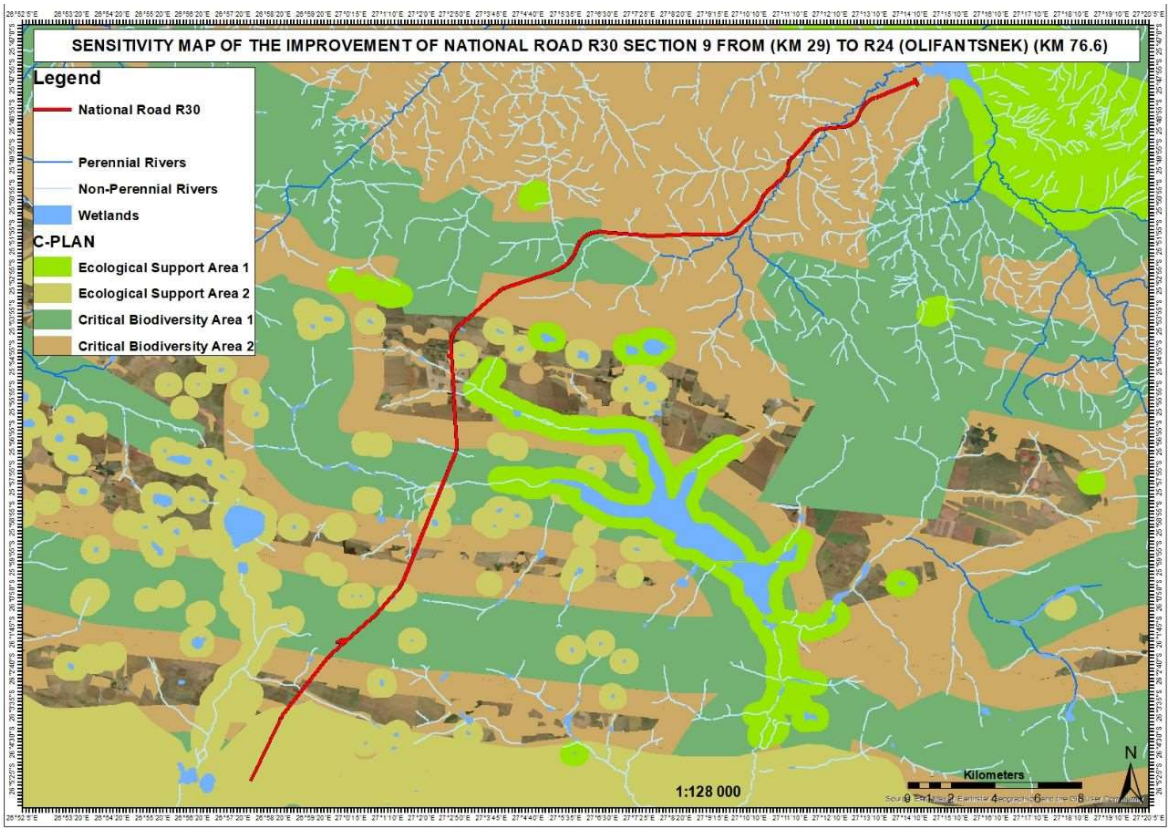


Figure 24: The R30 National Road in Relation to the 2015 North West Biodiversity Sector Plan

6.1.1.3.2. Freshwater Aquatic Species

The freshwater habitats (watercourses) onsite consist mainly of terrestrial plant species (Figure *25*). It is important to note that plants such as algae, water lilies, and willow trees help keep the water clean by using their root systems to filter pollution and excess nutrients from the water. The watercourses are dry, and thus unable to accommodate fish. During the site inspection there was evidence of avifaunal species within the watercourses (Figure *25*).



Figure 25: Typical Freshwater Habitat onsite.

6.1.1.3.3. Invertebrates

During the site inspection, no invertebrates were observed along the road servitude.

6.2. Biodiversity Impact Assessment

Earthlink Environmental Services appointed Ntumbuluko Consulting Pty Ltd to conduct the Biodiversity Impact Assessment for the proposed project, the specialist report is attached as Appendix D**.**

6.2.1. Results of the Flora Assessment

The R30 Road traverses a number of vegetation units namely, the Carletonville Dolomite Grassland, Rand Higveld Grassland, Gold Reef Mountain Bushveld and lastly the Moot Plains Bushveld vegetation units. The different vegetation units were observed along the R30 Road, they all have suffered various degrees of disturbance as a result of agricultural activities along the road. The Carletonville Dolomite Grassland is characterised by Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species. (Figure *26*)



Figure 26: Evidence of the disturbed Carletonville Dolomite Grassland observed where the R 30 Road Starts.

The Rand Highveld Grassland consisted mostly of common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. The grasses were observed along the side of the road (Figure *26*). This vegetation is generally found in Highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The Gold Reef Mountain Bushveld is Rocky hills and ridges often west-east trending with more dense woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of *Acacia caffra* on the southern slopes) (Figure *27*). Tree cover elsewhere is variable. Tree and shrub layers are often continuous.



Figure 27: Grasses associated with the Gm 11 Rand Highveld Grassland observed along the side of the road.

The area is also dominated by the Moot Plains Bushveld vegetation, Open to closed, low, often thorny savanna dominated by various species of Acacia in the bottomlands and plains as well as woodlands of varying height and density on the lower hillsides. Herbaceous layer is dominated by grasses (Figure *28*)





Figure 28: Gold Reef Mountain Bushveld vegetation unit observed along the R30 Road with dense woody vegetation.



Figure 29: Moot Plains Bushveld observed along the R30 Road.



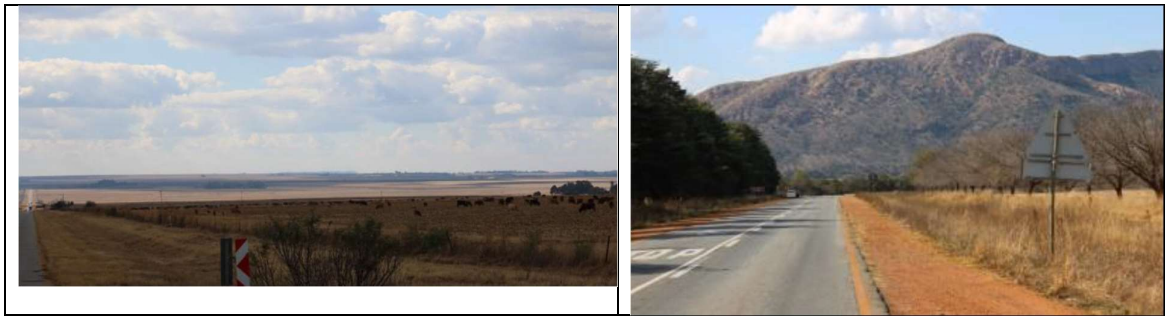


Figure 30: Agricultural activities observed on the R30 Road.

6.2.1.1. Flora species of special concern

South Africa has become the first country to fully assess the status of its entire flora (Domitilla and Raimondo, 2011). Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods)2. South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction but may nonetheless be of high conservation importance. As a result, a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northwest, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The following species protected in terms of the Northwest Biodiversity Management Act, No.4 of 2016 are known to be found in the area (**Table *14***).

Table 14: NCNCA are known to be found in the area.

FAMILY	SPECIES	NATIONAL STATUS	HABITAT	POC
AIZOACEAE	Delosperma leendertziae	NT	Range: Magaliesberg, Roodepoort Ridge and Suikerbosrand. Major habitats: Gold Reef Mountain Bushveld, DwarsbergSwartruggen s Mountain Bushveld, Loskop Mountain Bushveld, Andesite	Low

			Mountain Bushveld, Gauteng Shale Mountain Bushveld. Description: Steep, south-facing slopes of quartzite in mountain grassland. Population trend: Decreasing	
APOCYNACEAE	Stenostelma umbelluliferu m	NT	Range: Pretoria North and adjacent areas in North West Province. Major habitats: Savanna Description: Deep black turf in open woodland mainly in the vicinity of drainage lines. Population trend: Decreasing	Mediu m
ASPHODELACEA E	Kniphofia typhoides	NT	Range: Parys to Lydenburg to Paulpietersburg to Newcastle. Major habitats: Grassland Description: Low lying wetlands and seasonally wet areas in climax Themeda triandra grasslands on heavy black clay soils, tends to disappear from degraded grasslands. Population trend: Decreasing	Low

CRASSULACEAE	Adromischus umbraticola	NT	Range: Potchefstroom and Zeerust to Cullinan. Major habitats: Savanna Description: South-facing rock crevices on ridges, restricted to Gold Reef Mountain Bushveld in the northern parts of its range, and Andesite Mountain Bushveld in the south. Population trend: Decreasing	Low
FABACEAE	Melolobium subspicatum	VU	Range: Krugersdorp to Pretoria. Major habitats: Soweto Highveld Grassland, Egoli Granite Grassland, Carletonville Dolomite Grassland Description: Grassland Population trend: Stable	Low
ORCHIDACEAE	Habenaria mossii	EN	Range: Johannesburg, Pretoria and Krugersdorp. Major habitats: Andesite Mountain Bushveld, Carletonville Dolomite Grassland Description: Open grassland on dolomite or in black, sandy soil. Population trend: Decreasing	Low

EN= Endangered; EW = Extinct in the Wild; NT = Near Threatened; VU= Vulnerable; P= Protected; POC = Probability of Occurrence

During the field investigation no floral SCCs were found and the chances that the species above re-establish themselves on the site is medium to low. Should any floral SCC be encountered during any phase of the proposed development, these species should be rescued and relocated by a suitably qualified specialist to suitable habitat within the study area outside of the development footprint, utilised within the landscaping plan of the project, or moved to registered nurseries such as the Agricultural Research Council (ARC) or the South African National Biodiversity Institute (SANBI). Any other floral SCC encountered during the construction phase of the proposed development should also be relocated by a suitably qualified specialist and, where required, the necessary permits should be applied for. The study has Acacia species across the R30 Road (Figure *31*).



Figure 31: Acacia species observed onsite.

6.2.1.2. Ethnobotanical plant species

Ethnobotany/ Ethnoecology is a branch of botany that focuses on the use of plants for medicines, cultural and recreational purposes. The overexploitation of indigenous plants for ethnobotanical purposes can be detrimental to populations of those particular plant species, and the other species that depend on its existence for their survival.

South Africa has a rich diversity of medicinal plants that not only have a global significance, but also have a cultural and historical role (van Wyk *et al.* 2009). There is a rapidly growing concern for conservation of medicinal plants that are dwindling in number due to illegal harvesting (Institute of Natural Resources 2003). This is particularly apparent in rural areas where medicinal plants are overexploited by traditional doctors.

During the site inspection, no medical plants were encountered within the servitude of the road.

6.2.2. Results of the Fauna Assessment

6.2.2.1. Mammals

According to the desktop study conducted, the species listed in **Table *15*** were identified as being possible to occur within the study area or the immediate vicinity of the proposed construction area. It must be noted that some of these species are very sensitive to habitat modification? and in some instances; the likeliness for them to occur is minimal. There are nine Red List mammal species that have a HIGH chance of occurring in the study area. Cattle and other domestic animals graze in the property.

Table 15: Sensitive mammals that are likely to occur onsite.

COMMON NAME	RECOREDE ON SITE
Spotted necked otter	None
Greater dwarf shrew	None
Pangolin	None
Rock dormouse	None
Lesser grey-brown musk	None
African weasel	None
Scrub hare	
Honey badger	None
Southern hedgehog	None

6.2.2.1.1. Field Investigation findings

None of the sensitive mammals which were expected were spotted on site except for droppings of smaller mammals such as hare or rabbit species. The presence of the human settlements and the seasonality issues may explain why all the sensitive mammals were not seen during the site visit. Some of the expected animals are nocturnal, and thus may only be seen at night.



Figure 32: Grazing Cattle Observed onsite.

6.2.2.2. Reptiles

6.2.2.2.1. Three Reptiles

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Large areas surrounding the site have resulted in increased habitat modification and transformation as well as increased human presence and associated disturbances (illegal reptile collecting, indiscriminate killing of all snake species, fires) surrounding the site coupled with increased habitat destruction and disturbances on the neighbouring properties are all causal factors in the alteration and disappearance of reptile diversity in the area.

Trees including stumps; bark and holes in trees are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors). Reptile species recorded in the open and closed Acacia caffra woodland areas included Flap-neck Chameleon (*Chamaeleo dilepis*) and Cape Dwarf Gecko (*Lygodactylus capensis*). Limited logs and stumps were observed in the closed and open woodland areas.

6.2.2.2.2. Field Investigation findings

None of the expected reptiles were observed on site during the site visit, however the local residents indicated that the study site has an abundance of Reptile species.

6.2.2.3. Avifauna

Birds are generally regarded as good ecological indicators, because their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological conditions are directly linked to land cover. As the land cover of an area changes, so do the types of birds in that area (The Bird Community Index, 2007). Land cover is directly linked to habitats within the study area. The diversity of these habitats should give rise to many different species.

According to the South African Bird Atlas Project (SABAP2), almost 300 species of birds have been identified in the Sekhukhuneland area; the majority of these birds are comprised of Bushveld, Grassland and Mountainous species. All birds that could be present within the vicinity of the study area are listed in **Table 16**.

Table 16: Red Data bird species potentially found within the study site.

Scientific Name	Common Name	IUCN Status
Geronticus calvus	Southern Bald Ibis	VU
Sagittarius serpentarius	Secretary bird	NT
Gyps coprotheres	Cape Vulture	VU
Stephanoaetus coronatus	African Crowned Eagle	NT
Circus ranivorus	African Marsh-Harrier	VU
Circus maurus	Black Harrier	NT
Falco biarmicus	Lanner Falcon	LC
Alcedo semitorquata	Half Collared Kingfisher	CR
Bugeranus carunculatus	Wattled Crane	VU
Anthropoides paradiseus	Blue Crane	VU
Balearica regulorum	Grey Crowned Crane	VU
Eupodotis senegalensis	White-bellied Korhaan	VU

6.2.2.3.1. Field Investigation findings

A few avifaunal species were spotted onsite during the site visit, the species were observed within a watercourse. The proposed construction operations may generate noise pollution which serves as a deterrent to birds.

6.2.2.4. Invertebrates

Butterflies are a good indication of the habitats available in a specific region (Woodhall 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope or endemic species (specific habitat requirements with populations concentrated in a small area) which may be very specialised (Woodhall 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and therefore identify. A list of butterflies that are likely to be observed on the study site and the surrounding areas are summarised in **Table 17**.

Table 17: Butterfly species expected to occur on site.

Scientific Name	Common Name
Melanitis leda Helena	Evening Brown
Acraea anemosa	Broad-bordered Acraea
Acreae neobule	Wandering Acraea
Danaus chrysippus	African Monarch butterfly
Junonia hierta cebrene	Yellow Pansy butterfly
Danays chrysippus	Southern Milkweed

Charaxes jasius	Koppie Emperor
Cyclyrius pirithous	Common Blue
Hyalites esebria	Dusky Acrea butterfly
Phalantha aethiopica	Poplar Leopard
Alaena amazoula	Yellow Zulu
Catacroptera cloanthe	Pirate butterfly
Charaxes achaemenses	Bushveld Emperor
Pinacopteryx eriphia	Zebra White butterfly
Eurema brigitta	Broad-bordered yellow
Vanessa cardui	Painted Lady
Papilio demodocus	Citrus Swallowtail butterfly

6.2.2.4.1. Field Investigation findings

No butterflies were observed during the site visit.

6.3. Heritage Impact Assessment

Earthlink Environmental Services appointed Shasa Heritage Consultant to conduct the Heritage Impact Assessment for the proposed project, the specialist report is attached under Appendix D.

5.4.1. Results of the scoping survey and discussion

5.4.1.1. Social and / or religious intangible Heritage

The R30 passes the Middlefontein Farm where a Day of the Vow (geloftefees terrein) grounds area located. This area contains building from the hisrorical period and is important for socio-religious activities of the community on an annual basis.

The actual buildings and grounds should in no way be impacted by the proposed upgrading and access should be ensured.



View of Middlefontein Farm


View of Day of the Vow grounds area

5.4.1.2. Historical period and Built Environment

Historical maps from UCT digital collections were perused for information pertaining to the R30. A map from 1900, clearly shows that what is now the R30 existed at that time. Cognisance should be taken of this fact, as the road in various forms has connected Ventersdorp and Rustenburg for well over a century. However, as population increase occurred the road would have undergone many upgrades over more than 120 years.

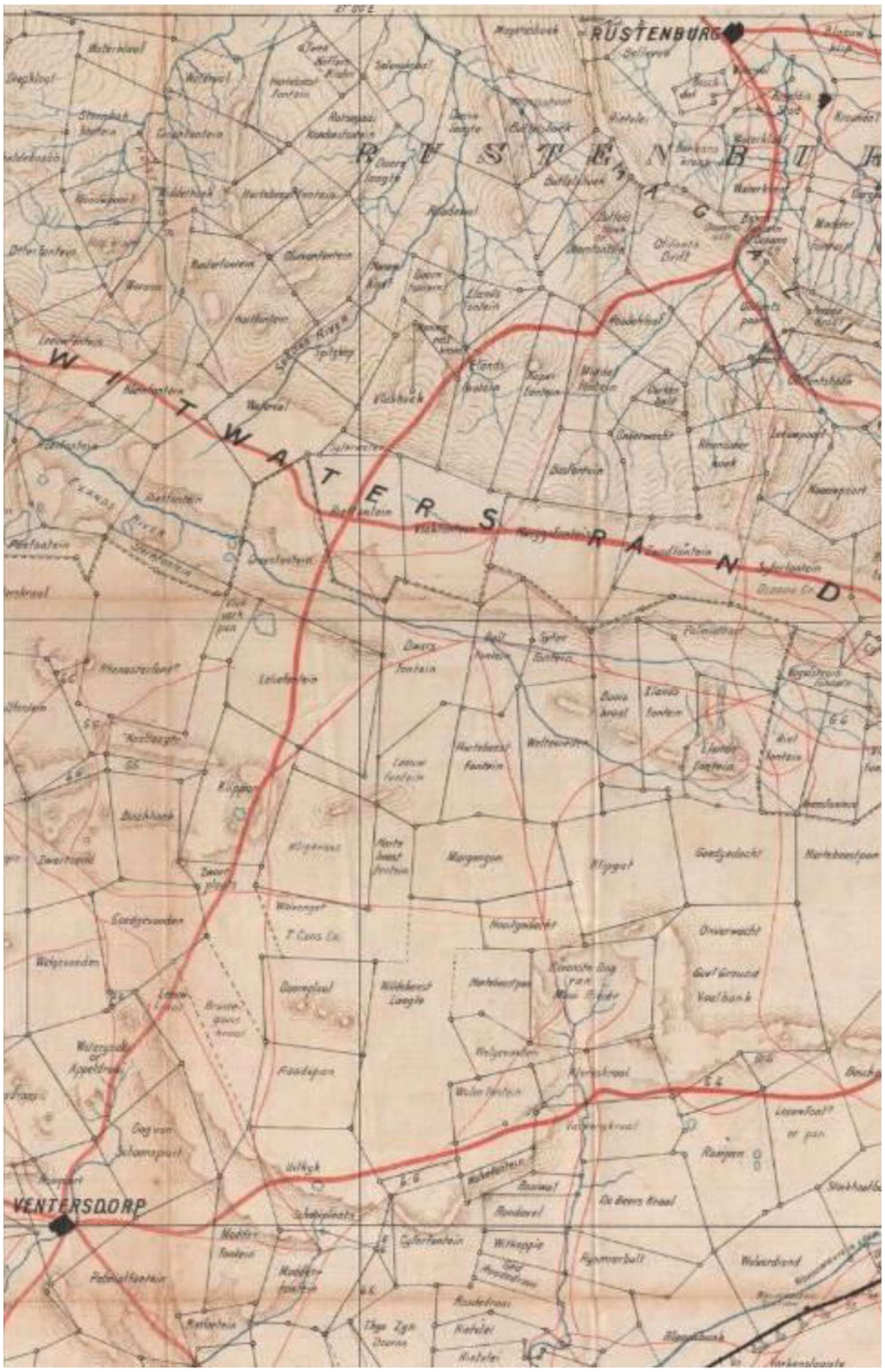


Figure 33: Black arrow points to the R30. UCT digital collections- map cropped to only show the R30.

5.4.1.3. Graves

No graves either marked or unmarked have been recorded.

5.4.1.4. Iron Age/ Early farming remains.

According to the most recent archaeological cultural distribution sequences by Huffman (2007), this area falls within the distribution area of various cultural groupings originating out of the Urewe Tradition. The facies that may be present are:

Urewe Tradition: Blackburn branch- Ntsuanatsatsi facies AD 1450 - 1650

Uitkomst facies AD 1650- 1820

Olifantspoort facies AD 1500- 1700

Buispoort facies AD 1700- 1840

No remains from the Iron Age were recorded.

Primarily, the Iron age in the Northwest and Gauteng is characterized by Late Iron Age, Stone walled sites. A large proportion of Late Iron Age sites are derived from occupation of Fokeng settlements who spread north across the Vaal river and settled in the Suikerbosrand (Heidelberg area) and Klipriviersberg areas (Huffman 2007). Most known Tswana archaeological sites are known from north of Rustenburg, and in the Koster and Groot Marico area, spreading into the Waterberg (Bergh 1999). Sites are also known and have been researched in the Pilanesberg Mountains, North west of the R30.

Walling primarily consists of circular patterned stone walls often displaying scallop patterns.

Enclosed within these walls are the main occupation areas of the settlement, consisting of huts with clay walls and floors and cooking areas as well as small stock enclosures.

5.4.1.5. Stone Age Remains

No Stone Age remains were recorded.

The below mentioned is generic background to the area adapted from Deacon and Deacon: 1999:

The Stone Age covers most of southern Africa and the earliest consist of the Oldowan and Acheul artefacts assemblages. Oldowan tools are regularly referred to as “choppers”. Oldowan artefacts are associated with Homo habilis, the first true humans. In South Africa definite occurrences have been found at the sites of Sterkfontein and Swartkrans, located East of the study area. They are dated to between 1.7 and 2 million years old. This was followed by the Acheulian technology from about 1.4 million years ago which introduced a new level of complexity. The large tools that dominate the Acheulian artefact assemblages range in length from 100 to 200 mm or more. Collectively they are called bifaces because they are normally shaped by flaking on both faces. In plain view they tend to be pear-shape and are broad relative to their thickness. Most bifaces are pointed and are classified as handaxes, but others have a wide cutting end and are termed cleavers. The Acheulian design persisted for more than a million years and only disappeared about 250 000 years ago.

The change from Acheulian with their characteristic bifaces, handaxes and cleavers to Middle Stone Age (MSA), which are characterized by flake industries, occurred about 250 000 years ago and ended about 30 000 – 22 000 years ago. For the most part the MSA is associated with modern humans; Homo sapiens. MSA remains are found in open spaces where they are regularly exposed by erosion as well as in caves. Characteristics of the MSA are flake blanks in the 40 – 100 mm size range struck from prepared cores, the striking platforms of the flakes reveal one or more facets, indicating the preparation of the platform

before flake removal (the prepared core technique), flakes show dorsal preparation – one or more ridges or arise down the length of the flake – as a result of previous removals from the core, flakes with convergent sides (laterals) and a pointed shape, and flakes with parallel laterals and a rectangular or quadrilateral shape: these can be termed pointed and flake blades respectively. Other flakes in MSA assemblages are irregular in form.

The change from Middle Stone Age to Later Stone Age (LSA) took place in most parts of southern Africa little more than about 20 000 years ago. It is marked by a series of technological innovations or new tools that, initially at least, were used to do much the same jobs as had been done before, but in a different way. Their introduction was associated with changes in the nature of hunter-gatherer material culture. LSA sites are known from the Magaliesberg mountains The innovations associated with the Later Stone Age “package” of tools include rock art – both paintings and engravings (engravings such as these mentioned are known in the Magaliesberg Mountain area North West of the R30, smaller stone tools, so small that the formal tools less that 25mm long are called microliths (sometimes found in the final MSA) and Bows and arrows.

6.4. Desktop Paleontological Assessment

Extract below is taken from the PIA compiled by Prof. B. Rubidge:

There is no possibility that the Precambrian rocks of the Pretoria and Chuniespoort groups and the Bushveld Igneous Complex will host metazoan fossils, but there is a very slight possibility that overlying Quaternary alluvial sediments could contain fossils. It is highly unlikely that palaeontological heritage will be affected by the development.

As the R30 road already exists, and this development is for an upgrade and widening of the road, impacts have already occurred. It is thus very unlikely that palaeontological heritage will be affected by the road development.

6.5. Agricultural compliance Statement

Earthlink Environmental Services appointed Matavha Environmental to conduct the Agricultural Compliance Statement for the proposed project, the specialist report is attached under Appendix D.

6.5.1. Agricultural Potential

The following description of agricultural characteristics/potential of the land include both desktop maps and field analyses, as the area is already disturbed from its natural state to a developed road. The soil classes coverage of the road site is of different classes that includes Freely drained structureless soil and Lithosols (Shallow soil on hard or weathering rock).

The area soil coverage is different from the desktop classification as the area has been deformed from its natural state. The proposed upgrade will be on the footprint of existing road and its road reserves. The geotechnical conducted during the first construction of the road uses the different layering of soil so to increase the soil stability to suite the road requirements.

6.5.2. Land use and land capability.

The current land use of the area is road transportation R30, the side of the road shows the agricultural practices outside the road reserves area. The land capability as classified during desktop study is characterised as moderate potential arable land and Non arable: Grazing, Woodland of Wildlife. The site visit confirms the desktop study as the area is non arable, the area cannot support any type of agricultural practices, it is non grazing, non-woodland and non-wildlife, it cannot support wildlife as it is non woodland. The moderate potential arable land of the site has also been converted to non-arable land as many activities has been conducted to the site leading it to new state. More to this, the road upgrade will be confined to the approved R30 road and its reserves.

6.5.3. Land type information

A large section of the road consists of the Clastic sediments and minor carbonates and volcanics of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west, all of the Transvaal Supergroup (Vaalian). There is also some contribution from mafic Bushveld intrusive. Soils often stony with colluvial clay-loam but varied, including red-yellow apedal freely drained, dystrophic and eutrophic plinthic catenas, vertic and melanic clays, and some less typical Glenrosa and Mispah forms. Land types Ae, Ba, Ea, Bc, Ac and less typically Fb.

6.5.4. Compliance statement

The desktop study confirmed that the proposed R30 route development site is of a “high” Agricultural sensitivity, as classified by the DEA Screening Tool. There are Three potential mechanisms of negative agricultural impact were identified as occupation of land, soil erosion, degradation, and dust generation. Two potential mechanisms of positive agricultural impact were identified as increased financial security for farming operations, improved security against stock theft and other crime. All of these are likely to have very low impact on future agricultural production potential and are therefore assessed as having very low significance.

It is the specialist’s opinion that the proposed development site is of low agricultural sensitivity and that the development at the proposed site will not significantly impact agricultural activities. In terms of agricultural sensitivity, the conclusion of this assessment is that the agricultural impact of the proposed development is acceptable because it offers a valuable opportunity for transportation facilities to be integrated with agricultural production in a way that it provides benefits to agriculture and leads to insignificant loss of future agricultural production potential. More to this, the proposed upgrade will take place on the existing R30 road and its approved road reserve, No green field will be poached by the proposed upgrade.

6.6. Geotechnical Assessment

In 2014 Zutari (Pty) Ltd was appointed by the South African National Roads Agency SOC (Pty) Ltd under contract number R.030-090-2016/1 for Consulting Engineering services for Assessment, Detailed Design and Contract Documentation for the Partial Reconstruction of National Road R30 Section 9 from km 29 to R24 (Olifantsnek) (km 76.6).

The geotechnical investigations are required to inform the preliminary design of the major culverts and bridges. The project has been sub-divided into two phases, namely Phase 1 and Phase 2. Phase 1, which is the current phase is focusing on geotechnical works for the bridge and culvert locations. Bridge B2920 and bridge B2230 are both proposed to be widened by 1000mm, whereas bridge 2147 is proposed to be a newly constructed bridge. Phase 2 entails the investigation for hard rock quarries along the route.

The geotechnical investigations included the excavation and profiling of six test pits at the various culvert positions in September 2023. Disturbed and undisturbed samples were taken for laboratory testing. The scope included rotary drilling of twelve boreholes (No. 4 per bridge) up to 20 metres where the core drilled was logged and sampled for soil and rock engineering properties. Water rest levels were recorded after 24 hours of drilling in each borehole. SPT tests were conducted within the boreholes to determine the consistency of the soils at 1.5 m interval.

The Geotechnical Investigation report is attached as Appendix D of this BAR

6.7. Traffic Assessment

The Traffic Assessment Report was undertaken as part of the Preliminary Design Report and the traffic information is attached as Appendix D of this BAR.

CHAPTER 7: PUBLIC PARTICIPATION PROCESS

PPP process is being undertaken in terms of regulation 41 of the EIA 2014 Regulations, as amended, for the project triggering listed activities under the NEMA. Earthlink on behalf of SANRAL took into account all relevant guidelines applicable to public participation as contemplated in section 24J of the NEMA. Earthlink Environmental Services will be giving notices to all potential to participate in the project by undertaking the following:

7.1. LEGAL REQUIREMENTS OF THE PPP AS REQUIRED BY SECTION 41 OF THE NEMA

41 (1) This regulation only applies in instances where adherence to the provisions of this regulation is specifically required.

(2) The person conducting a PPP must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential I&APs of an application or the proposed application which is subjected to public participation by:

(a) fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of (i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) any alternative site.

(b) giving written notice, in any of the manners provided for in section 47D of the Act, to (i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (iii) the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) the municipality which has jurisdiction in the area; (v) any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) any other party as required by the competent authority;

(c) placing an advertisement in (i) one local newspaper; or (ii) any official that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official referred to in paragraph (c)(ii); and

(e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to (i) illiteracy; (ii) disability; or (iii) any other disadvantage.

(3) A notice, notice board or advertisement referred to in sub regulation (2) must (a) give details of the application or proposed application which is subjected to public participation; and (b) state (i) whether a BA or S&EIR procedures are being applied to the application; (ii) the nature and location of the activity to which the application relates; (iii) where further information on the application or proposed application can be obtained; and (iv) the manner in which and the person to whom representations in respect of the application or proposed application may be made.

(4) A notice board referred to in sub regulation (2) must (a) be of a size of at least 60cm by 42cm; and (b) display the required information in lettering and in a format as may be determined by the competent authority.

7.2. ANNOUNCEMENT OF THE PROJECT AND THE DRAFT BASIC ASSESSMENT REPORT AVAILABILITY

The project is being announced to the public from **09 January 2026 to 09 February 2026**, by means of newspaper advertisement and placement of site notices. Background Information Documents (BIDs) are being distributed to I&APs to create awareness of the project. Earthlink Environmental have announced the availability of the Draft BAR. The report is being subjected to a PPP of at least 30 days, and the Final BAR will reflect the incorporation of comments received, including any comments from the competent and commenting authorities.

The following processes are being undertaken to announce the project and the Draft Basic Assessment Report:

- An I&AP database has been opened and is being maintained and includes all potential I&APs in respect of the application in accordance with Regulation 42.
- Letters will be sent to all I&APs, written in any of the manners provided for in section 47D of the NEMA, announcing the project and the availability of the Draft BAR, containing project information and a locality map to the municipal councillor of the ward in which the site is situated and any organisation of ratepayers that represent the community in the area, the municipality which has jurisdiction in the area, any organ of state having jurisdiction in respect of any aspect of the activity; and any other party as required by the competent authority.
- Site notice boards will be fixed on the at a place conspicuous to and accessible by the public at the boundary of the site where the activity to which the application relates to.
- Two (2) advertisement will be placed in the Citizen Newspaper.

- The Draft BAR will also be made available on the website; www.earthlinkenvironmental.co.za , at Reagile public Library, and upon request of the EAP.

Subsequent to the 30 days' period, all comments and representations received from I&APs will be considered and recorded in the Comments and Responses Report (CRR). All I&APs who would have participated in the PPP will be thanked, and their comments acknowledged.

The Draft Basic Assessment Report will be made available for public comment.

7.3. ANNOUNCEMENT OF THE DECISION

Earthlink Environmental Services will ensure that all registered I&APs are provided with access to the decision and the reasons for such decision. I&APs will be drawn to the fact that appeals may be lodged against the decision in terms of the National Appeals Regulations of 2014 (GNR. 993), if such appeals are available in the circumstances of the decision. The decision will be advertised through the following methods:

- Notification letter will be sent to the registered Interested and Affected Parties to notify them of the Environmental Authorisation

CHAPTER 8: IMPACTS ASSESSMENT METHODOLOGY

The main objective of this section is to provide independent and scientifically sound information on the impacts identified during the BA. Based on the requirements of the impact assessment, impacts identified, and issues and concerns raised are assessed with regard to their significance. The impact assessment is aimed at determining the impacts associated with the proposed development and the prescription of mitigation measures. Other impacts associated with the proposed development are discussed in detail in this section. The significance of the potential impacts is described in terms of their nature, extent, duration, intensity and probability.

8.1. METHODOLOGY FOR THE IMPACT ASSESSMENT

The assessment of the potential environmental and social impacts was based on Earthlink Environmental team's professional judgement, field observations, specialist input and desk-top analysis. The significance of potential impacts that may result from the proposed development was determined in order to assist decision-makers, specifically the DFFE.

The method of impact/risk rating has been adopted in order to enable the authorof the BAR to determine the overall impact of the proposed activities by collating the information at handinto a uniform rating matrix.

The following methodology has been applied to the prediction and assessment of impacts. Potential impacts have been rated in terms of the direct, indirect and cumulative nature of the impact:

- **Direct** impacts – are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable;
- **Indirect** impacts – of an activity are indirect or induced changes that may occur as a result of theactivity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity;
- **Cumulative** impacts – are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include

both direct and indirect impacts.

The significance of each potential impact, with and without the implementation of the proposed mitigation measures, will be assessed based on the following variables (evaluation components):

- Spatial extent – The size of the area that will be affected by the impact;
- Intensity (or Magnitude) – The anticipated severity of the impact;
- Duration – The timeframe during which the impact will be experienced;
- Probability – The probability of the impact occurring;
- Reversibility – The "reversibility" of the environmental impacts of the proposed development afterproject cessation or decommissioning; and
- Irreplaceability – The "irreplaceability" of natural characteristics in the area that may be impactedupon by the proposed development.

Using the criteria above, the impacts will further be assessed with the use of quantifiable values as described below:

Table 18: Evaluation of criteria, by means of quantitative ratings and descriptions

Criteria	Description	Quantitative Rating
Duration	Temporary (less than a year)	1
	Short term (1 to 6 years)	2
	Medium term (6 to 15 years)	3
	Long term (the impact will cease after the operational life of the activity)	4
	Permanent (mitigation will not occur in such a way or in such a time span than the impact can be considered transient)	5
Spatial extent	Site specific	1
	Local (less than 2 km from the site);	2
	Regional (within 30 km of the site)	3
	National (beyond Provincial boundaries and within National boundaries)	4
	International / Transboundary (Beyond National boundaries)	5
Intensity / Magnitude	None (Biophysical and/or social functions and/or processes will remain unaltered)	0
Applicable to	Very Low (Biophysical and/or social functions and/or	2

Negative Impacts (at indicated spatial extent)	processes might be negligibly altered)	
	Low (Biophysical and/or social functions and/or processes might be slightly altered)	4
	Medium (Biophysical and/or social functions and/or processes might be notably altered)	6
	High (Biophysical and/or social functions and/or processes might be considerably altered)	8
	Very High (Biophysical and/or social functions and/or processes might be severely altered)	10
Intensity / Magnitude Applicable to Positive Impacts (at indicated spatial extent)	None (Biophysical and/or social functions and/or processes will remain unaltered)	0
	Very Low (Biophysical and/or social functions and/or processes might be negligibly enhanced)	2
	Low (Biophysical and/or social functions and/or processes might be slightly enhanced)	4
	Medium (Biophysical and/or social functions and/or processes might be notably enhanced)	6
	High (Biophysical and/or social functions and/or processes might be considerably enhanced)	8
	Very High (Biophysical and/or social functions and/or processes might be substantially enhanced)	10
Probability	Improbable (5% to no chance of occurring)	1
	Probable (5% - 25% chance of occurring)	2
	Medium Probability (25% - 75% chance of occurring)	3
	Highly probable (75% - 95% chance of occurring)	4
	Definite (greater than 95% chance of occurring)	5
Reversibility	No impact	0
	Impact will be reversible	1
	High potential that impact might be reversed	2
	Moderate potential that impact might be reversed	3
	Low potential that impact might be reversed	4
	Impact cannot be reversed	5
Irreplaceability	None	0
	Very low potential for loss of irreplaceable resources	1
	Low potential for loss of irreplaceable resources	2
	Moderate potential for loss of irreplaceable resources	3
	High potential for loss of irreplaceable resources.	4

	Definite loss of irreplaceable resources	5
CUMULATIVE impact	**High**: The activity is one of several similar pasts, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern.	
	Medium: The activity is one of a few similar pasts, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socioeconomic resources of local, regional or national concern.	
	Low: The activity is localised and might have a negligible cumulative impact.	
	None: No cumulative impact on the environment.	

Once the evaluation components have been ranked for each impact, the significance of potential impacts are assessed (or calculated) using the following formula:

SP (significance points) = (intensity + duration + spatial extent + irreplaceable + reversibility) x probability.

The maximum value is 150 SP (significance points). The unmitigated and mitigated scenarios for each environmental impact was ranked as per the table below:

Table 19: Definition of significance ratings (positive and negative)

Significance Points	Environmental Significance	Description
125 – 150	**Very high (VH)**	An impact or high of very-high significance which could influence a decision about whether to proceed with the proposed project, regardless of available mitigation options.
100 – 124	High (H)	**Cumulative Impacts:** The activity is one of several similar pasts, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern.
75 – 99	Moderate-high (MH)	If left unmanaged, an impact of moderate-high significance could influence a decision about whether to proceed with the proposed project. Mitigation options should be re-evaluated.

Significance Points	Environmental Significance	Description
40 – 74	Moderate (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether to proceed with the proposed project. **Cumulative Impacts:** The activity is one of a few similar pasts, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern.
<40	Low (L)	An impact of low significance is likely to contribute to positive decisions about whether to proceed with the proposed project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation. **Cumulative Impacts:** The activity is localised and might have a negligible cumulative impact.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/effect and is likely to contribute to positive decisions about whether to proceed with the proposed project.

CHAPTER 9: ASSESSMENT OF ENVIRONMENTAL IMPACT

A Basic Assessment Report (BAR) must contain all the information that is necessary for a good understanding of the nature of issues identified during the Basic Assessment (BA) process. The BAR must include a description of environmental issues and potential impacts, including cumulative impacts, mitigation measures that have been identified and other aspects as outlined in Appendix 4 of the NEMA EIA Regulations, 2014 as amended. This chapter also describes the environmental issues and impacts as identified during the BA Process for the proposed road upgrade. The proposed mitigation measures are discussed in this Chapter as well as well as in the EMPr attached as **Appendix F** of this report.

The main objective of this section is to provide independent and scientifically sound information on the impacts identified during the Basic Assessment (BA) Process. Based on the requirements of the impact assessment, impacts identified, and issues and concerns raised are assessed with regard to their significance. The impact assessment is aimed at determining the impacts associated with the proposed development and the prescription of mitigation measures. Other impacts associated with the proposed development are discussed in detail in this section. It must be highlighted that the Impact Assessment Methodology discussed in **Chapter 8** of this report was used to assess the identified impacts.

The impacts discussed in this section were identified by the Project Team (including specialists). The potential impacts identified and elaborated on in this chapter have been presented as follows:

- Theme 1: Impacts on the Biophysical Environment; and
- Theme 2: Impacts on the Human Environment.

For the purposes of this assessment, this impact assessment will only focus on the impacts that are likely to occur during the construction and operational phases of the proposed development based on the location of the site and the site sensitivities determined from desktop and field assessment.

9.1. Construction Phase

9.1.1. Impacts of the Biophysical Environment

9.1.1.1. Degradation and/ or destruction of wetlands habitats

Description of Impact

The clearing of vegetation from construction working servitudes through watercourses; the setting up of construction camps and storage areas; the movement of construction vehicles and personnel during bridge and culvert upgrade / demolition, road widening / realignment and stormwater infrastructure upgrade activities as well as the inappropriate storage or dumping of building material / concrete in areas surrounding the direct development footprint may result in the disturbance of wetland, riparian and instream habitat as well as in the compaction / disturbance of soils. This disturbance may also result in the proliferation of alien and invasive species within the surrounding watercourses

Table 20: Impact associated with degradation and /or destruction of wetlands habitats

		Significance without mitigation									Significance with mitigation								
Project Phase	**Nature of Impact**	**Magnitude**	**Duration**	**Extent**	**Irreplaceable**	**Reversibility**	**Probability**	**TOTAL (SP)**	**Significance**	**CUMULATIVE**	**magnitude**	**Duration**	**Extent**	**Irreplaceable**	**Reversibility**	**Probability**	**TOTAL (SP)**	**Significance**	**CUMULATIVE**
Construction	Negative	6	2	3	4	5	5	100	H	L	4	2	2	1	1	1	10	L	L

The proposed mitigation measures to avoid adverse impacts on the Degradation and/ or Destruction of wetland habitats is provided below:

- Any construction activities in or within a delineated buffer zone of a water resource may only take place after the necessary water use license has been obtained.
- Where wetlands may be encroached upon by proposed activities, the edge of the wetland must be clearly demarcated in the field with pegs or poles that will last for the duration of the construction phase, color-coded as follows:
- Construction machinery and associated vehicles are not allowed to enter wetlands. Strictly no re- fuelling of vehicles or machinery will be allowed to take place in any area close to a wetland.
- During and after construction areas of exposed soil can easily erode and subsequently end up in the wetlands. A well-designed storm water system must be put in place to avoid erosion into wetlands. Natural runoff from the natural terrestrial habitat surrounding the wetlands should however not be restricted unnecessarily.
- The use of potential pollutants (paint, chemicals, etc.) during construction and operational phases must be strictly controlled and a high quality of management and supervision concerning such materials must be enforced, especially close to wetland buffer zone areas.
- Sanitary facilities must be made available to construction workers to prevent urine and human waste entering the wetlands.
- If at any point construction activities encroach on wetlands, it is strongly advised that a wetland/aquatic specialist is appointed during all phases to monitor impacts and related mitigation measures regarding wetland habitats.

9.1.1.2. Loss of species of special concern (SSC)

Description of Impact

Site clearance and removal of vegetation, increase human presence, machinery and vehicle operation could lead to a direct loss of species of special concern (SSC). Construction of infrastructure and access roads through sensitive habitat could also lead to a loss of potential SSC.

The loss of vegetation habitat on site will reduce the area available for fauna species. Since fauna have the ability to flee the area, the impacts on common animal species is not regarded as highly significant.

The impact of the loss of plant SSC can be reduced by implementing a plant relocation strategy. Plant SSC can be located, removed (and seeds collected) and relocated either in an area within proximity to the site or a nursery. If plants are to be translocated to a different area, it is imperative that the donor and host habitat are similar with regard to topography, geology, soil form and orientation of the slope face. Alternatively, a nursery can be established on site where SSC can be relocated to. Loss of some SSC will invariably occur during either process.

Cumulative impacts

As the indigenous vegetation along the majority of the route is already in a severely to moderately disturbed condition. The cumulative impacts would thus be considered of LOW significance

Table 21: Impact associated with Loss of species of special concern (SSC)

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceable	Reversibility	Probability	TOTAL (SP)	Significance	CUMULATIVE	magnitude	Duration	Extent	Irreplaceable	Reversibility	Probability	TOTAL (SP)	Significance	CUMULATIVE
Construction	Negative	6	2	3	4	5	5	100	H	L	2	1	2	1	1	1	7	L	L

The proposed mitigation measures to avoid adverse impacts on the loss of species of special concern (SSC) is provided below:

- Conduct a site walkdown to identify any SSC within the project area prior to site clearance
- Minimise the impacted area and clear only what is required
- Tag and avoid all Red Data plants
- No removal or relocation of Plant SSC without prior approval from the competent authority
- Restricting blasting and operation of machinery to daylight hours

9.1.1.3. Sedimentation and soil erosion

Description of impact

Excavations and vegetation clearing expose soil to environmental factors including rainfall and wind. The exposure to these factors will result in the removal of topsoil and the deposition of this sediment in the downslope watercourse system.

Table 22: Impact associated with sedimentation and soil erosion

		Significance without mitigation									Significance with mitigation								
Project Phase	**Nature of**	**Magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**	**magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**
Constructi on phase	Negative	10	4	3	5	5	4	10 8	H	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on sedimentation and soil erosion is provided below:

- Implement a stormwater management plan
- Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.
- Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. Erosion control measures must be employed where required.
- Riparian vegetation bordering on drainage lines, wetlands and rivers will be considered environmentally sensitive and impacts on these habitats should be avoided.
- If erosion has taken place, rehabilitation will commence as soon as possible.

9.1.1.4. Pollution of water resources and soils

Description of Impact

During construction phase of the project there will be pollution of water resources due to construction activities such as upgrading of major culverts, spillage of fuel and other harmful chemicals due to movement of construction vehicles.

Table 23: Impact associated with pollution of water resources

		Significance without mitigation									Significance with mitigation								
Project Phase	**Nature of Impact**	**Magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**	**magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**
Constructio n phase	Negative	8	2	3	5	5	5	11 5	H	L	4	2	2	1	1	1	10	L	L

The proposed mitigation measures to avoid adverse impacts on pollution of water resources is provided below:

- Demarcate wetland areas to avoid unauthorised access.
- No washing of any equipment in close proximity to a watercourse is permitted.
- No releases of any substances that could be toxic to fauna or faunal habitats within the channels or any watercourses is permitted.
- Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil must be removed, and the affected area rehabilitated immediately.
- Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency.
- Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control.
- The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks.
- All contractors and employees should undergo induction which is to include a component of environmental awareness.

9.1.1.5. Introduction and spread of Alien Invasive vegetation

Description of impact

The moving of soil and vegetation results in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasions of alien plants can impact on hydrology, by reducing the quantity of water entering a watercourse, outcompeting natural vegetation, and decreasing the natural biodiversity. Once in a system alien invasive plant can spread through the catchment. If allowed to seed before control measures are implemented alien plants can easily colonise and impact on downstream users

Table 24: Impact associated with introduction and spread of alien invasive vegetation

		Significance without mitigation									Significance with mitigation								
Project	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Constructio	Negative	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on alien invasive species is provided below:

- Implementation of an Alien Invasive Management Programme.
- Ongoing alien plant control must be undertaken, particularly in the disturbed areas as these areas will quickly be colonised by invasive alien species, especially in the riparian zone, which is particularly sensitive to AIP infestation.
- Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.
- Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas.
- After rehabilitation, re-vegetate any exposed surfaces and mulch re-vegetated areas.
- Select appropriate species for wetland and terrestrial areas and ensure species diversity is enhanced, with species commonly found in the natural wetland area.

9.1.1.6. Destruction, further loss of habitat and fragmentation of the vegetation community

Description of impact

The highest impact on faunal habitat will occur during the construction phase of the project, particularly at the realignment areas and the bridge and major culverts replacement areas. Site clearing associated with the road construction could lead to direct loss of habitat. Loss of habitat also means loss of food and nesting resources, cover and movement corridors, which could lead to the disappearance of the affected species from the area.

Table 25: Impacts associated with destruction, further loss of habitat and fragmentation of the vegetation community

		Significance without mitigation									Significance with mitigation								
Project Phase	**Nature of Impact**	**Magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI**	**magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**
Constru ction	Negativ e	10	4	3	5	5	4	108	H	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on the destruction, further loss and fragmentation of the vegetation community is provided below:

- Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further.
- All areas outside of the direct footprint that were disturbed by the geological sampling must be rehabilitated and restored to a natural state.
- Rehabilitation of the disturbed areas must be made a priority. Any disturbed area must be revegetated with plant and grass species which are endemic to this vegetation type.
- All activities must be restricted too within the low/medium sensitivity areas. No unnecessary loss of high sensitivity areas should be permitted.
- All construction/operational and access must make use of the existing roads.
- All laydown, chemical toilets etc. should be restricted to low/medium sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded.
- Construction impacts associated with the proposed project must be contained within the footprint of the demarcated areas as indicated on the final approved project layout plan.
- Prior to construction, the final road alignment, road reserve and development footprint area must be demarcated on site to ensure that construction impacts are contained

within this area. If necessary, these areas may be fenced or, alternatively, nearby sensitive areas are to be fenced to prevent access.

- Minimise the impacted area and clear only what is required
- Avoid erosion, manage alien invasive species establishment, ensure the re-establishment of natural vegetation
- Employ stormwater management measures

9.1.1.7. Loss of indigenous Fauna and Flora Diversity Associated with wetlands

Description of Impact

The highest impact on faunal habitat will occur during the construction phase of the project, particularly at the realignment areas and the bridge and major culverts replacement areas. Site clearing associated with the road construction could lead to direct loss of habitat. Loss of habitat also means loss of food and nesting resources, cover and movement corridors, which could lead to the disappearance of the affected species from the area.

Cumulative impacts

The watercourses have already been modified as a result of surrounding land use activities, the previous road construction activities and the ongoing road maintenance activities. Considering that the proposed activities are to the existing road, with intended improvements to the hydraulic capacity of the structures at the road, and have limited widening at the aquatic features, one can expect that the cumulative impact of this project on the watercourses and wetlands will be of a NEGLIBIBLE to LOW significance. The cumulative impacts will largely take place during the construction phase. While these impacts to the freshwater ecosystems are each of a low significance it is essential that they be adequately mitigated to minimise the potential cumulative impacts.

Table 26: Impact associated with loss of indigenous fauna and flora diversity associated with wetlands

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	Negative	8	2	3	5	5	5	115	H	L	4	2	2	1	1	1	10	L	L

The proposed mitigation measures to avoid adverse impacts on the Loss of indigenous Fauna and Flora Diversity Associated with wetlands is provided below:

- Destruction of natural wetland vegetation must be avoided at all costs.
- Development of an alien invasive management plan. Alien and invasive vegetation control must take place throughout all development phases to prevent loss of habitat of indigenous fauna and flora.
- Movement of vehicles and construction workers in wetlands and buffer zones must be strictly prohibited. No harvesting of plants or animals is allowed.
- Any specimens of protected plant species known to occur in the wetlands and the delineated buffer zone and may potentially be impacted by the construction activities, are to be fenced off for the duration of the activity.
- Include environmental awareness aspects into the site induction program to ensure all staff are aware of the location and importance of wetland habitats.
- Establish emergency response measures and a clearly defined chain of communication to rapidly deal with any unforeseen impacts to wetlands, e.g. spills.
- No stockpiling of materials may take place within wetland/ watercourse areas and temporary construction camps and infrastructure should be located outside the wetland footprint.
- Regular cleaning up of the wetland areas should be undertaken to remove litter.
- Design and implement a construction stormwater management plan that aims to minimise the concentration of flow and increase in flow velocity, as well as minimising sediment transport off site.
- Where practically possible, the major earthworks should be undertaken during the dry seasons to limit the erosion during rainfall.
- Store and handle potentially polluting substance and waste in designated bunded facilities.
- Waste should be regularly removed from the construction site by suitably equipped and qualified operators and disposed of in approved facilities.
- Locate temporary waste and hazardous substance storage facilities a minimum of 100m from any wetland edge
- Keep sufficient quantities of spill clean-up material on site.

9.1.2. Impacts on the Human Environment

9.1.2.1. In-Migration

During construction phase of the proposed upgrade of R30 there will be influx of job seekers from outside the Northwest Province.

Table 27: Impact associated with In-migration

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI
Constru ction	Negativ e	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on the In-migration is provided below

- No accommodation of construction workers permitted on site during the construction period.
- Appoint as many workers from the local community as possible.
- Implement proper screening and code of conduct for workers.
- Utilise established communication channels with community for awareness and information sharing.

9.1.2.2. Health safety and security

Description of Impact

The construction and maintenance work that will be required may have health and safety implications for the personnel that will be working on the project. However, during the operational phase of the project, the proposed new road will address safety, mobility functions and ensure that reasonable access is provided to adjacent properties and areas to enable the future land use development. The impact is considered to be positive.

Table 28: Impact associated with Health and safety security

		Significance without mitigation									Significance with mitigation								
Project	Nature of	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI
Constru	Negativ	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on the health safety and security is provided below

- Contractor must appoint a Health and Safety Officer for the construction phase of the project

- Suitable Personal Protective Equipment (PPE) must be worn at all times by all employees on site during the construction and maintenance phases of the project.
- With the exception of the project team members, no persons should be allowed to enter the construction site area. The site and crew are to be managed in strict accordance with the OHS Act.
- The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include (but not be limited to) fire, spills, contamination of soil, accidents to employees and limiting casual access to the construction site for workers, use of hazardous substances and materials, etc.
- The Contractor must ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site.
- The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle.
- The contact details of this emergency centre, including police and ambulance services must be available at prominent locations around the construction site.

9.1.2.3. Employment

Description of impact

The proposed development will have positive impact within the Kgetlengrivier Local Municipality and Rustenburg Local Municipality as suppliers of construction materials will experience economic growth during the construction phase. During the construction phase, the creation of skilled and semi-skilled jobs will be created. The use of local labour, as far as possible, is recommended as this would have positive impact on the local economy and would prevent influx of job seekers from outside the Northwest Province. The impact is considered to be positive

Table 29: Impact associated with Employment

		Significance without mitigation									Significance with mitigation								
Project	Nature of	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI
Constru	Negativ	10	4	3	5	5	4	108	H	L	10	4	3	5	5	4	108	H	L

The proposed mitigation measures to avoid adverse impacts on employment is provided below:

- No mitigation required, however, endeavour to use local construction companies/subcontractors as far as possible

9.1.2.4. Traffic Impact

Description of Impact

During the construction phase of the proposed project there is likely to be an increased risk of road traffic accidents and potential fatalities. A number of factors are likely to increase the likelihood of road traffic accidents such as increased traffic congestion around areas where construction is taking place, the narrowing of lanes, slow moving construction and commuter vehicles and the presence of construction workers. It is not only the vehicle users at risk but also construction workers working adjacent to the road or in the median.

The presence of these vehicles poses a particular threat in cases where traffic calming measures are not adhered to and road users do not reduce their speed sufficiently. Secondary impacts likely to occur as a result of traffic accidents include temporary road closures, traffic jams and increased travel time.

Cumulative impact

As upgrades will be occurring on the National R30, the cumulative impacts need to be considered. These cumulative impacts may lead to issues such as significant increased travel time leading to driver fatigue, an increase in aggressive driving, and increased congestion. These factors are likely to further increase the likelihood of road traffic accidents during the construction process.

Table 30: Impact associated with traffic impact

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	Negative	6	1	3	2	2	3	42	M	L	2	2	3	1	1	1	20	L	L

The proposed mitigation measures to avoid adverse impacts on traffic is provided below

- Develop a traffic management plan.

- Construction vehicles must not exceed speed limits of 40km/h within the construction site.
- Construction vehicles travelling on public roads must adhere to speed limits.
- Construction vehicles must not dispose of soil or other material on roads. Where this occurs, the ECO and Contractor must ensure that the material must is removed before the end of the working day.
- Ensure that all staff members and people on site undergo road safety training.
- Ensure that all staff members and people on site have suitable PPE.
- Ensure there is suitable signage informing road users of construction activities.
- Implement measures to reduce traffic speed, including rumble strips, speed cameras and digital signage showing approaching drivers their vehicle speed.
- Ensure measures are put in place to prevent unauthorised people from accessing the area where upgrades are taking place.

9.1.2.5. Increased Crime

Description of Impact

Prior to and during construction there is likely to be an in-migration of people which may include criminal opportunists. The increase in human traffic (construction workers, job seekers, informal traders, etc.) on the road and near adjacent properties makes the movement of criminal opportunists easier. Furthermore, during the construction phase of the project boundary fences of residential or business properties may be compromised, either intentionally or unintentionally, making these properties particularly vulnerable to criminal activity. These factors may result in an increase in crime, particularly general theft, during the construction phase of the project. All the necessary measures should be put in place to reduce the possibility of criminal activity increasing in the area.

Table 31: Impact associated with increased crime

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	Negative	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on increased crime is provided below:

- Construction teams should be clearly identified by wearing uniforms and/or identification cards that should be exhibited in a visible place on their body.
- Instant dismissal and prosecution of any staff caught in criminal activities of any kind.
- Inform local law enforcement agencies of the possibilities of increased criminal activity in the area.
- In the event of boundary fences being temporarily compromised alternative security measures should be put in place.

9.1.2.6. Increased Spread of diseases

Description of Impact

Any development which causes the migration of people has the potential to lead to the spread of disease. In the case of South Africa, the spread of HIV/AIDS as a result of project induced migration is particularly pertinent. Prior to and during the construction process there is likely to be an increase in the movement of people into and through the project area. This is inclusive of both people involved with the project (construction workers, truck drivers providing deliveries, etc.) as well as job seekers and criminal opportunists. The movement of people is likely to increase the likelihood of the spread of disease (in particular sexually transmitted infections and HIV and AIDS) either into the broader project area or alternatively from the project area to elsewhere. This is fuelled by the presence of incoming construction workers often increasing activities such as prostitution, with promiscuity often associated with groupings of construction workers. The most vulnerable sectors of the local population are those residing in low income and informal settlements and those already involved in prostitution

Table 32: Impact associated with increased spread of diseases

		Significance without mitigation									Significance with mitigation								
Project Phase	**Nature of Impact**	**Magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**	**magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**
Construction	Negative	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on spread of disease is provided below:

- An HIV/AIDS awareness/education component must be included in the induction programme for all personnel working on the proposed road upgrades.

- Ensure there is easy access to HIV/AIDS related information and condoms for all workers involved with the proposed road upgrades.

9.1.2.7. Noise Impact

Description of Impact

During the construction phase of the project there will be an increase in noise. Increased noise will result from activities associated with construction including the use of excavation machinery and jackhammers as well as potential blasting in some areas. The areas most likely to be negatively impacted on by an increase in noise are those where residential and/or business properties are situated close to the existing road reserve or where the proposed new road reserve extends close to such areas. Smaller communities along where the road upgrade will be in a residential area where it is believed that current traffic volumes are low. An increase in the traffic volumes on these roads is likely to have a significant increase in the current noise levels in the area. In addition, any plans to improve the condition of these roads will also result in an increase in noise for the adjacent residential properties.

It should be noted that while there will be a temporary increase in noise as a result of the construction activities, the receiving environment is already characterised by noise due the communities the road will transverse.

Table 33: Impact associated with noise impact

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	Negative	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on noise is provided below:

- The working hours stipulated in the Construction permit, where applicable, must be adhered to. Where this is not applicable, the following working hours must be adhered to: Monday to Friday from sunrise to sunset and where applicable on a Saturday which must be agreed upon between SANRAL and the Contractor.

- All construction plant and other equipment must be in a good working order to reduce possible noise pollution.
- Noise reduction is essential, and Contractors must endeavour to limit unnecessary noise, especially loud talking, shouting or whistling, radios, sirens or hooters, motor revving, etc.
- Should Blasting be undertaken on site:
  - All adjacent residents must be notified of the intention to undertake the initial blasting at least 7 working days in advance;
  - Method Statements for blasting shall be approved by the ECO; and
  - The survey of developments (buildings, etc.) should be conducted before the blasting takes place

9.1.2.8. Dust Impact

Description of impact

During the construction process there will be areas of exposed soil and building materials the presence of which will increase the likelihood of dust. In addition, there will also be an increase in vehicle emissions due to the presence of construction vehicles on site. During windy periods dust may be blown into nearby households and/or business properties becoming a nuisance impact reducing the quality of the living environment and affecting cleanliness and health. Likewise, an increase in vehicle emissions as a result of construction vehicles will reduce the air quality for surrounding landowners and people utilising areas adjacent to the where construction is taking place.

It should however be noted that the level of dust within and around the construction site will be temporary and sporadic in nature with it only occurring during the construction process and during times of strong wind.

Table 34: Impact associated with dust impact

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	Negative	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on dust impact is provided below:

- Implement dust suppression measures in all areas that will be affected by construction activities and where dust will be generated. Dust suppression must also be undertaken during windy and dry weather conditions.
- A continuous dust monitoring process needs to be undertaken during construction.
- Speed restriction of no more than 40km/h must be implemented for all construction vehicles within the construction site.
- Heavy vehicles and machinery should be serviced regularly to minimise exhaust fume pollution.
- Soil stockpiles shall be located in sheltered areas, where possible, to limit the erosive effects of the wind.
- All vehicles transporting friable materials such as sand must be covered by a tarpaulin or wetted down.

9.1.2.9. Visual Impact

Description of Impact

There will be a temporary impact on the aesthetic nature of the area due to construction activities. Changes in the aesthetic nature of the area will be caused by the temporary presence of infrastructure and materials associated with construction sites such as, construction vehicles, stockpiles, construction workers and equipment. Households and/or business properties in close proximity to the existing road reserve or close to the proposed new road reserve are most likely to be affected. It should however be noted that the impact is temporary in nature and is not considered of major significance as the majority of the construction activities will be taking place within an already transformed environment.

Table 35:Impact associated with visual impact

		Significance without mitigation									Significance with mitigation								
Project Phase	**Nature of**	**Magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**	**magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI VE**
Constru ction	Negativ	6	1	3	2	2	3	42	M	L	4	2	3	1	1	2	22	L	L

The proposed mitigation measures to avoid adverse impacts on visual is provided below:

- Dust levels must be kept down by regularly wetting dirt roads and exposed soil areas inside the site.

- Clearly demarcate the construction site to limit the area of disturbance.
- Remove all waste, including cleared vegetation from site as soon as possible unless the material will be reused on site. A dedicated area for the placement of waste that will either be removed or reused must be identified and demarcated.
- Domestic waste generated from the site camp must be kept in labelled bins with lids and removed every week or more often as the need arises and be disposed of at a registered landfill. Proof of the disposal must be kept. Where waste is removed from site through other means, e.g. arrangement with adjacent landowners, written confirmation of this arrangement must be obtained
- Ensure that 'good housekeeping 'is practiced on the construction site

9.1.2.10. Heritage Impact

Description of impact

Although there is One historical era farm stall building was recorded, the proposed project would not negatively impact on any of these sites or change the character of the road or cultural landscape.

Table 36: Impact associated with Heritage Impact

		Significance without mitigation									Significance with mitigation								
Project Phase	**Nature of Impact**	**Magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI**	**magnitude**	**Duration**	**Extent**	**Irreplaceabl**	**Reversibilit**	**Probability**	**TOTAL (SP)**	**Significanc**	**CUMULATI**
Constr uction	Negativ e	2	2	3	1	2	2	20	L	M	2	1	1	1	1	1	6	L	M

The proposed mitigation measures to avoid adverse impacts on Heritage is provided below:

- Monitoring is recommended.
- The contractor should be apprised of the procedures to follow should any heritage materials be unearthed during construction, especially paleontological remains.
- The contractors and workers should be made aware of possible heritage and archaeological finds during the construction activities.
- Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible.

- All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken;
- Should any graves be uncovered during the construction phase of the project, the applicant and appointed ECO must ensure in terms of section 38(6) of the Act, the responsible heritage resources authority as well as the South African Police Service (SAPS) are notified.
- The ECO must train the Contractor to recognise any heritage features. Should there be a sign of such objects, construction must halt in that area immediately and a suitably qualified heritage specialist must be called to investigate through the ECO.

9.1.2.11. Paleontological Resources

As the R30 road between Rustenburg and Ventersdorp is an existing structure, and this proposal is for an upgrade, most impacts have already occurred.

Table 37: Impact associated with Palaeontology Resource

		Significance without mitigation									Significance with mitigation								
Project	Nature of	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI
Constr	Negativ	2	2	3	1	2	2	20	L	M	2	1	1	1	1	1	6	L	M

The proposed mitigation measures to avoid adverse impacts on Palaeontology is provided below:

- If fossils are exposed by excavation in unconsolidated Quaternary alluvial deposits they must be inspected by the environmental officer or designated person.
- If fossils are noted in the unconsolidated Quaternary sands (includes bones, insects or plants) a suitably qualified palaeontologist must be approached for a verdict.
- Fossil material displaced by excavation should be placed in a protected area, in this way development activities will not be held up.

- Appropriate photographs of the fossils which have been noted should be sent to a qualified palaeontologist for a verdict on how to proceed. This may require a site inspection and excavation by the palaeontologist.
- Fossils that are deemed to be of good quality or of scientific importance by the palaeontologist must be removed and curated in a recognised palaeontological museum collection where they can be made available for further study.
- Before fossils are removed from the site a collecting permit must be obtained from SAHRA, and the required permitting procedures and requirements must be followed.
- If the fossil material is deemed by the registered palaeontologist (as a result of photographic evidence or a site visit) to not be worthy of excavation and curation in a museum collection, the material will not be removed.

9.2. Operational Phase

9.2.1. Impact on Biophysical Environment

9.2.1.1. Impact of freshwater sources

Description of impact

Potential longer-term impacts on freshwater ecosystems in the drainage lines crossed by the road during the operational phase could result from ongoing maintenance work as well as the potential for erosion and establishment of invasive alien vegetation in disturbed areas. In addition, there could also be a longer-term impedance of flow should any debris block the culvert crossing structures.

Cumulative Impact

Longer term impacts on freshwater features linked to maintenance activities are considered to be limited and of very low significance. Impacts on water quality impacts on the watercourses and wetland areas could be expected during the operational phase as a result of contaminated runoff from the road. This is considered to be a low risk as the road is already in existence and the watercourses have seasonal to ephemeral flow characteristics.

Table 38: Impact associated with freshwater sources

	Significance without mitigation	Significance with mitigation

Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI VE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI VE
Construction	Negative	6	4	3	0	1	2	28	L	L	2	1	1	0	1	1	5	L	L

The proposed mitigation measures to avoid adverse impacts on the freshwater resource is provided below

- During routine road maintenance operations, clear all channels located upstream of the road crossings of any debris and sediment build-up, particularly at the culverts and bridge structures where flows may be impeded; and
- Remove any invasive alien plants occurring in the river channels at the river crossings and the road reserve on an ongoing basis

9.2.1.2. Increased Impervious area (Hardened Surfaces)

Description of impact

An increase in hardened surfaces may increase stormwater runoff resulting in increased erosion of nearby areas and impacting on nearby watercourses.

Table 39: Impact associated with increased impervious area

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI VE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATI VE
Construction	Negative	8	2	3	1	2	3	48	M	L	2	2	3	1	1	1	9	L	L

The proposed mitigation measures to avoid adverse impacts on increased impervious area is provided below:

- During the operational phase, there is a medium-high risk due to the increased traffic that will occur on the road. This will increase the risk of toxic hydrocarbons being washed into the wetland areas.
- The increased area of hardened surfaces will increase flow volumes/ flood-peaks leading to increased erosion potential.

- Disturbed area in the watercourse as a result of road maintenance must be rehabilitated as soon as maintenance in an area is complete or near complete and not left until the end to be rehabilitated (progressive rehabilitation).
- Bank erosion must be monitored at regular intervals during the operational phase in order to assess whether further riverbank protection/stabilisation works are required.
- Ensure the stream banks are well maintained and vegetated to prevent any scouring of the supporting structures.
- The grass must be allowed to lengthen and thicken naturally to facilitate reduction in runoff velocity and volume, increase sediment deposition within the buffer zone and increase infiltration of stormwater.
- Areas sensitive to erosion must be identified and monitored to ensure that erosion risks are minimised.
- Watercourse crossings must be regularly checked to ensure they are not being degraded or causing degradation and that, openings (under or at a culvert opening) are kept clear to avoid impeding flows to downstream areas. This minimises erosion.
- Stockpiled topsoil must be replaced following construction activities and be shaped to match the natural topography of the site. All stripped topsoil MUST be appropriately replaced on the site.

9.2.2. Impact on Human Environment

9.2.2.1. Improve traffic flow and reduce congestion

Description of Impact

The upgrading the R30 will improve traffic flow, enhance safety, reduce travel time, and facilitate economic development in the area by providing a better-quality road infrastructure with improved conditions for vehicles and pedestrians, potentially including wider lanes, better signage, and improved surface quality

Table 40: Impact associated with traffic flow and reduce congestion

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	positive	6	5	3	1	1	5	80	MH	L	6	5	3	1	1	5	80	MH	L

The proposed mitigation measures to avoid adverse impacts on improved traffic flow and reduced congestion is provided below

No mitigation measures

9.2.2.2. Better-quality road infrastructure with improved conditions for vehicles and pedestrians

The upgrading the R30 will improve traffic flow, enhance safety, reduce travel time, and facilitate economic development in the area by providing a better-quality road infrastructure with improved conditions for vehicles and pedestrians, potentially including wider lanes, better signage, and improved surface quality

Table 41: Impacts associated with better-quality road infrastructure with improved conditions for vehicles and pedestrians

		Significance without mitigation									Significance with mitigation								
Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	positive	6	5	3	1	1	5	80	M H	L	6	5	3	1	1	5	80	M H	L

The proposed mitigation measures to avoid adverse impacts on quality of road is provided below

No Mitigation measures

9.2.2.3. Road user safety and traffic accommodation

Description of impact

The key aim of the project is to improve overall road user safety and accommodate future anticipated traffic volumes.

Table 42: impact associated with road user safety and traffic accommodation

	Significance without mitigation	Significance with mitigation

Project Phase	Nature of Impact	Magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE	magnitude	Duration	Extent	Irreplaceabl	Reversibilit	Probability	TOTAL (SP)	Significanc	CUMULATIVE
Construction	positive	6	5	3	1	0	5	75	MH	L	6	5	3	1	0	5	75	MH	L

The proposed mitigation measures to avoid adverse impacts on road user safety and traffic accommodation is provided below

- Ensure the safety and traffic accommodation measures as indicated in the proposed project design are implemented as planned; and
- Ensure that a Routine Road Maintenance Programme is implemented along the proposed project route

9.3. Decommissioning Phase

At present it is not anticipated that the R30 upgrade will ever be decommissioned in its entirety. Ongoing maintenance and upgrades, where necessary, will be carried out. In the unlikely event that decommissioning is necessary it is recommended that a detailed decommissioning strategy and rehabilitation plan is prepared and implemented

9.4. No-Go Impact Option

The No-Go alternative is the option of not proceeding with the proposed project, which would result in the status quo remaining and the limited negative biophysical impacts would not take place. The failure to upgrade the road as required would, however, result in the road section not conforming to the required SANRAL standards to accommodate future increases in traffic volumes, especially heavy vehicle traffic.

In relation to road safety, the key implication of the No-Go alternative is that the advantages to all road users as a result of the widening of the road and associated infrastructures along the rod would not be realised. The short-term benefits of local employment creation and participation in the local economy by the contractor would also not accrue to the local community under the No-Go alternative.

Pursuit of the No-Go Option would be counter to the Duty of Care with respect to road safety, ensuring the integrity and availability of well-functioning regional road transport

infrastructure. The No-Go Option is not considered to be a feasible or desirable alternative and would hold no benefits to society.

9.5. Overall summary of Impacts related to construction and operational phase

Table 43: Overall impacts of Construction phase

Potential aspect/impact	Significance before mitigation	Significance after mitigation
Degradation and/or destruction of wetlands habitats	High	Low
Loss of species of special concern (SSC)	High	Low
Sedimentation and soil erosion	High	Low
Pollution of water resources and soils	High	Low
Introduction and spread of alien invasive vegetation	Moderate	Low
Destruction, further loss of habitat and fragmentation of the vegetation community	High	Low
Loss of indigenous fauna and flora diversity associated with wetlands	High	Low
In-migration	Moderate	Low
Health, Safety and security	Moderate	Low
Employment	High (+)	High (+)
Traffic Impact	Moderate	Low
Increased Crime	Moderate	Low
Increased spread of diseases	Moderate	Low
Noise Impact	Moderate	Low
Dust Impact	Moderate	Low
Visual Impact	Moderate	Low
Heritage Impact	Low	Low
Palaeontological Resources	Low	Low

Table 44: Overall impacts of Operational phase

Potential aspect/impact	Significance before mitigation	Significance after mitigation

Potential aspect/impact	Significance before mitigation	Significance after mitigation
Improve traffic flow and reduce congestion	Moderate-High (+)	Moderate-High (+)
better-quality road infrastructure with improved conditions for vehicles and pedestrians,	Moderate-High (+)	Moderate-High (+)
Road user safety and traffic accommodation	Moderate-High (+)	Moderate-High (+)
Impact of freshwater sources	Low	Low
Increased Impervious area (Hardened Surfaces)	Moderate	Low

9.6. Environmental Impact Statement

Impacts likely to occur during the construction and operational phase of the proposed R30 upgrade are:

Physical Environment

The bulk of the study site (approximately 80% or more) is located within a heavily or moderately modified Area, while the road traverses a CBA and ESA. The site is dominated by four vegetation units. The region is heavily degraded in most places and overexploited by man for cultivation. The proposed expansion of the R30 Road will contribute towards the cumulative impacts, since the site is disturbed especially along the road servitude.

Since endemism and species richness are highly relevant to the prioritisation of areas for conservation, due to the existing disturbance the site has lost its some of sensitivity especially along the road reserve. Loss of endemic plant diversity in the study site will also result in a loss of faunal biodiversity and a resultant loss of faunal SSC. This is of specific relevance to invertebrates, since they are dependent on those plant species

Due to the nature of the proposed development the impact is expected to be significant. In addition to loss of important natural heritage, alien invasion is expected to occur, resulting in further degradation of vegetation.

The Social Environment

The social environment will be temporarily affected by the construction activities associated with the proposed road upgrades.

The Public Participation will be done by means of a newspaper notice; site notices placed on prominent points on the application site, hand delivered notices to surrounding tenants and landowners and the distributing of notices to stakeholders such as the Local Authorities, Councillors by means of e-mails.

The construction works could pose a safety risk to pedestrians and road users and thus precautionary measures must be implemented. Dangerous excavations can cause injury/ even death to pedestrians if proper precautions are not taken.

Noise associated with construction activities can be temporarily audibly and visually unpleasant to residents. Noise pollution but can be mitigated with limiting construction hours from 8:00 to 18:00 during weekdays and Saturdays. The proposed road upgrade will alleviate traffic congestion currently experienced in the area.

Economic Environment

The road construction works will create a number of employment opportunities for skilled and un-skilled workers during the construction phase of the project. The upgrading of road infrastructure will firstly alleviate existing traffic congestion.

Opinion of the EAP:

It is the opinion of the EAP that in terms of what is described above there is no reason why the proposed project should not receive a favourable decision with implementation of the proposed mitigation measures. Should a favourable decision be issued, it is recommended that a validity period of ten (10) years be granted.

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

The Basic Assessment Process for the proposed project has been undertaken in accordance with EIA Regulations published in Government Notice 982 to 985 of 4 December 2014 (as amended in 2017), in terms of the National Environmental Management Act (NEMA; No107 of 1998). The Basic Assessment Process is aimed at ensuring informed decision-making and environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA (No 107 of 1998), the commitment to sustainable development is evident in the provision that "development must be socially, environmentally and economically sustainable and requires the consideration of all relevant factors".

NEMA also imposes a duty of care, which places a positive obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act 108 of 1996) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of "reasonable measures".

The following key conditions would be required to be included within an authorisation issued for the upgrade of R30 and associated infrastructure:

- Conditions that may be set by DFFE in terms of the EA must be adhered to. If it is found that it will not be possible to adhere to certain conditions, this must be communicated to DFFE ahead of time to prevent a non-compliant situation.
- Should any additional activities listed in terms of the EIA Regulations be planned on the site, the appropriate application(s) for authorisation must be lodged with the relevant authority.
- All mitigation strategies described in this BA Report, as well as the specialist reports in Appendix D, must be put into practice.
- Obtain the relevant permits for any protected plant species or specimens that will be lost during project construction.
- A validity period of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

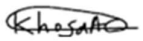
CHAPTER 10: UNDERTAKING BY THE EAP

I **Amukelani Khosa**, the EAP responsible for compiling this report, undertake that:

The information provided in this report is correct. Comments that were received during the review of the Draft Basic Assessment Report are correctly recorded and reported herein.

It must however be noted that the Draft Basic Assessment Report was subjected to PPP for commenting by the general public and state departments in parallel with the submission of the application forms to DFFE. Comments and objections received from stakeholders were recorded accordingly.

Signature: **Date**: **January 2026**



CHAPTER 11: REFERENCES

- BIODIVERSITY IMPACT ASSESSMENT (2023). Ntumbuluko Consulting Pty Ltd
- WETLAND DELINEATION AND IMPACT ASSESSMENT REPORT (2023). Ntumbuluko Consulting Pty Ltd
- HERITAGE IMPACT ASSESSMENT (2023). Shasa Heritage Consultant

APPENDICES

APPENDIX A: SITE PLAN (S)

APPENDIX B: SITE PHOTOGRAPHS

APPENDIX C: ROAD DESIGNS

APPENDIX D: SPECIALIST STUDIES

Appendix D1: Terrestrial Assessment

Appendix D2: Wetland Assessment

Appendix D3: Heritage Assessment

Appendix D4: Palaeontological Assessment

Appendix D5: Agricultural Assessment Compliance Statement

APPENDIX E: PUBLIC PARTICIPATION

Appendix 1: Site Notice

Appendix 2: Written Notices

Appendix 3: Newspaper Advert

Appendix 4: Communication with I&APs

Appendix 5: Comments Received on Circulated BAR

Appendix 6: Comments and Response Reports

Appendix 7: Interested and Affected Party Register

TO BE ATTACHED TO THE FINAL BAR

APPENDIX F: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

APPENDIX G: AUTHORITY CORRESPONDENCE

APPENDIX H: DETAILS OF EAP

APPENDIX I OTHER INFORMATION

LOCALITY MAP OF THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6)

Legend

National Road R30

Reagile
Koster
Derby
Mathopestad
Molote
Bojanala

R52
R509
R24

1:128 000

Kilometers
0 1 2 4 6 8

N

SENSITIVITY MAP OF THE PROPOSED UPGRADE OF ROAD R30 SECTION 9 GOEDGEVONDEN TO OLIFANTSNEK

Bridges Coordinates

Name	X	Y
B2147	27,200315	-25,820522
B2230	27,045583	-25,912493
B2920	27,045598	-25,910915

Culverts Coordinates

Name	X	Y
C0428	26,98335	-26,05414
C0451	27,041376	-25,969288
C0452	27,046144	-25,922797
C0453	27,120016	-25,864288
C0454	27,186696	-25,832524
C0455	27,2144	-25,815348
C2903	26,98401	-26,053316

B2147
C0455
C0454
C0453
B2920
B2230
C0452
C0451
C0428
C2903

Legend

- Bridges Coordinates
- Culverts Coordinates
- Road R30
- Perennial Rivers
- Non-Perennial Rivers
- Wetlands

Terrestrial C-PLAN

- Ecological Support Area 1
- Ecological Support Area 2
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2



Co-ordinate System:GCS WGS 1984

1:127 259

Kilometers
0 1 2 4 6 8

N

Earthlink Environmental Services
In rhythm with nature

Projection: Transverse Mercator CM XX Datum: WGS84
Source: Google TM@ 2011, Image © 2011 DigitalGlobe
Inset: ESRI Data and Maps

A3

SENSITIVITY MAP OF THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6)

Legend

- National Road R30
- Perennial Rivers
- Non-Perennial Rivers
- Wetlands

C-PLAN

- Ecological Support Area 1
- Ecological Support Area 2
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2

1:128 000

Kilometers

0 1 2 4 6 8

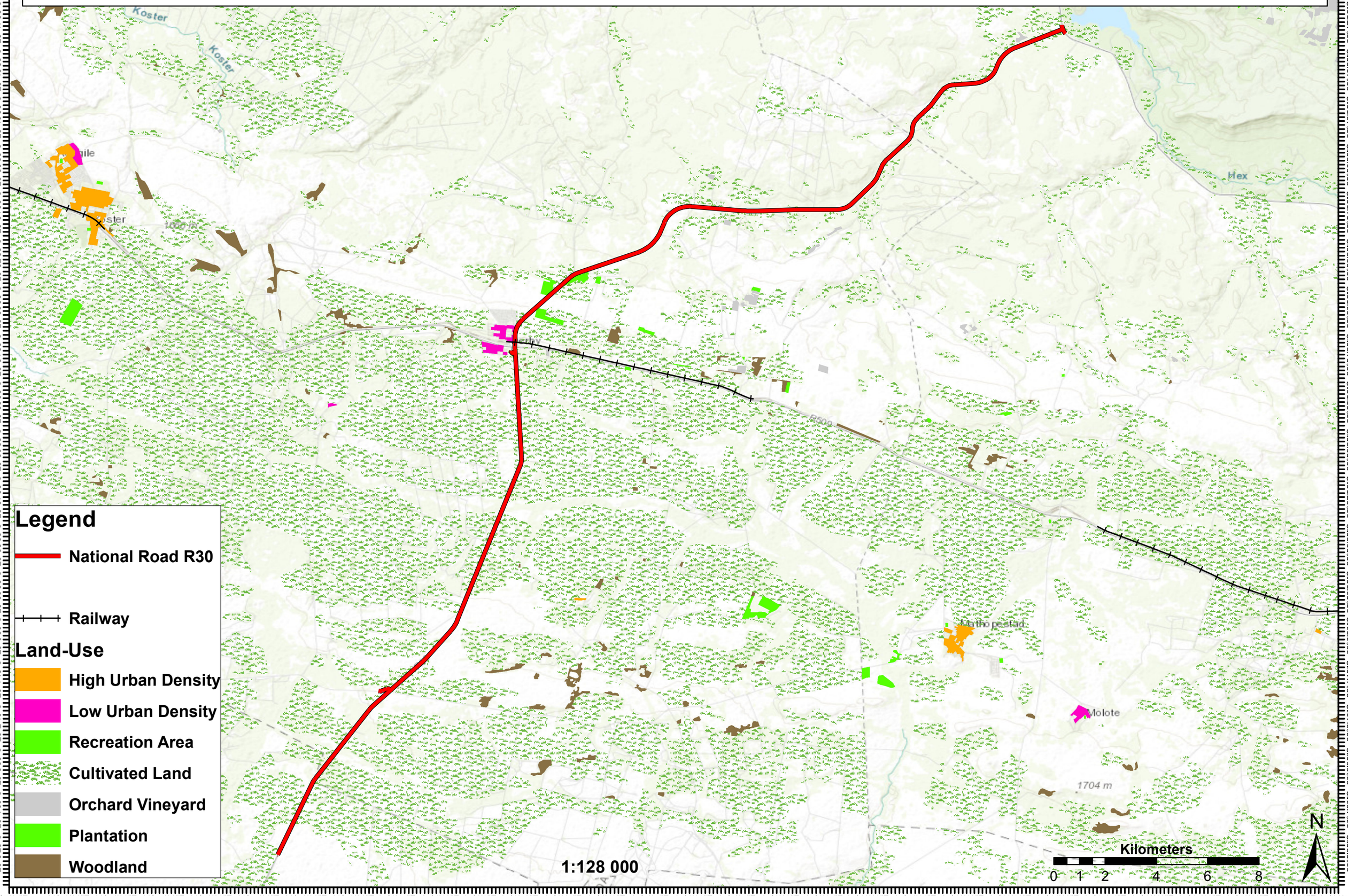
N

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

26°52'5"E 26°53'20"E 26°54'20"E 26°55'20"E 26°56'20"E 26°57'20"E 26°58'20"E 26°59'20"E 27°0'15"E 27°1'10"E 27°2'0"E 27°2'50"E 27°3'45"E 27°4'40"E 27°5'35"E 27°6'30"E 27°7'25"E 27°8'20"E 27°9'15"E 27°10'10"E 27°11'10"E 27°12'10"E 27°13'10"E 27°14'10"E 27°15'10"E 27°16'10"E 27°17'10"E 27°18'10"E 27°19'10"E 27°20'5"E

25°47'0"S 25°47'55"S 25°48'55"S 25°49'55"S 25°50'55"S 25°51'55"S 25°52'55"S 25°53'55"S 25°54'55"S 25°55'55"S 25°56'55"S 25°57'55"S 25°58'55"S 25°59'55"S 26°0'50"S 26°1'45"S 26°2'40"S 26°3'35"S 26°4'30"S 26°5'25"S

LAND-USE MAP OF THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6)



SENSITIVITY MAP OF THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6)

Legend

- National Road R30
- Perennial Rivers
- Non-Perennial Rivers

Wetlands

- Artificial
- Natural

Derby
Hex
R509
Matlhopestad
Molote
1646 m
1704 m

1:128 000

Kilometers
0 1 2 4 6 8

N

26°52'5"E 26°53'20"E 26°54'20"E 26°55'20"E 26°56'20"E 26°57'20"E 26°58'20"E 26°59'20"E 27°0'15"E 27°1'10"E 27°2'0"E 27°2'50"E 27°3'45"E 27°4'40"E 27°5'35"E 27°6'30"E 27°7'25"E 27°8'20"E 27°9'15"E 27°10'10"E 27°11'10"E 27°12'10"E 27°13'10"E 27°14'10"E 27°15'10"E 27°16'10"E 27°17'10"E 27°18'10"E 27°19'10"E 27°20'5"E

25°47'0"S 25°47'55"S 25°48'55"S 25°49'55"S 25°50'55"S 25°51'55"S 25°52'55"S 25°53'55"S 25°54'55"S 25°55'55"S 25°56'55"S 25°57'55"S 25°58'55"S 25°59'55"S 26°0'50"S 26°1'45"S 26°2'40"S 26°3'35"S 26°4'30"S 26°5'25"S

VEGETATION MAP OF THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6)

Legend

National Road R30

Vegetation Type

- Carletonville Dolomite Grassland
- Eastern Temperate Freshwater Wetlands
- Gauteng Shale Mountain Bushveld
- Gold Reef Mountain Bushveld
- Highveld Salt Pans
- Moot Plains Bushveld
- Rand Highveld Grassland
- Waterberg-Magaliesberg Summit Sourveld

1:128 000

Kilometers

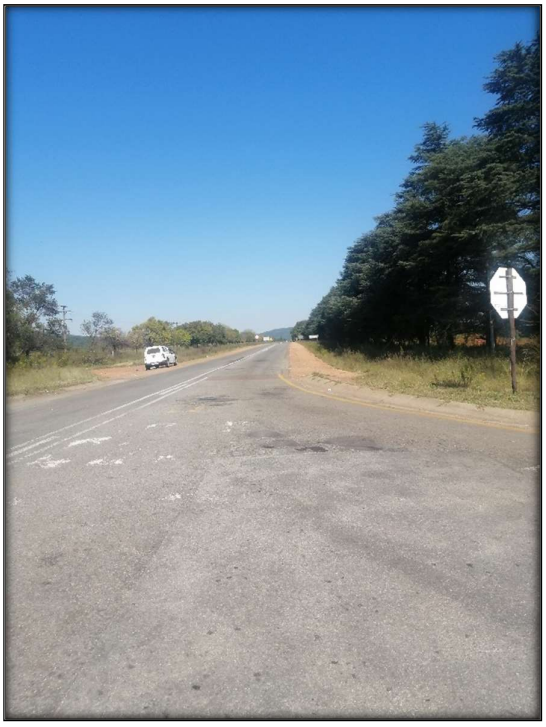
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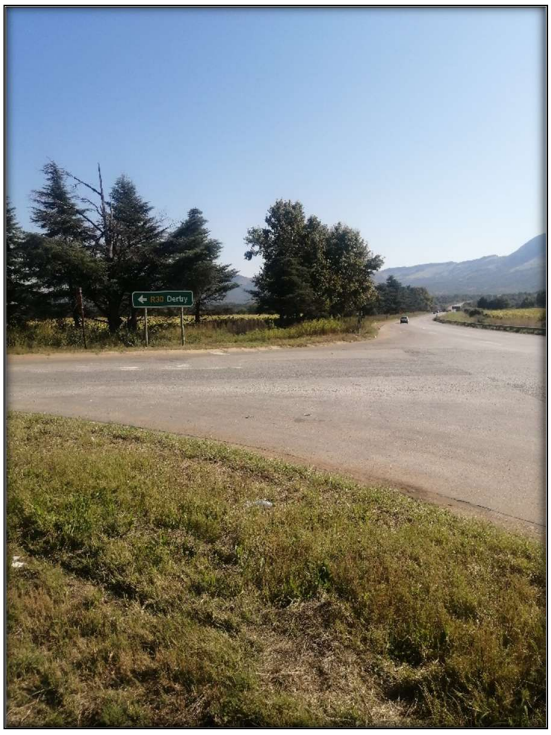
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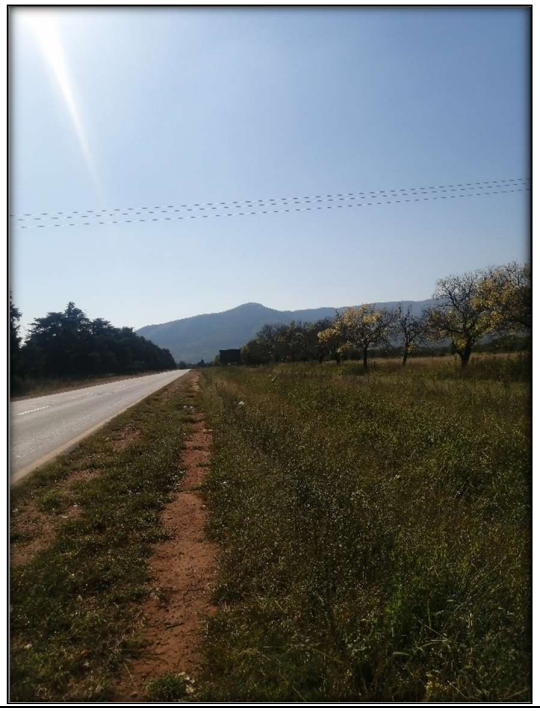
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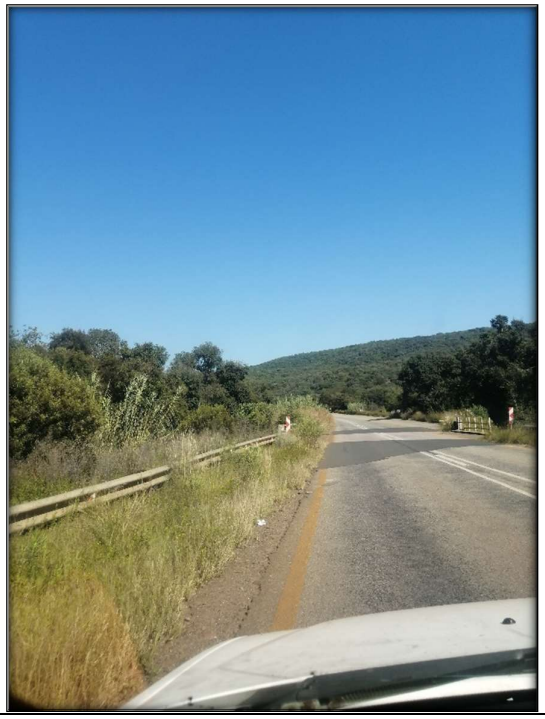
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PHOTO PLATE OF THE NATIONAL ROAD R30

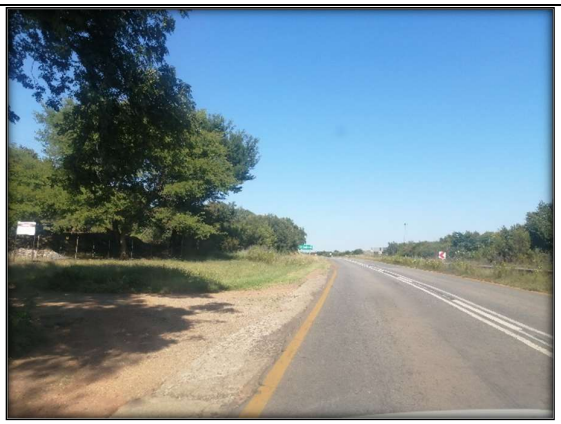




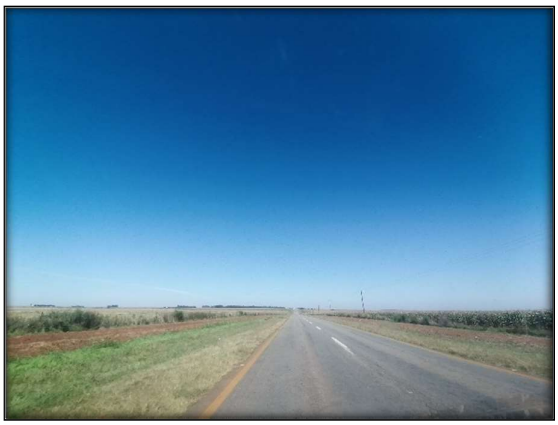


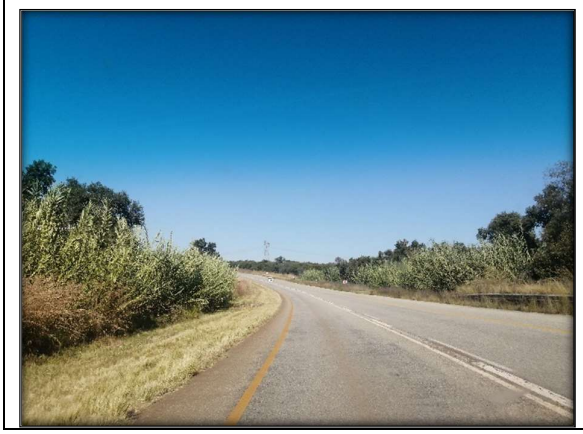


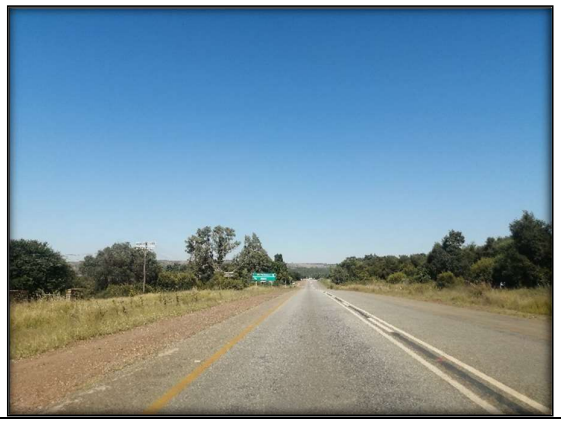


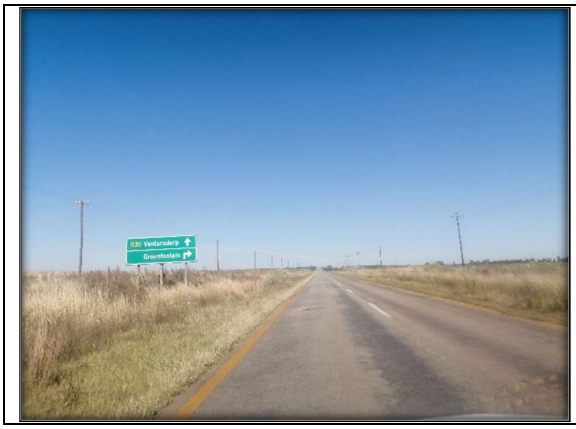


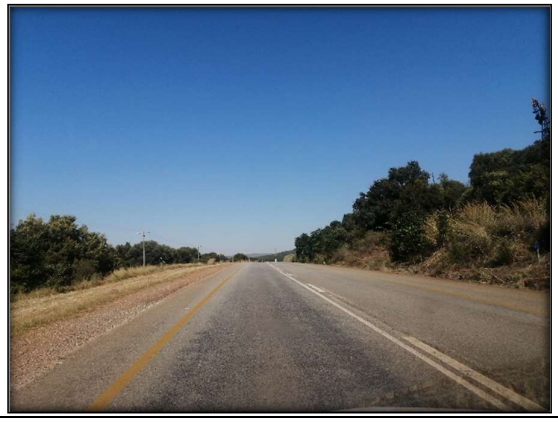


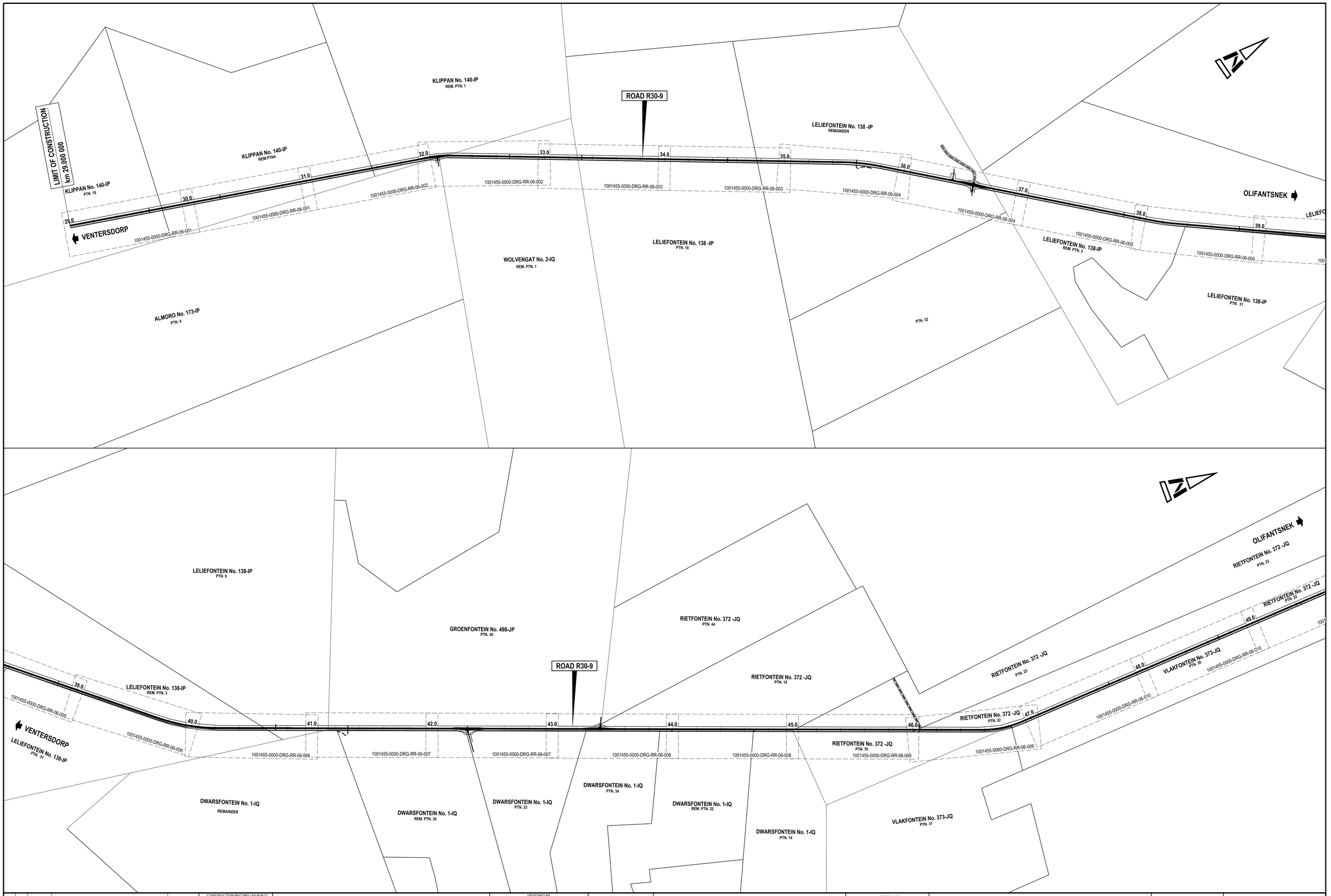







R30 Vanderbijl
Groenfontein





DWG NAME						
TYPE						
DWG DATE	A	V1	ORIGINAL VERSION	A. HARTMAN		
	No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.	

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :

SANRAL PROJECT MANAGER
Name :
Date :

ZUTARI
IMPACT. ENGINEERED.
T +27 12 427 2000 F +27 86 556 0521 E tshwane@zutari.com
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South Africa

DESIGNED BY
NAME: A. LIEBENBERG
Prof. Reg. No.: 2011456

CHECKED BY
NAME: W. DAVEL
Prof. Reg. No.: 950427

DRAWN BY
NAME: E. HOVE

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

HEAD OFFICE
48 Tambotie Avenue
Val de Grace
Pretoria
0184

PO Box 415
Pretoria 0001
South Africa

Tel: (012) 844 8000

SANRAL
SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
Reg No. 1998/009584/30
BUILDING SOUTH AFRICA THROUGH BETTER ROADS

NORTHERN REGION
38 Ida Street
Menlo Park
Pretoria
0081

Private Bag X17
Lynnwood Ridge
0040

Tel: (012) 426 6200

ACCEPTANCE
THIS ACCEPTANCE IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OR LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWEVER ARISING

for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
KEY PLAN
ROAD R30-9: km 29.000 TO km 49.000

SCALE : 1:10000 | SHEET 1 OF 3

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	29.000	49.000
DRAWING TYPE	ROADS - LOCALITY	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-02-001	VER
SANRAL DOCUMENT #		V1



DWG NAME						
TYPE						
DWG DATE	A.	V1	ORIGINAL VERSION	A. HARTMAN		
	No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.	

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
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Date :

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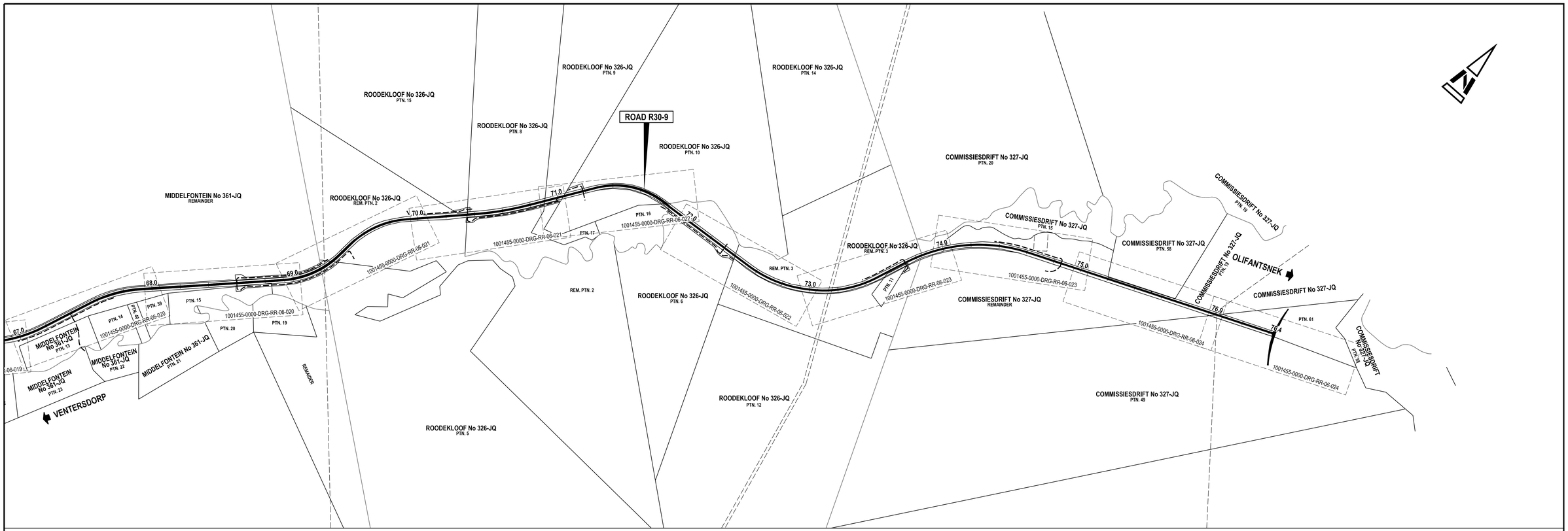
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
KEY PLAN
ROAD R30-9: km 49.000 TO km 69.000

SCALE : 1:10000 SHEET 2 OF 3

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	49.000	69.000
DRAWING TYPE	ROADS - LOCALITY	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-02-002	VER
SANRAL DOCUMENT #		V1



DWG NAME					
TIME					
DWG DATE	A.	V1	ORIGINAL VERSION	A. HARTMAN	
	No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.

CONSTRUCTION RECORD (AS-BUILT)

WORKS CONTRACT ENGINEER

Name :
Prof. Reg. No. :
Date :

SANRAL PROJECT MANAGER

Name :
Date :

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DESIGNED BY	
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NAME	W. DAVEL
Prof. Reg. No.	950427
DRAWN BY	
NAME	E. HOVE

CONSULTANT APPROVAL

Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

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Tel: (012) 426 6200

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Date:

PROJECT DESCRIPTION

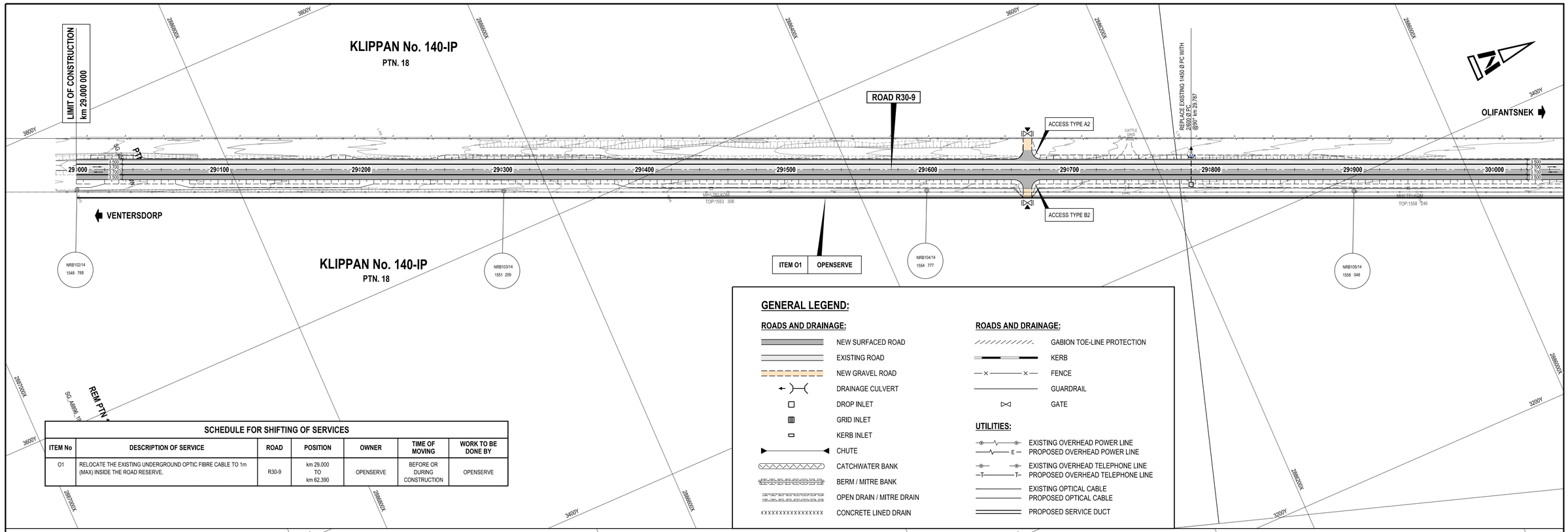
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

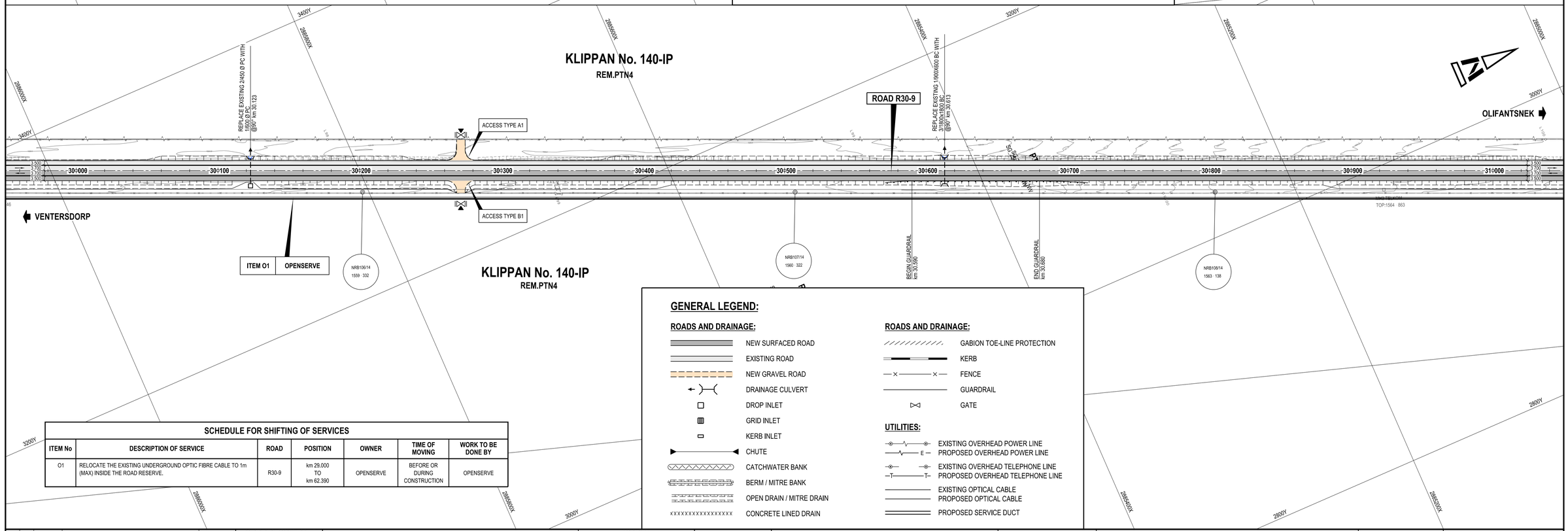
DRAWING DESCRIPTION

KEY PLAN
ROAD R30-9: km 69.000 TO km 76.438

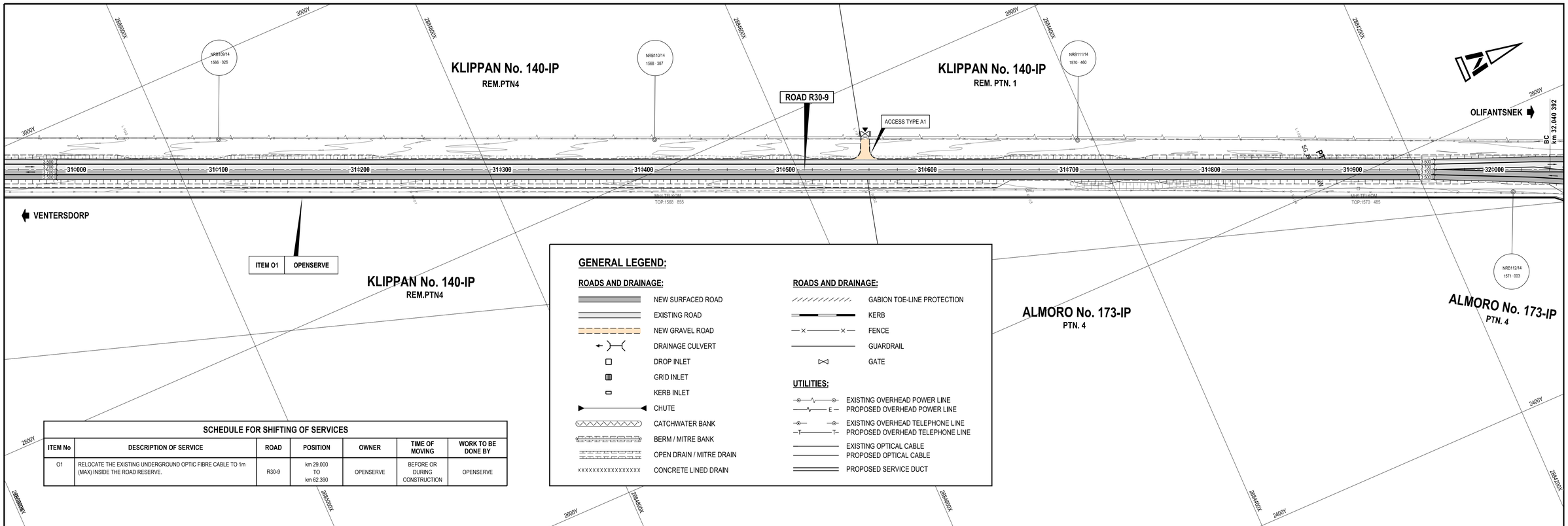
SCALE : 1:10000 | **SHEET 3 OF 3**

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	69.000	76.438
DRAWING TYPE	ROADS - LOCALITY	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-02-003	VER
SANRAL DOCUMENT #		V1

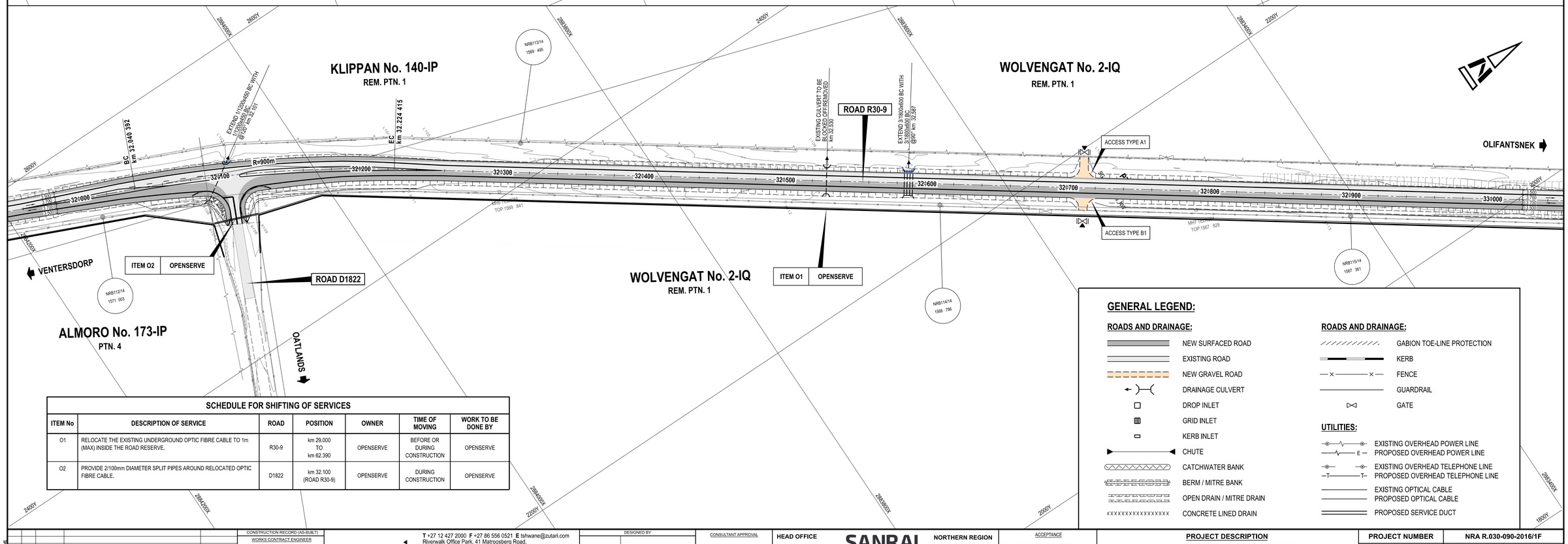




DRW NUM	No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.



SCHEDULE FOR SHIFTING OF SERVICES						
ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE



SCHEDULE FOR SHIFTING OF SERVICES						
ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
O2	PROVIDE 2/100mm DIAMETER SPLIT PIPES AROUND RELOCATED OPTIC FIBRE CABLE.	D1822	km 32.100 (ROAD R30-9)	OPENSERVE	DURING CONSTRUCTION	OPENSERVE

NO.	DATE	REVISION	CONSULT. ENG.
A		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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DESIGNED BY
NAME A. LIEBENBERG
Prof. Reg. No. 2011456
CHECKED BY
NAME W. DAVEL
Prof. Reg. No. 950427
DRAWN BY
NAME E. HOVE

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

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SANRAL
SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
Reg No. 1998/009584/30
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NORTHERN REGION
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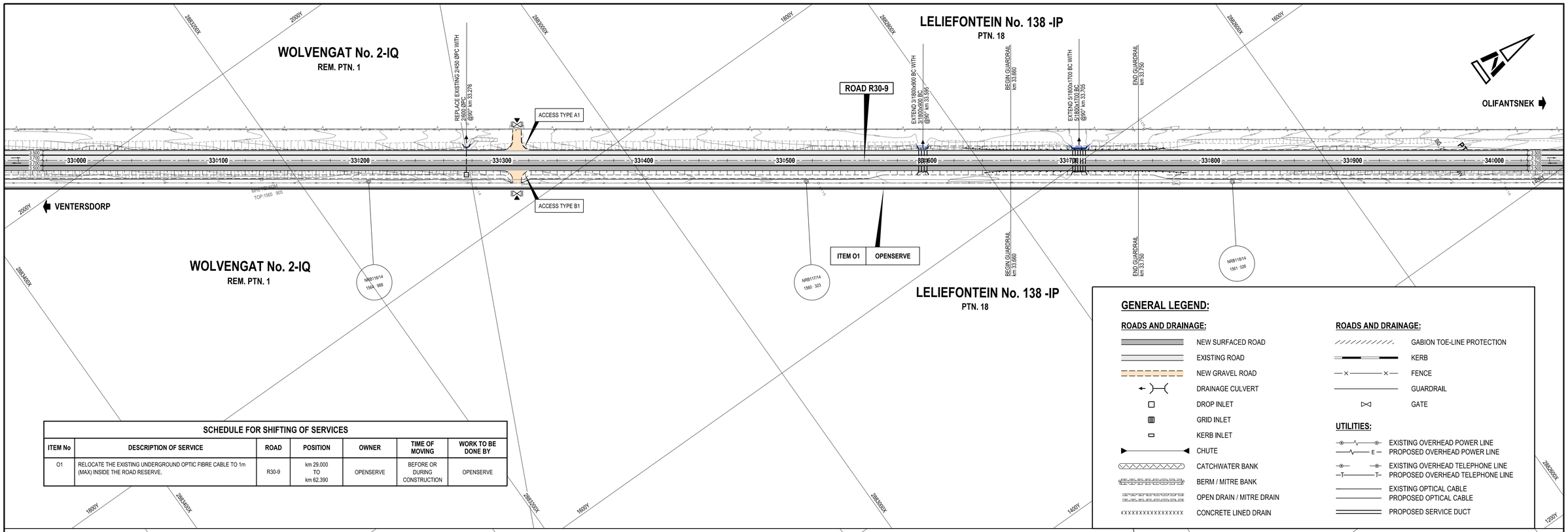
ACCEPTANCE
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 31.000 TO km 33.000

SCALE : 1:1000 SHEET 2 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	31.000	33.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-002	VER V1
SANRAL DOCUMENT #		

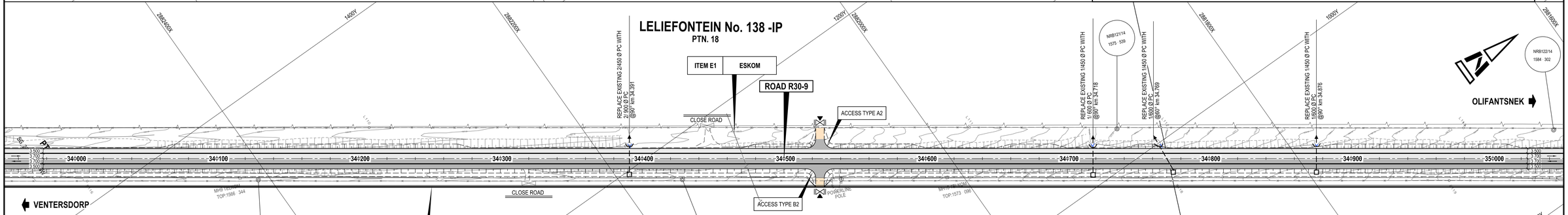


SCHEDULE FOR SHIFTING OF SERVICES						
ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE

GENERAL LEGEND:

ROADS AND DRAINAGE:
- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:
- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT



SCHEDULE FOR SHIFTING OF SERVICES						
ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
E1	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6,5m AT ROAD CROSSING.	R30-9	km 34.471	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:
- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:
- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

DWG ISSUE	No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1			ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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DESIGNED BY	
NAME	A. LIEBENBERG
Prof. Reg. No.	2011456
CHECKED BY	
NAME	W. DAVEL
Prof. Reg. No.	950427
DRAWN BY	
NAME	E. HOVE

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

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SANRAL SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
BUILDING SOUTH AFRICA THROUGH BETTER ROADS

NORTHERN REGION
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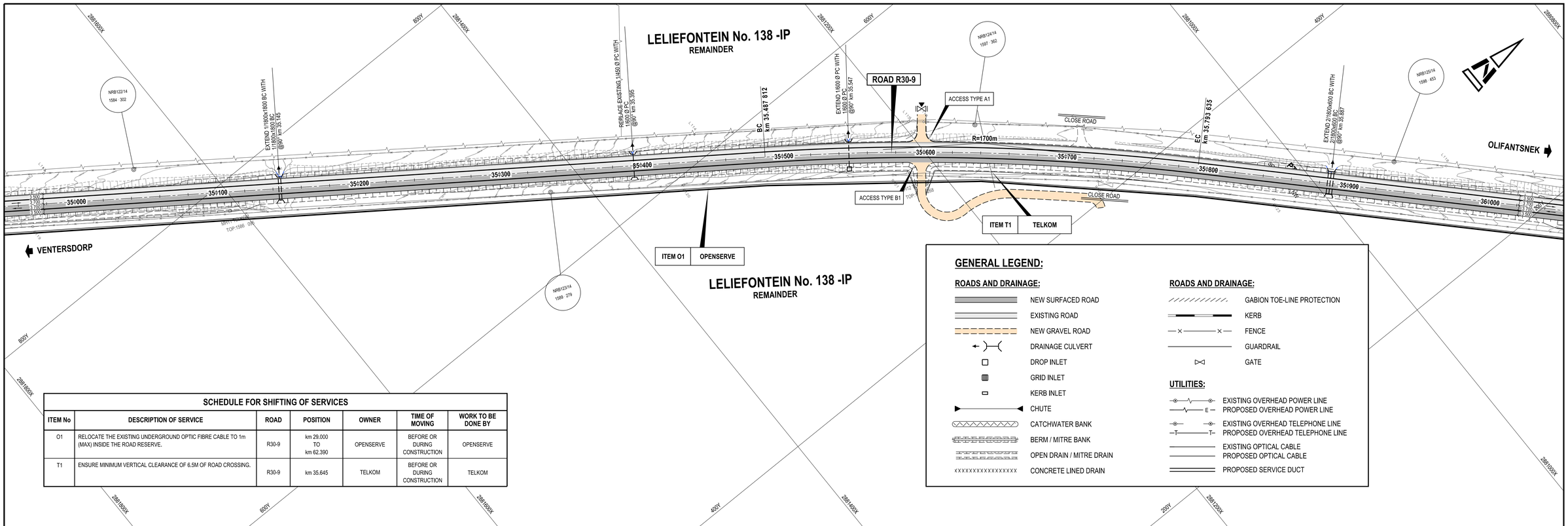
ACCEPTANCE
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 33.000 TO km 35.000

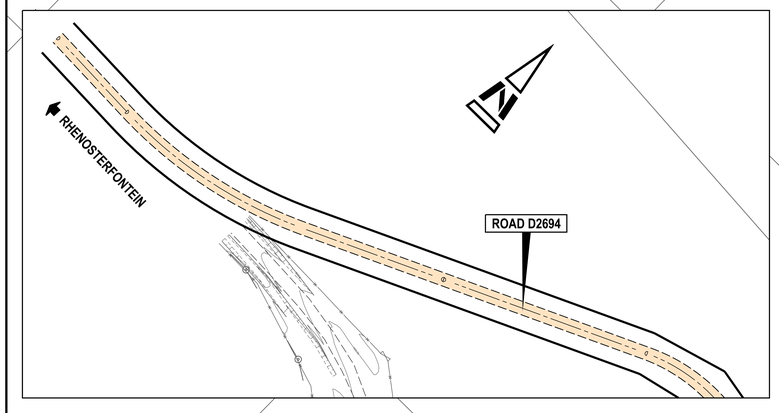
SCALE : 1:1000 | SHEET 3 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	33.000	35.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-003	VER V1
SANRAL DOCUMENT #		



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T1	ENSURE MINIMUM VERTICAL CLEARANCE OF 6.5M OF ROAD CROSSING.	R30-9	km 35.645	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
O3	PROVIDE 2/100mm DIAMETER SPLIT PIPES AROUND RELOCATED OPTIC FIBRE CABLE.	D2698	km 36.585 (ROAD R30-9)	OPENSERVE	DURING CONSTRUCTION	OPENSERVE
T2	ENSURE MINIMUM VERTICAL CLEARANCE OF 6.5M OF ROAD CROSSING.	R30-9	km 36.395	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E2	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	D2694	km36.585 (ROAD R30-9)	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:
ROADS AND DRAINAGE:
NEW SURFACED ROAD
EXISTING ROAD
NEW GRAVEL ROAD
DRAINAGE CULVERT
DROP INLET
GRID INLET
KERB INLET
CHUTE
CATCHWATER BANK
BERM / MITRE BANK
OPEN DRAIN / MITRE DRAIN
CONCRETE LINED DRAIN
ROADS AND DRAINAGE:
GABION TOE-LINE PROTECTION
KERB
FENCE
GUARDRAIL
GATE
UTILITIES:
EXISTING OVERHEAD POWER LINE
PROPOSED OVERHEAD POWER LINE
EXISTING OVERHEAD TELEPHONE LINE
PROPOSED OVERHEAD TELEPHONE LINE
EXISTING OPTICAL CABLE
PROPOSED OPTICAL CABLE
PROPOSED SERVICE DUCT

DWG No. CONS.	DWG No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
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Date :
SANRAL PROJECT MANAGER
Name :
Date :

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DESIGNED BY
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Prof. Reg. No. 2011456
CHECKED BY
NAME W. DAVEL
Prof. Reg. No. 950427
DRAWN BY
NAME E. HOVE

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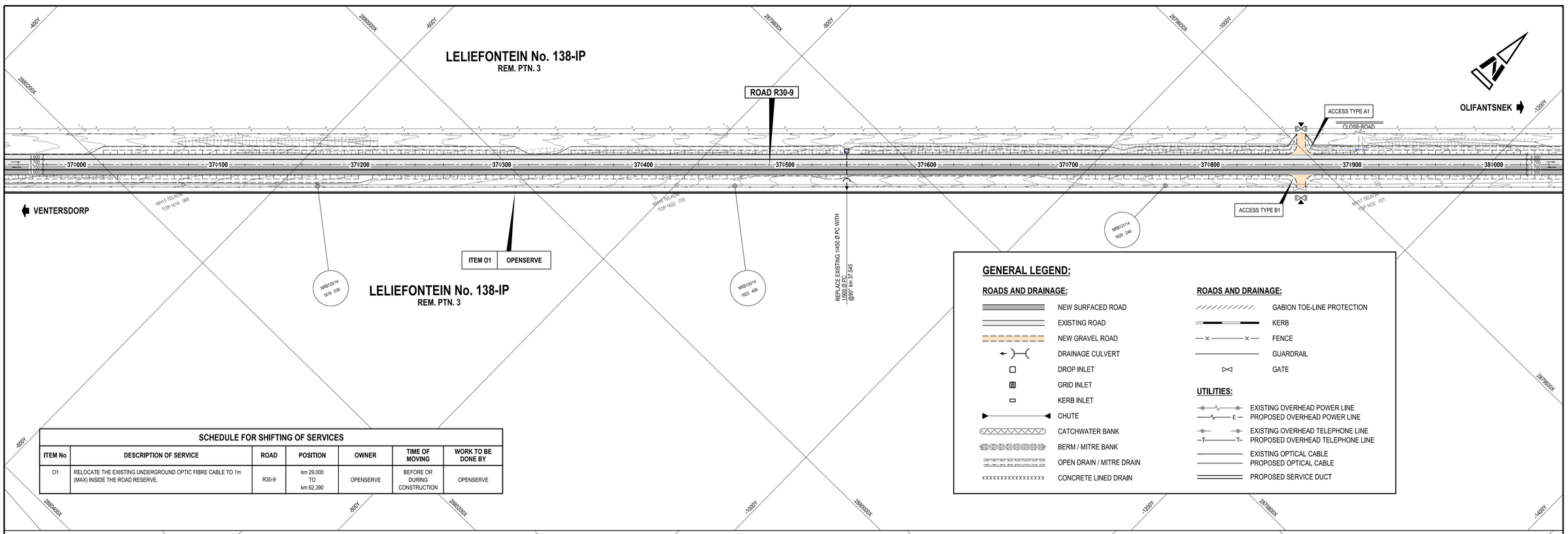
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 35.000 TO km 37.000

SCALE : 1:1000 SHEET 4 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	35.000	37.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-004	VER V1
SANRAL DOCUMENT #		



GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

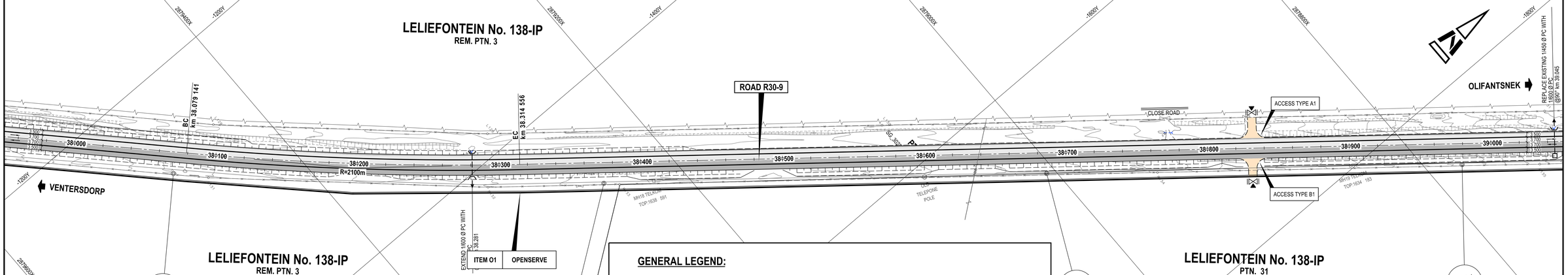
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE



LELIEFONTEIN No. 138-IP
REM. PTN. 3

LELIEFONTEIN No. 138-IP
PTN. 31

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE

DWG NUM	No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
TIME	A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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South Africa

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NAME	A. LIEBENBERG
Prof. Reg. No.	2011456
CHECKED BY	
NAME	W. DAVEL
Prof. Reg. No.	950427
DRAWN BY	
NAME	E. HOVE

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

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PO Box 415
Pretoria 0001
South Africa
Tel: (012) 844 8000

SANRAL
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Reg No. 1998/009485/30
BUILDING SOUTH AFRICA THROUGH BETTER ROADS

NORTHERN REGION
38 Ida Street
Menlo Park
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Lynnwood Ridge
0040
Tel: (012) 426 6200

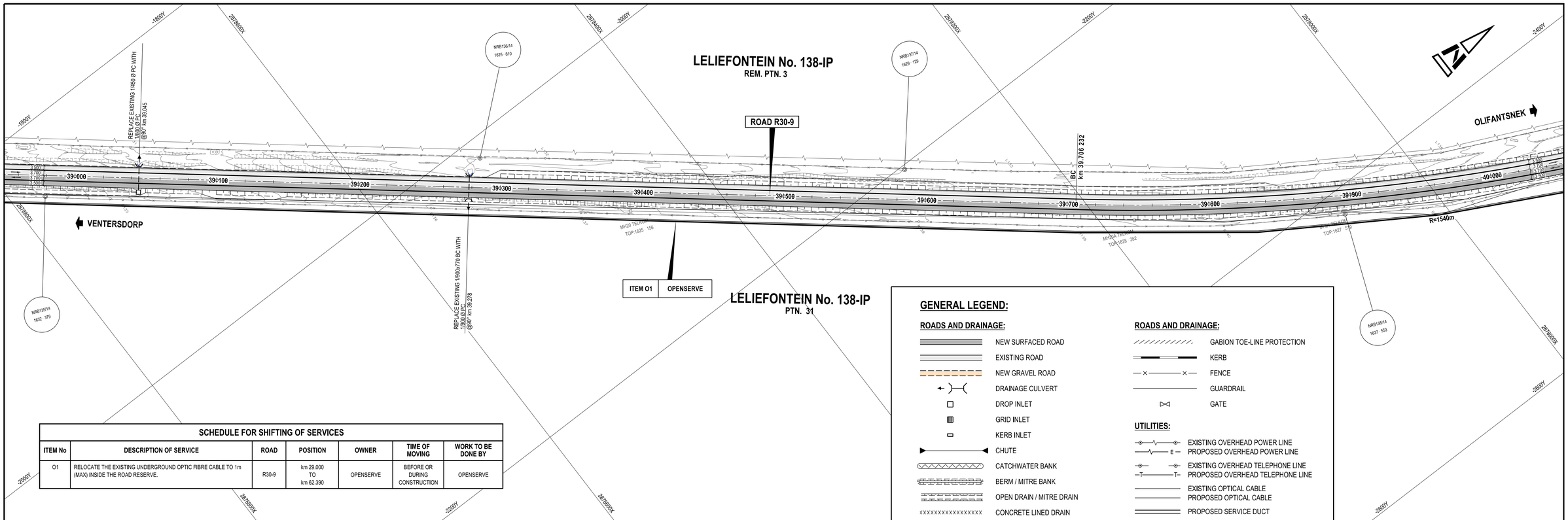
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 37.000 TO km 39.000

SCALE : 1:1000 SHEET 5 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	37.000	39.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-005	VER V1
SANRAL DOCUMENT #		



GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

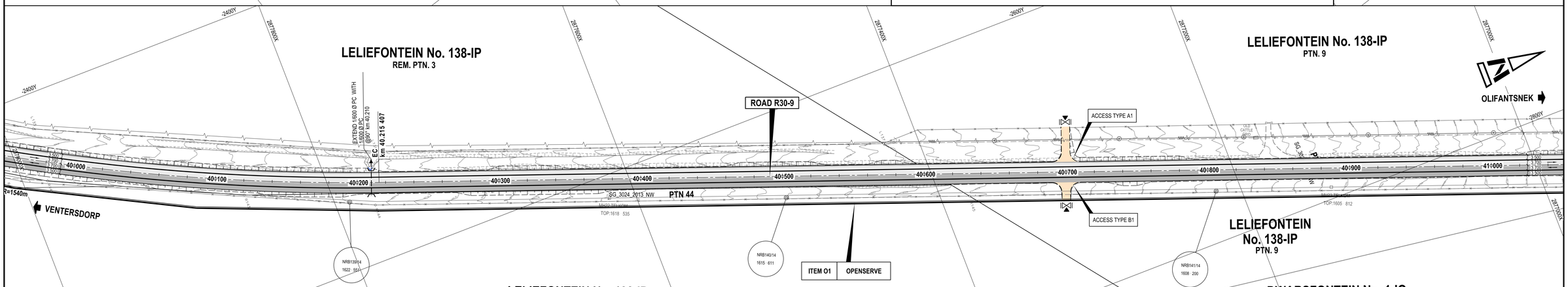
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE



GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE

No.	No.	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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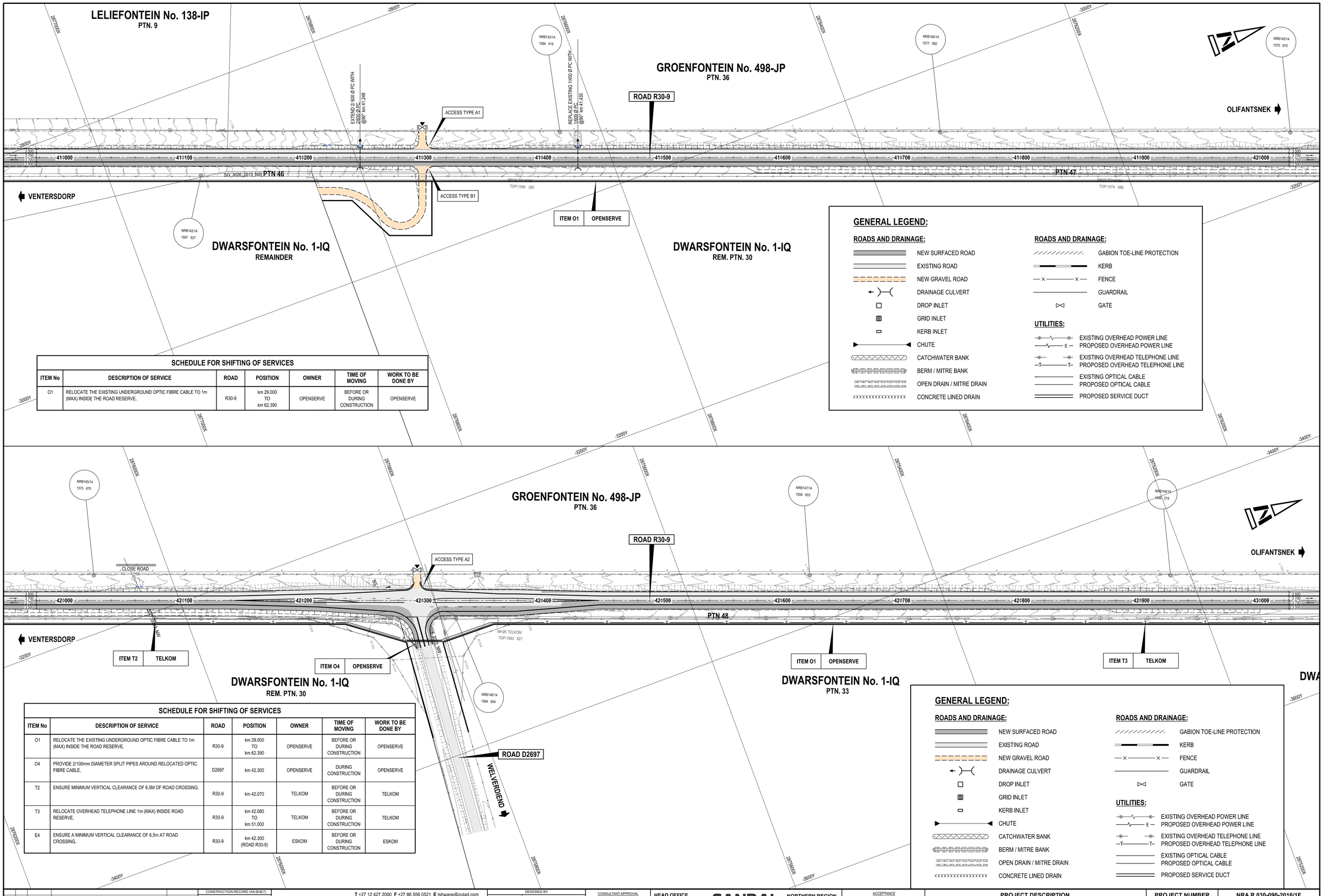
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 39.000 TO km 41.000

SCALE : 1:1000 SHEET 6 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	39.000	41.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-006	VER
SANRAL DOCUMENT #		V1



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
O4	PROVIDE 2/100mm DIAMETER SPLIT PIPES AROUND RELOCATED OPTIC FIBRE CABLE.	D2697	km 42.300	OPENSERVE	DURING CONSTRUCTION	OPENSERVE
T2	ENSURE MINIMUM VERTICAL CLEARANCE OF 6.5M OF ROAD CROSSING.	R30-9	km 42.070	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
T3	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 42.080 TO km 51.000	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E4	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 42.300 (ROAD R30-9)	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
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UTILITIES:

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- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

DWG No.	TYPE	AMD DATE	No. CONS	No. SANRAL	DATE	REVISION	CONSULT. ENG.
		A	V1			ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
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Name :
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Date :
SANRAL PROJECT MANAGER
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Tel: (012) 844 8000

SANRAL
SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
Reg No. 1998/009584/30
BUILDING SOUTH AFRICA THROUGH BETTER ROADS

NORTHERN REGION
38 Ida Street
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0081
Private Bag X17
Lynnwood Ridge
0040
Tel: (012) 426 6200

ACCEPTANCE
THIS ACCEPTANCE IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OR LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWEVER ARISING
for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 41.000 TO km 43.000

SCALE : 1:1000 SHEET 7 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	41.000	43.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-007	VER V1
SANRAL DOCUMENT #		

GROENFONTEIN No. 498-JP
PTN. 36

GROENFONTEIN

RIETFONTEIN No. 372 -JQ
PTN. 44

RIETFONTEIN No. 372 -JQ
PTN. 18

NRB149/14
1546 · 757

NRB150/14
1544 · 970

NRB151/14
1540 · 851

ROAD D2696

ROAD R30-9

ITEM E5 | ESKOM

OLIFANTSNEK

VENTERSDORP

43+000 | 43+100 | 43+200 | 43+300 | 43+400 | 43+500 | 43+600 | 43+700 | 43+800 | 43+900 | 44+000

1/600 Ø PC

ACCESS TYPE B1

ITEM O1 | OPENSERVE

ITEM T3 | TELKOM

EXTEND 1/1800 Ø 600 BC WITH 1/1800 Ø 600 EC @297° km 43.158

EXTEND 1/600 Ø PC WITH 1/600 Ø PC @347° km 43.259

DWARSFONTEIN No. 1-IQ
PTN. 33

DWARSFONTEIN No. 1-IQ
PTN. 34

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 46.600	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T3	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 29.000 TO km 46.600	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E5	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	D2696	km 43.400 (ROAD R30-9)	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

RIETFONTEIN No. 372 -JQ
PTN. 18

NRB153/14
1529 · 860

ROAD R30-9

VENTERSDORP

OLIFANTSNEK

44+000 | 44+100 | 44+200 | 44+300 | 44+400 | 44+500 | 44+600 | 44+700 | 44+800 | 44+900 | 45+000

1/600 Ø PC

ACCESS TYPE B1

ITEM T3 | TELKOM

ITEM O1 | OPENSERVE

NRB152/14
1534 · 983

DWARSFONTEIN No. 1-IQ
REM. PTN. 32

EXTEND 3/1800x800 BC WITH 2/1800x800 EC @90° km 44.750

NRB154/14
1528 · 373

EXTEND 3/1800x750 BC WITH 2/1800x750 EC @90° km 44.765

EXTEND 3/1800x650 BC WITH 2/1800x650 EC @90° km 44.845

EXTEND 3/1800x650 BC WITH 2/1800x650 EC @90° km 44.875

EXTEND 2/1800x650 BC WITH 2/1800x650 EC @90° km 44.900

DWARSFONTEIN No. 1-IQ
PTN. 14

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 46.600	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T3	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 42.080 TO km 46.600	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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DESIGNED BY	
NAME	I N NIEUWOUDT
Prof. Reg. No.	950345
CHECKED BY	
NAME	P KACHELHOFFER
Prof. Reg. No.	202101914
DRAWN BY	
NAME	I N NIEUWOUDT

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

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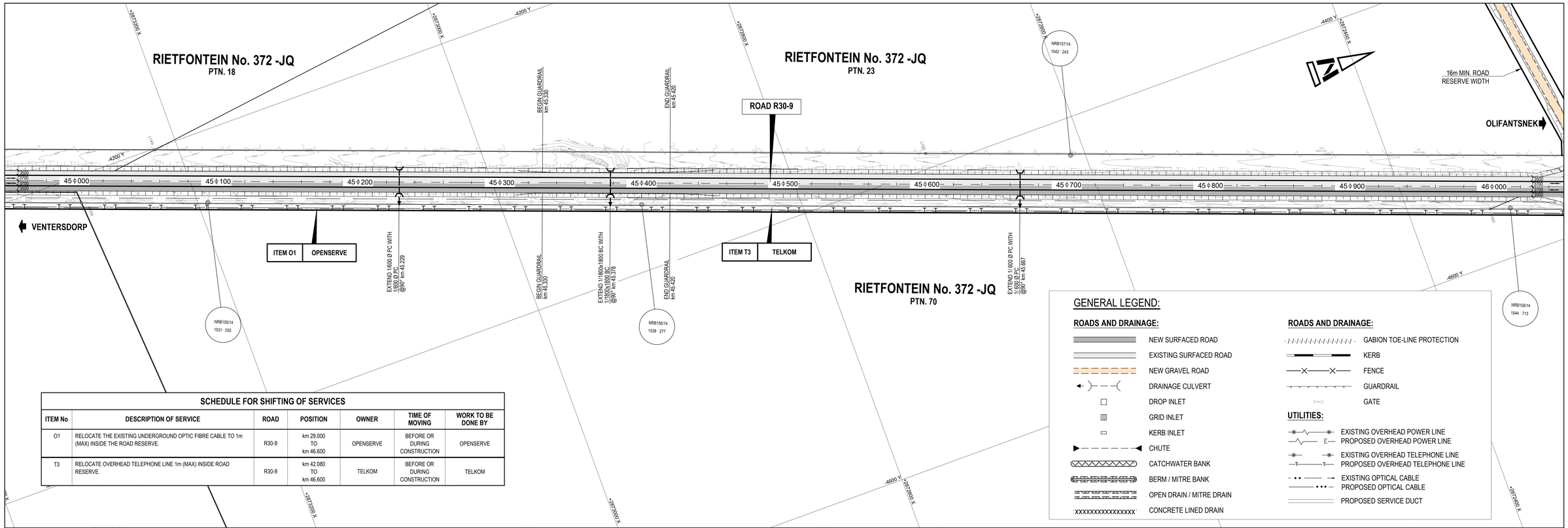
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 43.000 TO km 45.000

SCALE : 1:1000 | SHEET 8 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	43.000	45.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-008	VER
SANRAL DOCUMENT #		V1



GENERAL LEGEND:

ROADS AND DRAINAGE:

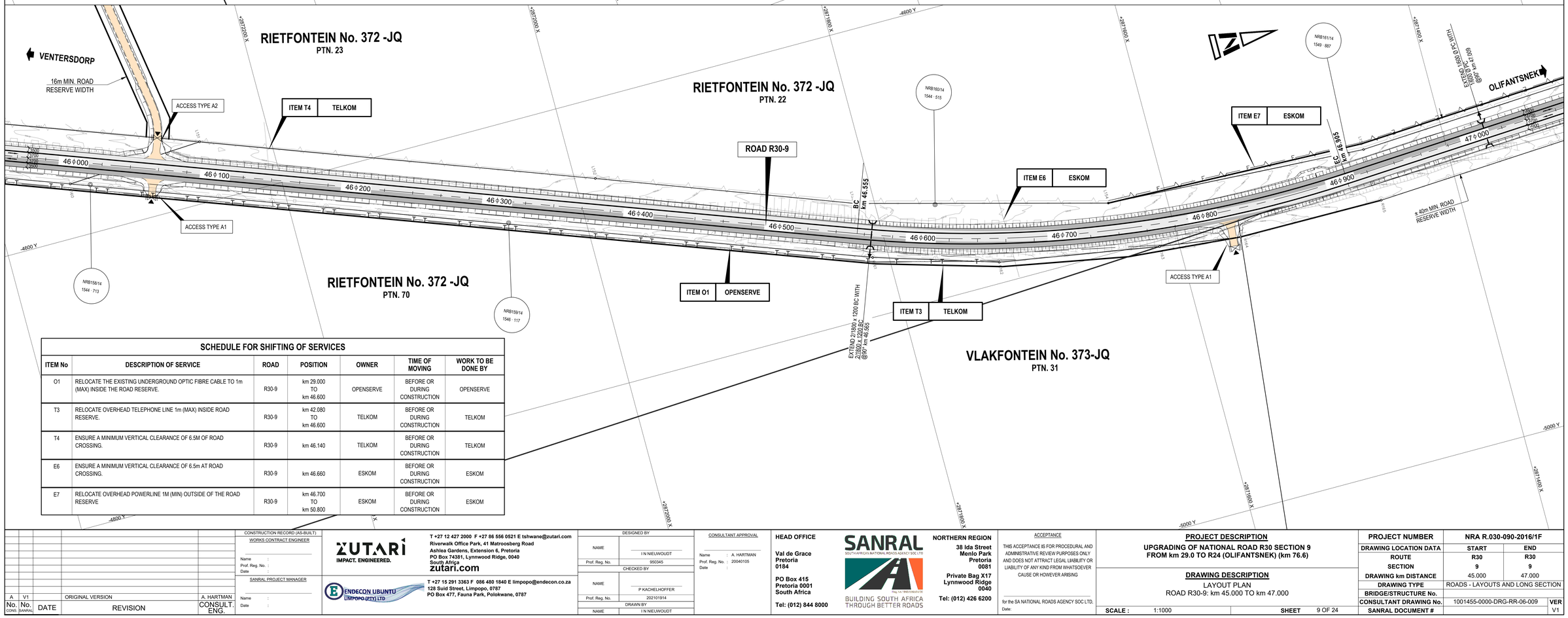
- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 46.600	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T3	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 42.080 TO km 46.600	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O1	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 29.000 TO km 46.600	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T3	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 42.080 TO km 46.600	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
T4	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5M OF ROAD CROSSING.	R30-9	km 46.140	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E6	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 46.660	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E7	RELOCATE OVERHEAD POWERLINE 1M (MIN) OUTSIDE OF THE ROAD RESERVE	R30-9	km 46.700 TO km 50.800	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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PO Box 477, Fauna Park, Polokwane, 0787

DESIGNED BY
NAME I N NIEUWOUDT
Prof. Reg. No. 950345
CHECKED BY
NAME P KACHELHOFFER
Prof. Reg. No. 202101914
DRAWN BY
NAME I N NIEUWOUDT

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

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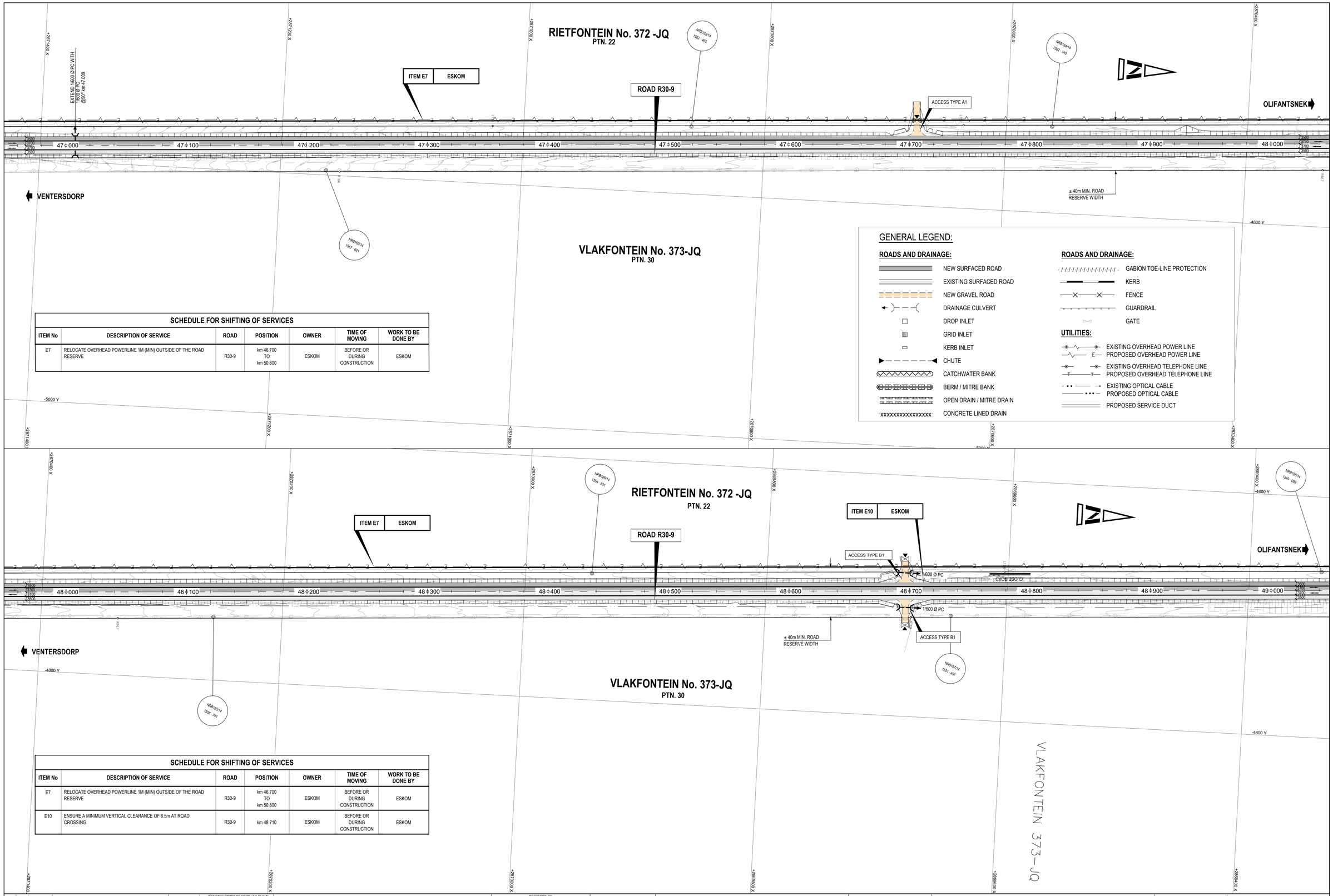
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 45.000 TO km 47.000

SCALE : 1:1000 SHEET 9 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	45.000	47.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-009	VER V1
SANRAL DOCUMENT #		



SCHEDULE FOR SHIFTING OF SERVICES						
ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E7	RELOCATE OVERHEAD POWERLINE 1M (MIN) OUTSIDE OF THE ROAD RESERVE	R30-9	km 46.700 TO km 50.800	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES						
ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E7	RELOCATE OVERHEAD POWERLINE 1M (MIN) OUTSIDE OF THE ROAD RESERVE	R30-9	km 46.700 TO km 50.800	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E10	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 48.710	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date
SANRAL PROJECT MANAGER
Name :
Date :

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DESIGNED BY	
NAME	I N NIEUWOUDT
Prof. Reg. No.	950345
CHECKED BY	
NAME	P KACHELHOFFER
Prof. Reg. No.	202101914
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NAME	I N NIEUWOUDT

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Name : A. HARTMAN
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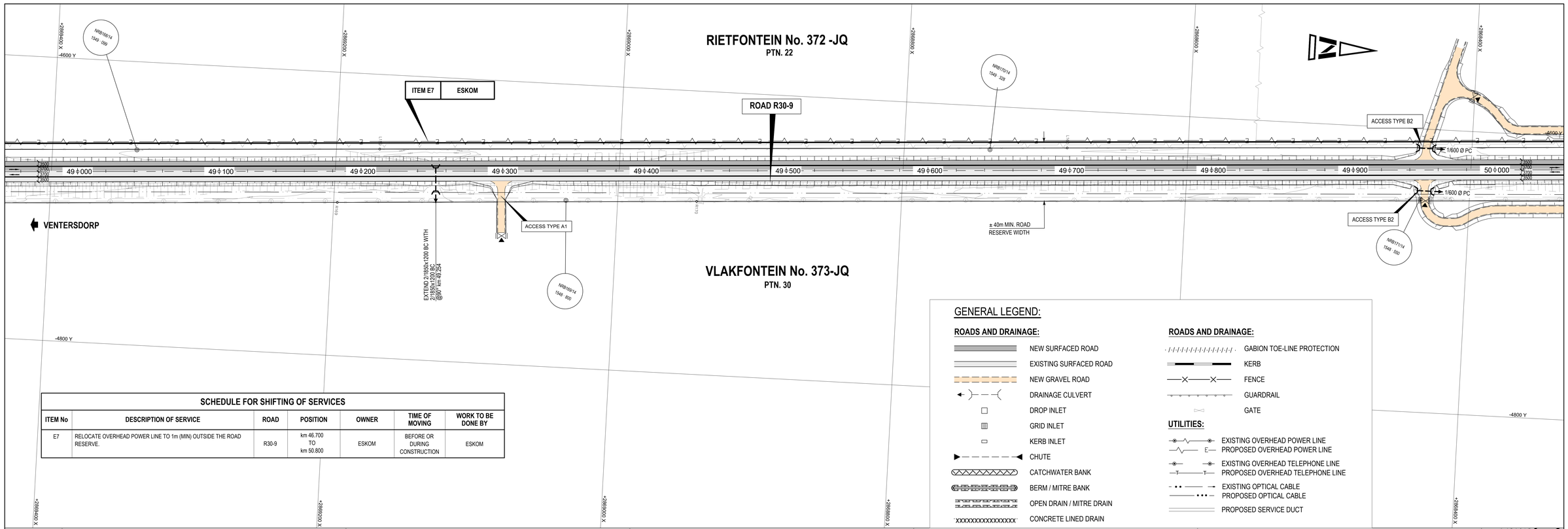
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 47.000 TO km 49.000

SCALE : 1:1000 SHEET 10 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	47.000	49.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-010	VER V1
SANRAL DOCUMENT #		



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E7	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 46.700 TO km 50.800	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

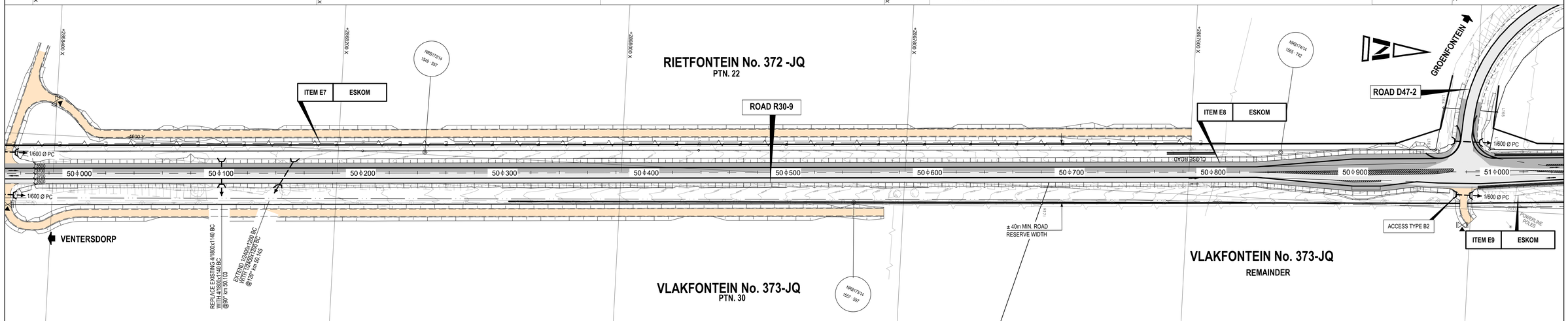
- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E7	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 46.700 TO km 50.800	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E8	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 50.805	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E9	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 51.015	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
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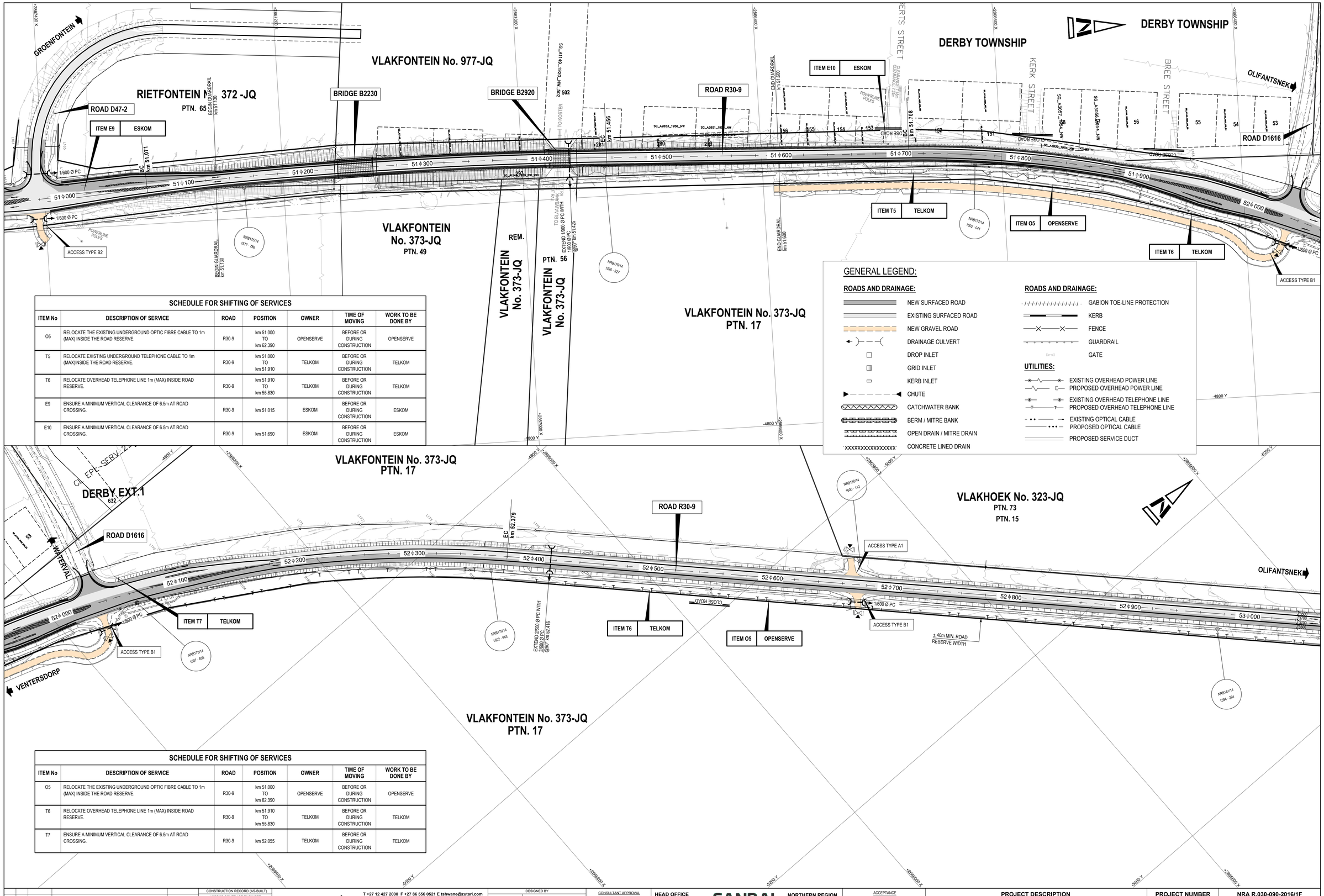
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 49.000 TO km 51.000

SCALE : 1:1000 SHEET 11 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	49.000	51.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-011	VER V1
SANRAL DOCUMENT #		



GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T5	RELOCATE EXISTING UNDERGROUND TELEPHONE CABLE TO 1m (MAX)INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 51.910	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
T6	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 51.910 TO km 55.830	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E9	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 51.015	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E10	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 51.690	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T6	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 51.910 TO km 55.830	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
T7	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 52.055	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM

No. CONS	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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CHECKED BY
NAME P KACHELHOFFER
Prof. Reg. No. 202101914
DRAWN BY
NAME I N NIEUWOUDT

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

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SANRAL SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
BUILDING SOUTH AFRICA THROUGH BETTER ROADS

NORTHERN REGION
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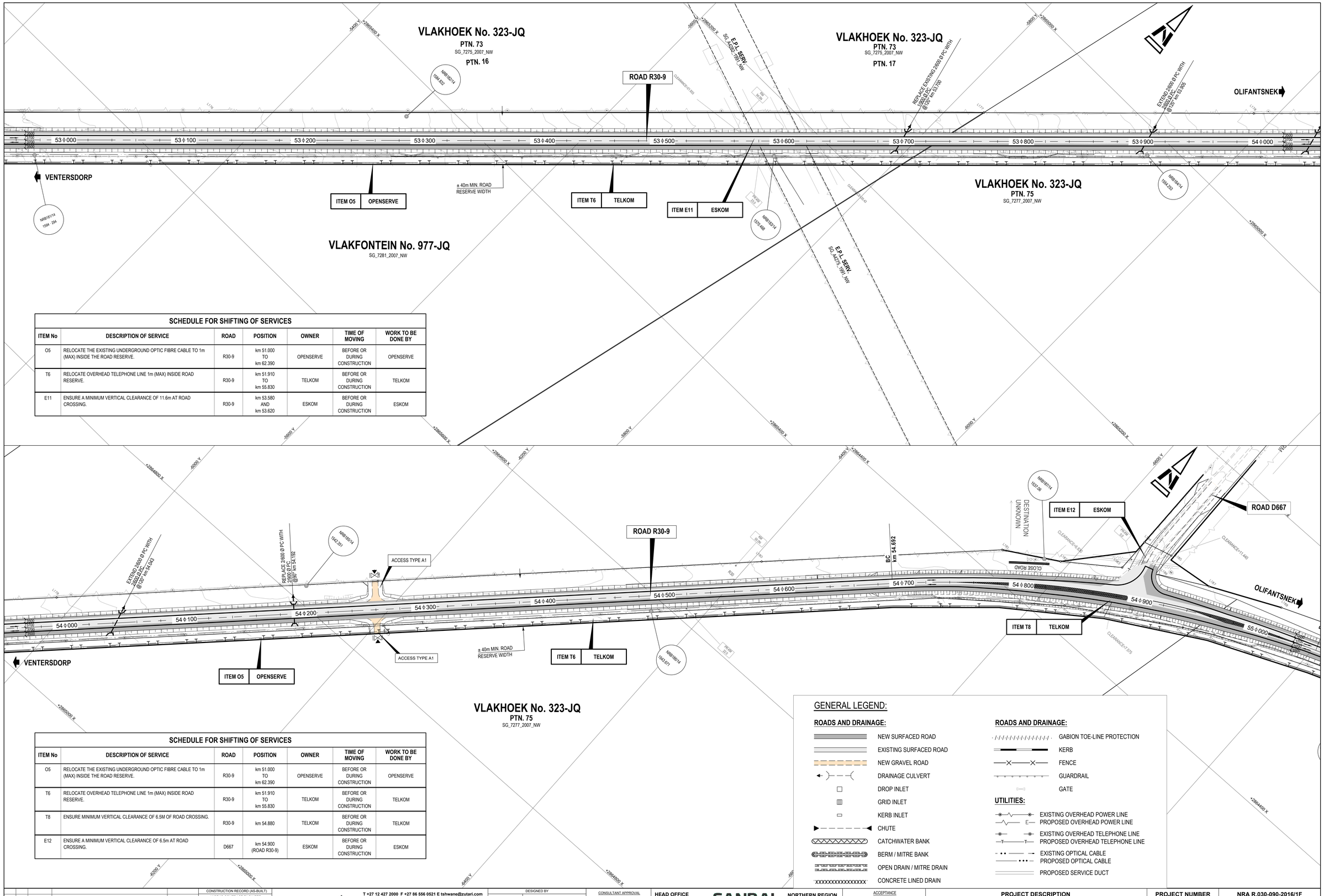
ACCEPTANCE
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 51.000 TO km 53.000

SCALE : 1:1000 SHEET 12 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	51.000	53.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-012	VER
SANRAL DOCUMENT #		V1



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T6	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 51.910 TO km 55.830	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E11	ENSURE A MINIMUM VERTICAL CLEARANCE OF 11.6m AT ROAD CROSSING.	R30-9	km 53.580 AND km 53.620	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T6	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 51.910 TO km 55.830	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
T8	ENSURE MINIMUM VERTICAL CLEARANCE OF 6.5M OF ROAD CROSSING.	R30-9	km 54.880	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E12	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	D667	km 54.900 (ROAD R30-9)	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

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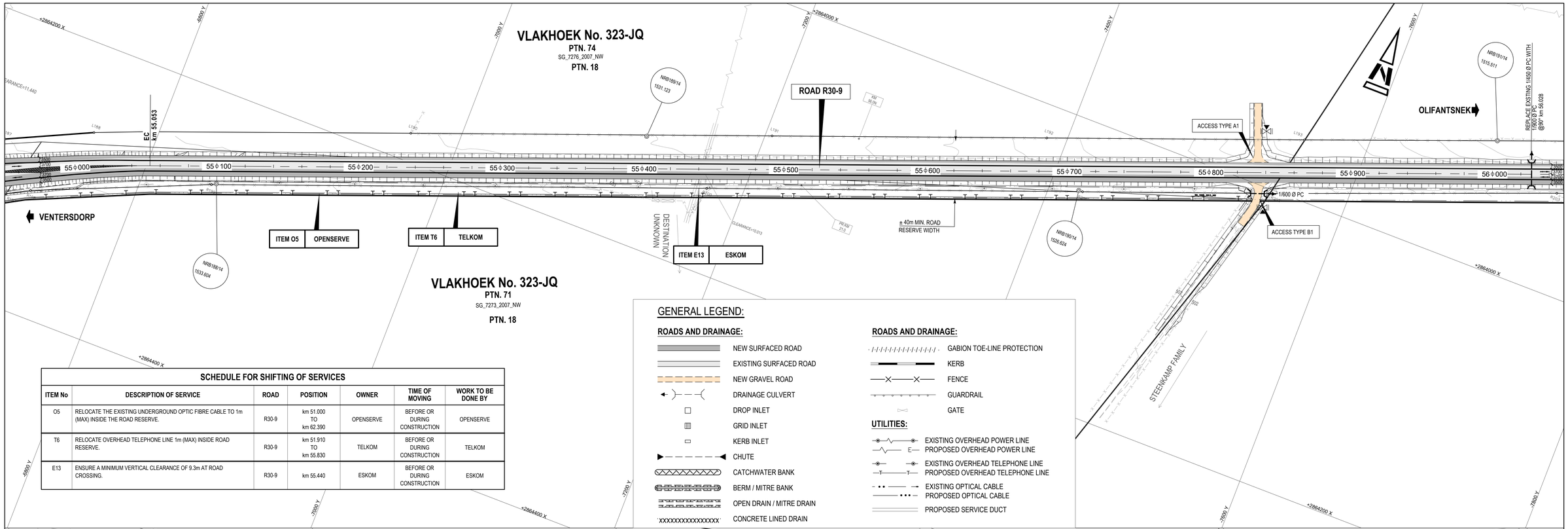
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 53.000 TO km 55.000

SCALE : 1:1000 SHEET 13 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	53.000	55.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-013	VER
SANRAL DOCUMENT #		V1



GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE / PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE / PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE / PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T6	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 51.910 TO km 55.830	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E13	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 55.440	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
E14	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 56.575	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
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Prof. Reg. No. :
Date :
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Date :

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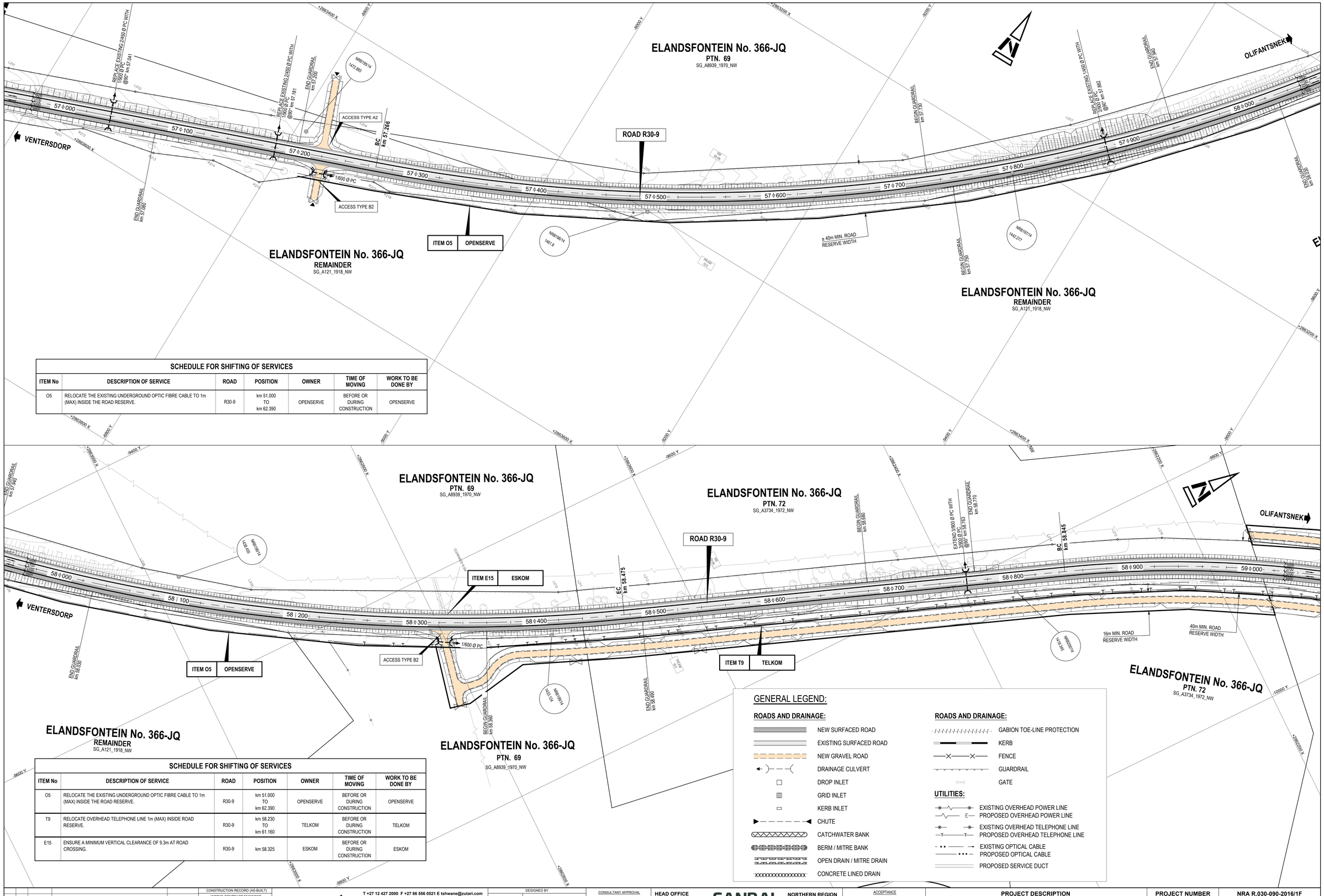
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 55.000 TO km 57.000

SCALE : 1:1000 SHEET 14 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	55.000	57.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-014	VER V1
SANRAL DOCUMENT #		



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T9	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 58.230 TO km 61.160	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E15	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 58.325	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date

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Date :

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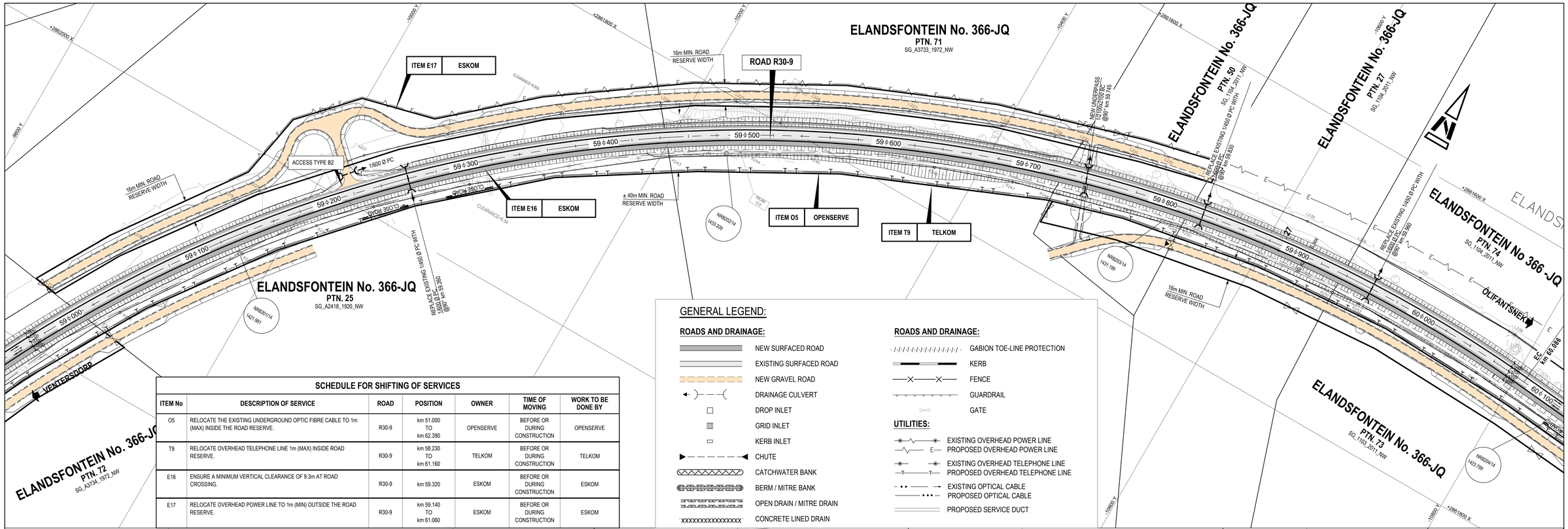
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 57.000 TO km 59.000

SCALE : 1:1000 SHEET 15 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	57.000	59.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-015	VER V1
SANRAL DOCUMENT #		



GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

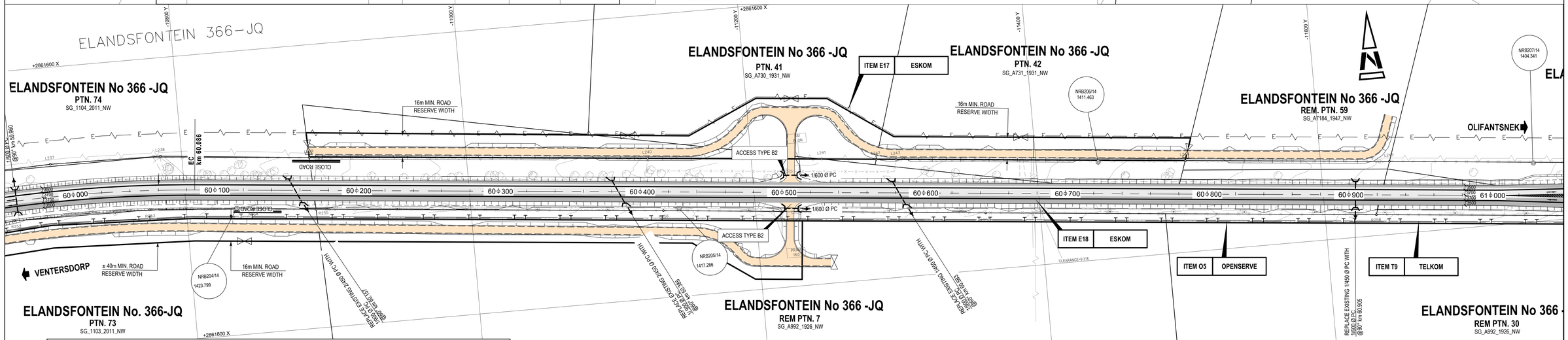
- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T9	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 58.230 TO km 61.160	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E16	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 59.320	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E17	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 59.140 TO km 61.060	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
T9	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 58.230 TO km 61.160	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E17	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 59.140 TO km 61.060	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E18	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 60.680	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

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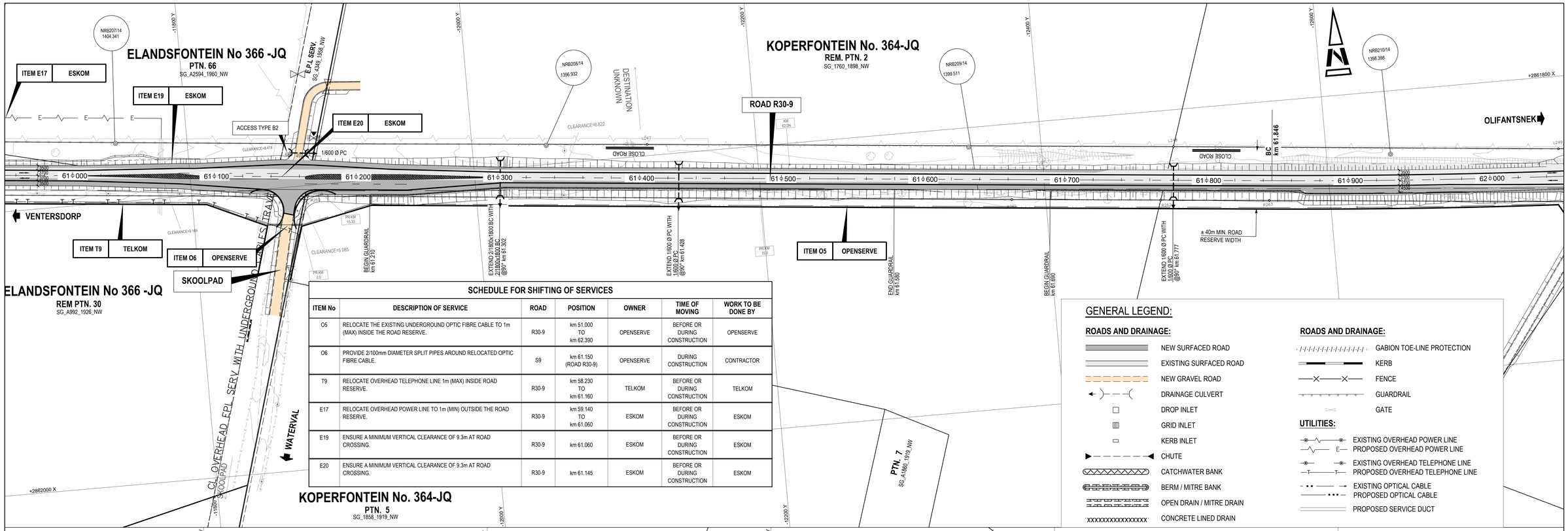
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for the SA NATIONAL ROADS AGENCY SOC LTD.
Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 59.000 TO km 61.000

SCALE : 1:1000 SHEET 16 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	59.000	61.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-016	VER
SANRAL DOCUMENT #		V1



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
O6	PROVIDE 2/100mm DIAMETER SPLIT PIPES AROUND RELOCATED OPTIC FIBRE CABLE.	S9	km 61.150 (ROAD R30-9)	OPENSERVE	DURING CONSTRUCTION	CONTRACTOR
T9	RELOCATE OVERHEAD TELEPHONE LINE 1m (MAX) INSIDE ROAD RESERVE.	R30-9	km 58.230 TO km 61.160	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM
E17	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 59.140 TO km 61.060	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E19	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 61.060	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E20	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 61.145	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

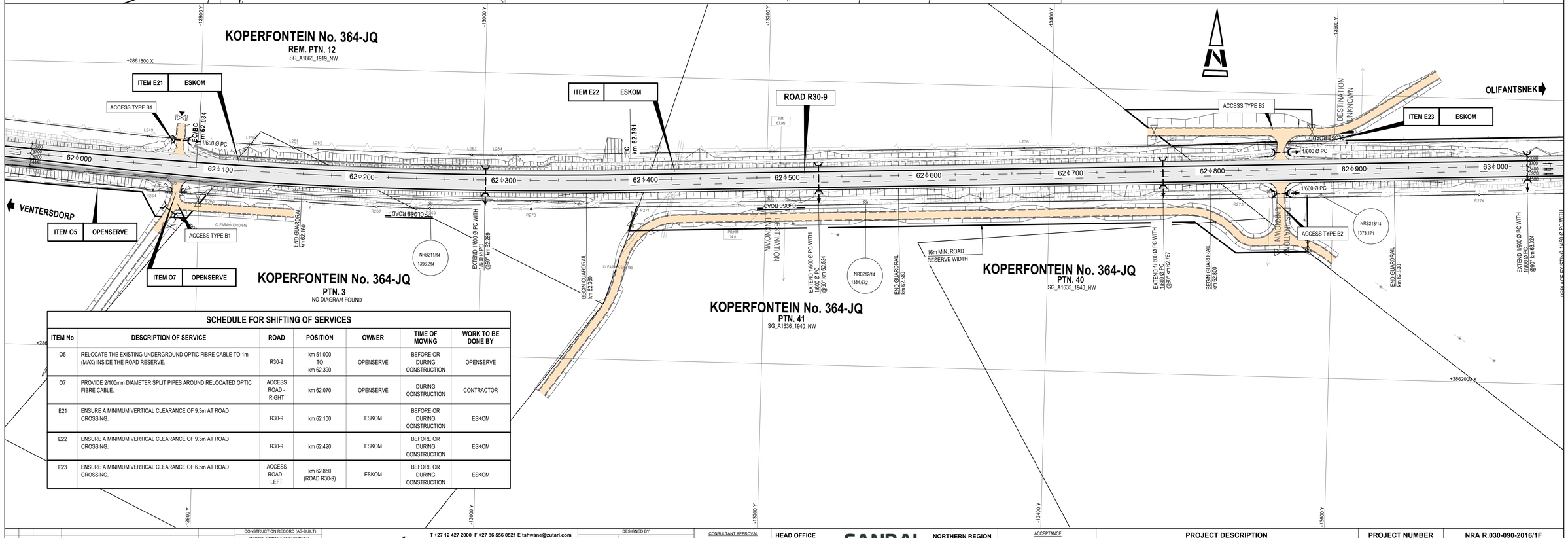
- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O5	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 51.000 TO km 62.390	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
O7	PROVIDE 2/100mm DIAMETER SPLIT PIPES AROUND RELOCATED OPTIC FIBRE CABLE.	ACCESS ROAD - RIGHT	km 62.070	OPENSERVE	DURING CONSTRUCTION	CONTRACTOR
E21	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 62.100	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E22	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 62.420	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E23	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	ACCESS ROAD - LEFT	km 62.850 (ROAD R30-9)	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
Name :
Prof. Reg. No. :
Date :
SANRAL PROJECT MANAGER
Name :
Date :

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NAME	I N NIEUWOUDT
Prof. Reg. No.	950345
CHECKED BY	
NAME	P KACHELHOFFER
Prof. Reg. No.	202101914
DRAWN BY	
NAME	I N NIEUWOUDT

CONSULTANT APPROVAL
Name : A. HARTMAN
Prof. Reg. No. : 20040105
Date :

HEAD OFFICE
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SANRAL SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
Reg. No 1998/009537/30
BUILDING SOUTH AFRICA THROUGH BETTER ROADS

NORTHERN REGION
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Private Bag X17
Lynnwood Ridge
0040
Tel: (012) 426 6200

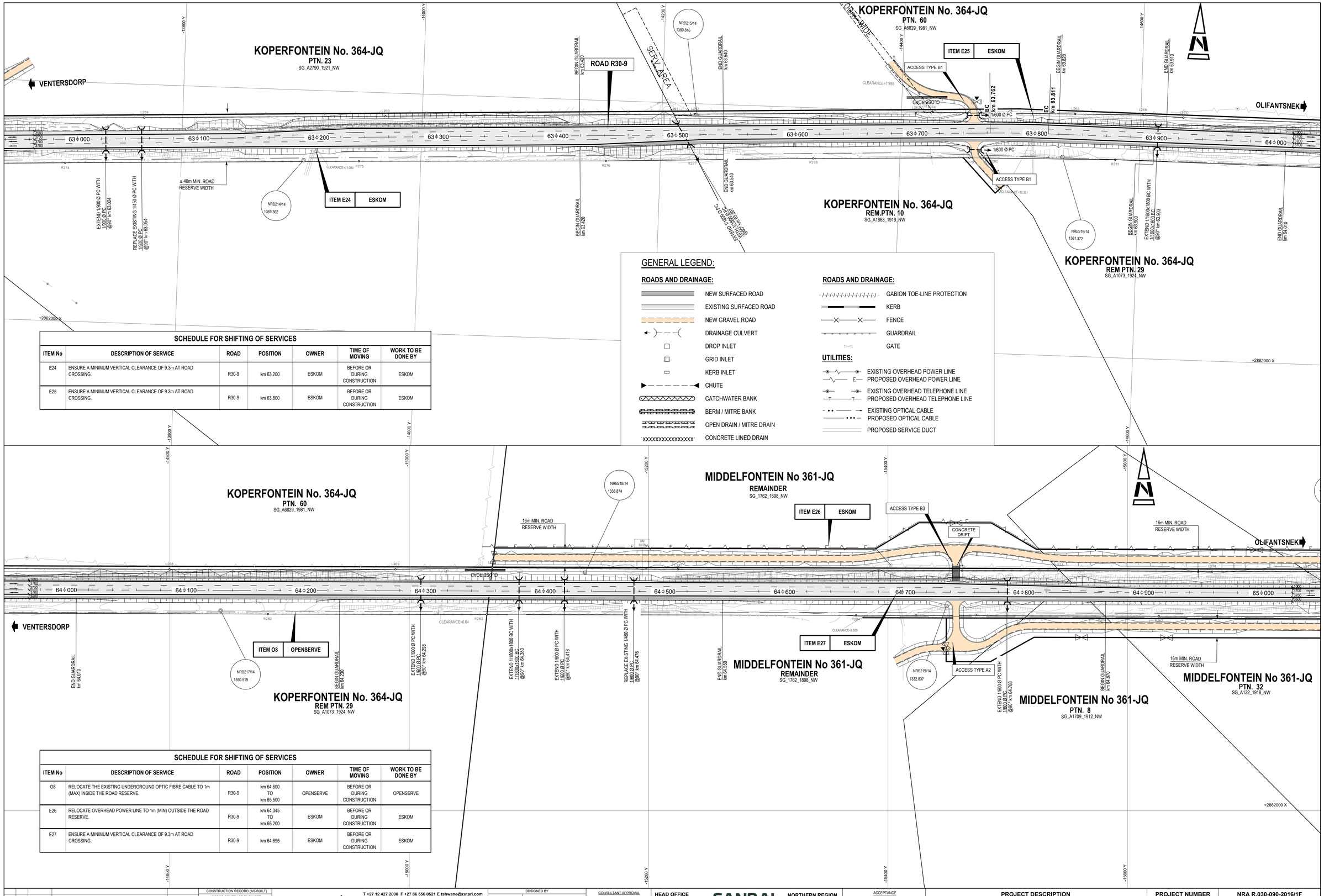
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 61.000 TO km 63.000

SCALE : 1:1000 SHEET 17 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	61.000	63.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-017	VER
SANRAL DOCUMENT #		V1



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E24	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 63.200	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E25	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 63.800	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O8	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 64.600 TO km 65.500	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
E26	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 64.345 TO km 65.200	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E27	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 64.695	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

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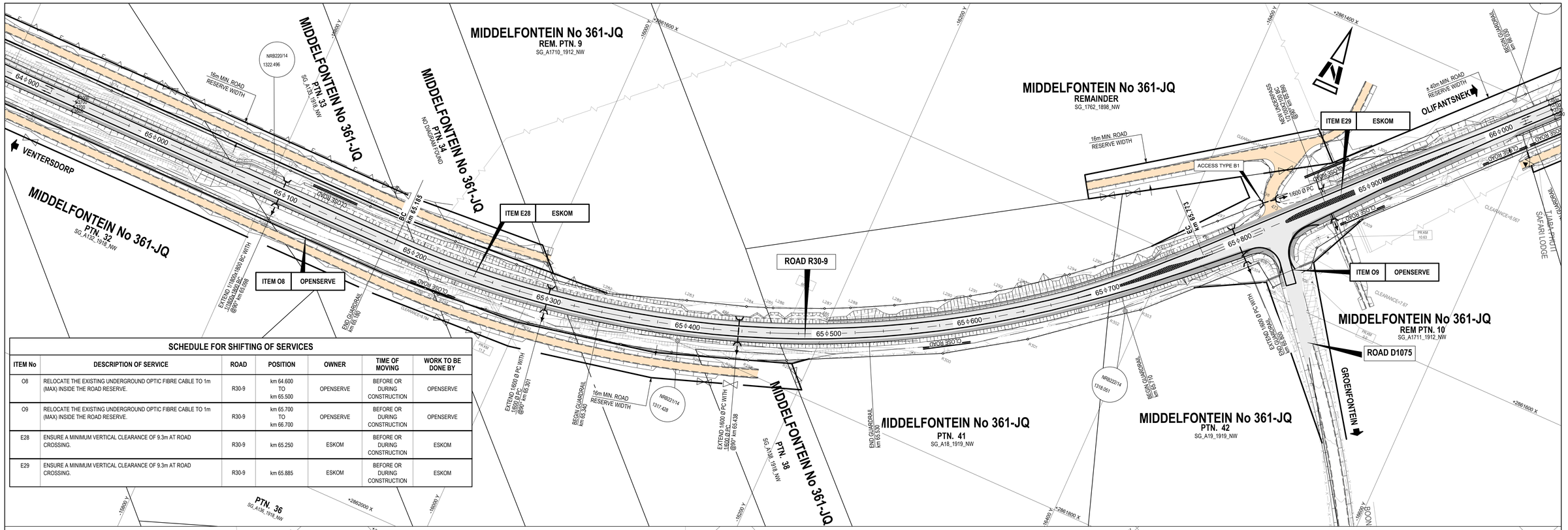
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 63.000 TO km 65.000

SCALE : 1:1000 SHEET 18 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	63.000	65.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-018	VER V1
SANRAL DOCUMENT #		


MIDDELFONTEIN No 361-JQ
REM. PTN. 9
SG_A1710_1912_NW
MIDDELFONTEIN No 361-JQ
PTN. 32
SG_A132_1916_NW
MIDDELFONTEIN No 361-JQ
PTN. 33
SG_A133_1916_NW
MIDDELFONTEIN No 361-JQ
PTN. 34
NO DIAGRAM FOUND
MIDDELFONTEIN No 361-JQ
REMAINDER
SG_1762_1898_NW
MIDDELFONTEIN No 361-JQ
PTN. 41
SG_A18_1919_NW
MIDDELFONTEIN No 361-JQ
PTN. 42
SG_A19_1919_NW
MIDDELFONTEIN No 361-JQ
REM PTN. 10
SG_A1711_1912_NW
PTN. 36
SG_A136_1916_NW
PTN. 38
SG_A138_1916_NW
MIDDELFONTEIN No 361-JQ
PTN. 11
NO DIAGRAM FOUND
MIDDELFONTEIN No 361-JQ
PTN. 12
SG_A1713_1912_NW
MIDDELFONTEIN No 361-JQ
REMAINDER
SG_1762_1898_NW
VENTERSDORP
OLIFANTSNEK
ROAD R30-9
ROAD D1075
GROENFONTEIN
SPRUIT
ITEM E28 ESKOM
ITEM E29 ESKOM
ITEM E30 ESKOM
ITEM E31 ESKOM
ITEM O8 OPENSERVE
ITEM O9 OPENSERVE
ACCESS TYPE B1
16m MIN. ROAD RESERVE WIDTH
±40m MIN. ROAD RESERVE WIDTH
CLOSE ROAD
CLEARANCE=9.87
CLEARANCE=9.067
CLEARANCE=9.87
CLEARANCE=9.87
CLEARANCE=9.87

MIDDELFONTEIN No 361-JQ
REMAINDER
SG_1762_1898_NW

MIDDELFONTEIN No 361-JQ
PTN. 13
SG_A1714_1912_NW

MIDDELFONTEIN No 361-JQ
PTN. 14
SG_A1715_1912_NW

MIDDELFONTEIN No 361-JQ
PTN. 39
SG_A140_1918_NW

PTN. 40
SG_A141_1918_NW

SG_A140_1918_NW

ROAD R30-9

ITEM E32 | ESKOM

ITEM E33 | ESKOM

BC km 67.553

EC km 67.179

EC km 67.919

± 40m MIN. ROAD RESERVE WIDTH

CLOSE ROAD

ACCESS TYPE A1

VENTERSDORP

OLIFANTSNEK

NRB2071/4 1298/89

NRB2071/4 1298/88

NRB2071/4 1298/87

NRB2071/4 1298/86

NRB2071/4 1298/85

NRB2071/4 1375/302

NRB2071/4 1298/29

67 ⌖ 000 | 67 ⌖ 100 | 67 ⌖ 200 | 67 ⌖ 300 | 67 ⌖ 400 | 67 ⌖ 500 | 67 ⌖ 600 | 67 ⌖ 700 | 67 ⌖ 800 | 67 ⌖ 900 | 68 ⌖ 000

BEGIN GUARDRAIL km 67.110

EXTEND 1600 Ø PC WITH 1600 Ø PC @90° km 67.284

EXTEND 1450 Ø PC WITH 1600 Ø PC @90° km 67.291

REPLACE EXISTING 1450 Ø PC WITH 1600 Ø PC @90° km 67.291

END GUARDRAIL km 67.310

BEGIN GUARDRAIL km 67.470

END GUARDRAIL km 67.590

EXTEND 1900 Ø PC WITH 1600 Ø PC @90° km 67.596

EXTEND 1900 Ø PC WITH 1600 Ø PC @90° km 67.603

EXTEND 1900 Ø PC WITH 1600 Ø PC @90° km 67.745

BEGIN GUARDRAIL km 67.860

EXTEND 1600 Ø PC WITH 1600 Ø PC @90° km 67.861

EXTEND 1900 Ø PC WITH 1600 Ø PC @90° km 67.882

END GUARDRAIL km 68.140

EXTEND 1600 Ø PC WITH 1600 Ø PC @90° km 68.017

EXTEND 1900 Ø PC WITH 1600 Ø PC @90° km 68.029

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E32	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 67.400	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E33	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 67.680	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

MIDDELFONTEIN No 361-JQ
REMAINDER
SG_1762_1898_NW

MIDDELFONTEIN No 361-JQ
PTN. 15
SG_A1716_1912_NW

MIDDELFONTEIN No 361-JQ
PTN. 20
SG_A1692_1912_NW

MIDDELFONTEIN No 361-JQ
PTN. 19
SG_A1692_1913_NW

MIDDELFONTEIN No 361-JQ
PTN. 39
SG_A140_1918_NW

SG_A1716_1912_NW

SG_A140_1918_NW

SPRUIT

ROAD R30-9

ITEM E34 | ESKOM

ACCESS TYPE B3

ACCESS TYPE A2

CONCRETE DRIFT

16m MIN. ROAD RESERVE WIDTH

± 40m MIN. ROAD RESERVE WIDTH

OLIFANTSNEK

VENTERSDORP

BC km 69.924

68 ⌖ 000 | 68 ⌖ 100 | 68 ⌖ 200 | 68 ⌖ 300 | 68 ⌖ 400 | 68 ⌖ 500 | 68 ⌖ 600 | 68 ⌖ 700 | 68 ⌖ 800 | 68 ⌖ 900 | 69 ⌖ 000

END GUARDRAIL km 68.000

EXTEND 1600 Ø PC WITH 1600 Ø PC @90° km 68.017

EXTEND 1900 Ø PC WITH 1900 Ø PC @90° km 68.029

BEGIN GUARDRAIL km 68.280

END GUARDRAIL km 68.360

BEGIN GUARDRAIL km 68.450

REPLACE 2300 Ø PC WITH 1600 Ø PC @90° km 68.529

NEW UNDERPASS 1210(W)x2100 BC @90° km 71.540

END GUARDRAIL km 68.560

BEGIN GUARDRAIL km 68.700

EXTEND 2300 Ø PC WITH 2300 Ø PC @90° km 68.812

EXTEND 1900 Ø PC WITH 1900 Ø PC @90° km 68.818

END GUARDRAIL km 68.910

EXTEND 1900 Ø PC WITH 1900 Ø PC @90° km 68.995

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E34	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 68.550 TO km 68.930	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

CONSTRUCTION RECORD (AS-BUILT)
WORKS CONTRACT ENGINEER
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SANRAL PROJECT MANAGER
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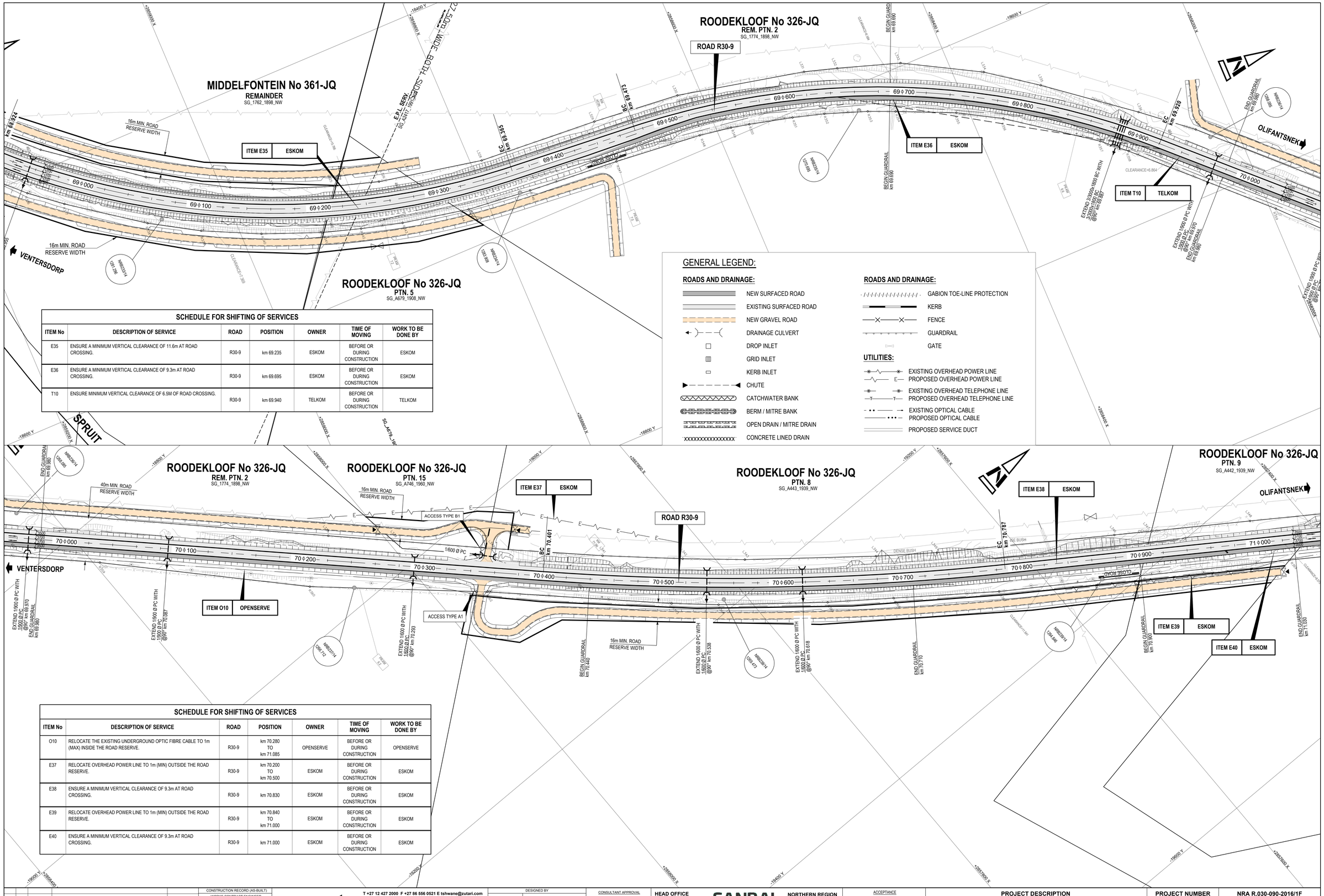
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 67.000 TO km 69.000

SCALE : 1:1000 SHEET 20 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	67.000	69.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-020	VER
SANRAL DOCUMENT #		V1



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E35	ENSURE A MINIMUM VERTICAL CLEARANCE OF 11.6m AT ROAD CROSSING.	R30-9	km 69.235	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E36	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 69.695	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
T10	ENSURE MINIMUM VERTICAL CLEARANCE OF 6.5M OF ROAD CROSSING.	R30-9	km 69.940	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O10	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 70.280 TO km 71.085	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
E37	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 70.200 TO km 70.500	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E38	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 70.830	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E39	RELOCATE OVERHEAD POWER LINE TO 1m (MIN) OUTSIDE THE ROAD RESERVE.	R30-9	km 70.840 TO km 71.000	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E40	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 71.000	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

No. CONS.	No. SANRAL	DATE	REVISION	CONSULT. ENG.
A	V1		ORIGINAL VERSION	A. HARTMAN

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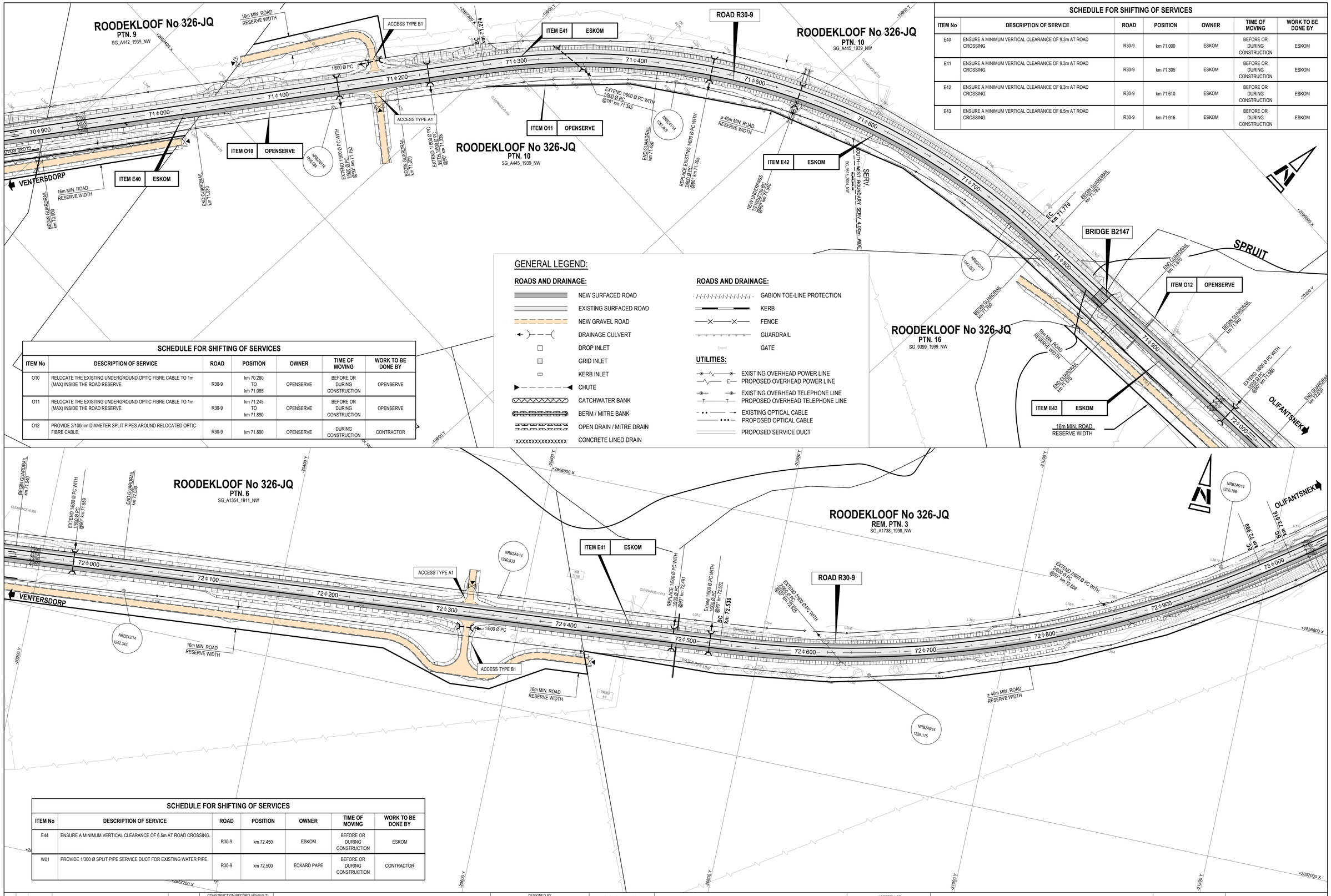
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 69.000 TO km 71.000

SCALE : 1:1000 SHEET 21 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	69.000	71.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-021	VER
SANRAL DOCUMENT #		V1



SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E40	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 71.000	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E41	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 71.305	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E42	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 71.610	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E43	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 71.915	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O10	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 70.280 TO km 71.085	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
O11	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	R30-9	km 71.245 TO km 71.890	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
O12	PROVIDE 2/100mm DIAMETER SPLIT PIPES AROUND RELOCATED OPTIC FIBRE CABLE.	R30-9	km 71.890	OPENSERVE	DURING CONSTRUCTION	CONTRACTOR

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E44	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 72.450	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
W01	PROVIDE 1/300 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING WATER PIPE.	R30-9	km 72.500	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR

No. CONS	No. [SANRAL]	DATE	REVISION	
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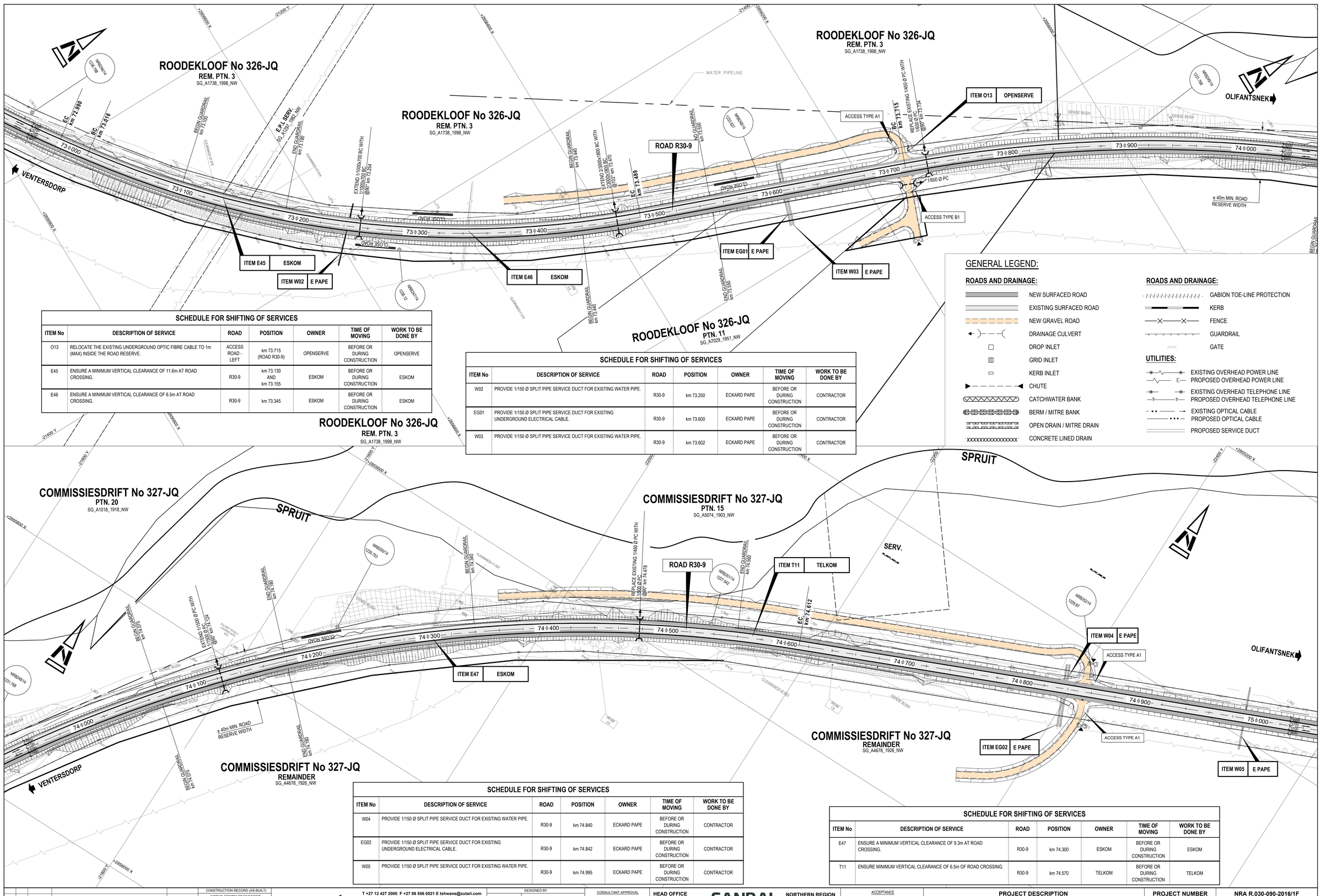
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Date:

PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 71.000 TO km 73.000

SCALE : 1:1000 SHEET 22 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	71.000	73.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-022	VER
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SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
O13	RELOCATE THE EXISTING UNDERGROUND OPTIC FIBRE CABLE TO 1m (MAX) INSIDE THE ROAD RESERVE.	ACCESS ROAD - LEFT	km 73.715 (ROAD R30-9)	OPENSERVE	BEFORE OR DURING CONSTRUCTION	OPENSERVE
E45	ENSURE A MINIMUM VERTICAL CLEARANCE OF 11.6m AT ROAD CROSSING.	R30-9	km 73.130 AND km 73.155	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E46	ENSURE A MINIMUM VERTICAL CLEARANCE OF 6.5m AT ROAD CROSSING.	R30-9	km 73.345	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
W02	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING WATER PIPE.	R30-9	km 73.250	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR
EG01	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING UNDERGROUND ELECTRICAL CABLE.	R30-9	km 73.600	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR
W03	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING WATER PIPE.	R30-9	km 73.602	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
W04	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING WATER PIPE.	R30-9	km 74.840	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR
EG02	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING UNDERGROUND ELECTRICAL CABLE.	R30-9	km 74.842	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR
W05	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING WATER PIPE.	R30-9	km 74.995	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E47	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 74.300	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
T11	ENSURE MINIMUM VERTICAL CLEARANCE OF 6.5m OF ROAD CROSSING.	R30-9	km 74.570	TELKOM	BEFORE OR DURING CONSTRUCTION	TELKOM

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

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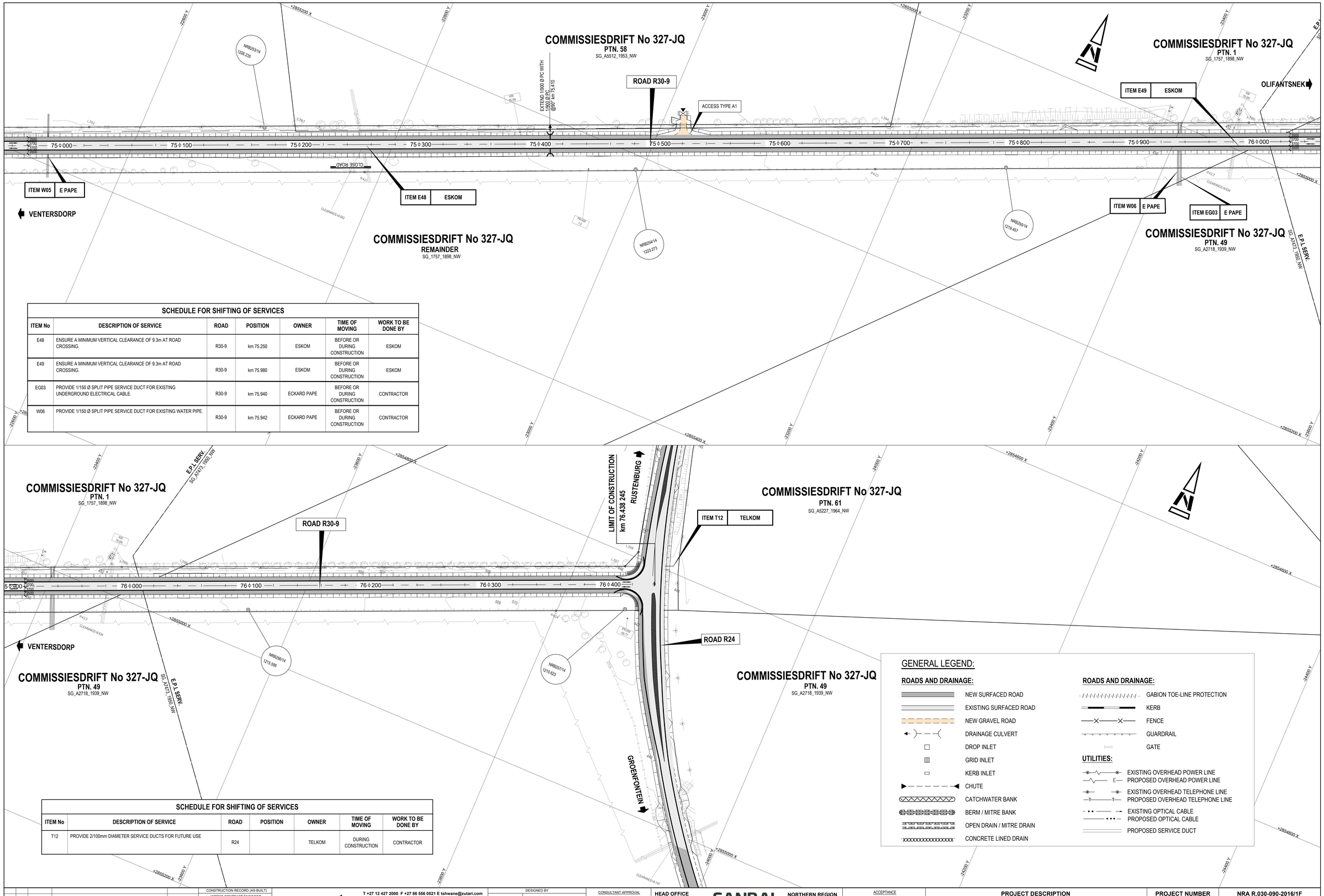
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PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9 FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 73.000 TO km 75.000

SCALE : 1:1000 SHEET 23 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	73.000	75.000
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-023	VER V1
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SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
E48	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 75.250	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
E49	ENSURE A MINIMUM VERTICAL CLEARANCE OF 9.3m AT ROAD CROSSING.	R30-9	km 75.980	ESKOM	BEFORE OR DURING CONSTRUCTION	ESKOM
EG03	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING UNDERGROUND ELECTRICAL CABLE.	R30-9	km 75.940	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR
W06	PROVIDE 1/150 Ø SPLIT PIPE SERVICE DUCT FOR EXISTING WATER PIPE.	R30-9	km 75.942	ECKARD PAPE	BEFORE OR DURING CONSTRUCTION	CONTRACTOR

SCHEDULE FOR SHIFTING OF SERVICES

ITEM No	DESCRIPTION OF SERVICE	ROAD	POSITION	OWNER	TIME OF MOVING	WORK TO BE DONE BY
T12	PROVIDE 2/100mm DIAMETER SERVICE DUCTS FOR FUTURE USE	R24		TELKOM	DURING CONSTRUCTION	CONTRACTOR

GENERAL LEGEND:

ROADS AND DRAINAGE:

- NEW SURFACED ROAD
- EXISTING SURFACED ROAD
- NEW GRAVEL ROAD
- DRAINAGE CULVERT
- DROP INLET
- GRID INLET
- KERB INLET
- CHUTE
- CATCHWATER BANK
- BERM / MITRE BANK
- OPEN DRAIN / MITRE DRAIN
- CONCRETE LINED DRAIN

ROADS AND DRAINAGE:

- GABION TOE-LINE PROTECTION
- KERB
- FENCE
- GUARDRAIL
- GATE

UTILITIES:

- EXISTING OVERHEAD POWER LINE
- PROPOSED OVERHEAD POWER LINE
- EXISTING OVERHEAD TELEPHONE LINE
- PROPOSED OVERHEAD TELEPHONE LINE
- EXISTING OPTICAL CABLE
- PROPOSED OPTICAL CABLE
- PROPOSED SERVICE DUCT

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PROJECT DESCRIPTION
UPGRADING OF NATIONAL ROAD R30 SECTION 9
FROM km 29.0 TO R24 (OLIFANTSNEK) (km 76.6)

DRAWING DESCRIPTION
LAYOUT PLAN
ROAD R30-9: km 75.000 TO km 76.438

SCALE : 1:1000 SHEET 24 OF 24

PROJECT NUMBER	NRA R.030-090-2016/1F	
DRAWING LOCATION DATA	START	END
ROUTE	R30	R30
SECTION	9	9
DRAWING km DISTANCE	75.000	76.438
DRAWING TYPE	ROADS - LAYOUTS AND LONG SECTION	
BRIDGE/STRUCTURE No.		
CONSULTANT DRAWING No.	1001455-0000-DRG-RR-06-024	VER
SANRAL DOCUMENT #		V1

BIODIVERSITY IMPACT ASSESSMENT:

PROPOSED UPGRADE ON THE NATIONAL ROAD R30 ROAD SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6), RUSTENBURG LOCAL MUNICIPALITY, BOJANALA DISTRICT MUNICIPALITY LOCATED IN THE NORTH WEST PROVINCE.



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November 2023

CONDITIONS RELATING TO THIS REPORT

DECLARATION OF INTEREST

Ntumbuluko Consulting Pty (Ltd) has no vested interest in the property studied nor is it affiliated with any other person/body involved with the property and/or proposed development. Ntumbuluko Consulting Pty (Ltd) is not a subsidiary, legally or financially of the proponent. The study was undertaken by Mr Tshuxekani Maluleke, he is a registered Natural Scientists with the following details:

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SPECIALIST	QUALIFICATION
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APPROVAL

PREPARED BY:

Mr Tshuxekani Maluleke



Wetland and Biodiversity Specialist

Msc. Environmental Sciences

SACNASP

07 November 2023

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LIST OF ABBREVIATIONS

ALARP	As Low as Reasonably Practicable
BES	Biodiversity and Ecosystem Services
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CBD	Convention on Biological Diversity
CR	Critically Endangered
ESA	Ecological Support Areas
EN	Endangered
GIS	Geographic Information System
I&APS	Interested & Affected Parties
IPPC	International Plant Protection Convention
IUCN	International Union for Conservation of Nature
LC	Least Concern
NBF	National Biodiversity Framework
NEMA	National Environmental Management Act (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NT	Near Threatened
PA	Protected Areas
SANBI	South African National Biodiversity Institute
SSC	Species of Special Concern
VU	Vulnerable

DEFINITIONS

Alien animal	**(a) Any live vertebrate, including a bird and a reptile, but excluding a fish, belonging to a species or subspecies that is not a recognised domestic species and the natural habitat of which is not in the Republic; or** **(b) The egg of such vertebrate.**
Biodiversity	Means the diversity of animals, plants or other organisms, including the diversity of animals, plants or other organisms found within and between— (a) Ecosystems; (b) Habitats; (c) The ecological complexes of which these systems and habitats are part; and (d) Species.
CITES	Means the Convention on International Trade in Endangered Species of Wild Fauna and Flora;
Endangered Species	Means a species is endangered when it is facing a very high risk of extinction in the wild in the near future and includes— (*a*) Any living or dead specimen of such a species; or (*b*) Any egg, skin, bone, feather, seed, flower or any other part or derivative of such a species.
Environment	Means the surroundings within which humans exist and that are made up of— (*a*) The land, water and atmosphere of the earth; (*b*) Microorganisms, plant and animal life; (*c*) Any part or combination of (*a*) and (*b*) and the interrelationships amongst and between them; and (*d*) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing;
Indigenous plant	(*a*) Means any living or dead plant which is indigenous to the Republic, whether artificially propagated or in its wild state; and

	(*b*) Includes the flower, pollen, seed, cone, fruit, bulb, tuber, stem or root or any other part or derivative of such plant but does not include a plant declared a weed in terms of any legislation.
Protected area	Means— (*a*) A provincial nature reserves; (*b*) A site of ecological importance; (*c*) A protected environment; (*d*) A private nature reserves; or (*e*) A resource use area.
Protected environment	Means an area declared a Protected Environment or Private Nature Reserve in terms of section 21 (1) (*a*).

1 INTRODUCTION

Ntumbuluko Consulting (Pty) Ltd has been appointed by Earthlink Environmental Services (Pty) Ltd on behalf of The South African National Roads Agency SOC Ltd or SANRAL to conduct a Biodiversity Impact Assessment along a 105.6km long section of the R30 Road, in the Rustenburg Local Municipality, Bojanala District Municipality, North West Province. The purpose of this study is to describe and characterise the terrestrial environment, habitats and species present on site. Biodiversity is defined according to the National Environmental Management: Biodiversity Act of 2004 (NEMBA), as "the variability among living organisms from all sources including, terrestrial, aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems". The NEMBA legislation upholds the country's commitment to the protection of South Africa's biological resources and it is imperative that development takes place in a sustainable way to achieve this.

2 PROJECT DESCRIPTION

SANRAL proposes to upgrade national Road R30 Section 9 from (Km 29) To R24 (Olifantsnek) (Km 76.6).

Major aspects of this project :

- Increasing road reserve width;
- Strengthening the existing pavement;
- Widening of the existing road cross section;
- Vertical and horizontal geometric improvements;
- Reconstruction of river bridge and lengthening of all major and minor culverts;
- Possible horizontal re-alignment of the road at river bridge or
- Possible 10m wide temporary deviation (approximately 500m in length) to accommodate two-way traffic during construction at river bridge;
- Construction of ± 15km of service roads including new right of way (ROW);
- Opening of 1 hard-rock quarry and re-entry into 6 potential borrow pits; and
- Stockpile areas and vegetation clearance outside road reserve in excess of one hectare.

3 STUDY AREA

The project is located within the boundaries of the Rustenburg Local Municipality, which forms part of the Bojanala District Municipality located in the North West Province, South Africa (**Figure 1**). The study site is dominated by cultivated land (**Figure 2**).

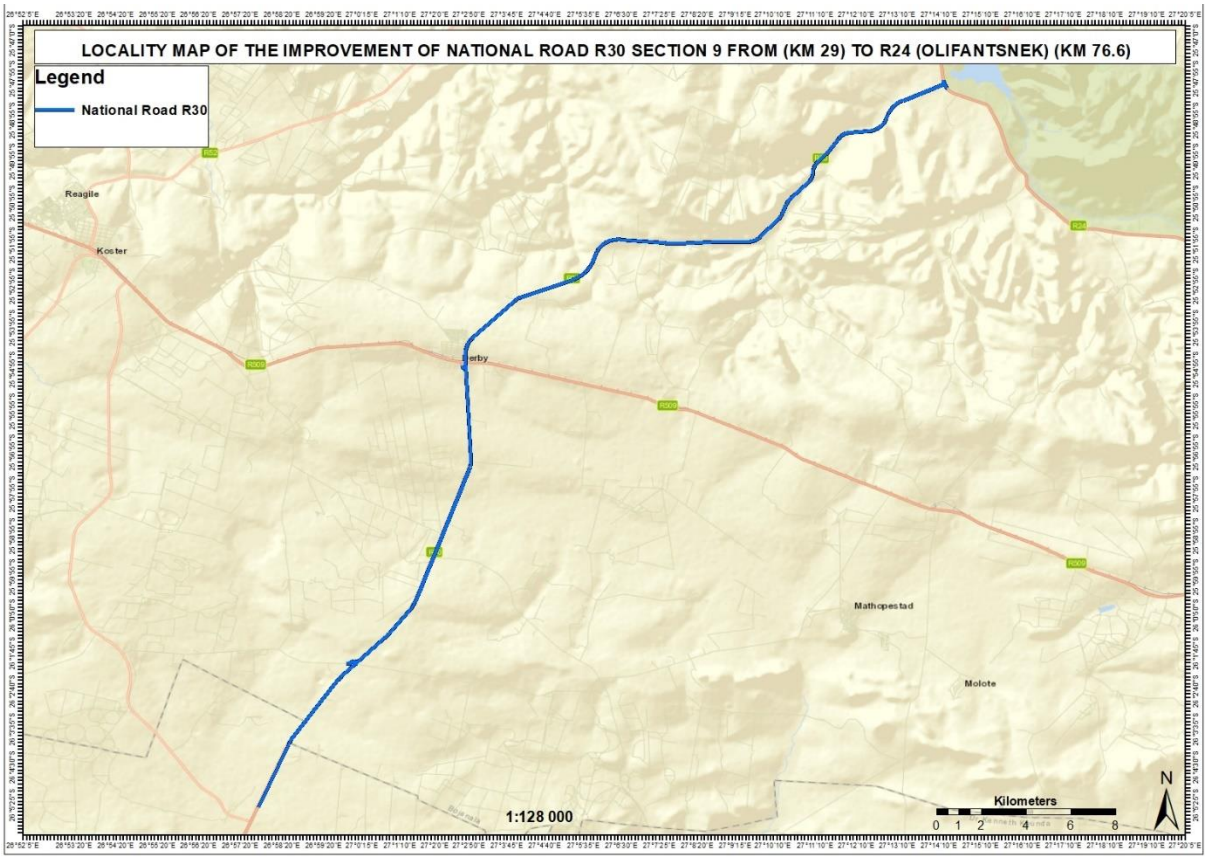


Figure 1:Locality Map

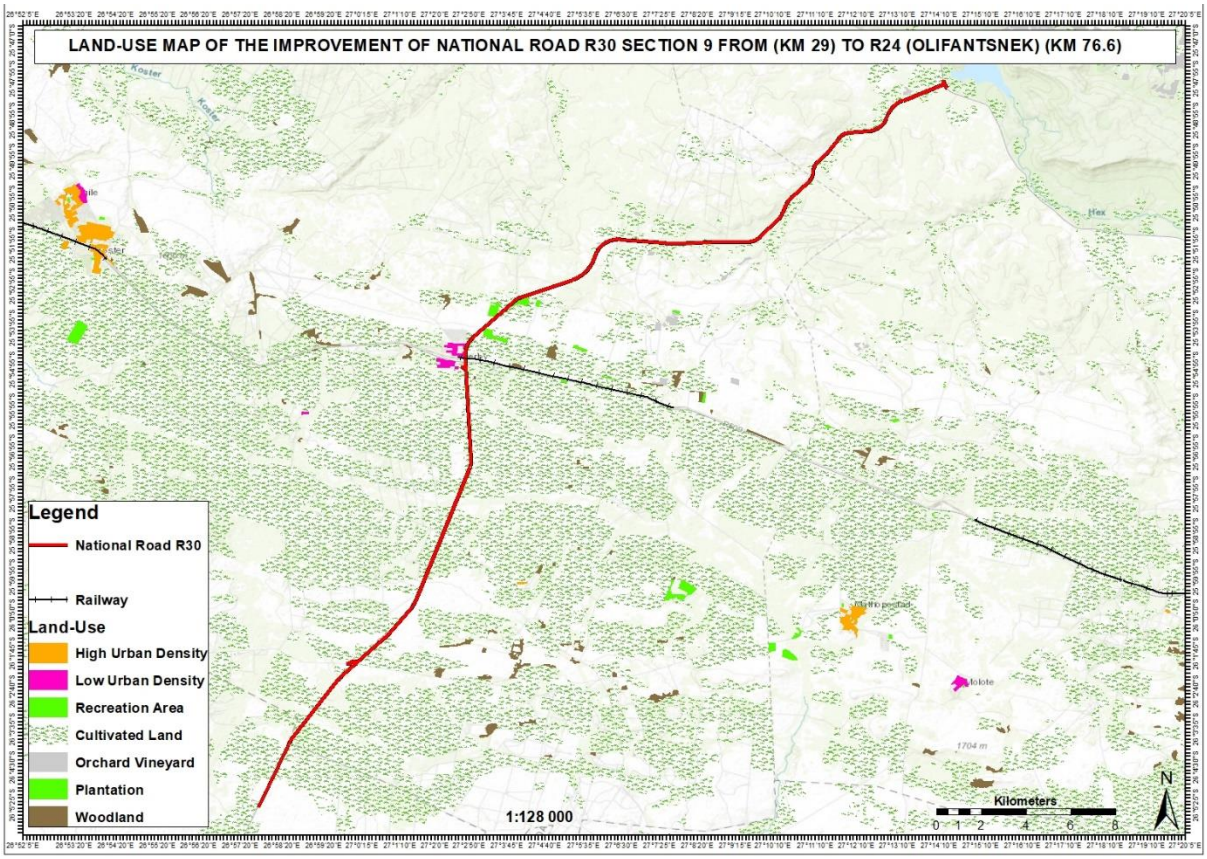


Figure 2: Landuse Map

4 TERMS OF REFERENCE

Ntumbuluko Consultants (Pty) Ltd has been appointed to undertake the following specialist functions:

- Assess the potential impacts of the proposed project on both the fauna and flora.
- Provide mitigation measures, rehabilitation process and/or vegetation removal procedures that would reduce the potential impacts of the developments on biodiversity.

4.1 SCOPE OF STUDY

1.1.1 Floral study:

- Conduct fieldwork to locate and identify the current state of vegetation on the study area, with emphasis on the footprint of the project.
- Determine the species that are present onsite.
- Identify sensitive vegetation types and critical biodiversity areas on site.
- Identify Critical Biodiversity and Ecological Support Areas onsite.

- Determine whether the location of the existing R30 is located within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected.
- Provide photographic evidence of the current state of vegetation onsite (i.e. natural or transformed, disturbed etc.) identify and describe the conservation value and conservation planning that are relevant to the site.
- Determine alien species present onsite and the recommended management actions.
- Describe the potential direct, indirect and cumulative negative and positive impacts of the proposed activity on the vegetation species during construction, operation and decommissioning phases of the project.
- Identification of issues and potential direct, indirect and cumulative biodiversity impacts.
- Provide monitoring requirements, mitigation measures and recommendations.

1.1.2 Faunal study:

- Conduct fieldwork to describe and assess the current state of terrestrial fauna in the area.
- Describe the existing micro-habitats, and the species associated with those habitats.
- Provide a description of species composition and conservation status in terms of protected, endangered or vulnerable faunal species.
    - This description will include species which are likely to occur within, traverse across or forage within the proposed project area, as well as species which may not necessarily occur on site, but which are likely to be impacted upon as a result of the proposed development.

5 LEGAL FRAMEWORK

The following national and provincial legislative guidelines and requirements were followed as part of this study:

5.1 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT NO 107 OF 1998) (NEMA) AS AMENDED

This Act embraces all three (3) fields of environmental concern namely: resource conservation and exploitation; pollution control and waste management; and land-use planning and development. The environmental management principles include the duty of care for wetlands and special attention is given to management and planning procedures. NEMA provides for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith.

5.2 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT NO 10 OF 2004) (NEM: BA)

NEMBA was signed into law in mid-2004 and entered into effect on 1 September 2004. NEM: BA provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities. Certain activities, known as Restricted Activities, are regulated on listed species using permits by a special set of regulations published under the Act. Restricted activities regulated under the act are keeping, moving, having in possession, importing and exporting, and selling.

5.3 THE NATIONAL BIODIVERSITY FRAMEWORK (2017-2022)

The National Biodiversity Framework (NBF) is a requirement under Section 38 of the National Environmental Management: Biodiversity Act (Act 10 of 2004, hereafter referred to as the 'Biodiversity Act'). The NBF is a short to medium-term coordination tool that shows the alignment between the strategic objectives and outcomes identified in the National Biodiversity Strategy and Action Plan (NBSAP v.2, 2015) and other key national strategies, frameworks and systems that currently guide the work of the biodiversity sector and identifies mechanisms through which this work is coordinated. It also identifies a set of interventions or "acceleration measures" that can unlock or fast-track implementation of the NBSAP and indicates the relative roles of the many agencies involved in implementing these activities. The purpose of the NBF is not to provide a comprehensive review of all work currently being undertaken in the biodiversity sector, nor to list all of the actions

required to conserve and manage South Africa's biodiversity in support of sustainable development.

5.4 THE NORTH WEST BIODIVERSITY MANAGEMENT ACT, 2016 (ACT NO. 4 OF 2016) (NWBMA).

The objective of this act is to provide for the management and conservation of the North West Province's biophysical environment and protected areas within the framework of the National Environmental Management Act, 1998 (Act No 107 of 1998); to provide for the protection of species and ecological systems that warrant provincial protection; to provide for the sustainable use of indigenous biological resources; and to provide for matters connected therewith.

As per Chapter 4 Part 1 Section 13 (2), in addition to the species contemplated in schedule 2 and 3 of this Act, the responsible Member may, by notice in the Gazette, publish a further list of:

(a) Specially protected species, includes all indigenous species of animals and plants that are potentially threatened, exploited and economically important, and those that are listed under Section 56(1) of the Biodiversity Act, as well as under the National Forests Act of 1998 (Act No 84 of 1998), and those to receive additional protection beyond that of the ordinary species in the province;

(b) ordinary species, includes all common, widely distributed, indigenous species of vertebrates of the province that are not otherwise listed in any other categories, and that are to receive nominal protection.

Restricted activities involving listed specially protected species as per section 15 include:

(1) Any person who intends to carry out a restricted activity involving a specimen of listed specially protected species must do so by means of a permit issued in terms of Chapter 8;

(2) Permits contemplated in subsection (1) may differentiate between different categories of applicants and may impose different validity periods, and

(3) No person may import, introduce into the province from another country, export or re –export from the Province to another country a specimen of any listed species in the Appendices of the CITES without a permit issued in terms of Chapter 8.

5.5 CONSERVATION OF AGRICULTURAL RESOURCES ACT (ACT NO 43 OF 1983) (CARA):

This act regulates the utilization and protection of wetlands, soil conservation and all matters relating thereto; control and prevention of veld fires, control of weeds and invader plants, the prevention of water pollution resulting from farming practices and losses in biodiversity.

5.6 THE NATIONAL FOREST ACT (ACT NO 84 OF 1998) (NFA)

The main objective of the National Forests Act, 1998 is to promote the sustainable management and development of forests and to provide protection for certain forests and trees. This said protection is provided through the protection of all natural forests (Section 7 (1), the protection of all trees declared to be protected in terms of section 12(1) of the Act, and the regulation of certain activities in a proclaimed State forest (Section 23(1)(a) – (k)). It should be noted that there are other environmental legislation administered by other State Departments that also regulate natural resources. The Act is responsible for:

- Promotes the sustainable management and development of forests for the benefit of all;
- Creates the conditions necessary to restructure forestry in South Africa;
- Provide special measures for the protection of certain forests and protected trees;
- Promotes the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes;
- Promotes community forestry; and
- Promotes greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination.

5.7 MINING AND BIODIVERSITY GUIDELINE

The Mining and Biodiversity Guideline, 2013 (the Guideline) was developed by the Department of Mineral Resources, Department of Mineral Resources, Chamber of Mines, South African National Biodiversity Institute and the South African Mining and Biodiversity Forum, with the intention to find a balance between economic growth and environmental sustainability (i.e. in the name of sustainable development). The Guideline is envisioned as a tool to “foster a strong relationship between biodiversity and mining which will eventually translate into best practice within the mining sector.” In identifying biodiversity priority areas which have different levels of risk against mining, the Guideline categorises

biodiversity priority areas into 4 classes with the following levels of risk for mining attached to them:

1. Legally protected areas, where mining is prohibited;
2. Ares of highest biodiversity importance, which are at the highest risk for mining;
3. Areas of high biodiversity importance, which are at a high risk for mining; and
4. Areas of moderate biodiversity importance, which are at a moderate risk for mining

5.8 CONVENTION ON BIOLOGICAL DIVERSITY

The objectives of the CBD are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from commercial and other utilization of genetic resources. The agreement covers all ecosystems, species, and genetic resources.

5.9 CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA (CITES)

The CITES aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Through its three appendices, the Convention accords varying degrees of protection to more than 30,000 plant and animal species.

5.10 CONVENTION ON THE CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS

The CMS, or the Bonn Convention aims to conserve terrestrial, marine and avian migratory species throughout their range. Parties to the CMS work together to conserve migratory species and their habitats by providing strict protection for the most endangered migratory species, by concluding regional multilateral agreements for the conservation and management of specific species or categories of species, and by undertaking co-operative research and conservation activities.

5.11 THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable

agriculture and food security. The Treaty covers all plant genetic resources for food and agriculture, while it's Multilateral System of Access and Benefit-sharing covers a specific list of 64 crops and forages. The Treaty also includes provisions on Farmers' Rights.

5.12 CONVENTION ON WETLANDS (POPULARLY KNOWN AS THE RAMSAR CONVENTION)

The Ramsar Convention provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention covers all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.

5.13 WORLD HERITAGE CONVENTION (WHC)

The primary mission of the WHC is to identify and conserve the world's cultural and natural heritage, by drawing up a list of sites whose outstanding values should be preserved for all humanity and to ensure their protection through a closer co-operation among nations.

5.14 RAMSAR CONVENTION

The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. The treaty was adopted in the Iranian city of Ramsar in 1971 and the Convention's member countries cover all geographic regions of the planet.

5.15 INTERNATIONAL PLANT PROTECTION CONVENTION (IPPC)

The IPPC aims to protect world plant resources, including cultivated and wild plants by preventing the introduction and spread of plant pests and promoting the appropriate measures for their control. The convention provides the mechanisms to develop the International Standards for Phytosanitary Measures (ISPMs), and to help countries to implement the ISPMs and the other obligations under the IPPC, by facilitating the national capacity development, national reporting and dispute settlement. The Secretariat of the IPPC is hosted by the Food and Agriculture Organization of the United Nations (FAO).

6 SITE CHARACTERISTICS

6.1 GEOLOGY & SOILS

A large section of the road consist of the Clastic sediments and minor carbonates and volcanics of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west, all of the Transvaal Supergroup (Vaalian). There is also some contribution from mafic Bushveld intrusives. Soils often stony with colluvial clay-loam but varied, including red-yellow apedal freely drained, dystrophic and eutrophic plinthic catenas, vertic and melanic clays, and some less typical Glenrosa and Mispah forms. Land types Ae, Ba, Ea, Bc, Ac and less typically Fb.

6.2 CLIMATE

The study site experiences strong seasonal summer-rainfall, warm-temperate region, with very dry winters. The Mean Annual Precipitation (MAP) is 654 mm, ranging between 570 mm and 730 mm, slightly lower in the western regions. The coefficient of variation of MAP is 28% in the west and 26–27% in the east, and varies only slightly from 25% to 29% across the unit. The incidence of frost is higher in the west (30–40 days) than in the east (10–35 days). See also climate diagram for Gm 11 Rand Highveld Grassland (Figure 8.36).

6.3 VEGETATION TYPES ALONG R30 ROAD

6.3.1 Gh 15 Carletonville Dolomite Grassland

The area where the National R30 Starts is dominated by the Gh 15 Carletonville Dolomite Grassland (Figure 2). This vegetation unit features Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species. It is distributed in the North-West (mainly) and Gauteng and marginally into the Free State Province. In the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province. Altitude 1 360–1 620 m, but largely 1 500–1 560 m.

6.3.2 Gm 11 Rand Highveld Grassland

The R30 Road consist of the **Gm 11 Rand Highveld Grassland** vegetation (**Figure 2**) type which is characterized by Highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper

slopes. Most common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra*, *P. welwitschii*, *Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Rhus* (especially *R. magalismonata*) is most prominent.

The Gm 11 Rand Highveld Grassland is distributed in the Gauteng, North-West, Free State and Mpumalanga Provinces: In areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugersdorp centred in the vicinity of Derby and Potchefstroom, extending southwards and northeastwards from there. Altitude 1 300–1 635 m, but reaches 1 760 m in places.

6.3.3 SVcb 8 Moot Plains Bushveld

A significant section of the R30 Road consists of the **SVcb 8 Moot Plains Bushveld** vegetation type (**Figure 2**). This vegetation type consists of Open to closed, low, often thorny savanna dominated by various species of *Acacia* in the bottomlands and plains as well as woodlands of varying height and density on the lower hillsides. Herbaceous layer is dominated by grasses.

The SVcb 8 Moot Plains Bushveld vegetation is distributed in the North-West and Gauteng Provinces: Main belt occurs immediately south of the Magaliesberg from the Selons River Valley in the west through Maanhaarrand, filling the valley bottom of the Magalies River, proceeding east of the Hartebeestpoort Dam between the Magaliesberg and Daspoort mountain ranges to Pretoria. It also occurs as a narrow belt immediately north of the Magaliesberg from Rustenburg in the west to just east of the Crocodile River in the east: also south of the Swartruggens–Zeerust line. Altitude typically about 1 050–1 450 m.

6.3.4 SVcb 9 Gold Reef Mountain Bushveld

In addition to the above mentioned vegetation units, the study site consists of the **SVcb 9 Gold Reef Mountain Bushveld.** This vegetation is characterized by Rocky hills and ridges often west-east trending with more dense woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of A*cacia caffra* on the southern slopes). Tree cover elsewhere is variable. Tree and shrub layers are often continuous. Herbaceous layer is dominated by grasses.

This vegetation unit is North-West, Gauteng, Free State and Mpumalanga Provinces: Occurs along rocky quartzite ridges of the Magaliesberg and the parallel ridge to the south, from

around Boshoek and Koster in the west to near Bronkhorstspruit in the east. The west-east-trending ridge of the Witwatersrand from around Krugersdorp in the west, through Roodepoort and Johannesburg to Bedfordview (Germiston District). Inner ridges (e.g. Dwarsberg and Witkop) of the Vredefort Dome on the Vaal River northwest of Parys and part of the Suikerbosrand and some other hills around Heidelberg. Altitude 1 200–1 750 m.

The taxa associated with the dominant vegetation units are summarized on **Table 1 below**.

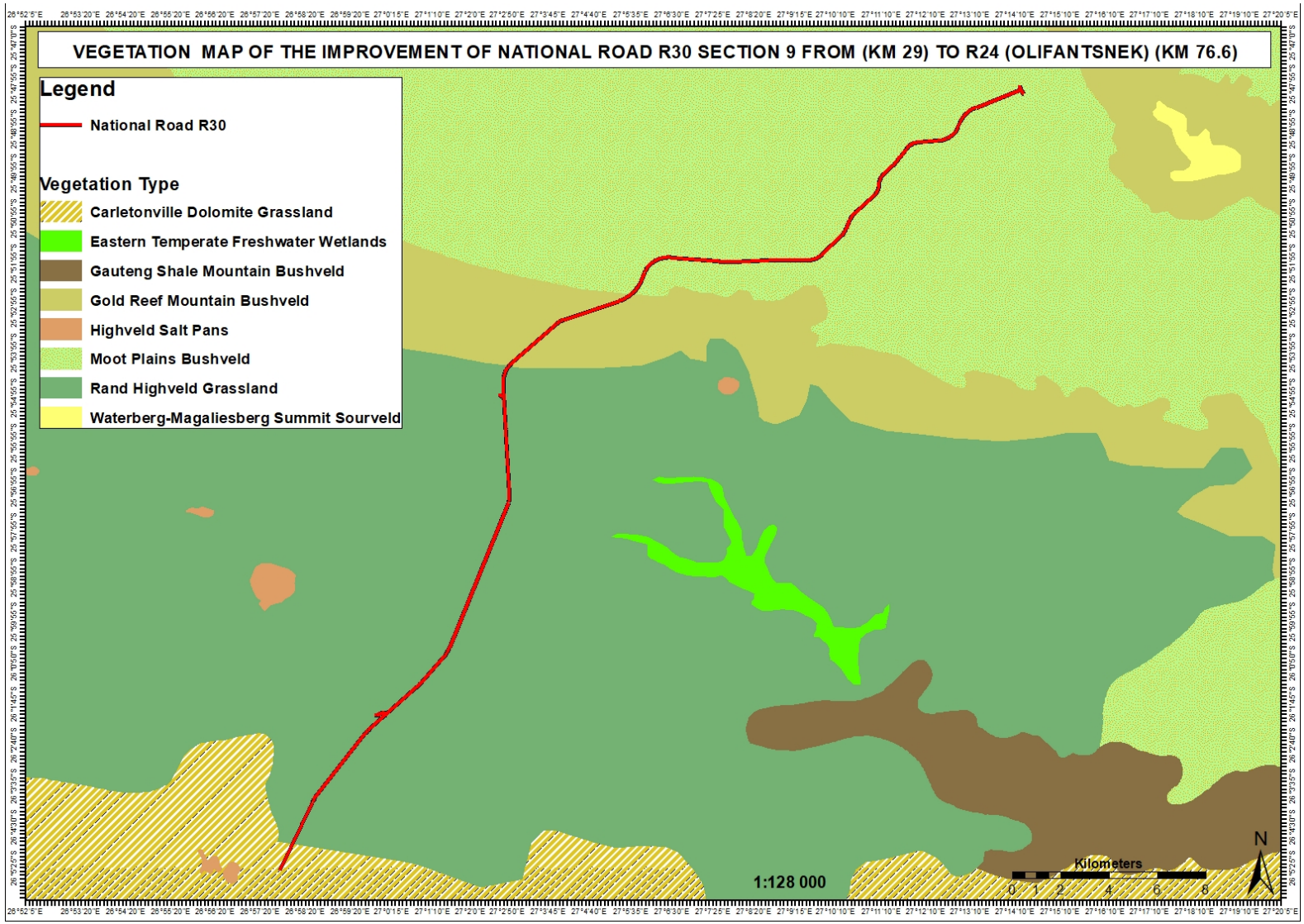


Figure 3: Vegetation Map-along the R30 Road.

Table 1: Important Taxa within the Sekhukhune Plains and Mountain Bushvelds (Mucina and Rutherford 2006)

PLANT FORM	SPECIES
Gm 11 Rand Highveld Grassland	
Graminoids	*Ctenium concinnum (d), Cynodon dactylon (d), Digitaria monodactyla (d), Diheteropogon amplec¬tens (d), Eragrostis chloromelas (d), Heteropogon contortus (d), Loudetia simplex (d), Monocymbium ceresiiforme (d), Panicum natalense (d), Schizachyrium sanguineum (d), Setaria sphacelata (d), Themeda triandra (d), Trachypogon spicatus (d), Tristachya biseriata (d), T. rehmannii (d), Andropogon schirensis, Aristida aequiglumis, A. congesta, A. junciformis subsp. galpinii, Bewsia biflora, Brachiaria nigropedata, B. serrata, Bulbostylis burchellii, Cymbopogon caesius, Digitaria tricholaenoides, Elionurus muticus, Eragrostis capensis, E. curvula, E. gummiflua, E. plana, E. racemosa, Hyparrhenia hirta, Melinis nerviglumis, M. repens subsp. repens, Microchloa caffra, Setaria nigrirostris, Sporobolus pectinatus, Trichoneura grandiglumis, Urelytrum agropyroides. Herbs: Acanthospermum australe (d), Justicia anagalloides (d), Pollichia campestris (d), Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Helichrysum caespititium, H. nudifolium var. nudifolium, H. rugulosum, Ipomoea crassipes, Kohautia amatymbica, Lactuca inermis, Macledium zeyheri subsp. argyrophylum, Nidorella hottentotica, Oldenlandia herbacea, Rotheca hirsuta, Selago densiflora, Senecio coronatus, Sonchus dregeanus, Vernonia oligocephala, Xerophyta reti¬nervis.*
Geophytic Herbs	*Boophone disticha, Cheilanthes hirta, Haemanthus humilis subsp. humilis, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia, Oxalis corniculata.*
Succulent Herb	*Aloe greatheadii var. davyana*
Low Shrubs	*Anthospermum rigidum subsp. pumilum, Indigofera comosa, Rhus magalismontana, Stoebe plumosa.*
Succulent Shrub	*Lopholaena coriifolia (d).*
Geoxylic Suffrutex	*Elephantorrhiza elephantina.*
SVcb 8 Moot Plains Bushveld	

PLANT FORM	SPECIES
Small Trees	*Acacia nilotica (d), A. tortilis subsp. heteracantha (d), Rhus lancea (d).*
Tall Shrubs	*Buddleja saligna (d), Euclea undulata (d), Olea europaea subsp. africana (d), Grewia occidentalis, Gymnosporia polyacantha, Mystroxylon aethiopicum subsp. burkeanum.*
Low Shrubs	*Aptosimum elongatum, Felicia fascicularis, Lantana rugosa, Teucrium trifidum. Succulent Shrub: Kalanchoe paniculata.*
Woody Climber	*Jasminum breviflorum*
Herbaceous Climber	*Lotononis bainesii*
Graminoids	*Heteropogon contortus (d), Setaria sphacelata (d), Themeda triandra (d), Aristida congesta, Chloris virgata, Cynodon dactylon, Sporobolus nitens, Tragus racemosus.*
Herbs	*Achyropsis avicularis, Corchorus asplenifolius, Evolvulus alsinoides, Helichrysum nudifolium, H. undulatum, Hermannia depressa, Osteospermum muricatum, Phyllanthus maderaspatensis.*
SVcb 9 Gold Reef Mountain Bushveld	
Small Trees	*Acacia caffra (d), Combretum molle (d), Protea caffra (d), Celtis africana, Dombeya rotundifolia, Englerophytum magalismontanum, Ochna pretoriensis, Rhus leptodictya, Vangueria infausta, V. parvifolia, Ziziphus mucronata.*
Tall Shrubs	*Canthium gilfillanii, Ehretia rigida subsp. rigida, Grewia occidentalis, Gymnosporia buxifolia, Mystroxylon aethiopicum subsp. burkeanum.*
Low Shrubs	*Athrixia elata, Pearsonia cajanifolia, Rhus magalismontana subsp. magalismontana, R. rigida var. rigida.*
Woody Climber	*Ancylobotrys capensis. Graminoids: Loudetia simplex (d), Panicum natalense (d), Schizachyrium sanguineum (d), Trachypogon spicatus (d), Alloteropsis semialata subsp. eckloniana, Bewsia biflora, Digitaria tricholaenoides, Diheteropogon amplectens, Sporobolus pectinatus, Tristachya biseriata, T. leucothrix.*

PLANT FORM	SPECIES
Herbs	*Helichrysum nudifolium, H. rugulosum, Pentanisia angustifolia, Senecio ve¬nosus, Xerophyta retinervis.*
Geophytic Herbs	*Cheilanthes hirta, Hypoxis hemerocallidea, Pellaea calomelanos.*

6.4 Gh 15 Carletonville Dolomite Grassland's Conservation Status

The Carletonville Dolomite Grassland is classified as **Vulnerable**. A Conservation Target of 24% has been set, while a Small extent of the Carletonville dolomite is statutory conserved in the (Sterkfontein Caves—part of the Cradle of Humankind World Heritage Site, Oog Van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas. Almost a quarter already transformed for cultivation, by urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams. Erosion very low (84%) and low (15%).

6.5 SVCB 9 GOLD REEF MOUNTAIN BUSHVELD'S SENSITIVITY

The SVcb 9 Gold Reef Mountain Bushveld is classified as **Least threatened**. A conservation target of 24% has been set, with Some 22% statutorily conserved mainly in the Magaliesberg Nature Area and much smaller proportions in the Rustenberg, Wonderboom and Suikerbosrand Nature Reserves. At least an additional 1% conserved in other reserves brings the total conserved very close to target. About 15% transformed mainly by cultivation and urban and built-up areas. Some areas with dense stands of the alien Melia azedarach but which is often associated with drainage lines or alluvia (i.e. azonal vegetation) embedded within this unit. Erosion is very low to low.

6.6 SVCB 8 MOOT PLAINS BUSHVELD'S SENSITIVITY

The SVcb 8 Moot Plains Bushveld is classified as **Vulnerable**. A conservation Target of 19% has been set. An estimated 13% is statutorily conserved mainly in the in the Magaliesberg Nature Area. About 28% transformed mainly by cultivation and urban and built-up areas. Very scattered occurrences to sometimes dense patches in places of various alien plants including Cereus jamacaru, Eucalyptus species, Jacaranda mimosifolia, Lantana camara, Melia azedarach and Schinus species. Erosion is mainly very low to low, moderate in some areas.

6.7 GM 11 RAND HIGHVELD GRASSLAND'S SENSITIVITY

The Gm 11 Rand Highveld Grassland is classified as **Endangered**. A conservation target of 24% has been, however this vegetation unit is poorly conserved (only 1%). Small patches protected in statutory reserves (Kwaggavoetpad, Van Riebeeck Park, Bronkhorstspruit, Boskop Dam Nature Reserves) and in private conservation areas (e.g. Doornkop, Zemvelo, Rhenosterpoort and Mpopomeni). Almost half has been transformed mostly by cultivation, plantations, urbanisation or dam-building. Cultivation may also have had an impact on an additional portion of the surface area of the unit where old lands are currently classified as grasslands in land-cover classifications and poor land management has led to degradation of significant portions of the remainder of this unit (D.B. Hoare, personal observation). Scattered aliens (most prominently Acacia mearnsii) occur in about 7% of this unit. Only about 7% has been subjected to moderate to high erosion levels.

6.8 2015 NORTH WEST BIODIVERSITY SECTOR PLAN

The Northwest Biodiversity Sector Plan identifies a network of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the province based on a systematic biodiversity plan. Collectively, the CBAs and ESAs cover 57% of the province. These were first identified in the Northwest Biodiversity Conservation Assessment (DACERD, 2009), and are comprehensively re-assessed and updated for this plan. This Biodiversity Sector Plan therefore represents the most current information available on biodiversity in the province and is an update of the data given in the NW Environment Outlook Report (2013) and other assessments that precede it, such as the National Biodiversity Assessment (2011), the National Freshwater Ecosystem Priority Assessment (2011).

The provincial Biodiversity Sector Plan is intended to be the biodiversity sector's input into government sector planning and development processes.The aim of the Biodiversity Sector Plan is to identify the minimum area necessary to conserve and maintain biodiversity and major ecological infrastructure in the province. Where possible, it is spatially aligned with other relevant spatial plans for the province, such as the Provincial Spatial Development Framework and gazetted Environmental Management Frameworks[1].

According to the 2015 North West Biodiversity Sector Plan, the R30 Road traverses three Critical Biodiversity Areas (CBA), while the rest of the road is located within a Heavily or moderately area. There is a section of the road that is located within an Ecological

[1] 2008 North-West Province Biodiversity Conservation Assessment

Support Area (Figure 3, Sensitivity map). Critical Biodiversity Areas are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan, while Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services.

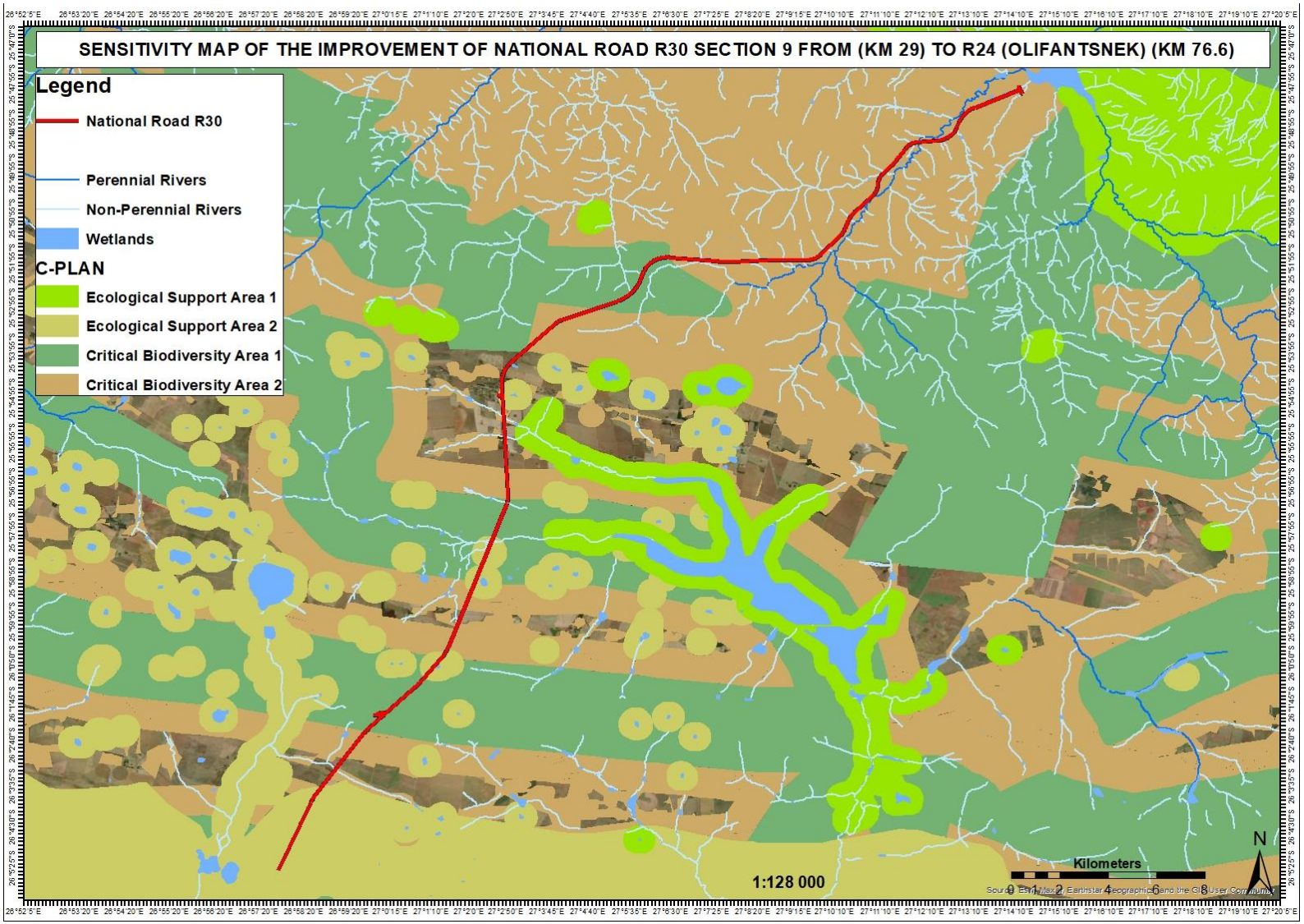


Figure 4: The R30 Road Upgrade in relation to the2015 North West Biodiversity Sector Plan .

6.9 WATERCOURSES ON SITE

The National Freshwater Ecosystems Priority Areas (NFEPA) identifies important wetlands in South Africa. The study site falls under the Crocodile West and Marico Water Management Area (WMA). **Figure 4** is a specific representation of the watercourses/wetlands that are found along the R30 Road. The existing R30 Road is located within 500m of a number of watercourses (Rivers) and wetlands.

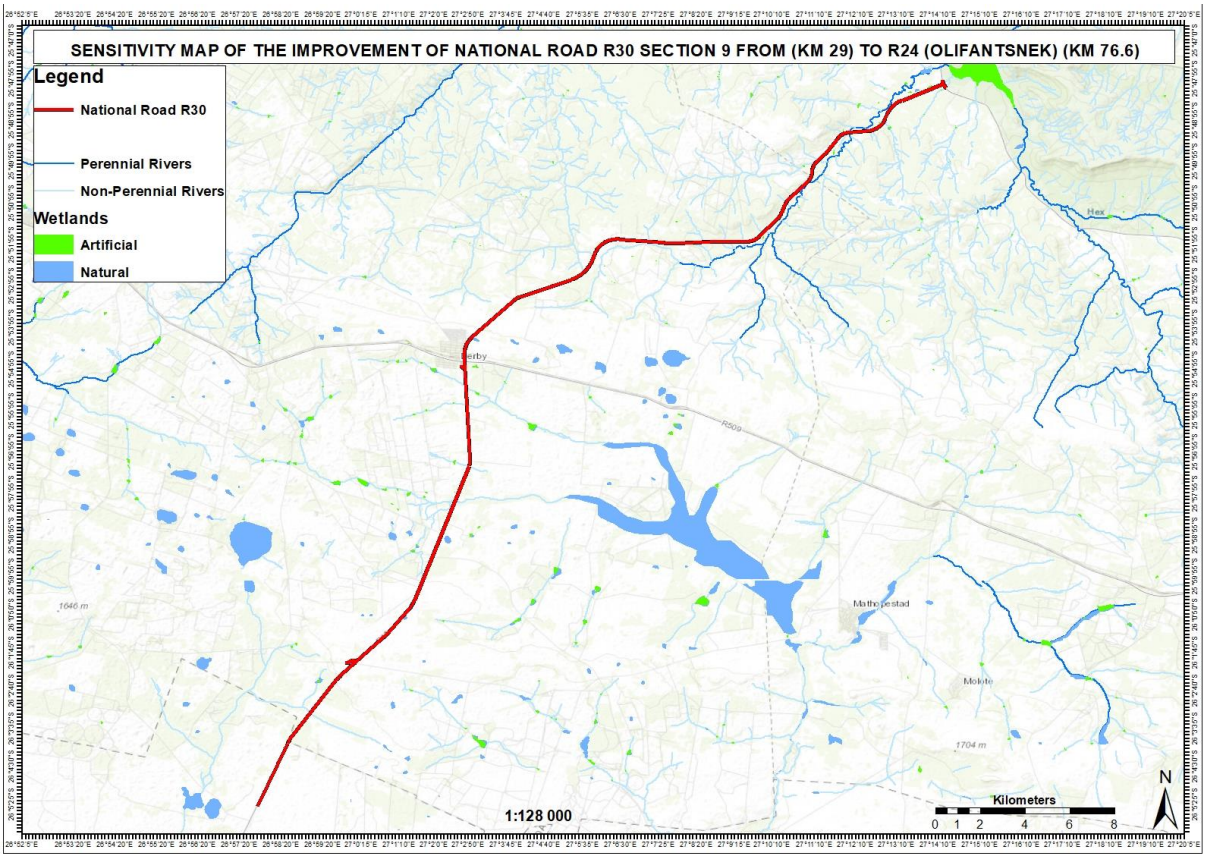


Figure 5: Hydrology of the site.

7 METHODOLOGY

The initial site visits were done on the **04 July 2023**. The site visit entailed walking through the entire study site (~20km) while investigating both fauna and flora. The aim of the fieldwork component was to scan the study site to gain insight into the current faunal and floral assemblages, to detect any special species that might be present on site.

7.1 SPECIES OF SPECIAL CONCERN (SSC)

The International Union of Conservation Networks (IUCN) is the international authority for Red Data species. In South Africa, the Threatened Species Programme (TSP) undertakes this role, in collaboration with the South Africa National Biodiversity Institute (SANBI). SSC include any national Red Data, Nationally Protected, Provincially Protected or endemic species recorded on site. The Red Data listed flora and fauna species identified were classified according to the following categories:

- Extinct (EX) – No known individuals remaining;
- Extinct in the Wild (EW) – Known only to survive in captivity, or as a naturalized population outside its historic range;
- Critically Endangered (CR) – Extremely high risk of extinction in the wild;
- Endangered (EN) – High risk of extinction in the wild;
- Vulnerable (VU) – High risk of endangerment in the wild;
- Near Threatened (NT) – Likely to become endangered in the near future;
- Least Concern (LC) – Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category;
- Data Deficient (DD) – Not enough data to make an assessment of its risk of extinction; and
- Not Evaluated (NE) – Has not yet been evaluated against the criteria.

7.2 IMPACTS ASSESSMENT

The potential impacts of the proposed expansion, existing operations and the alternatives were rated using a clearly defined rating scale. The significance rating formula is as follows:

Significance = Consequence x Probability

Where

Consequence = Type of Impact x (Intensity + Spatial Scale + Duration)

And

Probability = Likelihood of an Impact Occurring

In addition, the formula for calculating consequence:

***Type of Impact** = **+1** (Positive Impact) or **-1** (Negative Impact)*

The weight assigned to the various parameters for positive and impacts to biodiversity is provided for in the formula and is presented in **Table 2**. The probability consequence matrix is displayed in **Table 3**, with the impact significance rating described in **Table 4**.

Table 2: Biodiversity Impact Assessment Parameter Ratings

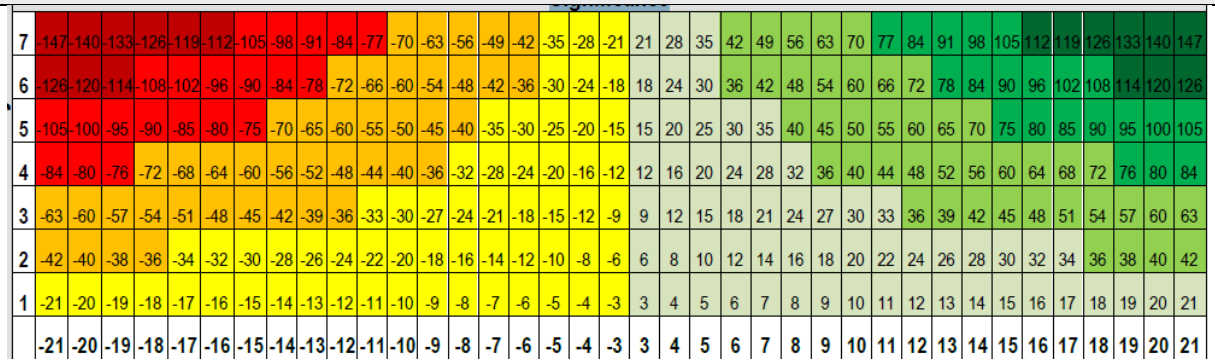
Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	**Positive Impacts (Type of Impact = +1)**			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or ecosystem. Persistent severe damage. Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	Noticeable, on-going social and environmental benefits which have improved the livelihoods and living standards of the local community in general and the environmental features.	International The effect will occur across international borders.	Permanent: No Mitigation The impact will remain long after the life of the Project.	Certain/ Definite. There are sound scientific reasons to expect that the impact will definitely occur.
6	Significant impact on highly valued species, habitat or ecosystem. Irreparable damage to highly valued items of cultural significance or breakdown of social order.	Great improvement to livelihoods and living standards of a large percentage of population, as well as significant increase in the quality of the receiving environment.	National Will affect the entire country.	Beyond Project Life The impact will remain for some time after the life of a Project.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that	On-going and widespread positive benefits to local communities which	Province/ Region Will affect the entire province or region.	Project Life	Likely The impact may occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	**Positive Impacts (Type of Impact = +1)**			
	may take several years to rehabilitate. Very serious widespread social impacts. Irreparable damage to highly valued items.	improves livelihoods, as well as a positive improvement to the receiving environment.		The impact will cease after the operational life span of the project	
4	Serious medium-term environmental effects. Environmental damage can be reversed in less than a year. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense social benefits to some people. Average to intense environmental enhancements.	Municipal Area Will affect the whole municipal area.	Long term 6-15 years.	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month.	Average, on-going positive benefits, not widespread but felt by some.	Local Extending across the site and to nearby settlements.	Medium term 1-5 years.	Unlikely Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	**Positive Impacts (Type of Impact = +1)**			
	On-going social issues. Damage to items of cultural significance.				
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by very few of population.	Limited Limited to the site and its immediate surroundings.	Short term Less than 1 year.	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the Project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures.
1	Limited damage to minimal area of low significance	Some low-level social and environmental benefits felt	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month.	Highly unlikely/None Expected never to happen.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	**Positive Impacts (Type of Impact = +1)**			
	that will have no impact on the environment. Minimal social impacts, low-level repairable damage to commonplace structures.	by very few of the population.			

Table 3: Probability Consequence Matrix

	Significance
Probability	
	Consequence

| Probability | Significance | | |

Score	Description	Rating
	of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects.	
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	

7.3 STUDY LIMITATIONS

- The site inspection was done over a single day, during the dry season, and thus it is possible that some of the plant species may have missed due to seasonality changes.
- It is assumed that plant species flowering only during specific times of the year could be confused with a very similar species of the same genus.
- Some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- Data collection in this study relied heavily on data from representative, homogenous sections of vegetation units, as well as general observations, analysis of satellite imagery from the past until the present, generic data and a desktop analysis.
- No faunal trapping was conducted as part of this study. The faunal assessment relied heavily on desktop and literature studies, supported by on-site observations.
- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

8 RESULTS OF THE FLORA ASSESSMENT

The R30 Road traverses a number of vegetation units namely; the Carletonville Dolomite Grassland, Rand Higveld Grassland, Gold Reef Mountain Bushveld and lastly the Moot Plains Bushveld vegetation units. The different vegetation units were observed along the R30 Road, they all have suffered various degrees of disturbance as a result of agricultural activities along the road. The Carletonville Dolomite Grassland is characterised by Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (**Figure 5**).



Figure 6: Evidence of the disturbed Carletonville Dolomite Grassland observed where the R 30 Road Starts.

The Rand Highveld Grassland consisted mostly of common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. The grasses were observed along the side of the road (**Figure 6**). This vegetation is generally found in Highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The Gold Reef Mountain Bushveld is Rocky hills and ridges often west-east trending with more dense woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of *Acacia caffra* on the southern slopes) (Figure 7). Tree cover elsewhere is variable. Tree and shrub layers are often continuous.



Figure 7: Grasses associated with the Gm 11 Rand Highveld Grassland observed along the side of the road.

The is also dominated by the Moot Plains Bushveld vegetation, Open to closed, low, often thorny savanna dominated by various species of Acacia in the bottomlands and plains as well as woodlands of varying height and density on the lower hillsides. Herbaceous layer is dominated by grasses (**Figure 8**).



Figure 8: Gold Reef Mountain Bushveld vegetation unit observed along the R30 Road with dense woody vegetation..






Figure 9: Moot Plains Bushveld observed along the R30 Road.



Figure 10: Agricultural activities observed on the R30 Road.

8.1 FLORA SPECIES OF SPECIAL CONCERN

South Africa has become the first country to fully assess the status of its entire flora (Domitilla and Raimondo, 2011). Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods)[2]. South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction but may nonetheless be of high conservation importance. As a result, a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northwest, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The following species protected in terms of the North West Biodiversity Management Act, No.4 of 2016 are known to be found in the area (Table 8-1).

Table 5: NCNCA are known to be found in the area.

FAMILY	SPECIES	NATIONAL STATUS	HABITAT	POC
AIZOACEAE	*Delosperma leendertziae*	NT	**Range:** Magaliesberg, Roodepoort Ridge and Suikerbosrand. **Major habitats:** Gold Reef Mountain Bushveld, DwarsbergSwartruggens Mountain Bushveld, Loskop Mountain Bushveld, Andesite	Low

[2] RAIMONDO, Domitilla. The Red List of South African plants: a global first. S. Afr. j. sci., Pretoria , v. 107, n. 3-4, p. 01-02, Apr. 2011 . on 17 Aug. 2021. http://dx.doi.org/10.4102/sajs.v107i3/4.653.

			Mountain Bushveld, Gauteng Shale Mountain Bushveld. **Description:** Steep, south-facing slopes of quartzite in mountain grassland. **Population trend:** Decreasing	
APOCYNACEAE	*Stenostelma umbelluliferum*	NT	**Range:** Pretoria North and adjacent areas in North West Province. **Major habitats:** Savanna **Description:** Deep black turf in open woodland mainly in the vicinity of drainage lines. **Population trend:** Decreasing	Medium
ASPHODELACEAE	*Kniphofia typhoides*	NT	**Range:** Parys to Lydenburg to Paulpietersburg to Newcastle. **Major habitats:** Grassland **Description:** Low lying wetlands and seasonally wet areas in climax Themeda triandra grasslands on heavy black clay soils, tends to disappear from degraded grasslands. Population trend: Decreasing	Low
CRASSULACEAE	*Adromischus umbraticola*	NT	**Range:** Potchefstroom and Zeerust to Cullinan. **Major habitats:** Savanna **Description:**	Low

			South-facing rock crevices on ridges, restricted to Gold Reef Mountain Bushveld in the northern parts of its range, and Andesite Mountain Bushveld in the south. **Population trend:** Decreasing	
FABACEAE	*Melolobium subspicatum*	VU	**Range:** Krugersdorp to Pretoria. **Major habitats:** Soweto Highveld Grassland, Egoli Granite Grassland, Carletonville Dolomite Grassland **Description:** Grassland **Population trend:** Stable	Low
ORCHIDACEAE	*Habenaria mossii*	EN	**Range:** Johannesburg, Pretoria and Krugersdorp. **Major habitats:** Andesite Mountain Bushveld, Carletonville Dolomite **Grassland Description:** Open grassland on dolomite or in black, sandy soil. **Population trend:** Decreasing	Low

EN= Endangered; EW = Extinct in the Wild; NT = Near Threatened; VU= Vulnerable; P= Protected; POC = Probability of Occurrence

During the field investigation no floral SCCs were found and the chances that the species above re-establish themselves on the site is medium to low. Should any floral SCC be encountered during any phase of the proposed development, these species should be rescued and relocated by a suitably qualified specialist and either relocated to suitable

habitat within the study area outside of the development footprint, utilised within the landscaping plan of the project, or moved to registered nurseries such as the Agricultural Research Council (ARC) or the South African National Biodiversity Institute (SANBI). Any other floral SCC encountered during the construction phase of the proposed development should also be relocated by a suitably qualified specialist and, where required, the necessary permits should be applied for. The study has Acacia species across the R30 Road (**Figure 10**).



Figure 11:Acacia species observed onsite.

8.1.1 Ethnobotanical plant species

Ethnobotany/ Ethnoecology is a branch of botany that focuses on the use of plants for medicines, cultural and recreational purposes. The overexploitation of indigenous plants for ethnobotanical purposes can be detrimental to populations of those particular plant species, and the other species that depend on its existence for their survival.

South Africa has a rich diversity of medicinal plants that not only have a global significance, but also have a cultural and historical role (van Wyk *et al*. 2009). There is a rapidly growing concern for conservation of medicinal plants that are dwindling in number due to illegal

harvesting (Institute of Natural Resources 2003). This is particularly apparent in rural areas where medicinal plants are overexploited by traditional doctors.

During the site inspection, no medical plants were encountered within the servitude of the road.

9 RESULTS OF THE FAUNA ASSESSMENT

9.1 MAMMALS

According to the desktop study conducted, the species listed in **Table 5** were identified as being possible to occur within the study area or the immediate vicinity of the proposed construction area. It must be noted that some of these species are very sensitive to habitat and in some instances; the likeliness for them to occur is minimal. There are nine Red List mammal species that have a HIGH chance of occurring in the study area. Cattle and other domestic animals graze in the property.

Table 6: Sensitive mammals that are likely to occur onsite

COMMON NAME	RECORDED ON SITE
Spotted necked otter	None
Greater dwarf shrew	None
Pangolin	None
Rock dormouse	None
Lesser grey-brown musk	None
African weasel	None
Scrub hare	
Honey badger	None
Southern hedgehog	None

9.1.1 Field Investigation Findings

None of the sensitive mammals which were expected were spotted on site except for droppings of smaller mammals such as hare or rabbit species. The presence of the human settlements and the seasonality issues may explain why all the sensitive mammals were not seen during the site visit. Some of the expected animals are nocturnal, and thus may only be seen at night.



Figure 12: Grazing Cattle Observed onsite.

9.2 REPTILES

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Large areas surrounding the site have resulted in increased habitat modification and transformation as well as increased human presence and associated disturbances (illegal reptile collecting, indiscriminate killing of all snake species, fires) surrounding the site coupled with increased habitat destruction and disturbances on the neighbouring properties are all causal factors in the alteration and disappearance of reptile diversity in the area.

Trees including stumps; bark and holes in trees are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors). Reptile species recorded in the open and closed Acacia caffra woodland areas included Flap-neck Chameleon (*Chamaeleo dilepis*) and Cape Dwarf Gecko (*Lygodactylus capensis*). Limited logs and stumps were observed in the closed and open woodland areas

.

9.2.1 Field investigation findings

None of the expected reptiles were observed on site during the site visit, however the local residents indicated that the study site has an abundance of Reptile species.

9.3 AVIFAUNA

Birds are generally regarded as good ecological indicators, because their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological conditions are directly linked to land cover. As the land cover of an area changes, so do the types of birds in that area (The Bird Community Index, 2007). Land cover is directly linked to habitats within the study area. The diversity of these habitats should give rise to many different species.

According to the South African Bird Atlas Project (SABAP2), almost 300 species of birds have been identified in the Sekhukhuneland area; the majority of these birds are comprised of Bushveld, Grassland and Mountainous species. All birds that could be present within the vicinity of the study area are listed in **Table *6***.

Table 7: Red Data bird species potentially found within the study site.

Scientific Name	Common Name	IUCN Status
Geronticus calvus	Southern Bald Ibis	VU
Sagittarius serpentarius	Secretary bird	NT
Gyps coprotheres	Cape Vulture	VU
Stephanoaetus coronatus	African Crowned Eagle	NT
Circus ranivorus	African Marsh-Harrier	VU
Circus maurus	Black Harrier	NT
Falco biarmicus	Lanner Falcon	LC
Alcedo semitorquata	Half Collared Kingfisher	CR
Bugeranus carunculatus	Wattled Crane	VU
Anthropoides paradiseus	Blue Crane	VU
Balearica regulorum	Grey Crowned Crane	VU
Eupodotis senegalensis	White-bellied Korhaan	VU

9.3.1 Field investigation findings

A few avifaunal species were spotted onsite during the site visit (**Figure 12**), the species were observed within a watercourse. The proposed construction operations may generate noise pollution which serves as a deterrent to birds.

9.4 INVERTEBRATES

Butterflies are a good indication of the habitats available in a specific region (Woodhall 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope or endemic species (specific habitat requirements with populations concentrated in a small area) which may be very specialised (Woodhall 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and therefore identify. A list of butterflies that are likely to be observed on the study site and the surrounding areas are summarised in **Table 7**.

Table 8: Butterfly species expected to occur on site.

Scientific Name	Common Name
Melanitis leda Helena	Evening Brown
Acraea anemosa	Broad-bordered Acraea
Acreae neobule	Wandering Acraea
Danaus chrysippus	African Monarch butterfly
Junonia hierta cebrene	Yellow Pansy butterfly
Danays chrysippus	Southern Milkweed
Charaxes jasius	Koppie Emperor
Cyclyrius pirithous	Common Blue
Hyalites esebria	Dusky Acrea butterfly
Phalantha aethiopica	Poplar Leopard
Alaena amazoula	Yellow Zulu
Catacroptera cloanthe	Pirate butterfly
Charaxes achaemenses	Bushveld Emperor
Pinacopteryx eriphia	Zebra White butterfly
Eurema brigitta	Broad-bordered yellow
Vanessa cardui	Painted Lady
Papilio demodocus	Citrus Swallowtail butterfly

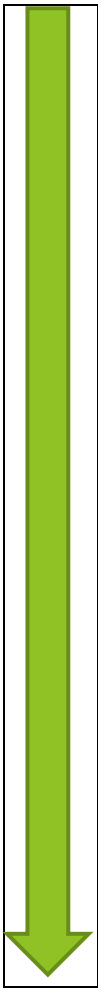
9.4.1 Field investigation findings

During the site inspection, No invertebrates were observed along the road servitude.

10 IMPACT ASSESSMENT

The impact assessment is aimed predicting potential impacts of the proposed project. Impact assessment strives to avoid damage, loss of ecosystems services, and where they cannot be avoided, to reduce and mitigate these impacts (DEA, 2013). Offsets to compensate for loss of habitat are regarded as a last resort, after all efforts have been made to avoid, reduce and mitigate. The mitigation hierarchy is represented in **Table 8**.

Table 9: Mitigation hierarchy of impacts

	**Avoid or Prevent**	Refers to considering options in project location, sitting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services and people. This is the best option but is not always possible. Where environmental and social factors give rise to unacceptable negative impacts, construction should not take place. In such cases, it is unlikely to be possible or appropriate to rely on the other steps in the mitigation.
	Minimise	Refers to considering alternatives in the project location, sitting, scale, layout, technology and phasing that would minimise impacts on biodiversity, associated ecosystem services. In cases where there are environmental constraints, every effort should be made to minimise impacts.
	Rehabilitate	Refers to rehabilitation of areas where impacts are unavoidable, and measures are provided to return impacted areas to near natural state or an agreed land use after mine closure. Rehabilitation can, however, fall short of replicating the diversity and complexity of natural systems.
	Offset	Refers to measures over and above rehabilitation to compensate for the residual negative impacts on biodiversity after every effort has been made to minimise and then rehabilitate the impacts. Biodiversity offsets can provide a mechanism to compensate for significant residual impacts on biodiversity.

A small portion of the study site is anticipated to be lost due to the proposed construction development and associated activities. The impact of the proposed activity will involve a loss of habitat for both flora and fauna.

10.1 LOSS OF HABITAT

The study site still has areas that have vegetation regarded as intact and to some degree species diverse. In addition to this, the R30 Road Traverses a number of Critical Biodiversity

Areas (CBA) and a single Ecological Support Area (ESA), with endemics and protected plant species present. As a result of this, the impacts of the proposed construction and associated aspects and features, although limited in extent are regarded as highly significant. Due to disturbance of the soil and removal of vegetation, it is likely that alien plants may establish on site.

Alien plants often reduce the diversity of an area due to their invasive habit. Invasive plants grow prolifically and out-compete native species. Loss of vegetation will be irreversible and although rehabilitation can be aimed at reinstating the land to some form of land-use, restoration of the natural habitat on site cannot be achieved. This is particularly significant in an area where some plant species remain undescribed. Many species in this habitat are adapted to specific soil composition and structure and the natural species composition cannot be restored after disturbance to the soil (Victor et al. 2005). The impacts attributed with the loss of habitat are listed below in the phase they occur.

10.1.1 Construction phase

Table 10: Loss of habitat during construction phase

Loss of habitat					
Phase	**Construction**				
Criteria	**Details / Discussion**				
Description of impact	• Removal of vegetation • Disturbance of the soil • Vehicle operation				
Mitigation required	• Minimise the impacted area and clear only what is required • Avoid erosion, manage alien invasive species establishment, ensure the re-establishment of natural vegetation • Employ stormwater management measures				
Parameters	***Intensity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre-Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Major (negative) (54)
Post Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Likely (4)	Minor (negative) (24)

10.1.2 Operational phase

No direct loss of habitat is expected during this phase of the project. Alien plant invasion is, however expected to occur. In addition, vehicular transport through the site may increase the risk of roadkill of fauna species that occur.

Table 11: Loss of habitat during operation phase

Loss of habitat					
Phase	**Operational**				
Criteria	**Details / Discussion**				
Description of impact	• Establishment of alien plant species in disturbed areas				
Mitigation required	• Manage alien invasive species establishment continually through chemical or mechanical removal • Reinstate vegetation cover through concurrent rehabilitation • Erect signage to control the speed limit for trucks and other vehicles moving through the site				
Parameters	***Intensity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre-Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Major (negative) (54)
Post Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Likely (4)	Minor (negative) (24)

10.1.3 Decommissioning phase

No direct loss of habitat is expected during this phase of the project. Alien plant invasion is, however expected to occur as vehicles and machinery move throughout the site and disturb the soil.

Table 12: Loss of habitat during decommissioning

Loss of habitat	
Phase	**Decommissioning**
Criteria	**Details / Discussion**
Description of impact	• Removal infrastructure and equipment • Disturbance of the soil • Vehicle operation
Mitigation required	• Minimise the impacted area and revegetate with indigenous where disturbed

	• Avoid erosion, manage alien invasive species establishment, ensure the re-establishment of natural vegetation • Employ stormwater management measures				
Parameters	***Intensity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre-Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Major (negative) (54)
Post Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Likely (4)	Minor (negative) (24)

10.1.4 Post-closure phase

No direct loss of habitat is expected during this phase of the project. Alien plant invasion should be monitored for up to three years after closure.

Table 13: Loss of habitat during post-closure phase

Loss of habitat					
Phase	**Post-closure**				
Criteria	**Details / Discussion**				
Description of impact	• On-going establishment of alien plant species in disturbed areas				
Mitigation required	• Manage alien invasive species establishment continually through chemical or mechanical removal. • Revegetation of the site where previously disturbed.				
Parameters	***Intensity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre-Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Major (negative) (54)
Post Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Likely (4)	Minor (negative) (24)

10.2 LOSS OF SPECIES OF SPECIAL CONCERN (SSC)

The loss of vegetation habitat on site will reduce the area available for fauna species. Since fauna have the ability to flee the area, the impacts on common animal species is not regarded as highly significant.

The impact of the loss of plant SSC can be reduced by implementing a plant relocation strategy. Plant SSC can be located, removed (and seeds collected) and relocated either in an area within proximity to the site or a nursery. If plants are to be translocated to a different area, it is imperative that the donor and host habitat are similar with regard to topography, geology, soil form and orientation of the slope face. Alternatively, a nursery can be established on site where SSC can be relocated to. Loss of some SSC will invariably occur during either process.

10.2.1 Construction phase

The greatest impact is expected during the construction phase for loss of SSC.

Table 14: Loss of SSC during construction phase

Loss of SSC					
Phase	**Construction**				
Criteria	**Details / Discussion**				
Description of impact	• Removal of vegetation • Increased human presence • Machinery and vehicle operation (noise)				
Mitigation required	• Minimise the impacted area and clear only what is required • Tag and avoid all Red Data plants • Plant SSC according to a relocation plan as a last resort • Restricting blasting and operation of machinery to daylight hours				
Parameters	***Intensity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre-Mitigation	Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Major (negative) (54)
Post Mitigation	Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Likely (4)	Minor (negative) (24)

10.2.2 Operational phase

No impacts to SSC are expected during the operational phase.

10.2.3 Decommissioning phase

No impacts to SSC are expected during the decommissioning phase.

10.2.4 Post-closure phase

No impacts to SSC are expected during the Post closure phase.

10.3 CUMULATIVE IMPACTS

The proposed project area is located in an area that is regarded as ecologically disturbed, especially along the servitude of the R30 Road. The area has evidence of disturbance from the ongoing anthropogenic landuses, specifically the agricultural activities. According to the above risk assessment the proposed project and associated infrastructures will place additional pressure on the environment especially on the fauna; that will be subjected to increased human presence and elevated noise levels during the construction phase. It is important to note that the impact can be managed if the proposed development is strictly restricted to the servitude.

11 DISCUSSION

The bulk of the study site (approximately 80% or more) is located within a heavily or moderately modified Area, while the road traverses a CBA and ESA. The site is dominated by four vegetation units. The region is heavily degraded in most places and overexploited by man for cultivation. The proposed expansion of the R30 Road will contribute towards the cumulative impacts, since the site is disturbed especially along the road servitude.

Since endemism and species richness are highly relevant to the prioritisation of areas for conservation, due to the existing disturbance the site has lost its some of sensitivity especially along the road reserve. Loss of endemic plant diversity in the study site will also result in a loss of faunal biodiversity and a resultant loss of faunal SSC. This is of specific relevance to invertebrates, since they are dependent on those plant species.

Due to the nature of the proposed development the impact is expected to be significant. In addition to loss of important natural heritage, alien invasion is expected to occur, resulting in further degradation of vegetation. However, if the proposed is executed as per the

Environmental Management Programme will help minimise the impact by restricting the development to areas that are already disturbed and conserving the undisturbed sites.

12 CONCLUSION AND RECOMMENDATIONS

The study site was surveyed on the 04 July 2023 to ascertain the overall state of biodiversity. According to the South African National Biodiversity Institute (SANBI) the majority of the site is classified as Moderately modified, with certain sections of the Road falling under Critical Biodiversity Areas and Ecological Support Areas, this implies that the proposed site plays a role in meeting biodiversity targets for ecosystems, species and ecological processes as identified in a systematic biodiversity plan. The proposed site has suffered general veld transformation because of the agricultural activities and associated activities. The proposed road upgrade is located within close proximity to a number of sites that are still pristine which may harbour a number of protected species, in addition to this the study site has a number of watercourses which are considered as sensitive habitats. Specific conclusions and recommendations are listed below:

- Restrict the construction activities to the existing road reserve/servitude, and avoid the pristine sites that fall outside the road reserve. This will help conserve the remaining vegetation, and thus maintain ecosystem services.
- If any of the plant Species of Special Concern such as the *Acacia erioloba* are identified during clearing of vegetation for the construction area, they should be recorded with a GPS and reported so that a relocation strategy can be employed by a suitably qualified botanical specialist. Given that plant SSC are present in large numbers on site, it is highly likely that some of these species will be encountered. No plant SSC should be destroyed as a result of the proposed activity.
- Fauna and Flora monitoring is recommended. The following should be adhered to for the monitoring programme:
  - Monitoring must take place annually.
  - Monitoring must be completed by qualified specialists;
  - Adaptive management must be applied;
  - Monitoring during the wet season is essential; and
  - Findings must be compared to previous years.

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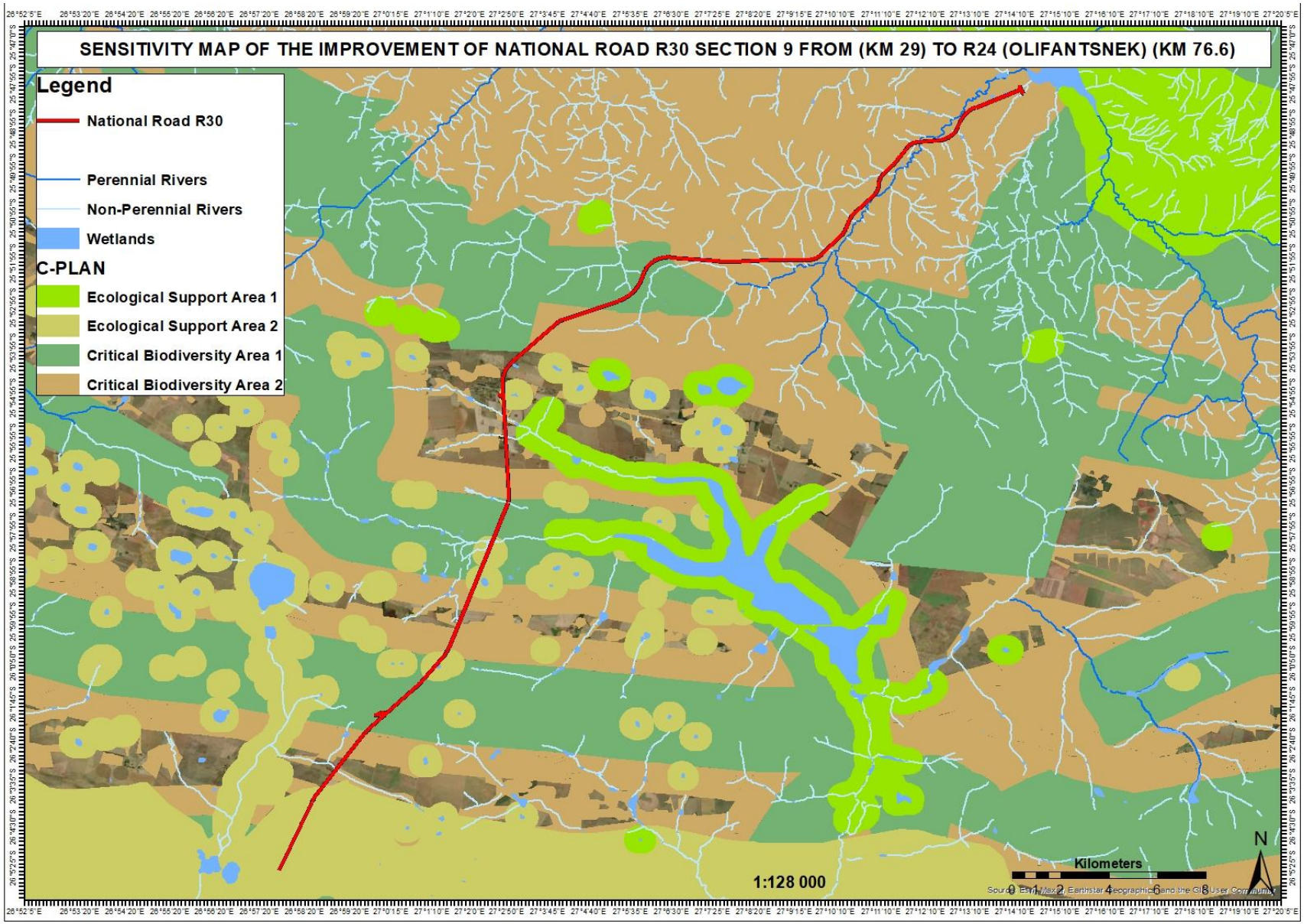
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Appendix A: Sensitivity Map


SENSITIVITY MAP OF THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6)
Legend
National Road R30
Perennial Rivers
Non-Perennial Rivers
Wetlands
C-PLAN
Ecological Support Area 1
Ecological Support Area 2
Critical Biodiversity Area 1
Critical Biodiversity Area 2
1:128 000
Kilometers
0 1 2 4 6 8
N

forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
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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
PROPOSED UPGRADE OF THE NATIONAL ROAD R30 SECTION 9 FROM KM 29 TO R24: BIODIVERSITY AND WETLAND STUDIES

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

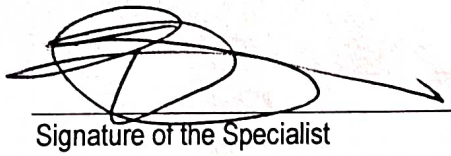
Title of Specialist Assessment	Wetland Delineation and Impact Assessment Report for the National Road R30 Biodiversity Impact Assessment Report for the National Road R30.
Specialist Company Name	Ntumbuluko Consulting (Pty)Ltd
Specialist Name	Tshuxekani Maluleke
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SPECIALIST DECLARATION FORM – AUGUST 2023

2. DECLARATION BY THE SPECIALIST

I, Tshuxekani Maluleke 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

Ntumbuluko Consulting (Pty) Ltd

Name of Company:

18/01/2024

Click or tap to enter a date

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _ Click or tap here to enter text. 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

Click or tap here to enter text. Consulting (Pty) Ltd

Name of Company

Click or tap here to enter text. 18/01/2024

Date

Click or tap here to enter text.

Signature of the Commissioner of Oaths

Click or tap to enter a date. 2024-01-18

Date

SOUTH AFRICAN POLICE SERVICE
STATION COMMANDER
2024 -01- 18
OLIEVENHOUTBOSCH
SOUTH AFRICAN POLICE SERVICE

WETLAND DELINEATION AND IMPACT ASSESSMENT REPORT:

PROPOSED FOR THE UPGRADE OF NATIONAL ROAD R30 SECTION 9 FROM KM 29 TO R24 (OLIFANTSNEK) KM 76.6, THREE BRIDGES AND SEVEN MAJOR CULVERTS, IN THE NORTHWEST PROVINCE WITHIN THE BOJANALA AND DR KENNETH KAUNDA DISTRICT MUNICIPALITIES, IN KGETLENGRIVIER LOCAL MUNICIPALITY AND RUSTENBURG LOCAL MUNICIPALITY.



PRODUCED BY:



Physical Address: **5 13th Avenue, Fairlands, Randburg 2170**

Mobile Number: **071 2082 364**

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November 2023

CONDITIONS RELATING TO THIS REPORT

DECLARATION OF INTEREST

Ntumbuluko Consulting Pty (Ltd) has no vested interest in the property studied nor is it affiliated with any other person/body involved with the property and/or proposed development. Ntumbuluko Consulting Pty (Ltd) is not a subsidiary, legally or financially of the proponent. The study was undertaken by Mr Tshuxekani Maluleke, he is a registered Natural Scientists with the following details:

QUALIFICATIONS

SPECIALIST	QUALIFICATION
Mr Tshuxekani Maluleke (SACNASP Reg. No. 120501)	MSc Environmental Sciences (Wits University) BSc Hons Zoology (University of Limpopo) BSc Hons Animal, Plant and Environmental Sciences (Wits University)

APPROVAL

PREPARED BY:

Mr Tshuxekani Maluleke



Wetland and Biodiversity Specialist

Msc. Environmental Sciences

07 November 2023

INDEMNITY

Although Ntumbuluko Consulting Pty (Ltd) exercises due care and diligence in rendering services and preparing documents, the client takes full responsibility for this report and its implementation in terms of the National Environmental Management Act of 1998, and exempt Ntumbuluko Consulting Pty (Ltd) and its associates and their sub-contractors from any legal responsibility based on the timing of the assessment, the result and the duration thereof, which has an influence on the credibility and accuracy of this report. Ntumbuluko Consulting Pty (Ltd) accepts no liability, and the client indemnifies Ntumbuluko Consulting Pty (Ltd) and its directors, managers, agents, and employees against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, directly or indirectly, by Ntumbuluko Consulting Pty (Ltd) and by the use of this document.

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LIST OF ABBREVIATIONS AND ACCRONYMS

BGIS: Biodiversity Geographic Information System

DEM: Digital Elevation Model

DWAF: Department of Water Affairs and Forestry

DWS: Department of Water Affairs and Sanitation

EA: Environmental Auhorisation

EIS: Ecological Importance and Sensitivity

EMPr: Environmental Management Program

GIS: Geographic Information System

HGM: Hydrogeomorphic

NFEPA: National Freshwater Priority Area

NWA: National Water Act (Act no 36 of 1998)

PES: Present Ecological Status

QDS: Quarter Degree Square

SANBI: South African National Biodiversity Institute

TWQRs: Target Water Quality Ranges

WMA: Water Management Areas

WUL: Water Use Licence

TERMS OF REFERENCE

Ntumbuluko Consulting Pty (Ltd) was requested to conduct a wetland delineation of the wetland/s present on the study sites. This report includes the delineation and provides an assessment on the ecological state of these areas.

1. INTRODUCTION

Ntumbuluko Consulting (Pty) Ltd has been appointed by Earthlink Environmental Services (Pty) Ltd on behalf of The South African National Roads Agency SOC Ltd or SANRAL to conduct a wetland delineation for the Proposed upgrade of national road R30 section 9 from km 29 to R24 (olifantsnek) km 76.6, three bridges and seven major culverts, in the Northwest Province within the Bojanala and Dr Kenneth Kaunda District Municipalities, in Kgetlengrivier Local Municipality and Rustenburg Local Municipality.

The investigation has been undertaken to form part of the Environmental Impact assessment (EIA), and associated management plan (EMP). This report presents the findings of the wetland assessment and delineation of which the fieldwork was conducted on the **04 July 2023** (**Figures 1**).

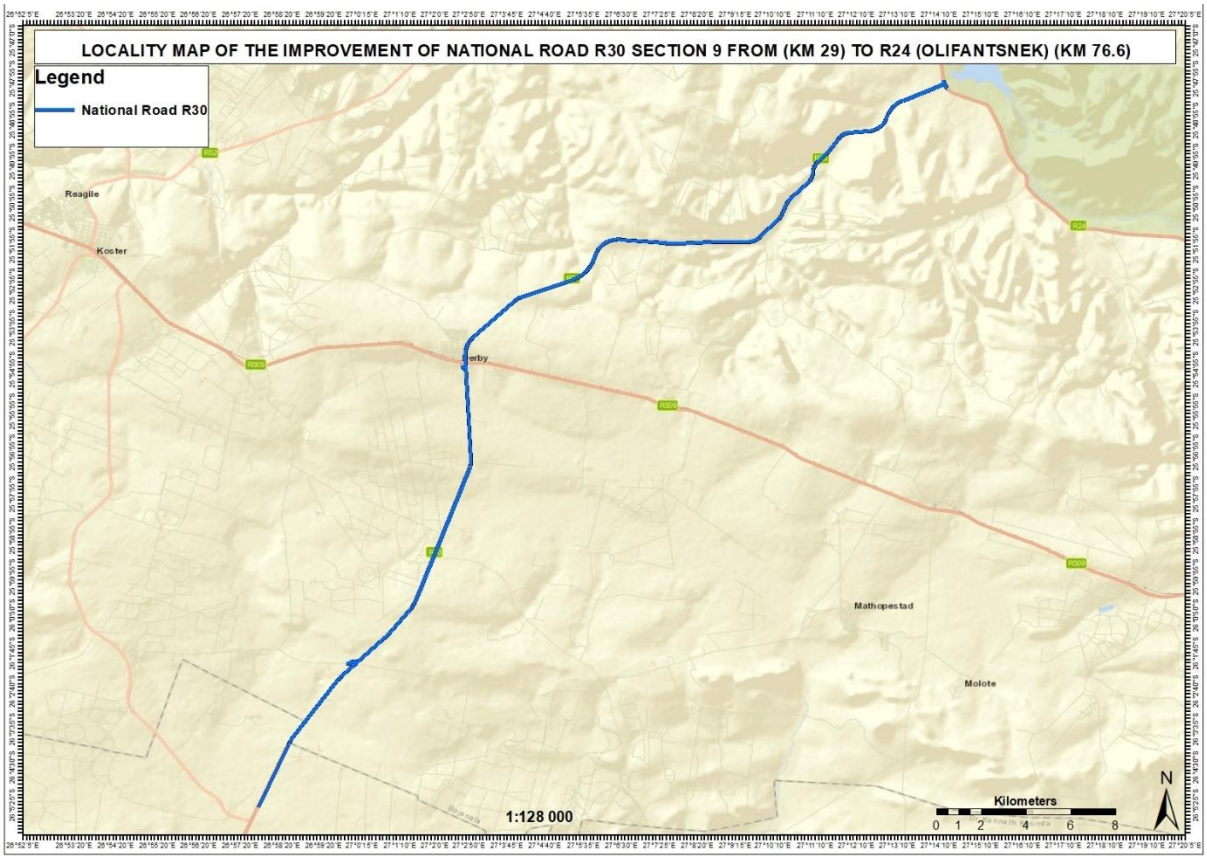


Figure 1: Locality Map (Study Site)

2. BACKGROUND

SANRAL proposes to upgrade national Road R30 Section 9 from (Km 29) To R24 (Olifantsnek) (Km 76.6).

Major aspects of this project :

- Increasing road reserve width;
- Strengthening the existing pavement;
- Widening of the existing road cross section;
- Vertical and horizontal geometric improvements;
- Reconstruction of river bridge and lengthening of all major and minor culverts;
- Possible horizontal re-alignment of the road at river bridge or
- Possible 10m wide temporary deviation (approximately 500m in length) to accommodate two-way traffic during construction at river bridge;
- Construction of ± 15km of service roads including new right of way (ROW);
- Opening of 1 hard-rock quarry and re-entry into 6 potential borrow pits; and
- Stockpile areas and vegetation clearance outside road reserve in excess of one hectare.

3. LEGAL FRAMEWORK

3.1 National Environmental Management Act (Act No. 107 of 1998)

The EIA Regulations, promulgated under NEMA, focus primarily on creating a framework for co-operative environmental governance. NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative

governance and procedures for co-ordinating environmental functions exercised by State Departments and to provide for matters connected therewith.

3.2 National Waste Act, 2008 (Act No. 59 of 2008)

The NEMWA aims at promoting sustainable waste management practices through the implementation of "Integrated Waste Management Planning", where "Integrated Waste Management Planning is viewed as a holistic approach of managing waste, aimed at optimising waste management practises to ensure that the implementation thereof yields practical solutions that are environmentally, economically and socially sustainable and acceptable to the public and all relevant spheres of government".

3.3 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in responsible ways. Of specific importance to this application is Section 19 of the NWA, which states that an owner of land, a person in control of land or a person who occupies or uses the land which thereby causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring and must therefore comply with any prescribed waste standard or management practices.

Regulations GN 704 dated June 1999 under the NWA, 1998 (Act 36 of 1998) stipulates that no development activities may take place within the 1:100 year floodline of a watercourse, or within 100 m of the watercourse, whichever is the furthest.

Regulations GN 509 dated August 2016 under the Section 21 c and i water uses of the NWA, 1998 (Act No 36 of 1998) stipulates the:

"Extent of a watercourse" as:

(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.

"Regulated area of a watercourse" for section 21(c) or (i) of the Act water uses in terms of this Notice means:

(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 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or
(c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

3.4 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

4. SCOPE OF WORK

4.1 Wetland Delineation and Assessment

The scope of work entailed the following:

- Field visit to delineate the outer boundary of wetland/riparian habitats within a 500 m buffer from the existing R30 Road site according to the methods contained in the manual 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005);
- Assess and describe the health of any wetland units identified, through evaluation of indicators based on geomorphology, hydrology and vegetation as per the WET-Health methods;

- Assess and describe the Ecological Services, Importance and Sensitivity (EIS) of any wetlands identified on site;
- Identify potential negative impacts on the wetland(s) from the R40 Road and assess the significance of these impacts;
- Provide recommended mitigation measures for the identified impacts in order to avert or lower the significance of the negative impacts.

4.2 Ecological Assessment

The scope of work entailed to the Biodiversity Assessment following:

- An examination of onsite and SANBI GIS databases on Endemic and Red Data faunal and floral species in the study area;
- Provide recommended mitigation measures for the identified impacts in order to avert or lower the significance of the negative impacts; and
- Identify any sensitive areas.

5. ASSUMPTIONS AND LIMITATIONS

- It is assumed that wetland plant species flowering only during specific times of the year could be confused with a very similar species of the same genus.
- Some wetland plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- In order to obtain a comprehensive understanding of the dynamics of the wetland habitats of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this survey was conducted in one season during a once-off site visit of five days.
- Data collection in this study relied heavily on data from representative, homogenous wetland sections, as well as general observations, analysis of satellite imagery from the past until the present, generic data and a desktop analysis.
- No formal water quality or aquatic faunal assessments (e.g., SASS 5) were conducted as part of this study. All comments on these subjects were made from estimations of the current, visible situation in the field.

- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

6. SITE LOCATION

The project is located within the boundaries of the Northwest Province Within the Bojanala And Dr Kenneth Kaunda District Municipalities, In Kgetlengrivier Local Municipality And Rustenburg Local Municipality, South Africa (**Figure 2**).

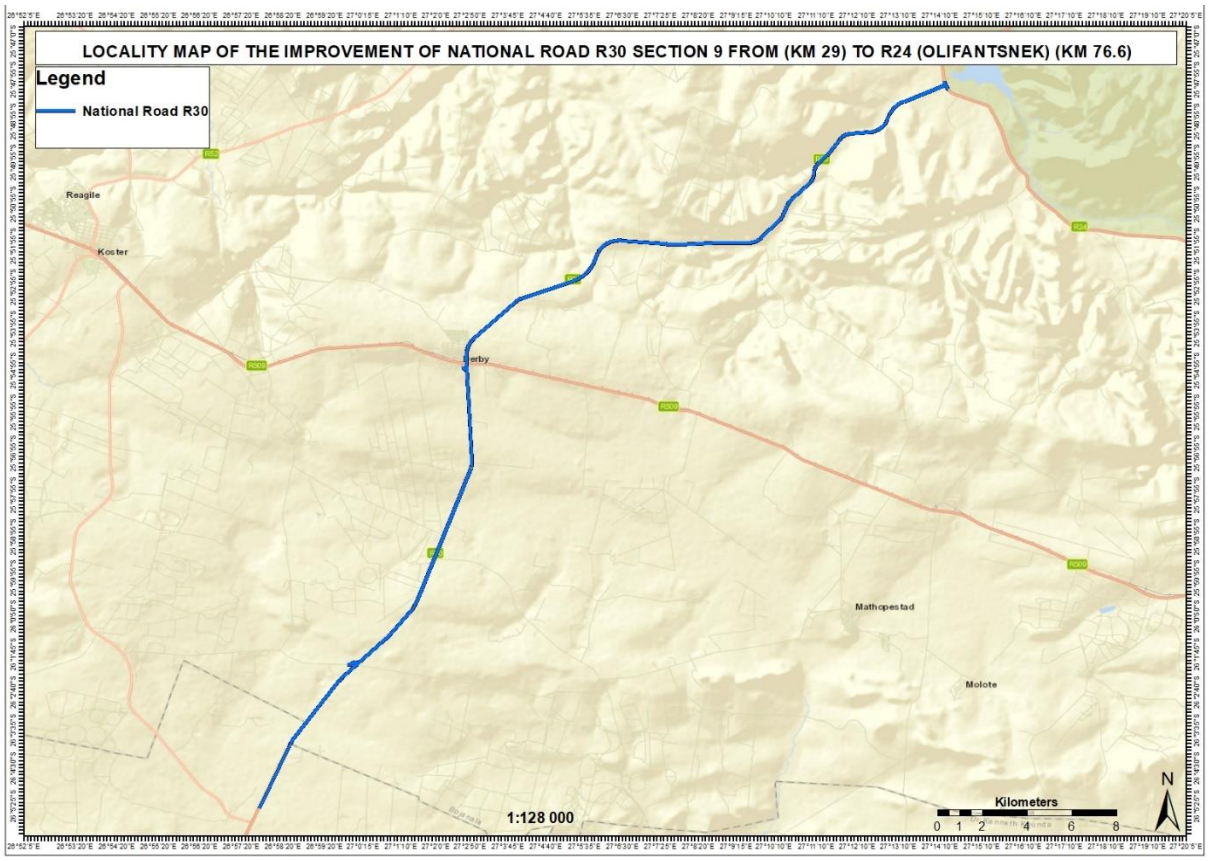


Figure 2: Locality Map

7. METHODOLOGY

7.1 Wetland Assessment

For the purpose of this assessment, wetlands are considered as those ecosystems defined by the National Water Act No. 36 of 1998 as:

"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

7.1.1 Desktop Assessment

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA)'s databases were undertaken for the project. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs. FEPAs are determined through a process of systematic biodiversity planning and involved collaboration of over 100 freshwater researchers and practitioners. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (MacFarlane et al., 2009).

The assessment of the study site involved the investigation of aerial photography, GIS databases including the NFEPA and South African National Wetland maps as well as literature reviews of the study site in order to determine the likelihood of wetland areas within this site.

7.1.2 Field Assessment

The wetland delineation was conducted as per the procedures described in 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1' (Department of Water Affairs, 2005) (**Figure 3**). This document requires the delineator to give consideration to four indicators in order to find the outer edge of the wetland zone:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur.
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.

- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation. Signs of wetness are characterised by a variety of aspects. These include marked variations in the colours of various soil components, known as mottling; a gleyed soil matrix or the presence of Mn/Fe concretions. It should be noted that the presence of signs of wetness within a soil profile is sufficient to classify an area as a wetland area despite the lack of other indicators.

In assessing whether an area is a wetland, the boundary of a wetland or a non-wetland area should be considered to be the point where the above indicators are no longer present. An understanding of the hydrological processes active within the area is also considered important when undertaking a wetland assessment. Indicators should be 'combined' to determine whether an area is a wetland, to delineate the boundary of that wetland and to assess its level of functionality and health.

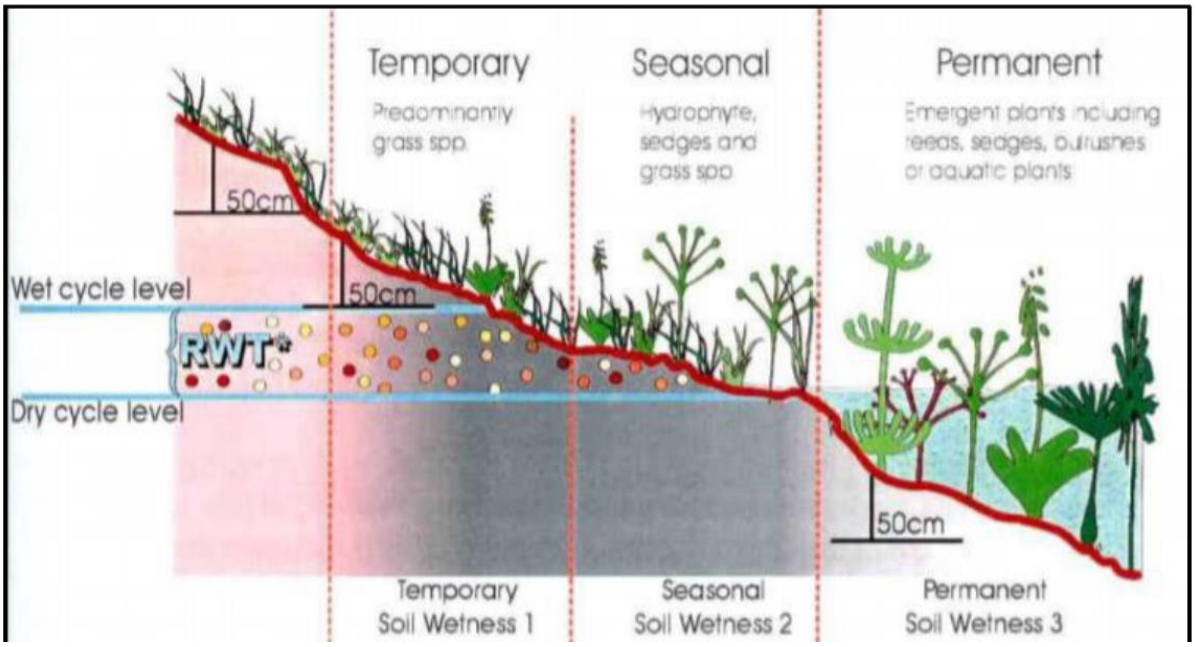


Figure 3: Different zones of wetness found in wetlands, indicating how the soil wetness and vegetation indicators change (DWAF, 2005).

7.1.3 Wetland Functionality and Health

Wetlands within the study area serve to improve habitat within and potentially downstream of the study area through the provision of various ecosystem services. Many of these functional benefits contribute directly or indirectly to increased biodiversity within the transformed study area as well as downstream of the study area through provision and maintenance of appropriate habitat and associated ecological processes (**Table 1**).

Table 1: Ecosystem services provided by wetlands (Kotze et al, 2008).

Ecosystem services supplied by wetlands	Indirect benefits	Regulating and supporting benefits	Flood attenuation		The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream.
			Streamflow regulation		Sustaining streamflow during low flow periods.
			Water quality enhanced benefits	Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters
				Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters.
				Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters.
				Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff waters.
				Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation.
			Carbon storage		The trapping of carbon by the wetland, principally as soil organic matter.
		Biodiversity Maintenance			Through the provision of habitat and maintenance of natural process by the wetland, a contribution is made to maintaining biodiversity of the surrounding area.
	Direct benefits	Provisioning benefits	Provision of water for human use		The provision of water extracted directly from the wetland for domestic, agriculture or other purposes.
			Provision of harvestable resources		The provision of natural resources from the wetland, including livestock grazing, craft plants, fish, etc.
			Provision of cultivated foods		The provision of areas in the wetland favourable for the cultivation of foods.
		Cultural benefits	Cultural heritage		Places of special cultural significance in the wetland, e.g., for baptisms or harvesting of culturally significant plants.
			Tourism and recreation		Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife.
	Education and research				Sites of value in the wetland for education or research.

An indication of the functions and ecosystem services provided by wetlands can be assessed through the WET- Ecoservices manual (Kotze et al., 2008) and are based on

a number of characteristics that are relevant to the particular benefit provided by the wetland. A Level 2 WET-Ecoservices assessment was undertaken for the wetlands occurring on site. A Level 2 assessment is the highest form of WET-Ecoservices assessment that can be undertaken and involves an on-site and desktop assessment.

Each wetland's ability to contribute to ecosystem services within the study area is further dependant on the particular wetland's Present Ecological State (PES) in relation to a benchmark or reference condition. A Level 2 Wetland Health assessment was conducted on the wetlands delineated as per the procedures described in 'Wet-Health: A technique for rapidly assessing wetland health' (MacFarlane et al., 2009). This document assesses the health status of a wetland through evaluation of three main factors –

Hydrology: defined as the distribution and movement of water through a wetland and its soils.

Geomorphology: defined as the distribution and retention patterns of sediment within the wetland.

Vegetation: defined as the vegetation structural and compositional state.

The WET-Health tool evaluates the extent to which anthropogenic changes have impacted upon wetland functioning or condition through assessment of the above-mentioned three factors. Scores range from 0 indicating no impact to a maximum of 10 which would imply that impacts had completely destroyed the functioning of a particular component of the wetland. Impact scores obtained for each of the modules reflect the degree of change from natural reference conditions (**Table 2**).

Table 2: Guideline for interpreting the magnitude of impacts on wetland integrity.

IMPACT CATEGORY	DESCRIPTION	RANGE
None	No discernible modification or the modification is such that it has no impact on wetland integrity.	0 – 0.9
Small	Although identifiable, the impact of this modification on wetland integrity is small.	1 – 1.9
Moderate	The impact of this modification on wetland integrity is clearly identifiable, but limited.	2 – 3.9
Large	The modification has a clearly detrimental impact on wetland integrity. Approximately 50% of wetland integrity has been lost.	4 – 5.9
Serious	The modification has a clearly adverse effect on this component of habitat integrity. Well in excess of 50% of the wetland integrity has been lost.	6 – 7.9
Critical	The modification is present in such a way that the ecosystem processes of this component of wetland health are totally / almost totally destroyed.	8– 10

The tool evaluates the health of the wetland and is determined by a score known as the Present Ecological Score. The health assessments for the hydrology, geomorphology and vegetation components were then represented by the Present Ecological State (PES) categories. The PES categories are divided into six units (A-F) based on a gradient from "unmodified/natural" (Category A) to "severe/complete deviation from natural" (Category F) as depicted in **Table 3**.

Table 3: Health categories used by WET-Health for describing the integrity of wetlands.

DESCRIPTION	IMPACT SCORE	HEALTH CATEGORY
Unmodified, natural.	0 – 1.0	A
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.	1.1 - 2.0	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2.1 - 4.0	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4.1 - 6.0	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6.1 - 8.0	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.1 - 10.0	F

Since hydrology, geomorphology and vegetation are interlinked their scores have been aggregated to obtain an overall PES health score using the following formula (MacFarlane et al., 2009):

Health = ((Hydrology score) x3 + (Geomorphology score) x2 + (Vegetation score) x2)) ÷ 7

This gives a score ranging from 0 (pristine) to 10 (critically impacted in all respects). Hydrology is weighted by a factor of 3 since it is considered to have the greatest contribution to wetland health. Due to differences in the pattern of water flow through various hydro-geomorphic (HGM) types (**Figure 4**), the tool requires that the wetland is divided into distinct HGM units at the outset. Ecosystem services for each HGM unit are then assessed separately.

Each HGM unit is discussed on the following pages in more detail in terms of the functional integrity, Present Ecological Score and the impacts which affect these.

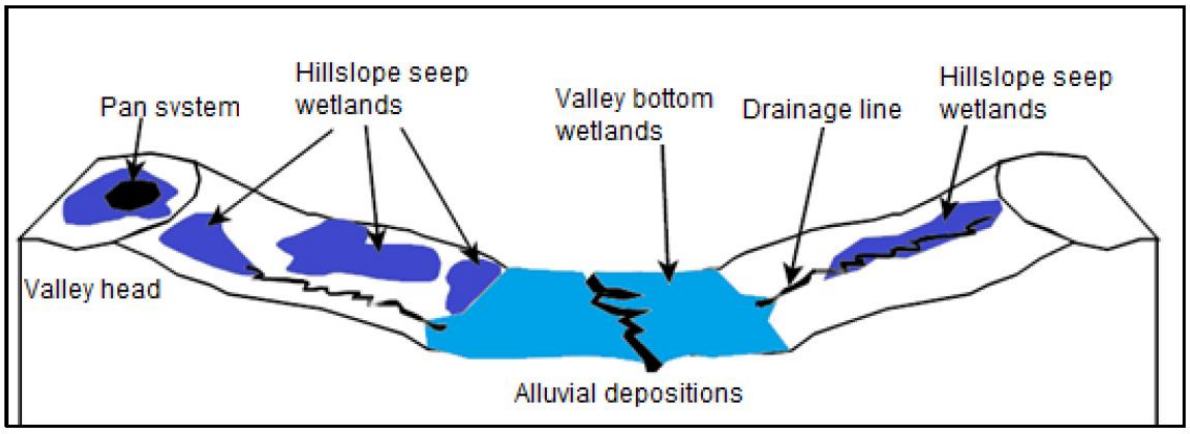


Figure 4: Diagrammatic representation of common wetland systems identified in Southern Africa (based on Kotze et al., 2008).

7.2 Risk Assessment to Watercourses

The risk assessment was conducted in accordance with the DWS risk-based water use authorisation approach and delegation guidelines.

The matrix assesses impacts in terms of consequence and likelihood. Consequence is calculated based on the following formula:

Consequence = Severity + Spatial Scale + Duration

Whereas likelihood is calculated as:

Likelihood=Frequency of Activity + Frequency of Incident +Legal Issues + Detection.

Significance is calculated as:

Significance \Risk= Consequence x Likelihood.

Each metric of the severity (flow regime, water quality, geomorphology, biota and habitat) and spatial scale, duration, frequency of the activity, frequency of the incident/impact and detection are rated to a 1 to 5 scale (GNR 509, of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as Defined in Section 21(C) or Section 21(I), 2016). The score is then placed into one of the three classes, with low risks to the watercourse will qualify for a General Authorisation (GA). Medium and high-risk activities will require a Section 21(C) and (I) water use licence as per the National Water Act of 1998 (**Table 4**).

Table 4: Significance of the Section 21 C and I ratings matrix as prescribed by the National Water Act 1998 (Act No. 36).

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

7.3 Ecological Desktop Assessment

It is important to note that many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have previously been disturbed. Assessing the impacts of the proposed construction of the road often requires evaluating the conservation value of the site relative to other natural areas in the surrounding area. Thus, the general approach and angle adopted for this type of study is to identify any potential faunal species that may have been affected by the existing road and other developments in the vicinity. This means that the focus of this report will be on rare, threatened, protected and conservation-worthy species.

Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which is most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National Legislation protecting environmental and biodiversity resources.

Biodiversity areas represent terrestrial and aquatic sites identified as Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESA), Other Natural Areas and No Natural Remaining Areas conducted by SANBI.

7.3.1 Critical Biodiversity Areas

Critical Biodiversity Areas are those areas required to meet biodiversity thresholds. CBA's are areas of terrestrial or aquatic features (or riparian vegetation alongside CBA aquatic features) which must be protected in their natural state to maintain biodiversity and ecosystem functioning (Desmet *et al.*, 2013). According to Desmet *et al* (2013), these CBAs include:

i) Areas that need to be protected in order to meet national biodiversity pattern thresholds (target area);
ii) Areas required to ensure the continued existence and functioning of species and ecosystems (including the delivery of ecosystem services); and/or
iii) Important locations for biodiversity features or rare species.

7.3.2 Ecological Support Areas

Ecological Support Areas (ESA) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may include an aquatic or terrestrial feature. ESAs can be further subdivided into Critical Ecological Support Areas (CESA) and Other Ecological Support Areas (OESA). Critical Ecological Support Areas are aquatic features, with their terrestrial buffers, which fall within priority sub-catchments, whose protection is required in order to support the aquatic and terrestrial CBAs. An example might be a river reach which feeds directly into a CBA. Other Ecological Support Areas are all remaining aquatic ecosystems (not classed as CESA or CBA), with their terrestrial buffers, which have a less direct impact on the CBA, e.g. a wetland that is geographically isolated from a CBA, but contributes to ecological processes such as groundwater recharge, thereby indirectly impacting on a CBA downstream. (Desmet et al., 2010).

7.3.3 Other Natural Areas

Other Natural Areas are areas of lesser biodiversity importance whose protection is not required in order to meet national biodiversity thresholds. Other Natural Areas may withstand some loss in terms of biodiversity through the conversion of their natural state for development. However, if all Critical Biodiversity Areas are not protected, certain Other Natural Areas will need to be reclassified as Critical Biodiversity Areas in order to meet thresholds. (Desmet et al., 2010).

No Natural Remaining Areas are those areas that have been irreversibly transformed through urban development, plantation and agriculture and poor land management. As a result, these areas no longer contribute to the biodiversity of the region. However, in some cases transformed land may be classified as an ESA or CBA if they still support biodiversity (Desmet et al., 2010).

7.3.4 Threatened Ecosystems

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver et al., 2012). Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver et al., 2012).

7.4 Vegetation Assessment

A comprehensive study was carried out to document all species recorded in the area and to predict vegetation characteristics. This was augmented by a site visit and comprised of the following:

A walkover field survey of the site verifying the presence or absence of species predicted to occur on the site included:

i. Identification and location of keystone or indicator species that may be impacted;
ii. Identify important habitats, including wetlands, grasslands etc;
iii. Identify areas of conservation and/or ecological importance;
iv. Consider invasive alien plant status and rehabilitation potential of natural areas; and

v. An overall condition of the vegetation found in the area, including an assessment of cover and vegetation structure and were classified as vegetation communities.

7.4.1 Conservation priority and Sensitivity

The vegetation types were evaluated in terms of conservation priority according to the following categories:

- **High:** Ecologically sensitive and valuable land with high species richness and/or sensitive ecosystems and/or red data species that should be conserved. No development is to be allowed.
- **Medium-high:** Land that is partially disturbed but that is generally ecologically sensitive to development / disturbances.
- **Medium:** Land on which developments with a limited / low impact on the vegetation / ecosystem can be considered. It is recommended that certain portions of the natural vegetation be maintained in open spaces.
- **Medium-low:** Land of which small sections could be considered to be conserved, but where the area in general has little conservation value.
- **Low:** Land that has little conservation value where development will have an insignificant or no impact on the vegetation.

Sensitivity Areas that are of High and Medium-high conservation priority are regarded as High sensitivity areas in which developments should not be allowed Areas that fall in the Medium, Medium-low and Low conservation priority categories are regarded as Low sensitivity areas in which development may be allowed. Areas where other environmental factors such as high erodibility and steep slopes that play a significant role are regarded as Moderate sensitivity areas. Developments can be allowed in these areas if suitable mitigation measures can be implemented.

7.4.2 Alien Invasive Plants

Invasive alien plants are described as species which are 'non-indigenous' to an area and which have been introduced from other countries either intentionally (for domestic or commercial use) or accidentally; furthermore, they have the ability to reproduce and spread without the direct assistance of people into natural or semi-natural habitats and are destructive to biodiversity and human interests.

Notice 3 of the National Environmental Management: Biodiversity Act 2004 (Act No, 10 of 2004) lists 379 plant species that are legally declared invasive species. Each species is assigned to one of three categories based on the level of threat posed by the species and the legal status assigned to each:

- **Category 1a** – Plant species that must be combatted or eradicated.
- **Category 1b** – Plant species that must be controlled.
- **Category 2** – Plant species that must not be allowed to spread outside any property.
- **Category 3** – Plant species that when occurring in riparian areas must be considered to be category 1b Listed Invasive Species and must be managed according to regulation 3 of NEM:BA,2014.

7.4.3 Faunal assessment

The faunal investigation was focused on mammals, reptiles and amphibians. The following methodology was applied:

- The data sets discussed above under "sources of information" were collected/collated and examined to determine the focus species for this study;
- The data was examined to determine the possible occurrence of any Red Data and non-Red Data species;
- The site was comprehensively assessed during a field investigation to determine fauna and faunal micro habitats present within the site.
- The impacts of the existing Road on faunal species were assessed and mitigation measures were proposed.

7.5 Significance of Identified Impacts on Biodiversity

Significance scoring assesses and predicts the significance of environmental impacts through evaluation of the following factors; probability of the impact; duration of the impact; extent of the impact; and magnitude of the impact. The significance of environmental impacts is then assessed considering any proposed mitigations. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Each of the above impact factors have been used to assess each potential impact using ranking scales as seen in **Table 5**. Impact scores given "with mitigation" are based on the assumption that the mitigation measures

recommended in this assessment are implemented correctly and rehabilitation of the site is undertaken. Failure to implement mitigation measures during operation will keep impacts at an unacceptably high level.

Table 5: Significance scoring used for each potential impact.

Probability	Duration
1 - very improbable	1 - very short duration (0-1years)
2 - improbable	2- short duration (2-5 years)
3 - probable	3 - medium term (5-15 years)
4 - highly probable	4 - long term (>15 years)
5 - definite	5 - permanent/unknown
Extent	**Magnitude**
1 - limited to the site	2 – minor
2 - limited to the local area	4 – low
3 - limited to the region	6 – moderate
4 - national	8 – high
5 - international	10 – very high

Significance Points = (Magnitude + Duration + Extent) x Probability. The maximum value is 100 Significance Points.

Potential Environmental Impacts are rated as high, moderate or low significance as per the following:

<30 significance points = Low environmental significance

31-59 significance points = Moderate environmental significance

>60 significance points = High environmental significance.

8. BACKGROUND INFORMATION

8.1 GEOLOGY & SOILS

A large section of the road consist of the Clastic sediments and minor carbonates and volcanics of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west, all of the Transvaal Supergroup (Vaalian). There is also some contribution from mafic Bushveld intrusives. Soils often stony with colluvial clay-loam but varied, including red-yellow apedal freely drained, dystrophic and eutrophic plinthic catenas, vertic and melanic clays, and some less typical Glenrosa and Mispah forms. Land types Ae, Ba, Ea, Bc, Ac and less typically Fb.

8.2 CLIMATE

The study site experiences strong seasonal summer-rainfall, warm-temperate region, with very dry winters. The Mean Annual Precipitation (MAP) is 654 mm, ranging between 570 mm and 730 mm, slightly lower in the western regions. The coefficient of variation of MAP is 28% in the west and 26–27% in the east, and varies only slightly from 25% to 29% across the unit. The incidence of frost is higher in the west (30–40 days) than in the east (10–35 days). See also climate diagram for Gm 11 Rand Highveld Grassland (Figure 8.36).

8.3 VEGETATION TYPES ALONG R30 NATIONAL ROAD

8.3.1 Gh 15 Carletonville Dolomite Grassland

The area where the National R30 Starts is dominated by the Gh 15 Carletonville Dolomite Grassland (**Figure 5**). This vegetation unit features Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species. It is distributed in the North-West (mainly) and Gauteng and marginally into the Free State Province. In the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province. Altitude 1 360–1 620 m, but largely 1 500–1 560 m.

The Carletonville Dolomite Grassland is classified as **Vulnerable.** A Conservation Target of 24% has been set, while a Small extent of the Carletonville dolomite is statutory conserved in the (Sterkfontein Caves—part of the Cradle of Humankind World Heritage Site, Oog Van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas.

Almost a quarter already transformed for cultivation, by urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams. Erosion very low (84%) and low (15%).

8.3.2 Gm 11 Rand Highveld Grassland

The R30 Road consist of the **Gm 11 Rand Highveld Grassland** vegetation (**Figure 5**) type which is characterized by Highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra*, *P. welwitschii*, *Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Rhus* (especially *R. magalismonata*) is most prominent.

The Gm 11 Rand Highveld Grassland is distributed in the Gauteng, North-West, Free State and Mpumalanga Provinces: In areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugersdorp centred in the vicinity of Derby and Potchefstroom, extending southwards and northeastwards from there. Altitude 1 300–1 635 m, but reaches 1 760 m in places.

The Gm 11 Rand Highveld Grassland is classified as **Endangered**. A conservation target of 24% has been, however this vegetation unit is poorly conserved (only 1%). Small patches protected in statutory reserves (Kwaggavoetpad, Van Riebeeck Park, Bronkhorstspruit, Boskop Dam Nature Reserves) and in private conservation areas (e.g. Doornkop, Zemvelo, Rhenosterpoort and Mpopomeni). Almost half has been transformed mostly by cultivation, plantations, urbanisation or dam-building. Cultivation may also have had an impact on an additional portion of the surface area of the unit where old lands are currently classified as grasslands in land-cover classifications and poor land management has led to degradation of significant portions of the remainder of this unit (D.B. Hoare, personal observation). Scattered aliens (most prominently Acacia mearnsii) occur in about 7% of this unit. Only about 7% has been subjected to moderate to high erosion levels.

8.3.3 SVcb 8 Moot Plains Bushveld

A significant section of the R30 Road consists of the **SVcb 8 Moot Plains Bushveld** vegetation type (**Figure 5**). This vegetation type consists of Open to closed, low, often thorny savanna dominated by various species of *Acacia* in the bottomlands and plains as well as woodlands of varying height and density on the lower hillsides. Herbaceous layer is dominated by grasses.

The SVcb 8 Moot Plains Bushveld vegetation is distributed in the North-West and Gauteng Provinces: Main belt occurs immediately south of the Magaliesberg from the Selons River Valley in the west through Maanhaarrand, filling the valley bottom of the Magalies River, proceeding east of the Hartebeestpoort Dam between the Magaliesberg and Daspoort mountain ranges to Pretoria. It also occurs as a narrow belt immediately north of the Magaliesberg from Rustenburg in the west to just east of the Crocodile River in the east: also south of the Swartruggens–Zeerust line. Altitude typically about 1 050–1 450 m.

The SVcb 8 Moot Plains Bushveld is classified as **Vulnerable**. A conservation Target of 19% has been set. An estimated 13% is statutorily conserved mainly in the Magaliesberg Nature Area. About 28% transformed mainly by cultivation and urban and built-up areas. Very scattered occurrences to sometimes dense patches in places of various alien plants including Cereus jamacaru, Eucalyptus species, Jacaranda mimosifolia, Lantana camara, Melia azedarach and Schinus species. Erosion is mainly very low to low, moderate in some areas.

8.3.4 SVcb 9 Gold Reef Mountain Bushveld

In addition to the above-mentioned vegetation units, the study site consists of the **SVcb 9 Gold Reef Mountain Bushveld (Figure 5).** This vegetation is characterized by Rocky hills and ridges often west-east trending with more dense woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of *Acacia caffra* on the southern slopes). Tree cover elsewhere is variable. Tree and shrub layers are often continuous. Herbaceous layer is dominated by grasses.

This vegetation unit is North-West, Gauteng, Free State and Mpumalanga Provinces: Occurs along rocky quartzite ridges of the Magaliesberg and the parallel ridge to the

south, from around Boshoek and Koster in the west to near Bronkhorstspruit in the east. The west-east-trending ridge of the Witwatersrand from around Krugersdorp in the west, through Roodepoort and Johannesburg to Bedfordview (Germiston District). Inner ridges (e.g. Dwarsberg and Witkop) of the Vredefort Dome on the Vaal River northwest of Parys and part of the Suikerbosrand and some other hills around Heidelberg. Altitude 1 200–1 750 m.

The SVcb 9 Gold Reef Mountain Bushveld is classified as **Least threatened**. A conservation target of 24% has been set, with Some 22% statutorily conserved mainly in the Magaliesberg Nature Area and much smaller proportions in the Rustenburg, Wonderboom and Suikerbosrand Nature Reserves. At least an additional 1% conserved in other reserves brings the total conserved very close to target. About 15% transformed mainly by cultivation and urban and built-up areas. Some areas with dense stands of the alien Melia azedarach but which is often associated with drainage lines or alluvia (i.e. azonal vegetation) embedded within this unit. Erosion is very low to low.

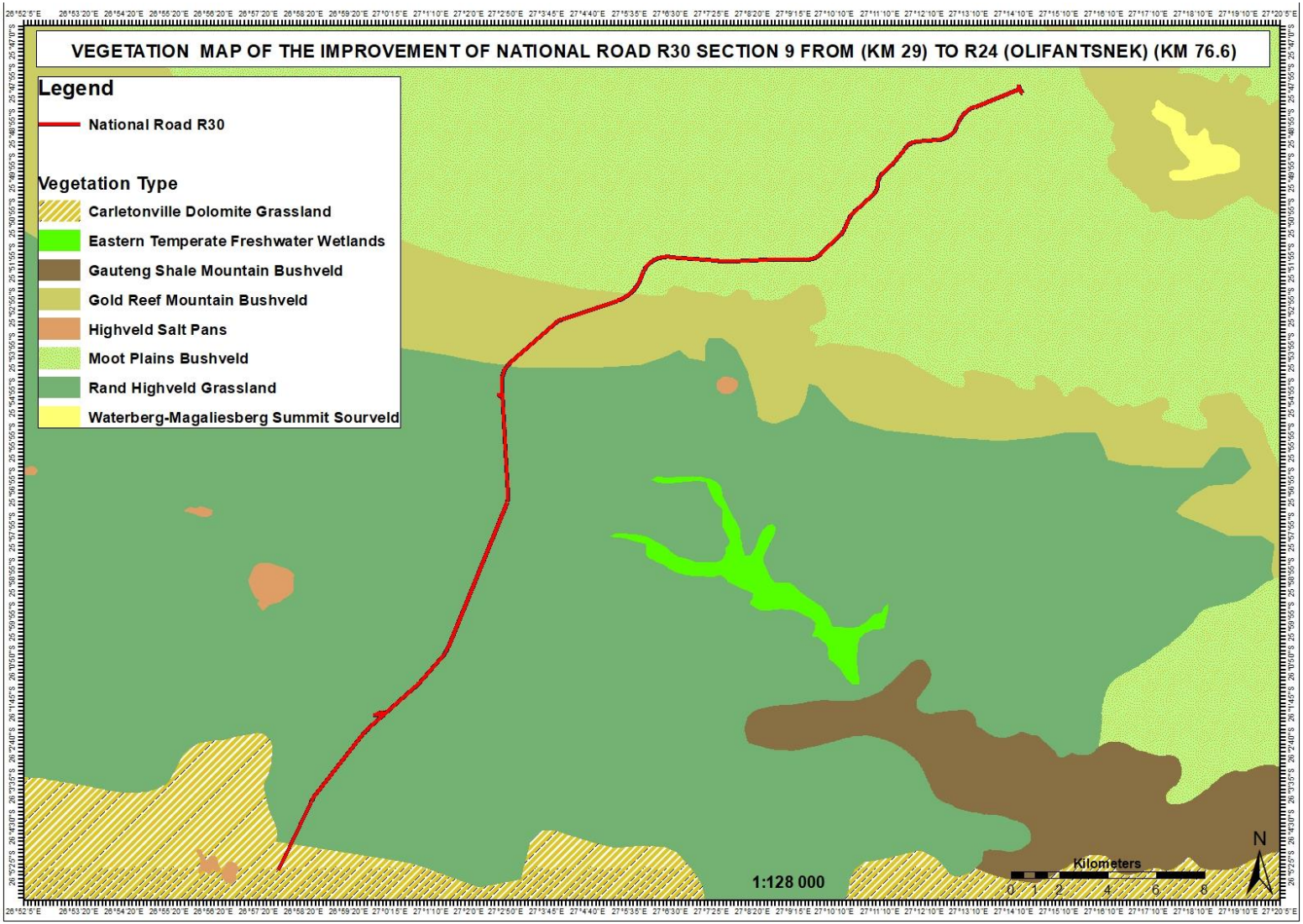


Figure 5: The vegetation type associated with the R30 National Road (2012 Vegetation Map)

The important taxa that is found onsite is summarised in **Table 6**.

Table 6: Important Taxa within the vegetation units found along the R30 National Road (Mucina and Rutherford 2006)

PLANT FORM	SPECIES
Gm 11 Rand Highveld Grassland	
Graminoids	*Ctenium concinnum (d), Cynodon dactylon (d), Digitaria monodactyla (d), Diheteropogon amplec¬tens (d), Eragrostis chloromelas (d), Heteropogon contortus (d), Loudetia simplex (d), Monocymbium ceresiiforme (d), Panicum natalense (d), Schizachyrium sanguineum (d), Setaria sphacelata (d), Themeda triandra (d), Trachypogon spicatus (d), Tristachya biseriata (d), T. rehmannii (d), Andropogon schirensis, Aristida aequiglumis, A. congesta, A. junciformis subsp. galpinii, Bewsia biflora, Brachiaria nigropedata, B. serrata, Bulbostylis burchellii, Cymbopogon caesius, Digitaria tricholaenoides, Elionurus muticus, Eragrostis capensis, E. curvula, E. gummiflua, E. plana, E. racemosa, Hyparrhenia hirta, Melinis nerviglumis, M. repens subsp. repens, Microchloa caffra, Setaria nigrirostris, Sporobolus pectinatus, Trichoneura grandiglumis, Urelytrum agropyroides. Herbs: Acanthospermum australe (d), Justicia anagalloides (d), Pollichia campestris (d), Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Helichrysum caespititium, H. nudifolium var. nudifolium, H. rugulosum, Ipomoea crassipes, Kohautia amatymbica, Lactuca inermis, Macledium zeyheri subsp. argyrophylum, Nidorella hottentotica, Oldenlandia herbacea, Rotheca hirsuta, Selago densiflora, Senecio coronatus, Sonchus dregeanus, Vernonia oligocephala, Xerophyta reti¬nervis.*
Geophytic Herbs	*Boophone disticha, Cheilanthes hirta, Haemanthus humilis subsp. humilis, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia, Oxalis corniculata.*
Succulent Herb	*Aloe greatheadii var. davyana*

Low Shrubs	*Anthospermum rigidum subsp. pumilum, Indigofera comosa, Rhus magalismontana, Stoebe plumosa.*
Succulent Shrub	*Lopholaena coriifolia (d).*
Geoxylic Suffrutex	*Elephantorrhiza elephantina.*
SVcb 8 Moot Plains Bushveld	
Small Trees	*Acacia nilotica (d), A. tortilis subsp. heteracantha (d), Rhus lancea (d).*
Tall Shrubs	*Buddleja saligna (d), Euclea undulata (d), Olea europaea subsp. africana (d), Grewia occidentalis, Gymnosporia polyacantha, Mystroxylon aethiopicum subsp. burkeanum.*
Low Shrubs	*Aptosimum elongatum, Felicia fascicularis, Lantana rugosa, Teucrium trifidum. Succulent Shrub: Kalanchoe paniculata.*
Woody Climber	*Jasminum breviflorum*
Herbaceous Climber	*Lotononis bainesii*
Graminoids	*Heteropogon contortus (d), Setaria sphacelata (d), Themeda triandra (d), Aristida congesta, Chloris virgata, Cynodon dactylon, Sporobolus nitens, Tragus racemosus.*
Herbs	*Achyropsis avicularis, Corchorus asplenifolius, Evolvulus alsinoides, Helichrysum nudifolium, H. undulatum, Hermannia depressa, Osteospermum muricatum, Phyllanthus maderaspatensis.*
SVcb 9 Gold Reef Mountain Bushveld	
Small Trees	*Acacia caffra (d), Combretum molle (d), Protea caffra (d), Celtis africana, Dombeya rotundifolia, Englerophytum magalismontanum, Ochna pretoriensis, Rhus leptodictya, Vangueria infausta, V. parvifolia, Ziziphus mucronata.*
Tall Shrubs	*Canthium gilfillanii, Ehretia rigida subsp. rigida, Grewia occidentalis, Gymnosporia buxifolia, Mystroxylon aethiopicum subsp. burkeanum.*

Low Shrubs	*Athrixia elata, Pearsonia cajanifolia, Rhus magalismontana subsp. magalismontana, R. rigida var. rigida.*
Woody Climber	*Ancylobotrys capensis. Graminoids: Loudetia simplex (d), Panicum natalense (d), Schizachyrium sanguineum (d), Trachypogon spicatus (d), Alloteropsis semialata subsp. eckloniana, Bewsia biflora, Digitaria tricholaenoides, Diheteropogon amplectens, Sporobolus pectinatus, Tristachya biseriata, T. leucothrix.*
Herbs	*Helichrysum nudifolium, H. rugulosum, Pentanisia angustifolia, Senecio ve¬nosus, Xerophyta retinervis.*
Geophytic Herbs	*Cheilanthes hirta, Hypoxis hemerocallidea, Pellaea calomelanos.*

8.4 SURFACE HYDROLOGY

The aquatic sensitivity of the proposed site is classified as **VERY HIGH** in the Screening Report. The National Freshwater Ecosystems Priority Areas (NFEPA) identifies important wetlands in South Africa (**Figure 6**), The study site falls under the Crocodile West and Marico Water Management Area (WMA). **Figure 6** is a specific representation of the watercourses/wetlands that are found along the R30 Road. The existing R30 Road is located within 500m of a number of watercourses.

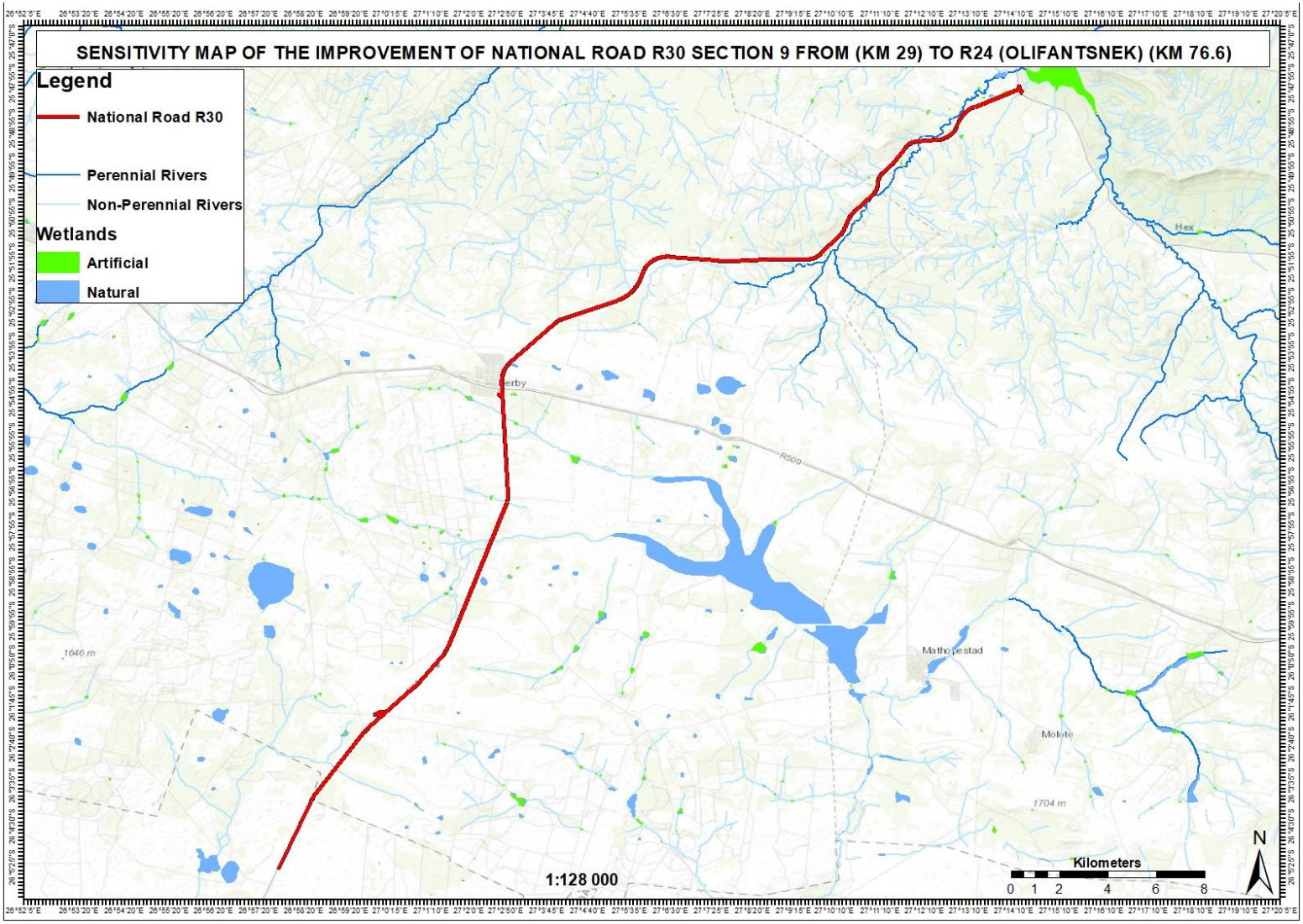


Figure 6: Wetland/Watercourses along the R30 Road

9. RESULTS

9.1 Wetland Delineation and Assessment

This section provides the findings of the various methodologies utilised during the wetland assessment.

9.1.1 Desktop Assessment

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA) database were undertaken for the study site. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. They were identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (MacFarlane et al., 2009). Identification of FEPA Wetlands are based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland-dependent birds.

9.1.1.1 FIELD SURVEY

The study site suffered various degrees of disturbance as a result of the existing R30 National Road, and anthropogenic activities onsite. The disturbance has taken place over time. There are patches of indigenous vegetation along the road, with an abundances of Acacia species. Vegetation is observed along the edges of the road, and there is evidence of alien invasive plant species. The result has been high vegetation surface areas with moderate biodiversity sensitivity cover or topsoil in many areas adjacent the servitude of the road.

9.1.1.2 WETLAND FEATURES

The R30 Road is traversed by a number of perennial rivers(streams) (**Figure 7 and Figure 8**). The road has a number of drainage lines that serve the purpose of conveying water into the perennial rivers and the existing culverts during and immediately after rainfall events. The existing watercourses service support a host of hydrophytes and avifaunal species onsite (**Figure 8**).

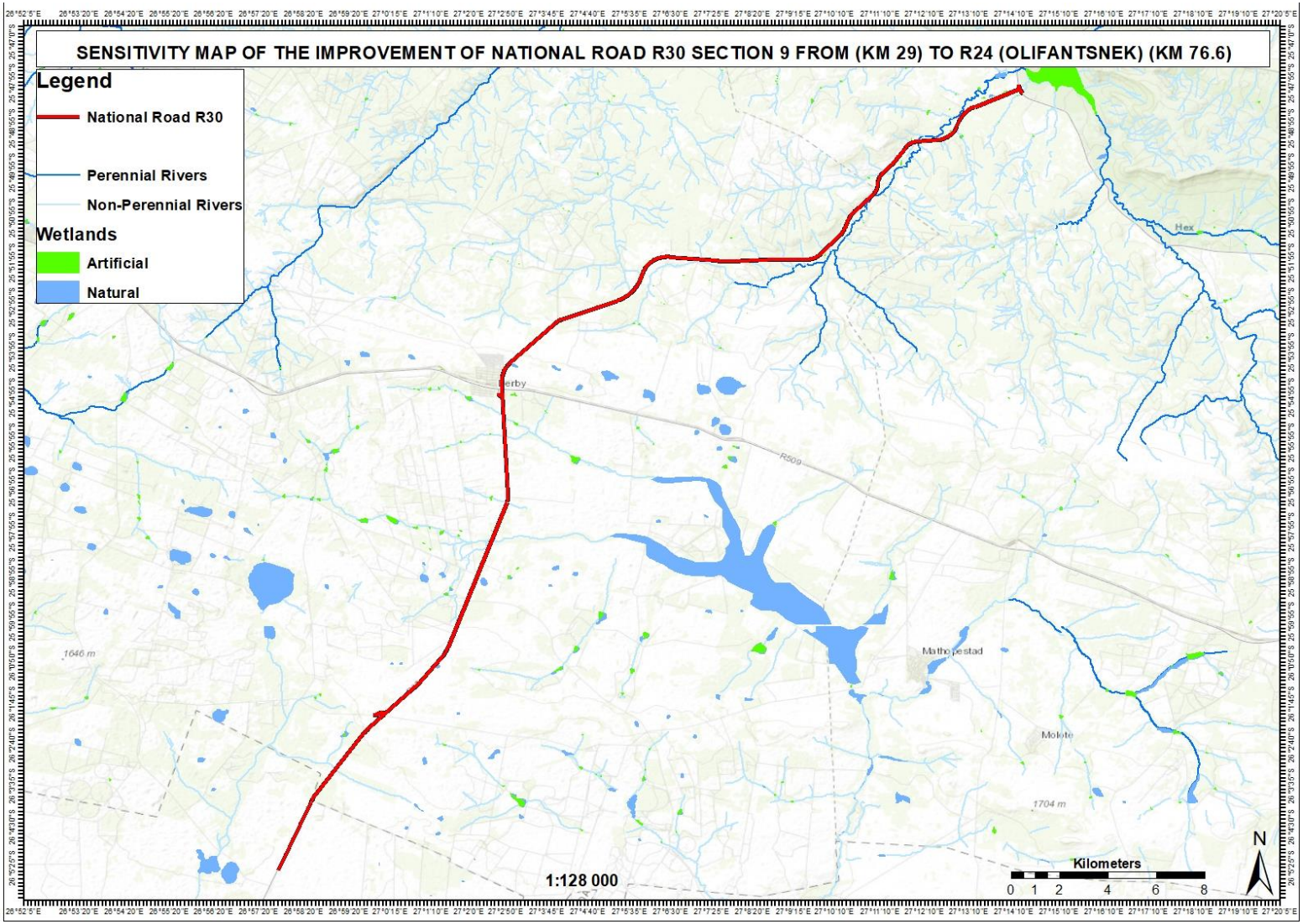


Figure 7:Map of the wetland and Watercourses within 500m of the R30 Road.





COMMENT 1: DRAINAGE LINES ALONG THE R30 NATIONAL ROAD.









COMMENTS 2: WATERCOURSE OBSERVED ALONG THE R30 ROAD





COMMENT 3: WETLAND WITHIN 500M OF THE R30 NATIONAL ROAD.

Figure 8: Delineated watercourses along the R30 National Road.

9.1.2 Terrain indicator

The topography of an area is generally a good practical indicator for identifying those parts in the landscape where wetlands are likely to occur. Generally, wetlands occur as a valley bottom unit however wetlands can also occur on steep to mid slopes where groundwater discharge is taking place through seeps (DWAF, 2005). In order to classify a wetland system, the localised landscape setting must be taken into consideration through ground-truthing of the study site after initial desktop investigations (Ollis et al., 2014).

The study site can be characterized as Gently to moderately sloping upper pediment slopes (**Figure 9**).



Figure 9: Slope of the R30 National Road.

9.1.3 Soil wetness and soil form indicator

The watercourses onsite have water and support a host of hydrophytes and alien invasive plant species. Wetland areas were identified and mainly delineated according to the presence of hydric (wetland) soil types. Hydric soils are defined as

those which show characteristics (redoximorphic features) resulting from prolonged and repeated saturation. Characteristics include the presence of mottling (i.e., bright insoluble manganese and iron compounds) a gleyed matrix and/or Mn/Fe concretions. The watercourses consist mainly of sand (**Figure 11**).



Figure 10:Soil Observed within one of the watercourses along the road servitude.

9.1.4 Vegetation indicator

According to DWAF (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act, Act 36 of 1998. However, using vegetation as a primary wetland indicator requires an undisturbed condition (DWAF, 2005). Major disturbances were however noted in the wetland systems making it difficult to rely solely on vegetation as a wetland indicator. Disturbances included the presence of agricylturla activities, servitude of the road aand powerlines along the

R30 National Road. There was evidence of hydrophyres as reeds(*Phragmites australis*) (**Figure12**),



Figure 11: Phragmite species observed onsite.

The study site consists of The R30 Road traverses a number of vegetation units namely; the Carletonville Dolomite Grassland, Rand Higveld Grassland, Gold Reef Mountain Bushveld and lastly the Moot Plains Bushveld vegetation units. The different vegetation units were observed along the R30 Road, they all have suffered various degrees of disturbance as a result of agricultural activities along the road. The Carletonville Dolomite Grassland is characterised by Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (**Figure 12**).



Figure 12: Vegetation observed along the R30 National Road.

9.1.5 Wetland Delineation

Any wetlands identified on the site were categorised according to the National Wetland Classification System for South Africa (Ollis et al., 2013). The wetland area was classified as a hydrogeomorphic (HGM) unit. An HGM unit is a recognisable physiographic wetland-unit based on the geomorphic setting, water source of the wetland and the water flow patterns (MacFarlane et al., 2009). The proposed project is located within 500m of a number watercourse (rivers), a single wetland (**Figure 13**).

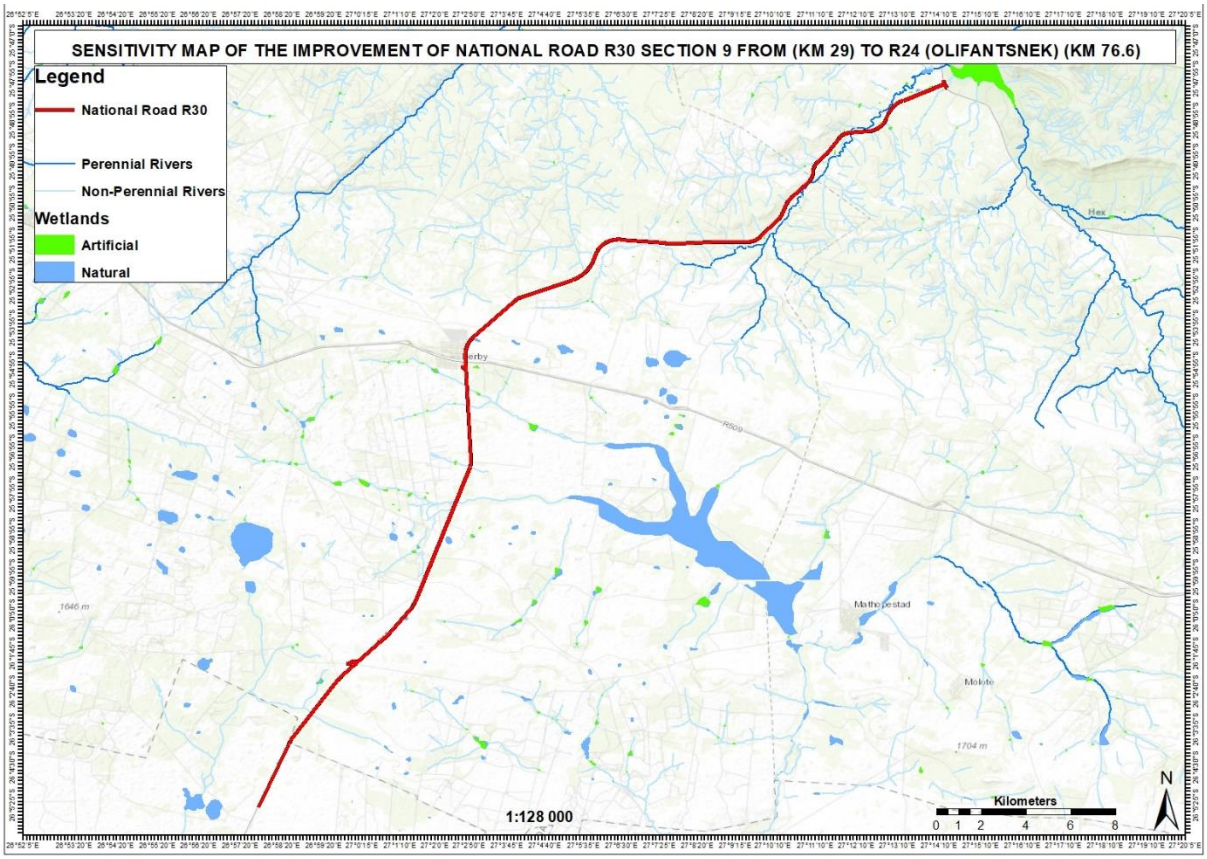


Figure 13:Wetland delineation Map

9.2 Wetland Functional and Health Assessment

9.2.1 Wetland Ecological Importance and Sensitivity

The EIS and functions were calculated using the new draft DWA guidelines and model, as developed by M. Rountree, but not yet published. Information used form the SIBIS and VEGMAP products. A mean score between 0 and 4 is obtained, with 0 as the lowest and 4 as the highest score. No classification of the scores is given.

The watercourses onsite have an Ecological Importance and Sensitivity (EIS) score of 1 (**Table 7**). This is a value between 0 and 4, with 0 being very low and 4 very high. The rivers, therefore, have a Medium EIS score. It is regarded as being modified.

Table 7: EIS calculation of the wetland

ECOLOGICAL IMPORTANCE AND SENSITIVITY	SCORE (0-4)	*CONFIDENCE (1-5)*	MOTIVATION
Biodiversity support	**3.00**	***4***	
Presence of Red Data species	**4.00**	*4.00*	No known red data or protected species observed on site.
Populations of unique species	**0.00**	*4.00*	No unique plant or animal populations were observed.
Migration/breeding/feeding sites	**2.00**	*4.00*	Though a few bird species were observed, few nests were present.
Landscape scale	**1.00**	***4.80***	
Protection status of the wetland	**4.00**	*5.00*	The wetland and surrounding area have been exposed to various industrial and housing developments surrounding the area.
Protection status of the vegetation type	**4.00**	*5.00*	The wetland is not located in an Endangered and Vulnerable vegetation types. Although dominated by *Phragmites* it is very homogeneous as a result of the polluted state of the water. The vegetation surrounding the wetland is mostly pioneer and alien invasive

ECOLOGICAL IMPORTANCE AND SENSITIVITY	SCORE (0-4)	CONFIDENCE (1-5)	MOTIVATION
			species with few indigenous species present.
Regional context of the ecological integrity	**2.50**	*5.00*	The wetland is in PES class E due to the large scale degradation of the surrounding areas as well as the wetland area itself.
Size and rarity of the wetland type/s present	**4.00**	*4.00*	The wetland is not particularly rare and has no vulnerable ecosystem present.
Diversity of habitat types	**1.00**	*5.00*	The wetland has a low species diversity as well as habitat diversity. The wetland is dominated by a homogeneous stand of *Phragmites australis*.

9.2.2 Wetland Health and PES

It should be noted in **Table 8** by Kleynhans (1999) that if a score of less than 2 is attributed to any impact, the lowest rating, rather than the mean, is used to attribute PES class.

Table 8:PES classes (from Kleynhans 1999) indicating the interpretation of the mean scores to rate the PES category.

WITHIN GENERALLY ACCEPTABLE RANGE		
Category	**Score**	**Description**
A	>4	Unmodified, or approximates natural condition and/or represents a natural condition due to successful rehabilitation process/program(s) which has occurred and/or are in the process of occurring.
B	>3 and 4	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged Moderately modified.

C	>2 and 3	Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	2	Largely modified. A large loss of natural habitats and basic Ecosystem functions has occurred.
OUTSIDE GENERAL ACCEPTABLE RANGE		
E	>0 and 2	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive Critically modified.
F	0	Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat

The wetland perennial rivers in the study area have EIS categories and EMC values as indicated in **Table 9**.

Table 9: Summary of EIS onsite.

Wetland	EIS category	EMC
Perennial River	C	D
Wetland	C	C

9.2.3 Wetland ecoservices

WET-EcoServices (Kotze et al. 2004) is a tool for evaluating the services provided by the watercourses (Rivers, allowing for more informed planning and decision-making. In general, the riverine wetland provides low-moderate ecosystem services (spider diagram right). Because of the destruction of natural vegetation and the resulting loss of habitat for insects and amphibians, it has a low species richness and biodiversity. (See **Figure 14**).

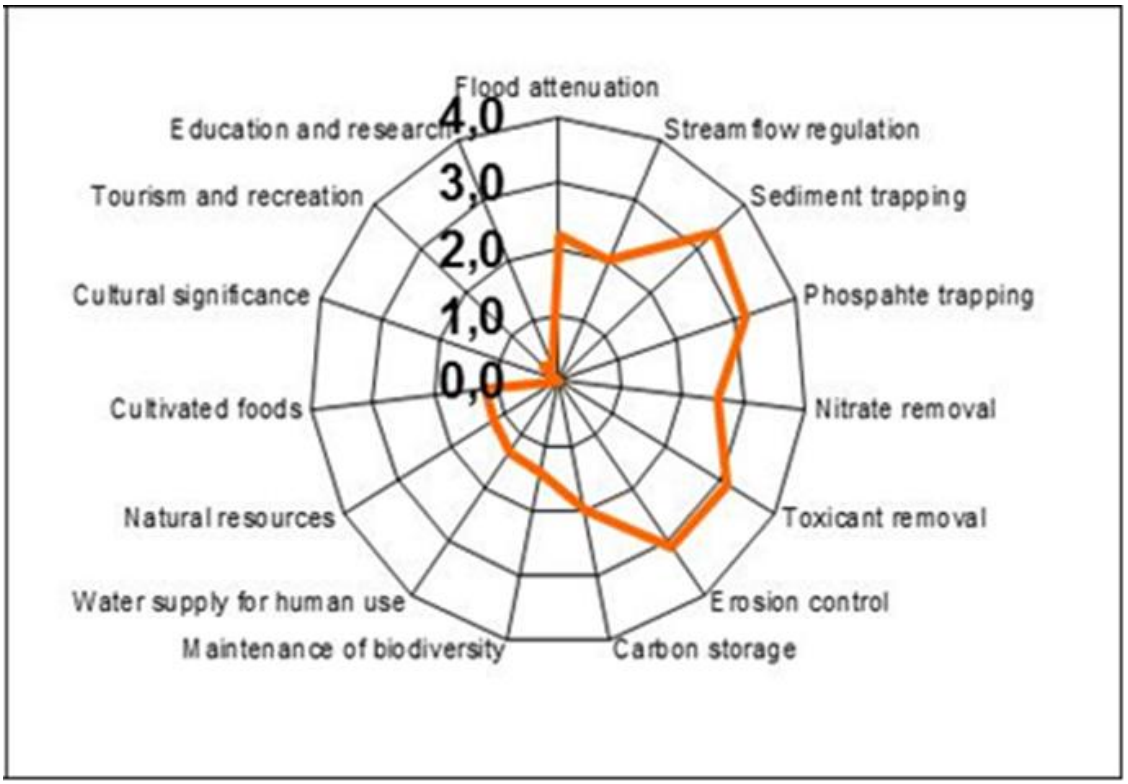


Figure 14: Eco services

9.3 Ecological Assessment

9.3.1 Critical Biodiversity Areas

According to the 2015 North West Biodiversity Sector Plan, the R30 Road traverses three Critical Biodiversity Areas (CBA), while the rest of the road is located within a Heavily or moderately transformed area. There is a section of the road that is located within an Ecological Support Area (Figure 3, Sensitivity map). Critical Biodiversity Areas are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan, while Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services.

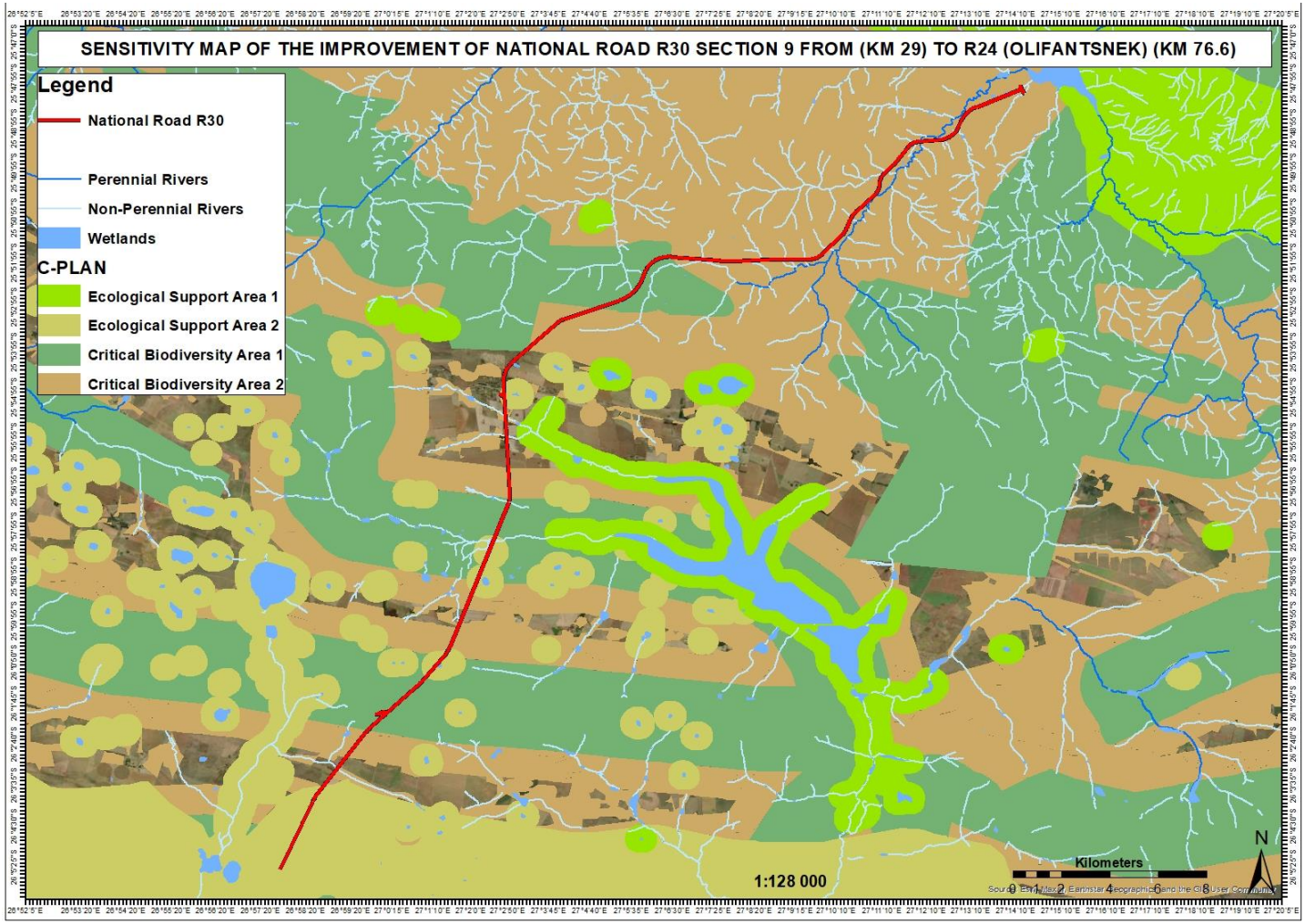


Figure 15: The R30 National Road In Relation to the 2015 North West Biodiversity Sector Plan.

9.3.2 Freshwater Aquatic Species

The freshwater habitats (watercourses) onsite consist mainly of terrestrial plant species (Figure 16). It is important to note that plants such as algae, water lilies, and willow trees help keep the water clean by using their root systems to filter pollution and excess nutrients from the water. The watercourses are dry, and thus unable to accommodate fish. During the site inspection there was evidence of avifaunal species within the watercourses (Figure 17).



Figure 16:Typical Freshwater Habitat onsite.

9.3.3 INVERTEBRATES

During the site inspection, No invertebrates were observed along the road servitude. In order to get accurate results, invertebrate traps should be placed along the watercourses for a number of days.

10. RISK ASSESSMENT OF DELINEATED WETLAND

The following impact assessment is supplied, the assessment was conducted only for existing degradation of the study site by the existing R30 National Road site with the focus on wetland habitats. From the assessments it is clear that impacts can be expected from the proposed activities (**Table 10**).

Table 10: Impact 1: Degradation and / or destruction of Freshwater habitats (Watercourses and the wetland).

Impact Name	**1. Degradation and/or destruction of wetland habitats.**				
Alternative	**Proposal**				
Phase	**All phases**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	1	1	Reversibility ofImpact	2	1
Duration ofImpact	2	1	Probability	3	2
Environmental Risk (Pre-mitigation)					-4.50
Mitigation Measures					

In terms of section 19 of the NWA (1998), owners / managers / people occupying land on which any activity orprocess undertaken which causes or is likely to cause pollution or degradation of a water resource must take all reasonable measures to prevent any such disturbance from occurring, continuing or recurring. These measures may include measures to (inter alia):

- Cease, modify, or control any act or process causing the pollution/degradation.
- Comply with any prescribed waste standard or management practice.
- Contain or prevent the movement of pollutants or the source of degradation.
- Remedy the effects of the pollution/degradation.
- Remedy the effects of any disturbance to the bed and banks of a watercourse/wetland.

According to the NWA (1998) part of the definition of pollution of water resources states that any physical alterations to a water resource, for example the excavation of a wetland / stream or changes to the morphology of such a water resource may be considered to be pollution. Activities which cause an alteration to the biological properties of a wetland i.e. the fauna and flora contained within and supported by that water resource are therefore also considered to be a form of pollution.

Any construction activities in or within a delineated buffer zone of a water resource may only take place afterthe necessary water use license has been obtained.

Where wetlands may be encroached upon by proposed activities, the edge of the wetland must be clearly demarcated in the field with pegs or poles that will last for the duration of the construction phase, color-codedas follows:

• RED – Indicating the edge of the wetland (Note: This includes the permanent, seasonal and

temporal zonesof wetlands, or parts thereof; and no vehicles or building materials are allowed in this zone). These should beput along the entire length of the site. • ORANGE – Indicating the edge of the buffer zone Construction machinery and associated vehicles may not be allowed to enter wetlands. Strictly no re-fueling ofvehicles or machinery should be allowed to take place in any area close to a wetland. During and after construction areas of exposed soil can easily erode and subsequently end up in the wetlands. A well-designed storm water system must be put in place to avoid erosion into wetlands. Naturalrunoff from the natural terrestrial habitat surrounding the wetlands should however not be restricted unnecessarily.
The use of potential pollutants (paint, chemicals, etc.) during construction and operational phases must bestrictly controlled and a high quality of management and supervision concerning such materials must be enforced, especially close to wetland buffer zone areas. Sanitary facilities must be made available to construction workers to prevent urine and human waste enteringthe wetlands. If at any point construction activities encroach on wetlands, it is strongly advised that a wetland/aquaticspecialist is appointed during all phases to monitor impacts and related mitigation measures regardingwetland habitats.

Environmental Risk (Post-mitigation)	-2.00
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it isprobable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-2.33

Table 11: Impact 2: Loss of indigenous fauna and flora diversity associated with watercourses.

Impact Name	**2. Loss of indigenous fauna and flora diversity associated with wetlands.**				
Alternative	**Proposal**				
Phase	**All phases**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	2	1	Reversibility ofImpact	4	2
Duration ofImpact	2	2	Probability	2	1
Environmental Risk (Pre-mitigation)					-5.00
Mitigation Measures					
Destruction of natural wetland vegetation must be avoided at all costs. Special attention should be paid to alien and invasive control within the whole study area. Alien and invasivevegetation control should take place throughout all development phases to prevent loss of habitat of indigenous fauna and flora. Movement of vehicles and construction workers in wetlands and buffer zones should be strictly prohibited. Noharvesting of plants or animals should be allowed. Any specimens of protected plant species known to occur in the wetlands and the delineated buffer zone and may potentially be impacted by the construction activities, are to be fenced off for the duration of the activity. Conservation of these specie and their natural habitat must be a high priority. If at any point construction activities encroach on wetlands, it is strongly advised that a wetland/aquatic specialist is appointed during all phases to monitor impacts and related mitigation measures regarding wetland habitats. Red Data listed and protected species as well as sensitive habitats related to wetlands should be strictly monitored. Any conservation recommendations and measures that aim to mitigate the impacts of this development must also be monitored by such a specialist during the construction, operational and decommissioning phases.					
Environmental Risk (Post-mitigation)					-1.50
Degree of confidence in impact prediction:					High

Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value(services and/or functions) of these resources is limited.	
Prioritisation Factor	1.33
Final Significance	-2.00

Vegetation clearing has occurred and resulted increased turbidity and sedimentation in the watercourse as well as altered flow patterns. The machinery used has a risk of hydrocarbon spills into the watercourse. There are impacts on the flow patterns to the watercourse.

This report highlights the findings for a one site survey, limiting the confidence for the risk assessment in **Table 10 and 11 above**.

Operational Phase

Increased sedimentation may occur as a result from the runoff from the tar road (R30). This has the potential to change habitat structure within the receiving environment and this will in turn result in changes in ecosystem function. Changes in habitat structure due to sedimentation would result in changes in the species composition.

Water quality impairment has the potential to change ecosystem function, change community structure as species sensitive to water quality impairment are eliminated and tolerant species increase in number, this results in a loss of biodiversity of sensitive species.

Invasive alien plants have far-reaching detrimental effects on native biota and has been widely accepted as being a leading cause of biodiversity loss. They typically have rapid reproductive turnover and are able to outcompete native species for environmental resources, alter soil stability, and promote erosion, change litter accumulation and soil properties. In addition, certain alien plants exacerbate soil

erosion whilst others contribute to a reduction in stream flow thereby potentially increasing sediment inputs and altering natural hydrology of receiving watercourses. These impacts negatively affect areas that are largely natural (with low existing weed levels) greater than for areas already characterised by dense infestations of alien plants with low indigenous plant diversity (Macfarlane *et al*., 2014).

10.1.1 Sedimentation and soil erosion

Soil erosion will result in the deposition of sediment into the freshwater system; posing a risk to the downstream catchment geomorphological/functional integrity. Subsequent impacts that are likely to result are:

- sedimentation of the watercourse that will be destructive to many faunal species affecting their habitat; breeding and feeding cycles.

Local site factors such as soil erodibility, vegetation cover, gradient of local slopes and regional rainfall/runoff intensity will affect the probability and intensity of erosion impacts (Macfarlane *et al*., 2014). Typical results of erosion & sedimentation on water resources may include:

- Localised scouring at stormwater discharge points into watercourses
- Deposition of large masses of sediment downstream causing localised channel braiding, instability of the riverbanks and alterations in water distribution.

10.1.2 Pollution of water resources and soil

Changes to the water quality will result in changes to the ecosystem structure and function as well as a potential loss of biodiversity. Water quality pollution leads to modification of the species composition where sensitive species are lost and organisms tolerant to environmental changes dominate the community structure. Any substances entering and polluting watercourses will directly impact downstream ecology through surface runoff during rainfall events, or subsurface water movement, particularly during the wetter summer months.

Contaminants such as hydrocarbons, solids, pathogens and hazardous materials may enter watercourses (examples include petrol/diesel, oil/grease, paint, cement/concrete and other hazardous substances). These contaminants negatively affect aquatic ecosystems including sensitive or intolerant species of flora and fauna.

Where significant changes in water quality occur, this will ultimately result in a shift in aquatic species composition, favouring more tolerant species, and potentially resulting in the localised exclusion of sensitive species. Water quality monitoring must be implemented to ensure sustainable management of water sources within that area. Sudden drastic changes in water quality can also have chronic effects on aquatic biota leading to localised extinctions. Deterioration in water quality will also affect its suitability for human domestic/agricultural use and have far reaching impacts for local communities who may rely on rivers as water supply (Macfarlane et al., 2014).

10.1.3 Alien Invasive Species

There are alien invasive plant species currently present along the Road. Any ground disturbance provides an opportunity for alien invasive plant species to spread and for new species to establish themselves in the areas. Alien invader plant species pose an ecological threat as they alter habitat structure, lower biodiversity (both number and "quality" of species), change nutrient cycling and productivity, and modify food webs (Zedler & Kercher, 2004). Such changes on the ecology of the riparian habitat have/will have a detrimental impact on its ability to maintain both floral and faunal biodiversity. Invasive alien plant species, particularly woody species, have much increased water usage compared with indigenous vegetation. Many alien invasive plant species are particularly found in riparian ecosystems and their invasion results in the destruction of indigenous species; increased inflammable biomass (high fire intensity); erosion; clogging of waterways such as small streams and drainage channels causing decreased river flows and incision of river beds and banks. This results in an overall impact on the hydrological functioning of the system.

10.1.4 Mitigation

The proposed upgrading of the road will have negative effects on the environment. The following mitigation measures may reduce the severity of impacts:

- Rehabilitation of the disturbed areas;
- Minimising pollutants entering the watercourse;
- Implement a programme for the clearing/eradication of alien species including long term control of such species;

- Wetland monitoring and biomonitoring must take place bi-annually.

Sedimentation and soil erosion

Mitigation options

- Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.
- Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. Erosion control measures must be employed where required.
- Riparian vegetation bordering on drainage lines, wetlands and rivers will be considered environmentally sensitive and impacts on these habitats should be avoided.
- If erosion has taken place, rehabilitation will commence as soon as possible.

Pollution of water resources and soil

Mitigation options

- Demarcate wetland areas to avoid unauthorised access.
- No washing of any equipment in close proximity to a watercourse is permitted.
- No releases of any substances that could be toxic to fauna or faunal habitats within the channels or any watercourses is permitted.
- Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil must be removed, and the affected area rehabilitated immediately.
- Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency.
- Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control.
- The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other

hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks.

- All contractors and employees should undergo induction which is to include a component of environmental awareness.

Alien Invasive Species

Mitigation Options

Serious (4)	Limited (2)	Short-term (3-5 years) (3)	Likely (6)	Major (negative) (54)
Limited (1)	Minor (2)	Short-term (3-5 years) (3)	Likely (4)	Minor (negative) (24)

- Ongoing alien plant control must be undertaken, particularly in the disturbed areas as these areas will quickly be colonised by invasive alien species, especially in the riparian zone, which is particularly sensitive to AIP infestation.
- Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.
- Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas.
- After rehabilitation, re-vegetate any exposed surfaces and mulch re-vegetated areas.
- Select appropriate species for wetland and terrestrial areas and ensure species diversity is enhanced, with species commonly found in the natural wetland area.

10.2 ASSESSMENT OF THE NO-GO ALTERNATIVE

Currently there is no proposal from a wetland point of view of a no-go alternative, Since the road is already in existence. In addition, the necessary culverts and crossing structures have been constructed.

10.3 MONITORING REQUIREMENTS

There are no monitoring requirements for the proposed development, because the sites are currently dry. In the event that the proposed road upgrade activities will encroach on the watercourses/wetland, the following is strongly advised from a wetland point of view:

- It is strongly advised that a wetland/aquatic specialist is appointed during the construction, operational and decommissioning phases to monitor impacts and related mitigation measures regarding wetlands and the faunal and floral assemblages occurring in this habitat.
- If the no-go alternative is enforced no monitoring is advised at this stage.

11. FINAL COMMENTS

The aquatic sensitivity of the proposed site is classified as VERY HIGH in the Screening Report. The study site falls under the Crocodile West and Marico Water Management Area (WMA), and the existing R30 National Road is located within 500m of a number of watercourses (Perennial Rivers) and a single wetland.

The ecological significance of the dry watercourses should be viewed in the context of the overall level of functionality of the catchment, and the integrity of the freshwater ecosystem. Since the applicant is proposing the construction of a road, it is important to take note of section 19 of the NWA (1998), owners / managers / people occupying land on which any activity or process undertaken which causes or is likely to cause pollution or degradation of a water resource must take all reasonable measures to prevent any such disturbance from occurring, continuing or recurring. These measures may include measures to (*inter alia*):

- Cease, modify, or control any act or process causing the pollution/degradation.
- Comply with any prescribed waste standard or management practice.
- Contain or prevent the movement of pollutants or the source of degradation.
- Remedy the effects of the pollution/degradation.

Remedy the effects of any disturbance to the bed and banks of a watercourse/wetland.

12. RECOMMENDATIONS

- Include environmental awareness aspects into the site induction program to ensure all staff are aware of the location and importance of wetland habitats.
- Establish emergency response measures and a clearly defined chain of communication to rapidly deal with any unforeseen impacts to wetlands, e.g. spills.
- No stockpiling of material may take place within the wetland/watercourse areas and temporary construction camps and infrastructure should also be located outside the wetland footprint.
- Regular cleaning up of the wetland areas should be undertaken to remove litter.
- Design and implement a construction stormwater management plan that aims to minimise the concentration of flow and increase in flow velocity, as well as minimising sediment transport off site.
- Where practically possible, the major earthworks should be undertaken during the dry season (roughly from April to August) to limit erosion due to rainfall runoff.
- Store and handle potentially polluting substances and waste in designated, bunded facilities.
- Waste should be regularly removed from the construction site by suitably equipped and qualified operators and disposed of in approved facilities.
- Locate temporary waste and hazardous substance storage facilities a minimum of 100m from any wetland edge.
- Keep sufficient quantities of spill clean-up materials on site.

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forestry, fisheries
& the environment

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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
PROPOSED UPGRADE OF THE NATIONAL ROAD R30 SECTION 9 FROM KM 29 TO R24: BIODIVERSITY AND WETLAND STUDIES

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

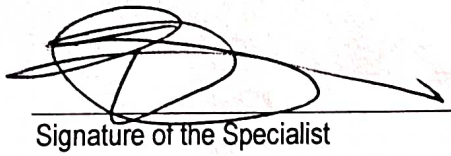
Title of Specialist Assessment	Wetland Delineation and Impact Assessment Report for the National Road R30 Biodiversity Impact Assessment Report for the National Road R30.
Specialist Company Name	Ntumbuluko Consulting (Pty)Ltd
Specialist Name	Tshuxekani Maluleke
Specialist Identity Number	9010195360086
Specialist Qualifications:	**MSc Environmental Sciences**
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SPECIALIST DECLARATION FORM – AUGUST 2023

2. DECLARATION BY THE SPECIALIST

I, Tshuxekani Maluleke 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

Ntumbuluko Consulting (Pty) Ltd

Name of Company:

18/01/2024

Click or tap to enter a date

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _ Click or tap here to enter text. 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

Click or tap here to enter text. Consulting (Pty) Ltd

Name of Company

Click or tap here to enter text. 18/01/2024

Date

Click or tap here to enter text.

Signature of the Commissioner of Oaths

Click or tap to enter a date. 2024-01-18

Date

SOUTH AFRICAN POLICE SERVICE
STATION COMMANDER
2024 -01- 18
OLIEVENHOUTBOSCH
SOUTH AFRICAN POLICE SERVICE

Shasa Heritage Consultants

Heritage Scoping Report for the proposed R30 Upgrading, Olifantsnek to Ventersdorp, North West Province

FIELDWORK: FE ROODT

REPORT COMPILED BY: FE ROODT

PRINCIPAL INVESTIGATOR: F ROODT

DATE: 3 August 2023

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EXECUTIVE SUMMARY

Earthlink Environmental Services contracted the author to survey the proposed area for upgrading and development and produce a scoping report for a Phase 1 heritage study to advise on potential impacts and mitigation measures. The proposed development is along a section of the road along the R30, between Rustenburg and Ventersdorp, North West Province.

Project description and parameters:

SANRAL proposes to upgrade national road R30 Section 9 from (Km 29) To R24 (Olifantsnek) (Km 76.6).

The major aspects of this project include the following:

• Increasing road reserve width
• Strengthening the existing pavement
• Widening of the existing road cross section
• Vertical and horizontal geometric improvements
• Reconstruction of river bridge and lengthening of all major and minor culverts
• Possible horizontal re-alignment of the road at river bridge or
• Possible 10m wide temporary deviation (approximately 500m in length) to accommodate two-way traffic during construction at river bridge
• Construction of ± 15km of service roads including new right of way (ROW)

No heritage resources appear to be impacted. One historical era farm stall building was recorded, but it is not known if it will be impacted.

No graves, marked or unmarked, no heritage remains or socio-religious areas were recorded during survey.

From a heritage resources point of view, we have no objection to the development taking place.

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INDEMNITY AND CONDITIONS RELATING TO THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Shasa Heritage Consultants reserves the right to modify aspects of the report including the recommendations if and when new information becomes available from ongoing research or further work in this field, or pertaining to this investigation. Although Shasa Heritage Consultants exercises due care and diligence in rendering services and preparing documents, Shasa Heritage Consultants accepts no liability, and the client, by receiving this document, indemnifies Shasa Heritage Consultants against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by Shasa Heritage Consultants and by the use of the information contained in this document. This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

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1. INTRODUCTION AND TERMS OF REFERENCE

Application purpose: Proposed R30 (Rustenburg to Ventersdorp) upgrade and associated infrastructure (bridges and culverts)

Area: R30 North West Province

Size: ±50 km

GPS:
Start *S25º 48' 03.8" E27º 14' 16.6"*
End *S26º 05' 27.0" E26º 57' 44.7"*

Map reference number: 2526DD, 2527 CC, CD, 2626 BB, 2627 AA and AB

This report will enable the Applicant to take pro-active measures to limit the adverse effects that the development could have on heritage resources.

In terms of the National Heritage Resources Act (1999) the following is of relevance:

Historical remains

Section 34(1) 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.

Archaeological remains

Section 35(4) No person may, without a permit issued by the responsible heritage resources authority-

(a) destroy, damage, excavate, alter, deface, or otherwise disturb any archaeological or palaeontological site or any meteorite

Burial grounds and graves

Section 36 (3)(a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority-

(c) 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; or

(b) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in detection or recovery of metals.

Culture resource management

Section **38(1)** Subject to the provisions of subsection (7), (8) and (9), any person who intends to undertake a development* …

must at the very earliest stages of initiating such development notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development.

***'development'** means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including-

(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;
(b) carry out any works on or over or under a place*****;
(e) any change to the natural or existing condition or topography of land, and
(f) any removal or destruction of trees, or removal of vegetation or topsoil;

"place** means a site, area or region, a building or other structure** ..."

***"structure** means any building, works, device or other facility made by people and which is fixed to the ground, …"

2. METHOD

2.1 Sources of information and methodology

The source of information was primarily the field reconnaissance and referenced literary sources.

A pedestrian survey of the area was undertaken, during which standard methods of observation were applied. The area was surveyed on 9 July 2023 during the early morning to late afternoon and was thoroughly traversed. Mr FE Roodt (primary), Ms KD Roodt and Ms L De Andrande (assistants) conducted fieldwork.

Special attention was given to any areas displaying soil and or vegetative changes. As most archaeological material occurs in single or multiple stratified layers beneath the soil surface, special attention was given to disturbances, both man-made such as roads and clearings, as well as those made by natural agents such as burrowing animals and erosion. Locations of heritage remains were recorded by means of a Google map pins correct to 1m and images captured with an S9 cellular phone.

The area was surveyed on both sides of the road. Where bridges were noted embankments were searched. Private property was not entered and not surveyed. Maps included at the end of this document.

2.2 Limitations

The scoping survey was thorough, but limitations were experienced due to the fact that archaeological sites are subterranean and only visible when disturbed. Vegetation was sparse and dense in patches. Private property was not entered. Due to heavy rains the past summer season, much of the undeveloped land is currently under dense vegetation.

2.3 Categories of significance

The significance of heritage resources is ranked into the following categories.

Significance rating	Action required
Not protected	1a. No action required
Low	2a. Recording and documentation (Phase 1) of site adequate; no further action required 2b. Controlled sampling (shovel test pits, auger sampling), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium	3. Excavation of representative sample, 14C dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism 4b. Graves: Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

Nomination and protection levels of significance:

Level	Details	Action
National (Grade 1)	Site is considered to be of National Significance	Nominated to be declared by by SAHRA
Provincial (Grade 2)	Site is considered to be of Provincial Significance	Nominated to be declared by Provincial Heritage Authority
Local Grade 3A	Site is considered to be of HIGH significance locally	Site should be retained as a heritage site
Local Grade 3B	Site is considered to be of HIGH significance locally	The site should be mitigated and part retained as a heritage site
Generally Protected A	High to Medium significance	Mitigation necessary before destruction

Generally Protected B	Medium significance	Site needs to be recorded before destruction
Generally Protected C	Low significance	No further recording before destruction

The significance of heritage resources is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences.

A crucial aspect in determining the significance and protection status of a heritage resource is often whether or not the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. Many aspects must be taken into consideration when determining significance, such as rarity, national significance, scientific importance, cultural and religious significance, and not least, community preferences. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and mitigated in order to gain data / information which would otherwise be lost. Such sites must be adequately recorded and sampled before being destroyed. These are generally sites graded as of low or medium significance.

2.4 Terminology

Early Stone Age: Predominantly the Acheulean hand axe industry complex dating to + 1Myr yrs – 250 000 yrs. before present.

Middle Stone Age: Various lithic industries in SA dating from ± 250 000 yr. - 30 000 yrs. before present.

Late Stone Age: The period from ± 30 000-yr. to contact period with either Iron Age farmers or European colonists.

Early Iron Age: Most of the first millennium AD

Middle Iron Age: 10th to 13th centuries AD

Late Iron Age: 14th century to colonial period. *The entire Iron Age represents the spread of Bantu speaking peoples.*

Historical: Mainly cultural remains of western influence and settlement from AD1652 onwards – mostly structures older than 60 years in terms of Section 34 of the NHRA, though more recent remains can be termed historically significant should the remains hold social significance for the local community.

Phase 1 assessment: Scoping surveys to establish the presence of and to evaluate heritage resources in a given area

Phase 2 assessments: In depth culture resources management studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required.

Sensitive: Often refers to graves and burial sites although not necessarily a heritage place, as well as ideologically significant sites such as ritual / religious places. *Sensitive* may also refer to an entire landscape / area known for its significant heritage remains.

3. DESCRIPTION OF THE PROPOSED DEVELOPMENT AND TERRAIN

Vegetation: Carletonville Dolomite Grassland GH 15, Rand Highveld Grassland Gm11, Moot Plains Bushveld SVcb 8 and Gold Reef Mountain Bushveld SVcb

Geology: The entire study area is deeply underlain by Precambrian rocks of the Pretoria and Chuniespoort groups of the Transvaal Supergroup, as well as igneous diabase of the Bushveld Igneous Complex. These rocks are in turn, in isolated places, overlain by Quaternary alluvial deposits. (extracted from the PIA)

Terrain: The terrain is **severely impacted** by the existing road and subsequent degradation of the road.

Proposed development: To upgrade a section of the R30



Fig 1. View of area – near Olifantsnek



Fig 2. View of area



Fig 3. View of area



Fig 4. View of area



Fig 5. View of area



Fig 6. View of area



Fig 7. View of area – nearing Ventersdorp



Fig 8. View of area

4. RESULTS OF THE SCOPING SURVEY AND DISCUSSION

4.1 SOCIAL and/or RELIGIOUS INTANGIBLE HERITAGE

The R30 passes the Middlefontein Farm where a Day of the Vow (geloftefees terrein) grounds area located. This area contains building from the hisrorical period and is important for socio-religious activities of the community on an annual basis.

The actual buildings and grounds should in no way be impacted by the proposed upgrading and access should be ensured.

Significance: Low to medium- outside the road reserve but cognizance should be taken by developer and contractors

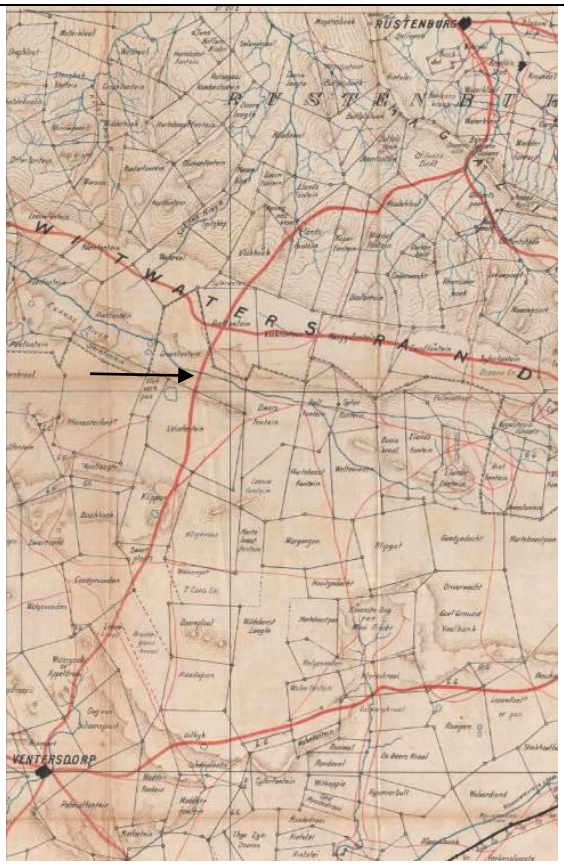


Fig 9. View of Middlefontein Farm


Fig 10. View of Day of the Vow grounds area

4.2 HISTORICAL PERIOD AND BUILT ENVIRONMENT

Historical maps from UCT digital collections were perused for information pertaining to the R30. A map from 1900, clearly shows that what is now the R30 existed at that time. Cognisance should be taken of this fact, as the road in various forms has connected Ventersdorp and Rustenburg for well over a century. However, as population increase occurred the road would have undergone many upgrades over more than 120 years.



Map 1. Black arrow points to the R30. UCT digital collections- map cropped to only show the R30

Significance: For noting, low

4.3 GRAVES

No graves either marked or unmarked have been recorded.

Significance: None – no further action required

4.4 IRON AGE/ EARLY FARMING REMAINS

According to the most recent archaeological cultural distribution sequences by Huffman (2007), this area falls within the distribution area of various cultural groupings originating out of the Urewe Tradition. The facies that may be present are:

Urewe Tradition: Blackburn branch- Ntsuanatsatsi facies AD 1450 - 1650
Uitkomst facies AD 1650- 1820
Olifantspoort facies AD 1500- 1700
Buispoort facies AD 1700- 1840

No remains from the Iron Age were recorded.

Primarily, the Iron age in the North West and Gauteng is characterized by Late Iron Age, Stone walled sites. A large proportion of Late Iron Age sites are derived from occupation of Fokeng settlements who spread north across the Vaal river and settled in the Suikerbosrand (Heidelberg area) and Klipriviersberg areas (Huffman 2007). Most known Tswana archaeological sites are known from north of Rustenburg, and in the Koster and Groot Marico area, spreading into the Waterberg (Bergh 1999). Sites are also known and have been researched in the Pilanesberg Mountains, north west of the R30.

Walling primarily consists of circular patterned stone walls often displaying scallop patterns. Enclosed within these walls are the main occupation areas of the settlement, consisting of huts with clay walls and floors and cooking areas as well as small stock enclosures.

Significance: None- no recorded artefacts or features

4.5 STONE AGE REMAINS

No Stone Age remains were recorded.

The below mentioned is generic background to the area adapted from Deacon and Deacon: 1999:

The Stone Age covers most of southern Africa and the earliest consist of the Oldowan and Acheul artefacts assemblages. Oldowan tools are regularly referred to as “choppers”. Oldowan artefacts are associated with Homo *habilis*, the first true humans. In South Africa definite occurrences have been found at the sites of Sterkfontein and Swartkrans, located East of the study area. They are dated to between 1.7 and 2 million years old. This was followed by the Acheulian technology from about 1.4 million years ago which introduced a new level of complexity. The large tools that dominate the Acheulian artefact assemblages range in length from 100 to 200 mm or more. Collectively they are called bifaces because they are normally shaped by flaking on both faces. In plain view they tend to be pear-shape and are broad relative to their thickness. Most bifaces are pointed and are classified as handaxes, but others have a wide cutting end and are termed cleavers. The Acheulian design persisted for more than a million years and only disappeared about 250 000 years ago.

The change from Acheulian with their characteristic bifaces, handaxes and cleavers to Middle Stone Age (MSA), which are characterized by flake industries, occurred about 250 000 years ago and ended about 30 000 – 22 000 years ago. For the most part the MSA is associated with modern humans; Homo sapiens. MSA remains are found in open spaces where they are regularly exposed by erosion as well as in caves. Characteristics of the MSA are flake blanks in the 40 – 100 mm size range struck from prepared cores, the striking platforms of the flakes reveal one or more facets, indicating the preparation of the platform before flake removal (the prepared core technique), flakes show dorsal preparation – one or more ridges or arise down the length of the flake – as a result of previous removals from the core, flakes with convergent sides (laterals) and a pointed shape, and flakes with parallel laterals and a rectangular or quadrilateral shape: these can be termed pointed and flake blades respectively. Other flakes in MSA assemblages are irregular in form.

The change from Middle Stone Age to Later Stone Age (LSA) took place in most parts of southern Africa little more than about 20 000 years ago. It is marked by a series of technological innovations or new tools that, initially at least, were used to do much the same jobs as had been done before, but in a different way. Their introduction was associated with changes in the nature of hunter-gatherer material culture. LSA sites are known from the Magaliesberg mountains The innovations associated with the Later Stone Age “package” of tools include rock art – both paintings and

engravings (engravings such as these mentioned are known in the Magaliesberg Mountain area North West of the R30, smaller stone tools, so small that the formal tools less that 25mm long are called microliths (sometimes found in the final MSA) and Bows and arrows.

Significance: None- no further action required. The area has already been impacted on.

4.6 PALAEONOTOLOGICAL SENSITIVITY

Extract below is taken from the PIA compiled by Prof. B. Rubidge:

here is no possibility that the Precambrian rocks of the Pretoria and Chuniespoort groups and the Bushveld Igneous Complex will host metazoan fossils, but there is a very slight possibility that overlying Quaternary alluvial sediments could contain fossils. It is highly unlikely that palaeontological heritage will be affected by the development.

As the R30 road already exists, and this development is for an upgrade and widening of the road, any impacts have already occurred. It is thus very unlikely that palaeontological heritage will be affected by the road development.

Significance: None- no further action required

5. BACKGROUND ON THE AREA

Generic background on both Rustenburg and Ventersdorp is provided below. The section of road to be upgraded does not run into either actual town but begins and ends well outside of each.

Rustenburg

Pre-1851	Oral histories show that the Rustenburg and wider area was occupied prior to the Colonial period. Primarily cultural villages were established by the Tswana, consisting of stone walled sites that are still evident over the wider landscape.
1851	Township proclaimed
1850-1899	Town developed around the establishment of 3 Dutch-reformed churches
1899-1902	3rd largest town in the Transvaal and thus played a role during the Anglo-Boer War
1980's	Royal Bafokeng became well known by gaining compensation

	form mining companies in the area.

Ventersdorp:

1866	Town grew around the establishment of a Dutch Reformed Church, officially proclaimed in 1867
1991	9 August 1991- Battle of Ventersdorp- incident between AWB and SAPS. The incident occurred due to opposition by the ABW IRO President FW De Klerk recognising the African National Congress and releasing Nelson Mandela.

6. EVALUATION AND STATEMENT OF SIGNIFICANCE

6.1	**Significance**	**Rating**
1	The importance of the cultural heritage in the community or pattern of South Africa's history (Historic and political significance)	None
2	Possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage (Scientific significance).	None
3	Potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage (Research/scientific significance	None
4	Importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects (Scientific significance)	None
5	Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group (Aesthetic significance)	None
6	Importance in demonstrating a high degree of creative or technical achievement at a particular period (Scientific significance)	None
7	Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons (Social significance)	None
8	Strong or special association with the life and work of a person, group or organization of importance in the history of South Africa (Historic significance)	None
9	The significance of the site relating to the history of slavery in South Africa.	None

6.2 Section 38(3) (c) An assessment of the impact of the development on such heritage resources.

The development should have no impact on any heritage resources as none were recorded and the area has been heavily impacted on in the past and present.

6.3 ***Section 38(3) (d) An evaluation of the impact of the development on heritage resources relative to the sustainable economic benefits to be derived from the development***.

Roads are essentially the backbone of commerce and no heritage resources besides the historical nature of the actual road was recorded.

6.4 ***Section 38(3) (e) The results of consultation with the communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources***.

Social consultative process is ongoing as part of EIA.

6.5 Section 38(3)(f) If heritage resources will be adversely affected by the proposed development the consideration of alternatives.

The road is an upgrade. However, the upgrading is unlikely to impact any resources.

6.6 Section 38(3)(g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

Activity	Potential Impact	Significance without mitigation	Mitigation Measures	Significance with mitigation	Monitoring
Proposed road upgrade	Surface and ground disturbance will destroy potential heritage and environmental resources	Low	• Identify heritage resources prior to development- • Exclude areas from development to reduce impact on known heritage resources	Low	Monitoring

Nature		
A brief description of the impact of the heritage parameter being assessed in the context of the specific border delineated project. Criteria, includes a brief written statement of the heritage aspect being impacted upon by a particular action or activity.		
Topographical Extent		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	Impact limited to site
2	Local/District	Impact limited to district
3	Province/Region	Impact will affect region
4	International/National	Impact is on a national or international scale
Probability		
The probability of the impact occurring		
2	Unlikely	The chance of the impact occurring is extremely low (Less than 25% chance of occurrence).

4	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
6	Probable	The impact will likely occur (Between 50% to 75% chance of occurrence).
8	Definite	Impact will certainly occur (Greater than 75% chance of occurrence).
Reversibility		
The degree to which the impact on heritage resources can be reversed after the activity has been completed		
1	Completely reversible	The impact is reversible with minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures will be required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible regardless of mitigation measures.
Permanent loss of heritage resources		
The degree to which heritage resources will be lost as a result of proposed activity. This applies to destruction of the context of the resource, as excavation could preserve objects but not context.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of any resources.
3	Severe loss of resource	The impact will result insignificant loss of resources.
4	Complete loss of resource	The impact is result in a complete loss of all resources.
Duration		
The duration of the impact on the heritage parameter. Duration indicates the lifetime of a result of the proposed activity.		
1	Short	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in span shorter than the construction phase (0-1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0-2 years).
2	Medium	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2-10 years).
3	Long	The impact and its effects will continue or last for entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10-50 years).
4	Permanent	The only class of the impact that will non-

		transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
Cumulative effect		
The cumulative effect of the impacts on the heritage resource. A cumulative effect/impact is an effect, which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects.
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative Impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects.
Magnitude		
The severity of the impact- it must be considered that once a heritage resource is removed from its original context much of its significance is lost.		
1	Low	Impact affects the quality, use and integrity of the Heritage resource in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the heritage resource but heritage resource still continues and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the heritage resource and the quality, use, integrity and context of heritage resource is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very High	Impact affects the continued viability of the heritage resource and the quality, use, integrity and context of the heritage resource permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation. This would involve a destruction permit or reconstruction- essentially losing the essence of what made the resource significant in the first place.
Significance		
It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. (S) is formulated by adding the sum of numbers assigned to Topographical effect (E), Duration (D), and Magnitude (M) and multiplying the sum by the Probability. S= (E+D+M) P		
<30	Low	Mitigation of impacts is easily achieved where

		this impact would not have a direct influence on the decision to develop in the area.
30-60	Medium	Mitigation of impact is both feasible and fairly easy. The impact could influence the decision to develop in the area unless it is effectively mitigated.
>60	High	Significant impacts where there is difficult. The impact must have an influence on the decision process to develop in the area.

Impact and rating

Impact	Rating
Nature	Road upgrade- R30
Topographical effect	1- limited to site
Reversibility	2
Permanent loss of heritage resources	1
Cumulative effect	1
Duration	3
Magnitude	1
Probability	2
Significance S= (E+D+M) P	1+3+1 x2 =10 The area is considered of low significance
Mitigation	Monitoring on site- see CFP

7. RECOMMENDATIONS

1. We do not have an objection to the development going ahead. Monitoring is recommended.
2. The contractor should be apprised of the procedures to follow should any heritage materials be unearthed during construction, especially paleontological remains.

The discovery of previously undetected subterranean heritage remains on the terrain must be reported to the Heritage Authority or the heritage practitioner, and may require further mitigation measures.

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SAHRIA website for reports in immediate area



Frans E Roodt
BA Hons Archaeology Unisa,



FRANS ROODT (*BA Hons, MA Archaeology, Post Grad. Dip. Museology; UP*)
Principal Investigator for SHASA Heritage Consultants

Maps below are close up views of adjoining sections of the R30. These also serve as survey maps as each side was surveyed



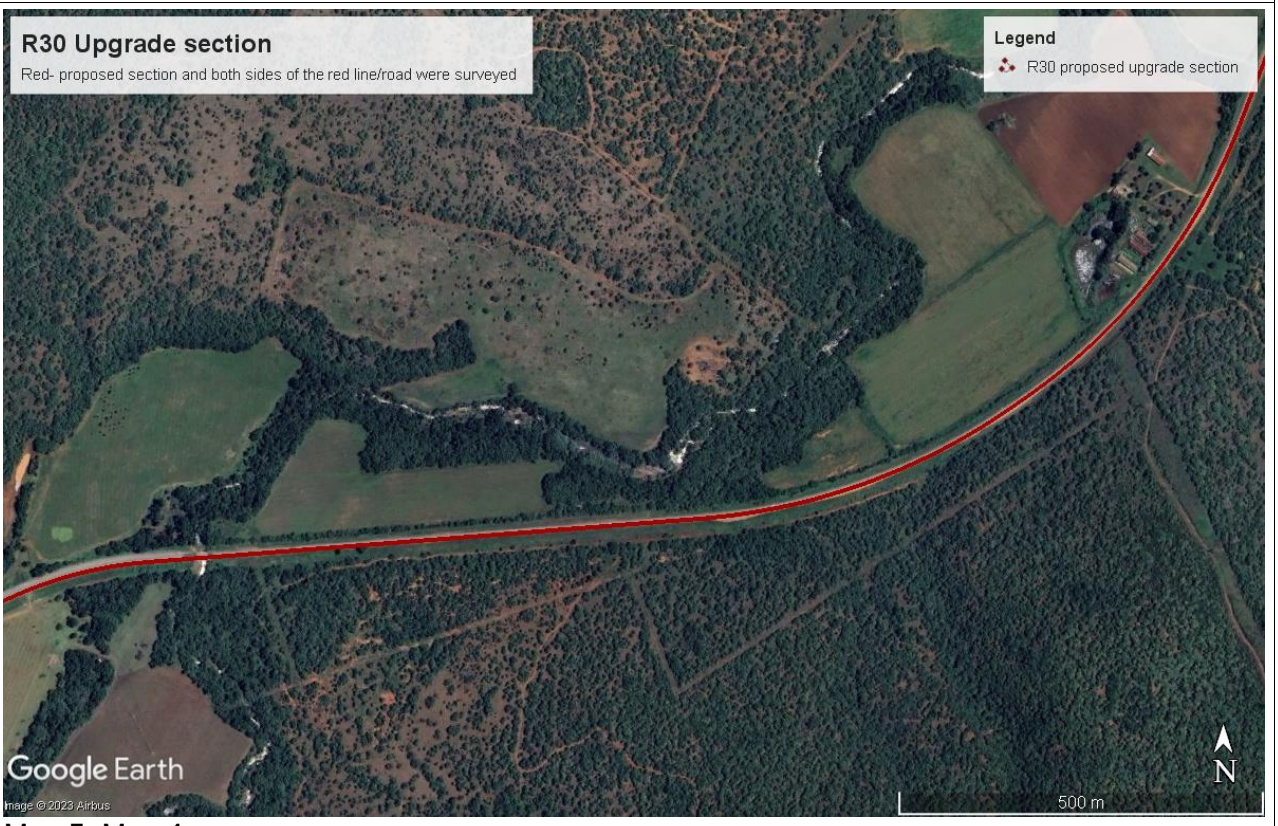
Map 2. Google map 1



Map 3. Map 2



Map 4. Map 3



Map 5. Map 4



Map 6. Map 5



Map 7. Map 6



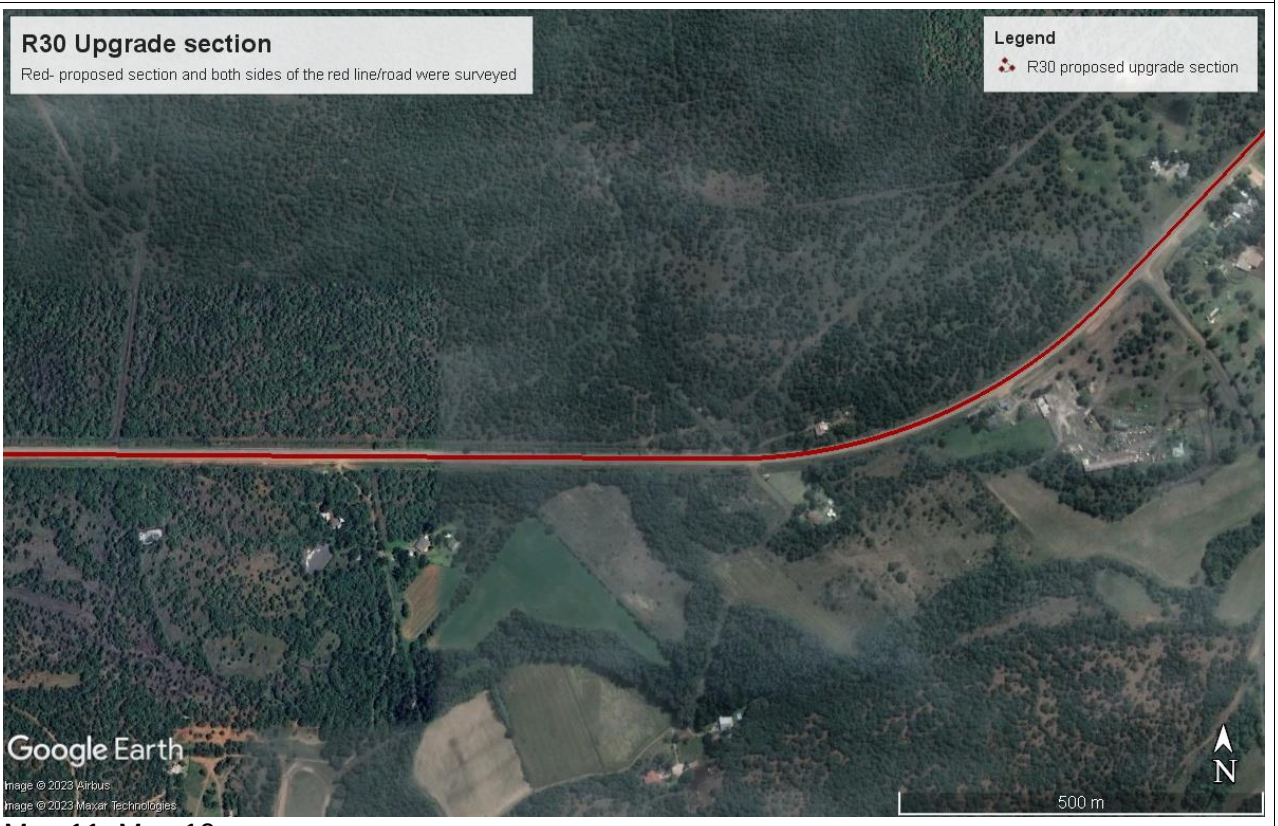
Map 8. Map 7



Map 9. Map 8



Map 10. Map 9



Map 11. Map 10



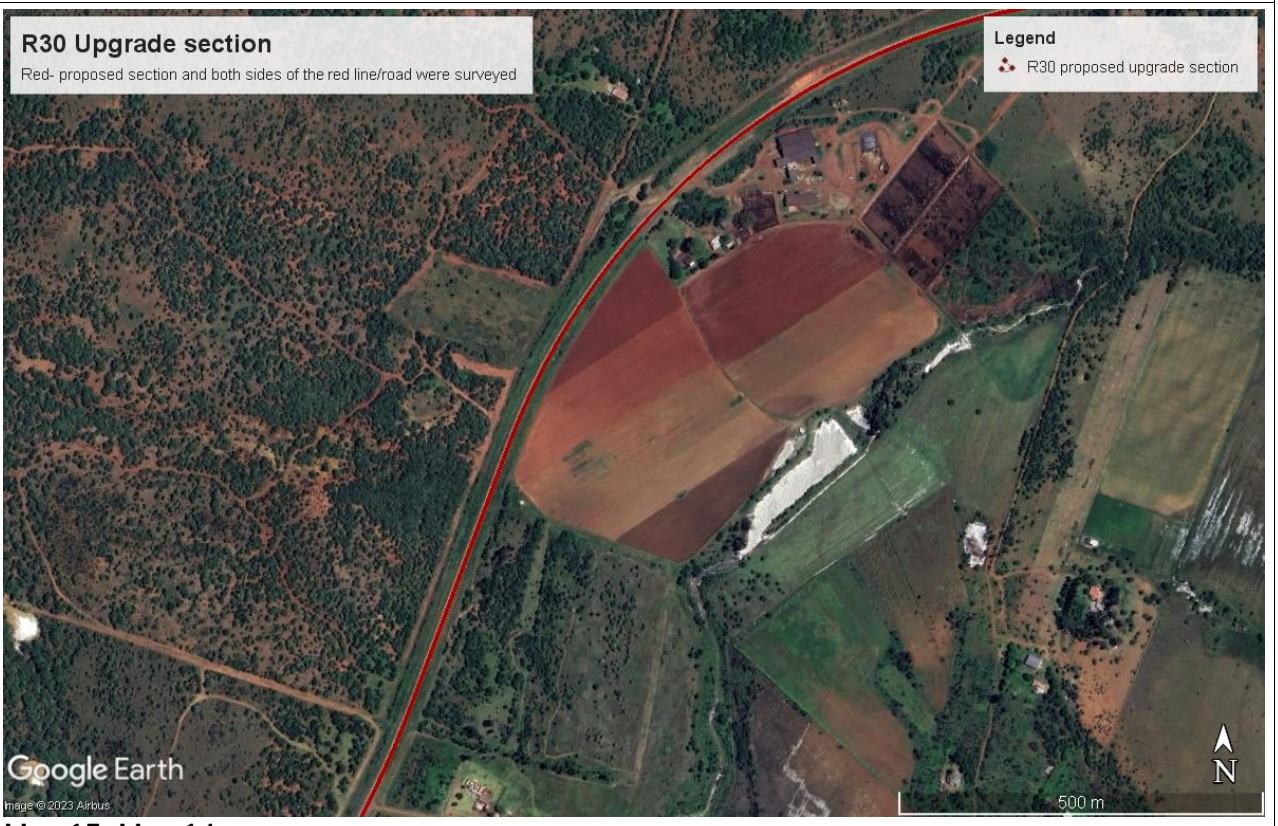
Map 12. Map 11



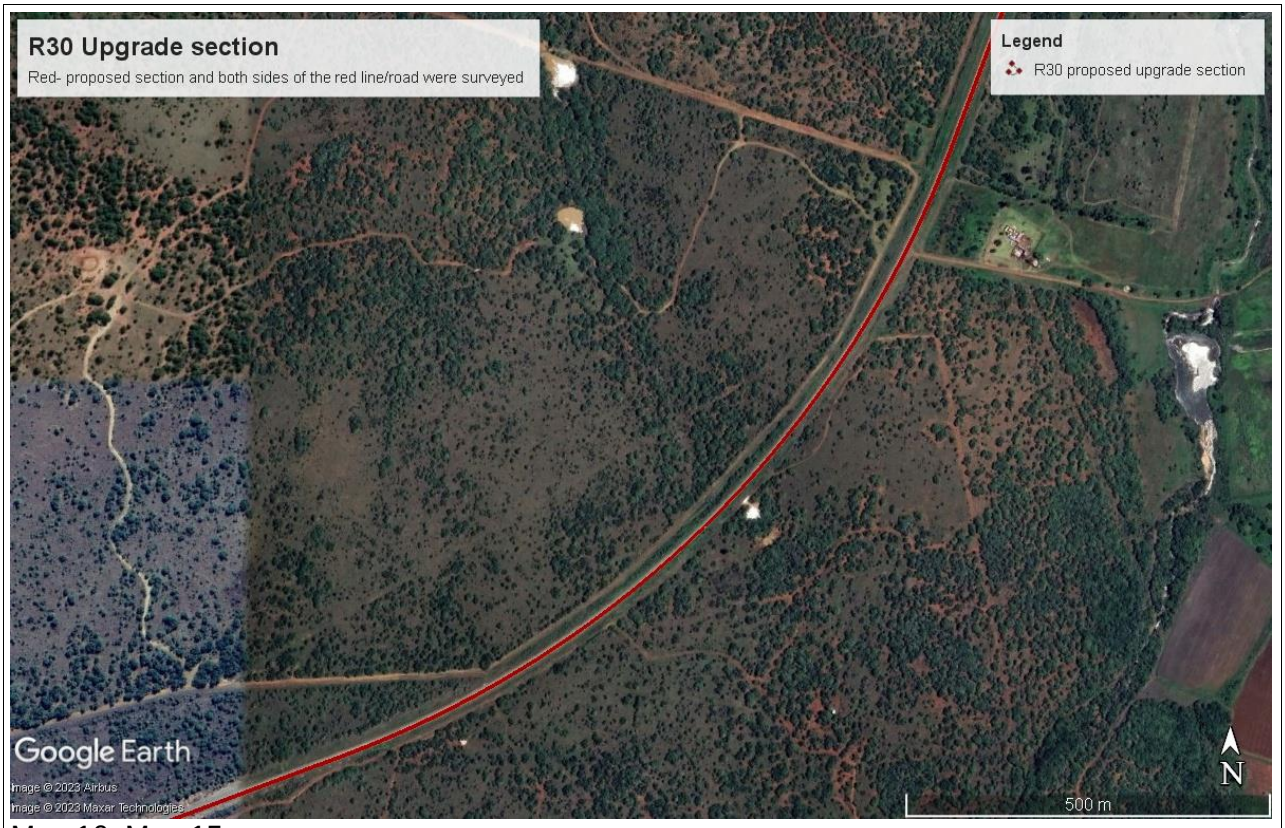
Map 13. Map 12



Map 14. Map 13



Map 15. Map 14



Map 16. Map 15



Map 17. Map 16



Map 18. Map 17



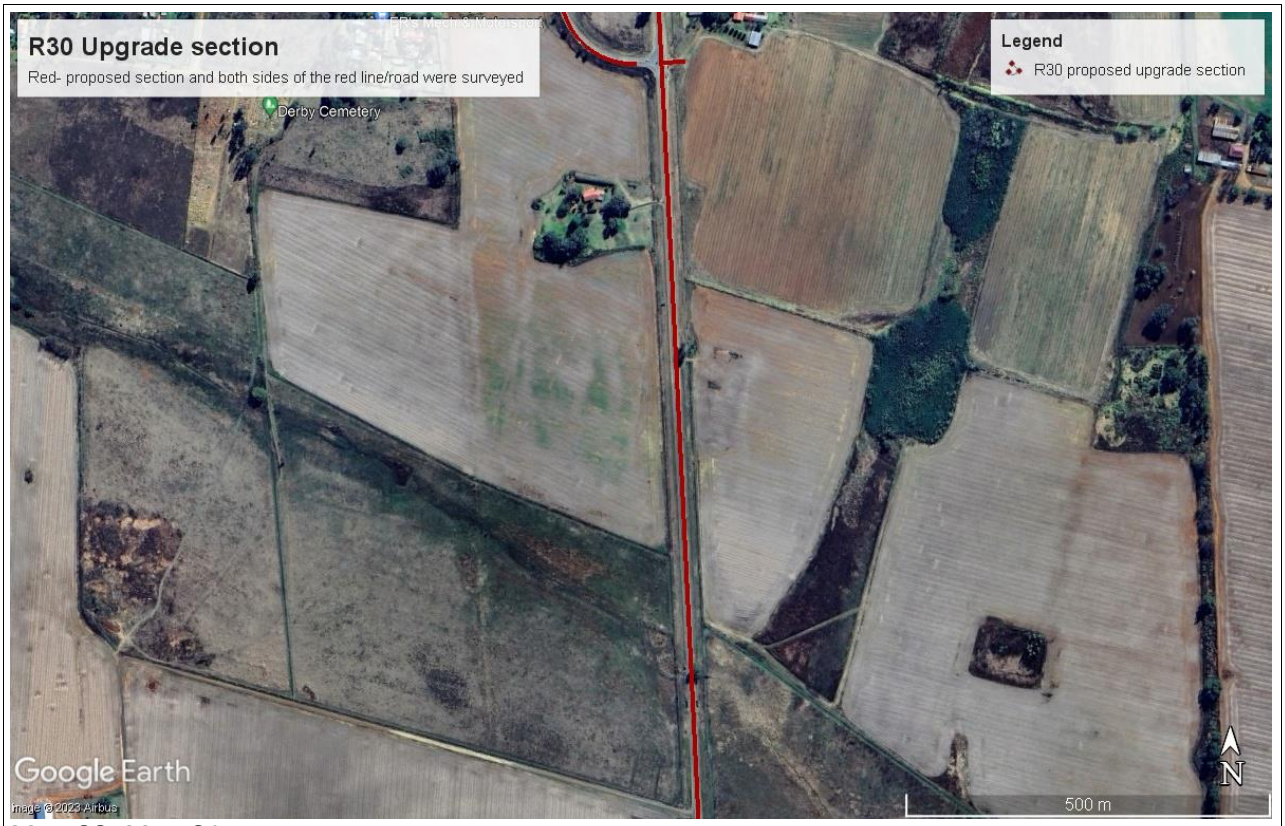
Map 19. Map 18



Map 20. Map 19



Map 21. Map 20



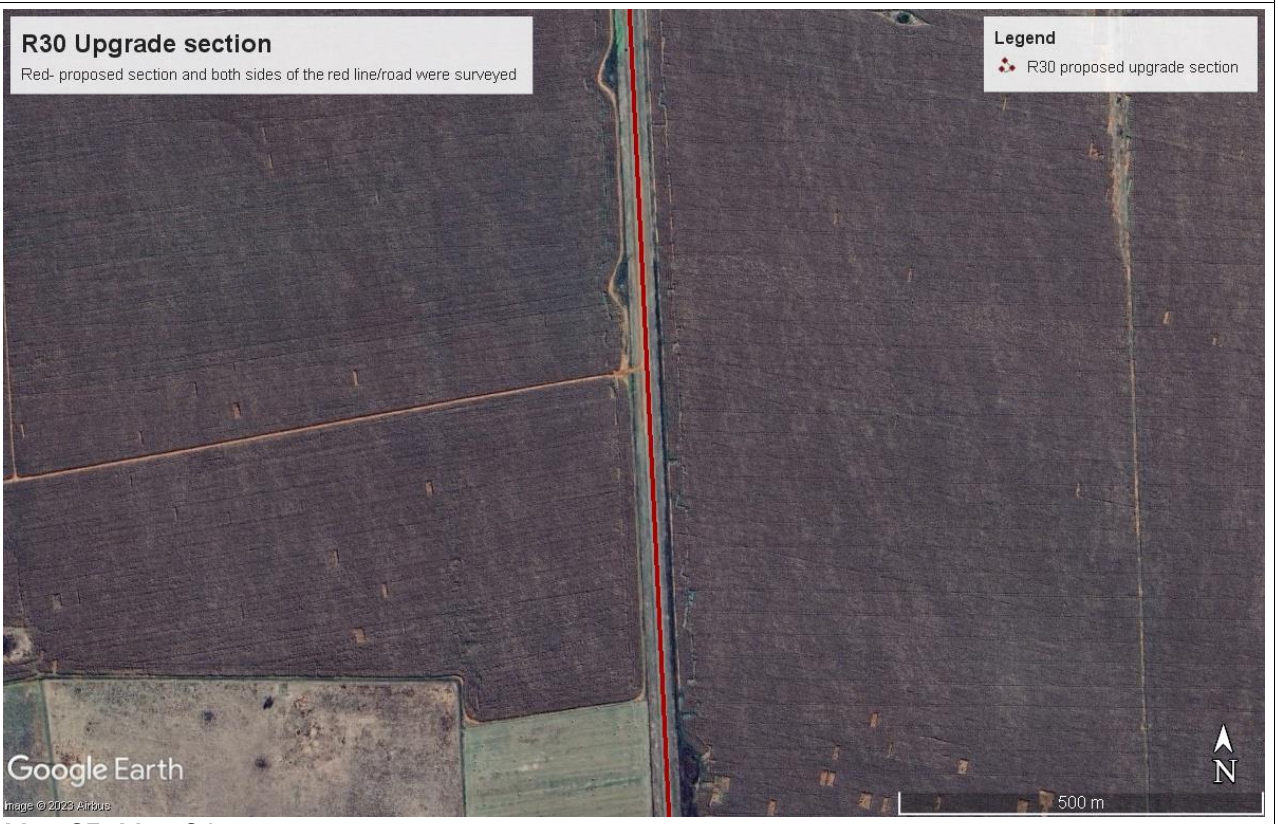
Map 22. Map 21



Map 23. Map 22



Map 24. Map 23



Map 25. Map 24



Map 26. Map 25



Map 27. Map 26



Map 28. Map 27



Map 29. Map 28



Map 30. Map 29



Map 31. Map 30



Map 32. Map 31



Map 33. Map 32



Map 34. Map 33



Map 35. Map 34



Map 36. Map 35



Map 37. Map 36



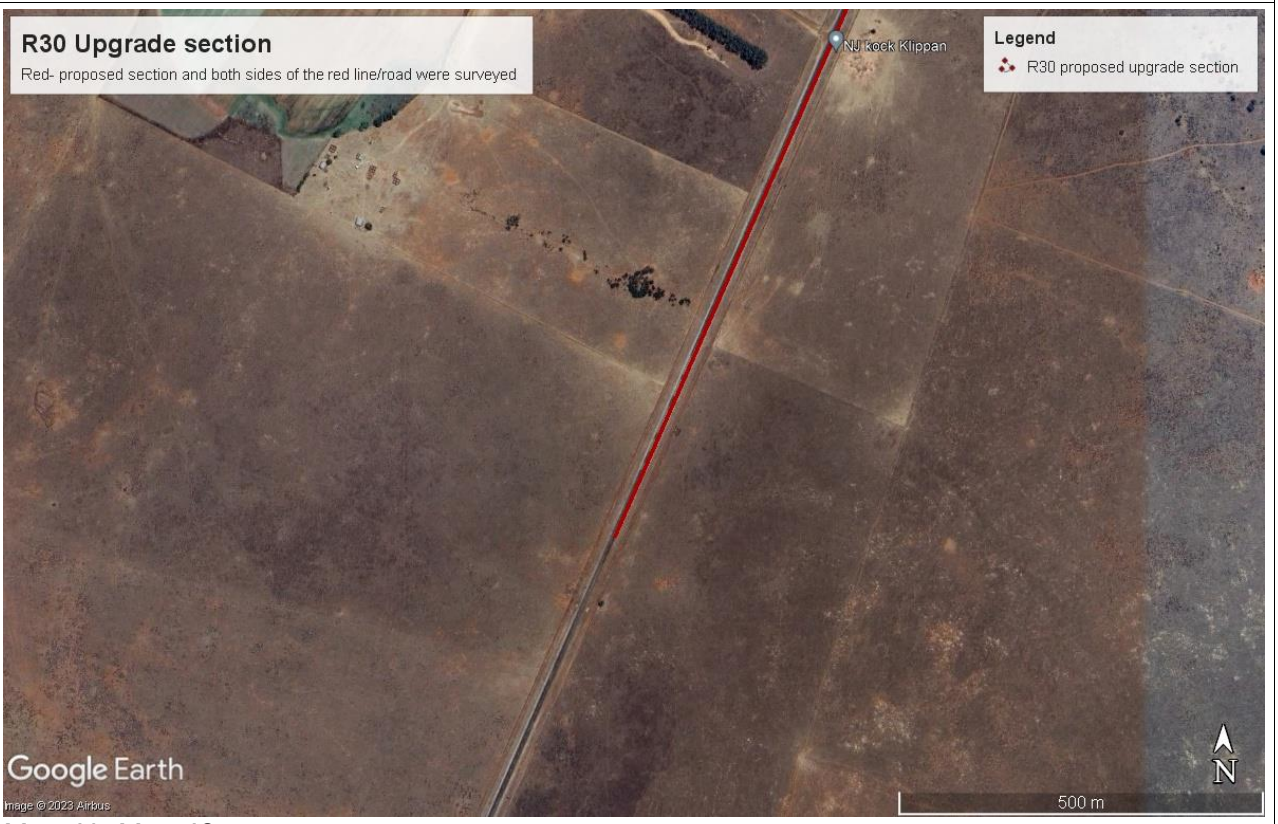
Map 38. Map 37



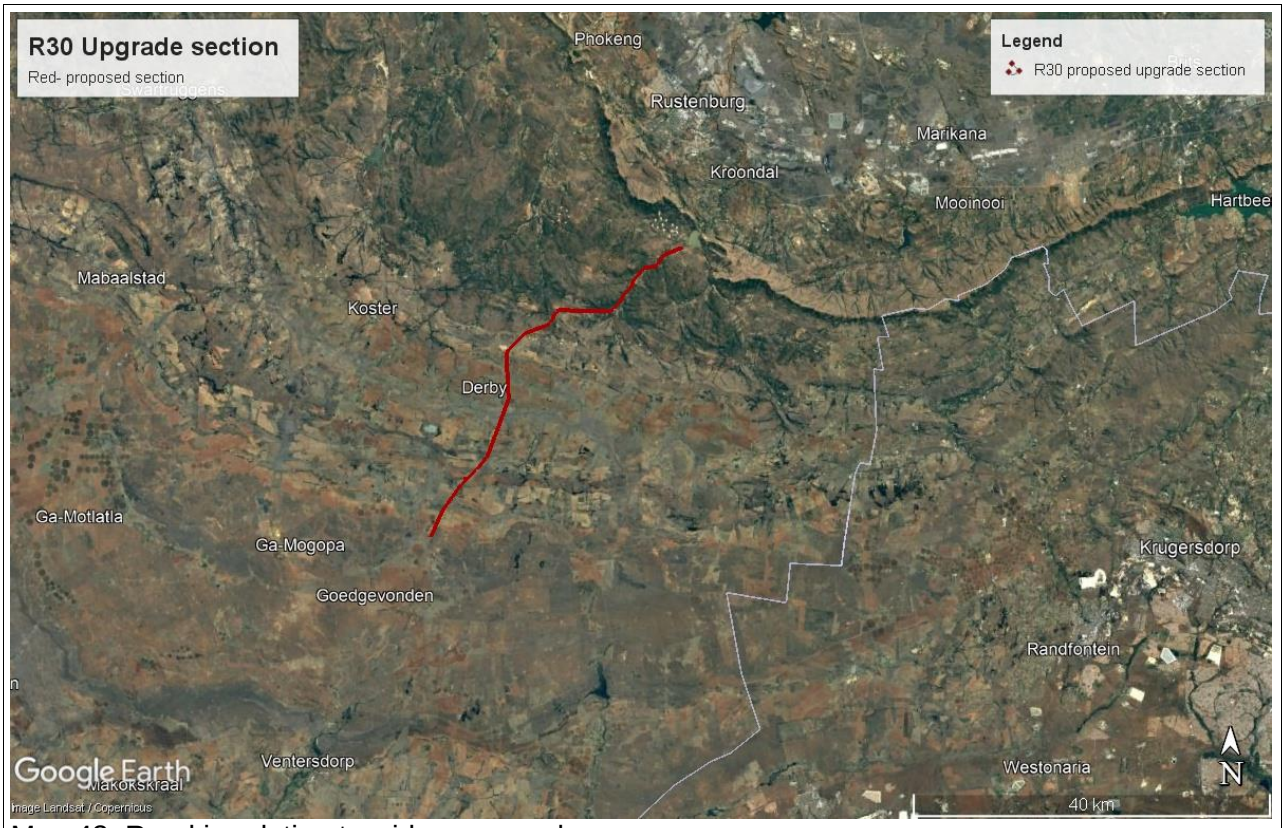
Map 39. Map 38



Map 40. Map 39



Map 41. Map 40



Map 42. Road in relation to wider geography

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
R30 upgrade heritage scoping report

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.

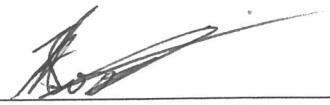
1. SPECIALIST INFORMATION

Title of Specialist Assessment	**R30 upgrade HSR**
Specialist Company Name	**Shasa Heritage Consultants**
Specialist Name	**Frans Roodt**
Specialist Identity Number	**771 10800324 5019080**
Specialist Qualifications:	BA Hons Archaeology
Professional affiliation/registration:	Click or tap here to enter text.
Physical address:	**54 Wildebeestfontein Polokwane**
Postal address:	**46 Burger Street Polokwane 0699**
Postal address	Click or tap here to enter text.
Telephone	Click or tap here to enter text.
Cell phone	**0614575172**
E-mail	shasaheritageconsultants@gmail.com

2. DECLARATION BY THE SPECIALIST

I, Frans Roodt 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

Click or tap here to enter text.

Name of Company:

17/01/2024

Click or tap to enter a date.

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

Frans Roodt

I, _ Click or tap here to enter text._____, 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

Click or tap here to enter text.

Name of Company

17/01/2024

Click or tap here to enter text.

Date

Click or tap here to enter text.

Signature of the Commissioner of Oaths

Click or tap to enter a date.

Date

WESTENBURG

2024 -01- 17

COMMUNITY SERVICE CENTRE
SOUTH AFRICAN POLICE SERVICE

DESKTOP PALAEONTOLOGICAL IMPACT ASSESSMENT

Proposed R 30 road upgrade – Rustenburg to Ventersdorp, Northwest Province

Specialist report by:

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DATE: 3 August 2023

EXECUTIVE SUMMARY

Bruce Rubidge was appointed by Shasa Heritage Consultants on behalf of Earthlink Environmental to undertake a desktop palaeontological desktop impact study for the upgrading of the R30 Section 9 from (Km 29) To R24 (Olifantsnek) (Km 76.6)- a 47 km stretch of road between Rustenburg and Ventersdorp in the North West Province.

The entire study area is deeply underlain by Precambrian rocks of the Pretoria and Chuniespoort groups of the Transvaal Supergroup, as well as igneous diabase of the Bushveld Igneous Complex. These rocks are in turn, in isolated places, overlain by Quaternary alluvial deposits.

There is no possibility that the Precambrian rocks of the Pretoria and Chuniespoort groups and the Bushveld Igneous Complex will host metazoan fossils, but there is a very slight possibility that overlying Quaternary alluvial sediments could contain fossils. It is highly unlikely that palaeontological heritage will be affected by the development.

As the R30 road already exists, and this development is for an upgrade and widening of the road, any impacts have already occurred. It is thus very unlikely that palaeontological heritage will be affected by the road development. However, in the unlikely event that fossils are discovered, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented (See Appendix A – CFP).

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Introduction and Brief

A desktop Palaeontological Impact Assessment was requested by Shasa Heritage Consultants on behalf of Earthlink Environmental to undertake a desktop palaeontological impact study for the upgrade of National Road R30 between Rustenburg and Ventersdorp.

The intention is to upgrade approximately 47 km [Section 9 from (Km 29) To R24 (Olifantsnek) (Km 76.6)] of the existing R30 road (Figure 1 & 2). This upgrade will include increasing road reserve width; Strengthening the existing pavement; Widening of the existing road cross section; Vertical and horizontal geometric improvements; Reconstruction of river bridge and lengthening of all major and minor culverts; Possible horizontal re-alignment of the road at river bridge or; Possible 10m wide temporary deviation (approximately 500m in length) to accommodate two-way traffic during construction at river bridge; Construction of ± 15km of service roads including new right of way (ROW).

This report is part of a Heritage Impact Assessment to determine the effect that the development will have on palaeontological heritage.

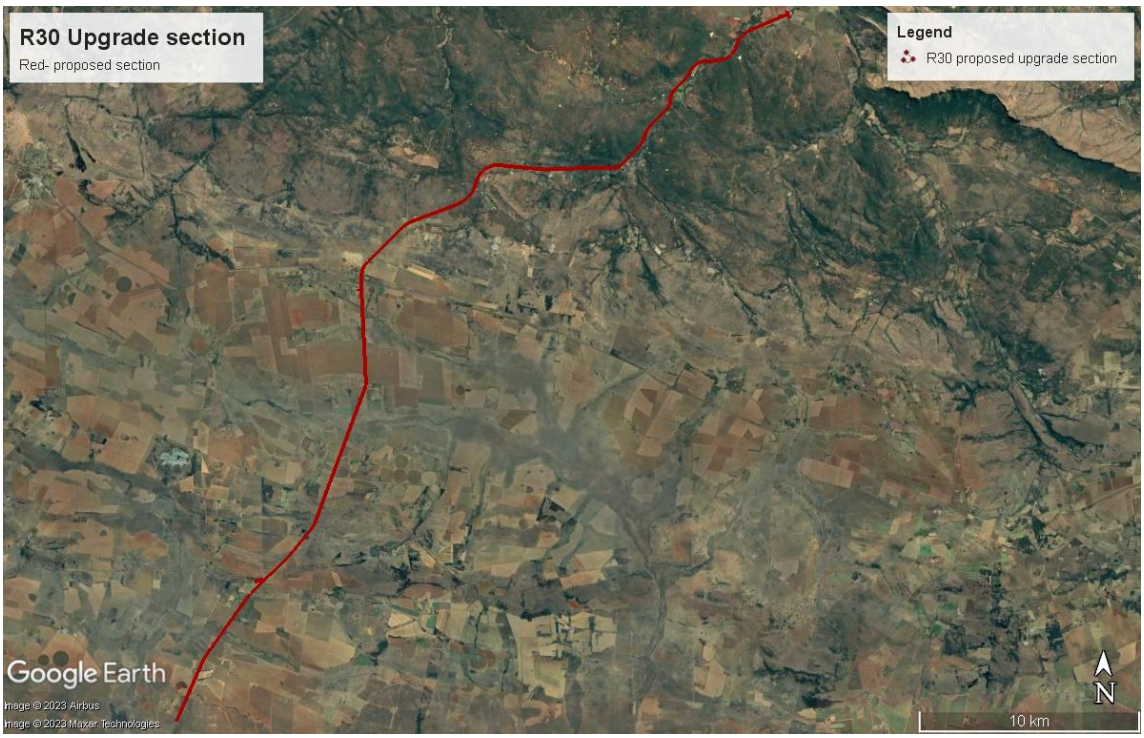


Figure 1: Google Earth image showing the transect of the road R30 between Rustenburg and Ventersdorp in Northwest Province. The road section which is proposed for upgrading is coloured red.

Legislative framework

The Department of Environment, Forestry and Fisheries (DEFF) through the National Environmental Management Act (NEMA Act 107 of 1998) requires that developers apply to the competent authority for Environmental Authorization of the proposed development.

National Heritage is protected by the South African Heritage Resources Act (Act No 25) of 1999. Developers are required to submit development plans to SAHRA for approval. These plans must include documentation detailing the expected impact that the development will have on national heritage.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act include:

- Geological sites of scientific or cultural significance.
- Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, material, meteorites and rare geological specimens.
- Objects with the potential to contribute to understanding South Africa's natural or cultural heritage.

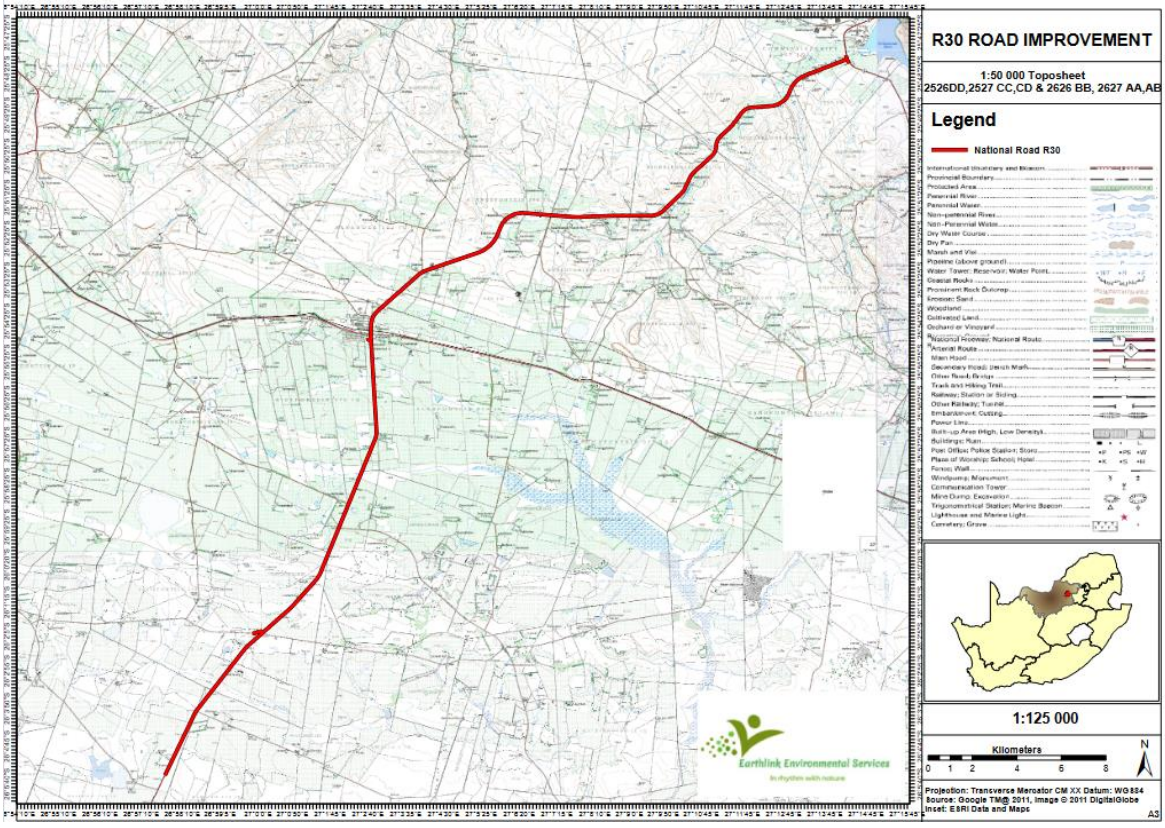


Figure 2: 1:50 000 Topographic map (2526 DD; 2527 CC, CD; 2626 BB; & 2627 AA, AB) showing the transect of the road R30 between Rustenburg and Ventersdorp in Northwest Province. The road section which is proposed for upgrading is coloured red.

Accordingly, a Heritage Impact Assessment (HIA) is required to assess the possible impacts of a proposed development on archaeological and palaeontological heritage. This report addresses the palaeontological aspects of the HIA as part of the Environmental Management Plan (EMP).

Details of the study area

The study area for the proposed road upgrade of the existing R30 road for approximately 47 km [Section 9 from (Km 29) to R24 (Olifantsnek) (Km 76.6)], in the North West Province.

The study area is covered by the 1:50 000 topographic maps 2526 DD; 2527 CC, CD; 2626 BB; & 2627 AA, AB (Figure 2). The plan is to completely upgrade approximately 47km of the existing R30 road, which will include widening the road as detailed. As this is an upgrade the road already exists and has already impacted on the environment.

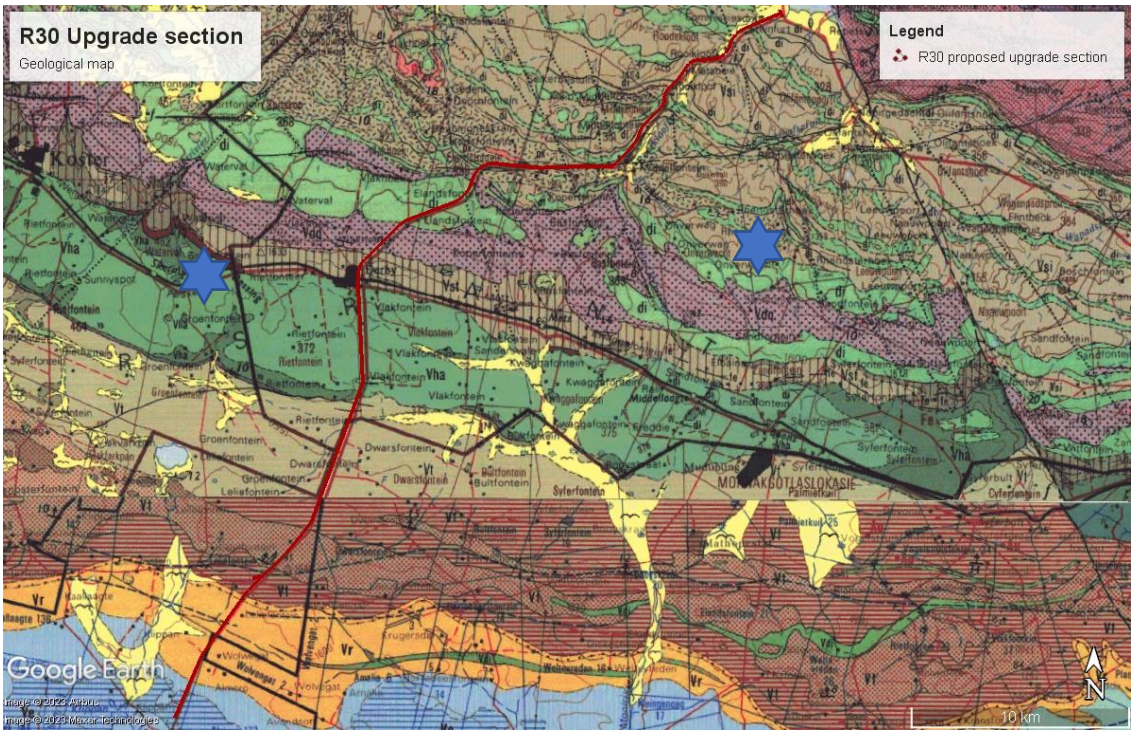


Figure 3: 1: 250 000 Geological map (2526 Rustenburg and 2626 West Rand) showing the transect of the road R30 (in red) between Rustenburg and Ventersdorp in Northwest Province in relation to the regional geology. Ve – Eccles Formation (Malmani Subgroup); Vsi – Silverton Formation; Vdq - Daspoort; Vs - Strubenskop; Vc - Silverton Formation; Vh – Hekpoort Formation; Vt/Vl – Timeball Hill Formation; di Bushvel Igneous Complex; Q – Quaternary alluvial deposits.

Geological Setting

Based on the 1:250 00 geological sheets, 2626 West Rand and 2526 Rustenburg (Figure 3), the study area is deeply underlain by Precambrian rocks of the underlying

Pretoria Group (Silverton, Daspoort, Hekpoort, Strubenskop and Timeball Hill formations) which are overlain by the Chuniespoort Group (Malmani Subgroup) of the Transvaal Supergroup. These rocks are in turn overlain by Quaternary alluvial deposits along low-lying areas (Figure 3).

The Hekpoort Formation includes andesite, agglomerate, and tuff, the Silverton Formation comprises shale, basalt and pyroclastic rock, Daspoort Formation comprises quartzite and shale, Hekport Formation comprises basaltic andesite pyroclastic rocks, the Strubenskop Formation includes ferruginous shale and quartzite and the Timeball Hill Formation shales and subordinate sandstone. The overlying Malmani Subgroup comprises dolomite and chert, and also hosts stromatolites.

Palaeontological Heritage

The underlying Precambrian rocks of the Pretoria Group do not host metazoan fossils (fossil stromatolites are present in the Malmani Subgroup) and no fossils have been reported from the overlying Quaternary sediments in the vicinity of the study area. It is thus extremely unlikely that metazoan fossils will be found in the study area.



Figure 4: Photographs showing the existing R30 road between Rustenburg and Ventersdorp. Note the alluvial cover along the verges of the road.

Methodology

Because the study area is underlain by Precambrian rocks of the Pretoria Group of the Transvaal Supergroup which is of very low palaeontological sensitivity, and because the R30 National Road already exists, a desktop Palaeontological Impact Assessment was undertaken to identify and assess possible fossil occurrences, comment on the

impact of the proposed development, and to make mitigating recommendations. A Chance Find Protocol (CFP) is presented in Appendix A.

Recommendations

As the rock successions underlying the transect of the road R30 from Rustenburg to Ventersdorp are Precambrian in age, they will not contain metazoan fossils. There is always the slight possibility that the sporadic overlying Quaternary alluvial deposits could contain fossils but this is unlikely. In the unlikely event that fossils are exposed in the alluvial Quaternary deposits during developments it will create a unique opportunity to explore the area for fossils.

As the R30 road between Rustenburg and Ventersdorp is an existing structure, and this proposal is for an upgrade, most impacts have already occurred. However, in the unlikely event that fossils are discovered in the Quaternary sediments, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented (See Appendix A – CFP). Depending on the nature of the fossils discovered this could entail excavation and removal to a registered palaeontological museum collection. A list of professional palaeontologists is available from South African Heritage Resources Agency (SAHRA).

Conclusion

The R30 road between Rustenburg and Ventersdorp is an existing structure and this proposal is for an upgrade. The study area is underlain by Precambrian rock formations of the Pretoria Group of the of the Transvaal Supergroup, which in turn are overlain by unconsolidated Quaternary alluvial deposits. It is thus extremely unlikely that palaeontological heritage will be disrupted by the development. However, there is a slight possibility that fossils could be preserved in the superficial Quaternary deposits. If fossils are discovered in the superficial Quaternary deposits in the development process the developer must immediately contact a qualified palaeontologist to assess the situation and, if necessary, undertake excavation of the fossils (See Appendix A – Chance Find Protocol).

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Bruce Rubidge PhD, FGSSA, FRSSA, Pr Sci Nat
3 August 2023

APPENDIX A – CHANCE FIND PROTOCOL (CFP)

It is noted that following the findings of this desktop Palaeontological Impact Assessment it is unlikely that fossils will be destroyed or disrupted as a result of the upgrade of the R30 road between Rustenburg and Ventersdorp. The following procedure is required if fossils are exposed by excavations.

1. If fossils are exposed by excavation in unconsolidated Quaternary alluvial deposits they must be inspected by the environmental officer or designated person.
2. If fossils are noted in the unconsolidated Quaternary sands (includes bones, insects or plants) a suitably qualified palaeontologist must be approached for a verdict.
3. Fossil material displaced by excavation should be placed in a protected area, in this way development activities will not be held up.
4. Appropriate photographs of the fossils which have been noted should be sent to a qualified palaeontologist for a verdict on how to proceed. This may require a site inspection and excavation by the palaeontologist.
5. Fossils that are deemed to be of good quality or of scientific importance by the palaeontologist must be removed and curated in a recognised palaeontological museum collection where they can be made available for further study.
6. Before fossils are removed from the site a collecting permit must be obtained from SAHRA, and the required permitting procedures and requirements must be followed.
7. If the fossil material is deemed by the registered palaeontologist (as a result of photographic evidence or a site visit) to not be worthy of excavation and curation in a museum collection, the material will not be removed.

8. Mitigation will involve an attempt to capture all rare fossils and systematic collection of all fossils discovered by a registered palaeontologist. This will require routine collecting protocols involving descriptive, diagrammatic and photographic recording of fossils and exposures. The fossils and appropriate contextual samples will be processed to create an archive collection.
9. Should a major *in situ* occurrence be exposed, excavation will immediately cease in that area so that the discovery is not disturbed or altered in any way until the appointed palaeontologist has investigated the find.
10. Should no fossils be discovered in the process of development and excavations have been completed, no further monitoring will be required.
11. Any site visits by a registered palaeontologist and/or excavation of fossil material required, will be undertaken at the cost of the developer.

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

Desktop Palaeontological Impact Assessment for the proposed Upgrade of R30 road in Northwest Province.

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	Palaeontological Impact Assessment
Specialist Company Name	Click or tap here to enter text.
Specialist Name	Bruce Rubidge
Specialist Identity Number	5606015012080
Specialist Qualifications:	PhD
Professional affiliation/registration:	SACNASP 400084/09
Physical address:	20 Donkin Str, Graaff-Reinet 6280
Postal address:	20 Donkin Str, Graaff-Reinet 6280
Postal address	Click or tap here to enter text.
Telephone	072 575 7752
Cell phone	072 575 7752
E-mail	bruce.rubidge@wits.ac.za

2. DECLARATION BY THE SPECIALIST

I, Bruce Sidney Rubidge 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

Click or tap here to enter text.

Name of Company:

Click or tap to enter a date. 16 August 2023

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Bruce Rubidge 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

Click or tap here to enter text.

Name of Company

16/8/2023
Click or tap here to enter text.

Date

Click or tap here to enter text.

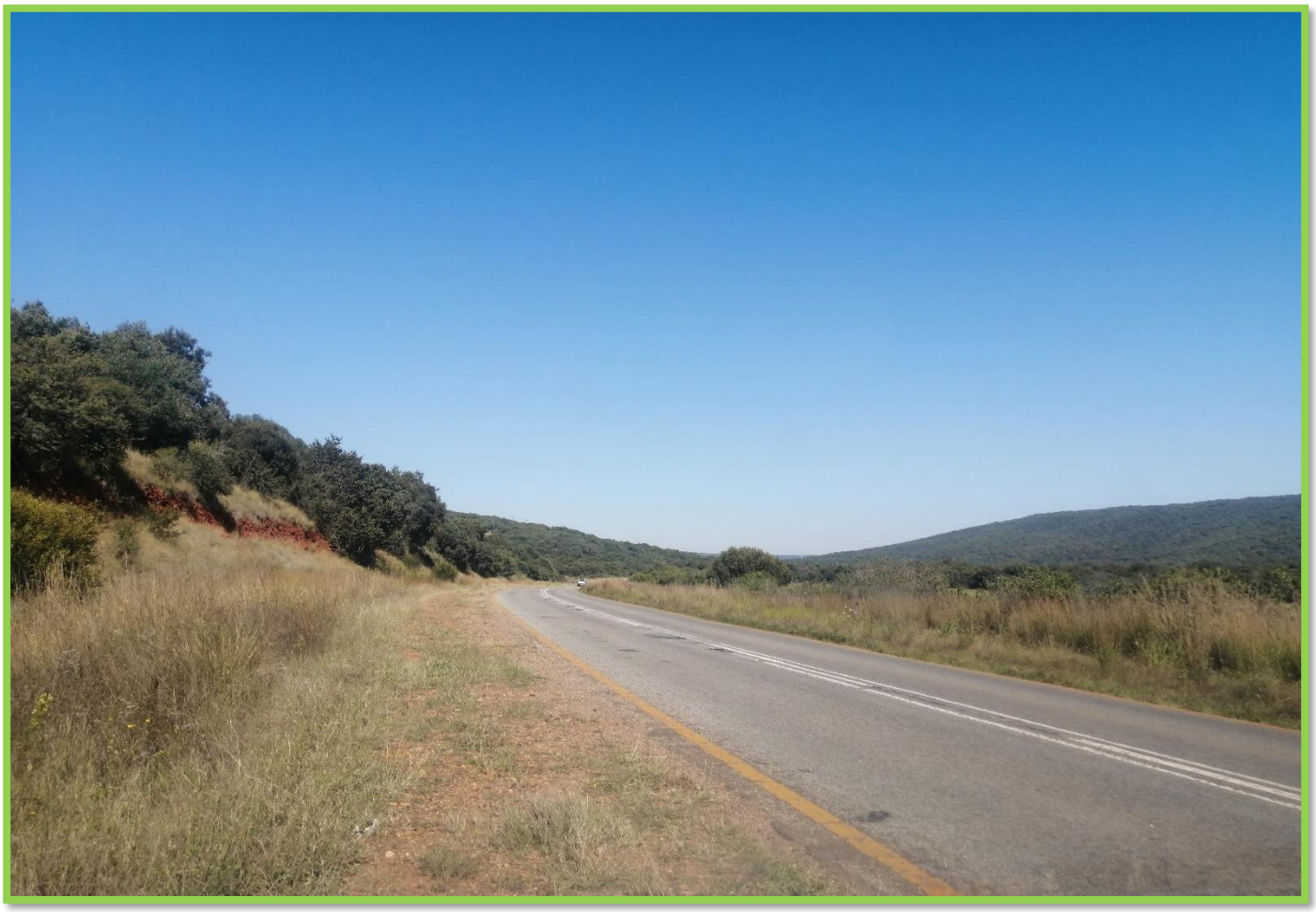
Signature of the Commissioner of Oaths

Click or tap to enter a date.

Date 16 AUGUST 2023

DEREK LIGHT
COMMISSIONER OF OATHS
PRACTISING ATTORNEY
26 CHURCH SQUARE
GRAAFF-REINET

AGRICULTURAL COMPLIENCE STATEMENT FOR THE PROPORSED UPGRADE OF REGIONAL ROUTE (R30) SECTION 9, LOCATED WITHIN BOJANALA DISTRICT MUNICIPALITY OF NORTHWEST PROVINCE.



PREPARED FOR: Earthlink Environmental Services (Pty) Ltd

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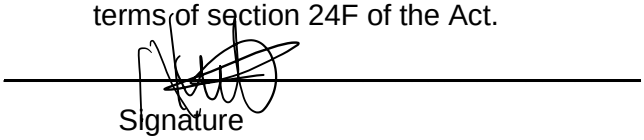
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DECLARATION OF INDEPENDENCE

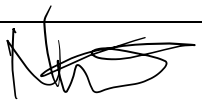
I, **Lutendo Ndou**, declare that I:

- I act as the independent specialist in this application.
- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP).
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable 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
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B (2) of the National Environmental Management Act, 1998 (Act 107 of 1998).
- I realize that a false declaration is an offence in terms of Regulation 71 of NEMA and is punishable in terms of section 24F of the Act.



Signature

Document Control.

Report status	**Draft for client review**
Report title	Agricultural Compliance Statement for the proposed R30 road upgrade activity located within bojanala district municipality of northwest province.
Date	10 April 2024
Author(s)	Lutendo Ndou (Pri. Sci. Nat) – 127690 Nokwanda Siwela (Cand.Sci.Nat – 125488)
Signature	

EXECUTIVE SUMMARY

Matavha Environmental (Pty) Ltd was appointed to conduct an Agricultural Impact assessment for the proposed upgrade of the regional Route R30 in length of 76,6 km, which is located at section 9 Rustenburg local municipality of Northwest province. In terms of the National Environmental Management Act (Act No 107 of 1998 - NEMA), an application for environmental authorization requires an agricultural assessment. In this case, based on the verified sensitivity of the site of very high, the level of agricultural assessment required is an Agricultural Compliance Statement.

Objectives:

Main objective of the study is to assess whether the proposed activities will have an unacceptable agricultural impact, and based on this, to make a recommendation on whether they should be approved or not.

Specific objectives:

- Describe the agricultural potential of the soil identified within the site.
- Describe the land use and land capability of the site based on the soil forms identified.
- Provide recommendation for the proposed project.

In the case of road development, the first factor, amount of land loss, is so small that the total extent of the loss of future agricultural production potential is insignificantly small, regardless of how much production potential the land has. All agricultural activities are able to continue unaffectedly on all parts of the farmland other than the small agricultural footprint and the actual loss of production potential is therefore insignificant. The road upgrade is also considered a best activity for better transportation of farm produce and livestock from adjacent farms.

Furthermore, the production potential of that land is suitable as grazing land and farming. The loss of a very small, widely distributed area of grazing land, of which there is no particular scarcity in the country, represents negligible loss of agricultural production potential in terms of national food security and for the affected farm. Although the development will occupy land that is currently zoned for agriculture, it will lead to minimal loss of both current production and of future agricultural production potential. The agricultural impact of the proposed development is assessed as being of medium

significance and as acceptable. From an agricultural impact point of view, it is recommended that the proposed development be approved.

1. BACKGROUND OF THE STUDY

Matavha Environmental (Pty) Ltd was appointed to conduct an Agricultural Impact assessment for the proposed upgrade of the regional Route R30 in length of 76,6 km, which is located at section 9 Rustenburg local municipality of Northwest province. In terms of the National Environmental Management Act (Act No 107 of 1998 - NEMA), an application for environmental authorization requires an agricultural assessment. In this case, based on the verified sensitivity of the site, the level of agricultural assessment required is an Agricultural Compliance Statement.

Objectives

Main objective of the study is to assess whether the proposed activities will have an unacceptable agricultural impact, and based on this, to make a recommendation on whether they should be approved or not.

Specific objectives

- Describe the agricultural potential of the soil identified within the site.
- Describe the land use and land capability of the site based on the soil forms identified.
- Provide recommendation for the proposed project.

The aim of the protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources (Government Notice No. 320 of 20 March 2020) is to preserve valuable agricultural land for agricultural production. The purpose of the agricultural component in the environmental assessment process is to preserve the agricultural production potential, particularly of scarce arable land, by ensuring that development does not exclude existing or potential agricultural production from such land or impact it to the extent that its future production potential is reduced.

2. PROJECT LOCATION

The project area is located on the R30 route which join from the R24 at Olifants Nek and to R53 where it ends at about 0,758 km Northeast of Farm Roodepoort Venterdorp. The locality map Figure 1 below shows the location of the project area. The R30 route to be upgraded is situated within Bujanala District Municipality of Northwest Province.

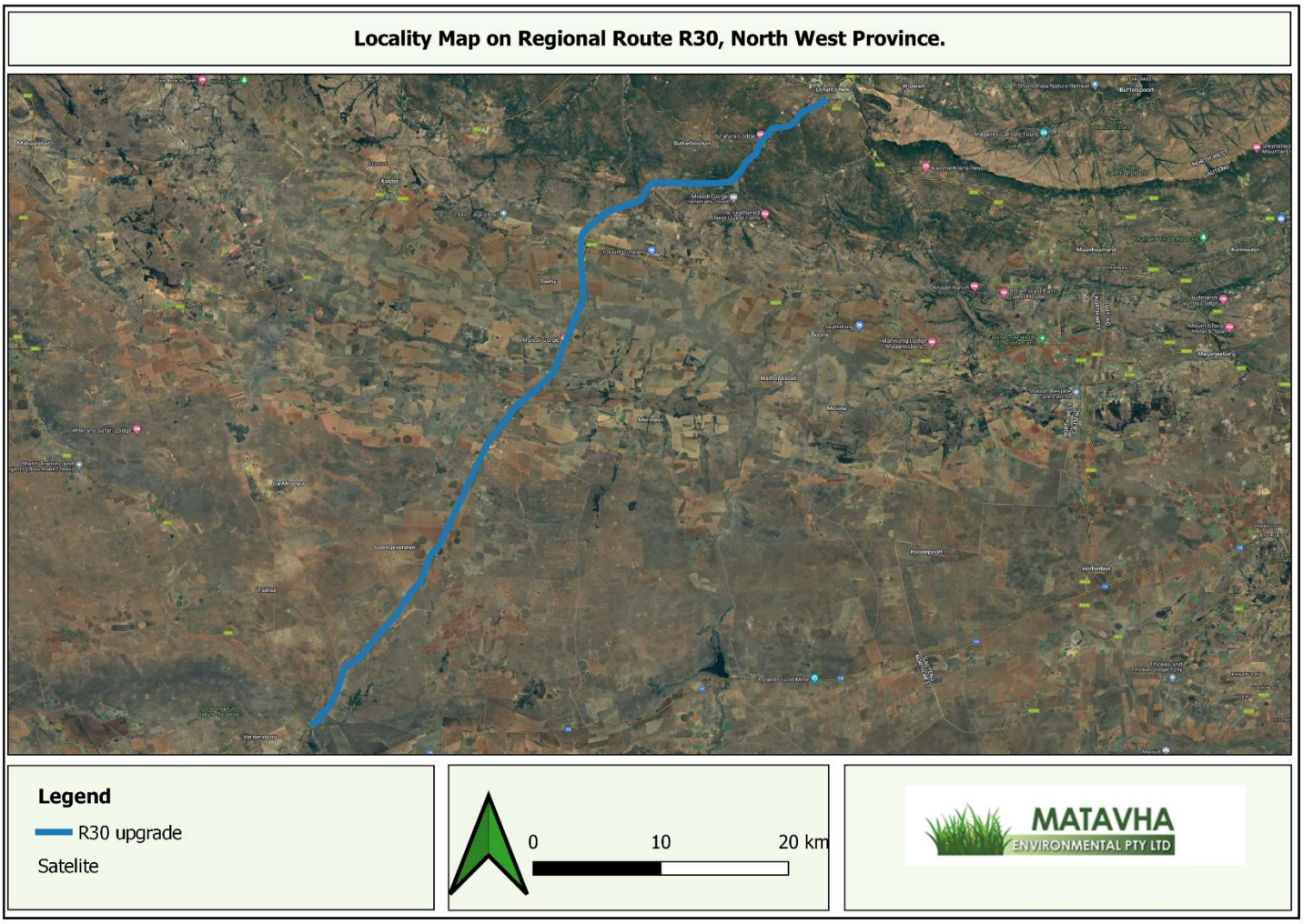


Figure 1: Locality map of the project area.

3. ENVIRONMENTAL LEGISLATION AND SOIL MANAGEMENT GUIDELINES APPLICABLE TO STUDY

The relevant environmental legislation pertaining to the soil/agricultural resources in South Africa is listed below, but is not limited to:

- The Constitution of the Republic of South Africa (Act 108 of 1996).
- Sub-division of Agricultural Land Act (Act 70 of 1970).
- Municipal Structures Act (Act 117 of 1998).
- Municipal Systems Act (Act 32 of 2000); and
- Spatial Planning and Land Use Management Act, 16 of 2013.

The above is supported by additional legislation that aims to manage the impact of developments and activities on the environment and the natural resource base of the country. Related legislation to this effect includes:

- Conservation of Agricultural Resources Act (Act 43 of 1983).
- Environment Conservation Act (Act 73 of 1989).
- National Environmental Management Act (Act 107 of 1998).
- The Mineral and Petroleum Resources Development Act 28 of 2002; and
- National Water Act (Act 36 of 1998).

4. PURPOSE AND PROJECT DESCRIPTION

The overarching purpose of the Agricultural Compliance Statement is to ensure that the sensitivity of the site from the perspective of agricultural production to the proposed road is sufficiently considered. Also, the information provided in this report, enables the Competent Authority to reach a sound conclusion on the impact of the proposed project on the food production potential of the study area. Again, it is important to conduct agricultural environmental assessment process to preserve agricultural production potential by ensuring that development does not unnecessarily exclude existing or potential agricultural production from land, or unnecessarily impact agricultural land to the extent that its production potential is reduced.

The primary focus is on preservation of the agricultural production potential of scarce, arable land. The most important part of an agricultural impact assessment is therefore assessing how much existing or

potential agricultural production land will be lost as a result of the proposed activity and assessing whether that land has economically viable future cropping potential or not. This project poses negligible threat to agricultural production potential because of the small extent of land loss and the site's lack of crop production potential. The project activities proposed is the upgrade of the regional route R30, in the North West Province.

According to GN320, the agricultural compliance statement that is submitted must meet the following requirements:

- It must be applicable to the preferred site and the proposed development footprint.
- It must confirm that the site is of “low” or “medium” sensitivity for agriculture.
- It must indicate whether the proposed development will have an unacceptable impact on the agricultural production capability of the site.

The following checklist is supplied as per the requirements of GNR 320, detailing where in the report the various requirements have been addressed:

Table 1: Checklist Agricultural requirements.

GNR 320 requirements of an Agricultural Compliance Statement (Low to Medium Sensitivity)	Reference in this report
3.1. The compliance statement must be prepared by a soil scientist or agricultural specialist registered with the SACNASP.	P2 & 3
3.2. The compliance statement must: 3.2.1. be applicable to the preferred site and proposed development footprint;	Section 1&2
3.2.2. confirm that the site is of "low" or "medium" sensitivity for agriculture; and	Section 6 Section 9.3
3.2.3. indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.	Section 9.3
3.3. The compliance statement must contain, as a minimum, the following information: 3.3.1. contact details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae	Appendix C
3.3.2. a signed statement of independence.	P2: Declaration of independence

3.3.3. a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool;	Section 6
3.3.4. confirmation from the specialist that all reasonable measures have been taken through micro- siting to avoid or minimize fragmentation and disturbance of agricultural activities;	Section 9&10
3.3.5. a substantiated statement from the soil scientist or agricultural specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development;	Section 10
3.3.6. any conditions to which the statement is subjected;	Section 10
3.3.7. in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;	N/A -The project is not a linear activity
3.3.8. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr; and	
3.3.9. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data.	Section 8
3.4. A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	

5. TERMS OF REFERENCE

The terms of reference for this study are to fulfill the requirements of the “Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources” gazette on 20 March 2020 in GN 320 [in terms of Sections 24(5)(A) and (H) and 44 of NEMA, 1998]. In addition to the requirements stipulated in GN320, the points below summaries the terms of reference and key components of the study.

- To ensure a thorough assessment, that includes both the desktop assessment of databases and aerial photography as well as on-site verification of the agricultural potential of the area to be affected by the proposed project.
- Assess the spatial distribution of various soil types within the study area.
- Identify restrictive soil properties on land capability under prevailing conditions.

- Compile various maps depicting the on-site conditions, soil forms and land capability based on desktop review of existing data.
- Classify the dominant soil forms within the study area according to the South African Soil Classification System (Soil Classification Working Group, 2018).
- Compile various maps depicting the soil forms, land use and land capability within the study area based on the field assessment findings.
- Compile a report presenting the results of the desktop study and a description of the findings during the field assessment; and
- Provide recommended mitigation measures and management practices to implement in order to comply with applicable articles of legislation.

6. METHODOLOGY OF THE STUDY

As per the protocol requirement, the assessment was based on a desktop analysis and site investigation of existing soil and agricultural potential data for the site. A desktop study, including literature review, was conducted to determine the expected land and soil capacity of the study area. Various data sources were utilised to obtain available information of the site area, data layer such as Aerial imagery (Google EarthTM), Agriculture Geo-Referenced Information (AGIS) and Quantum Geographic Information System (QGIS). Field assessment was also conducted, the site was traversed on foot and a field soil survey including, soil classification and soil sampling was conducted by a qualified specialist.

6.1 AGRICULTURAL POTENTIAL

The following description of agricultural characteristics/potential of the land include both desktop maps and field analyses, as the area is already disturbed from its natural state to a developed road. The soil classes coverage of the road site is of different classes that includes Freely drained structureless soil and Lithosols (Shallow soil on hard or weathering rock) see Figure 2 below.

During site visit, the area soil coverage is different from the desktop classification as the area has been deformed from its natural state. The proposed upgrade will be on the footprint of existing road and its road reserves. The geotechnical conducted during the first construction of the road uses the different layering of soil so to increase the soil stability to suite the road requirements.

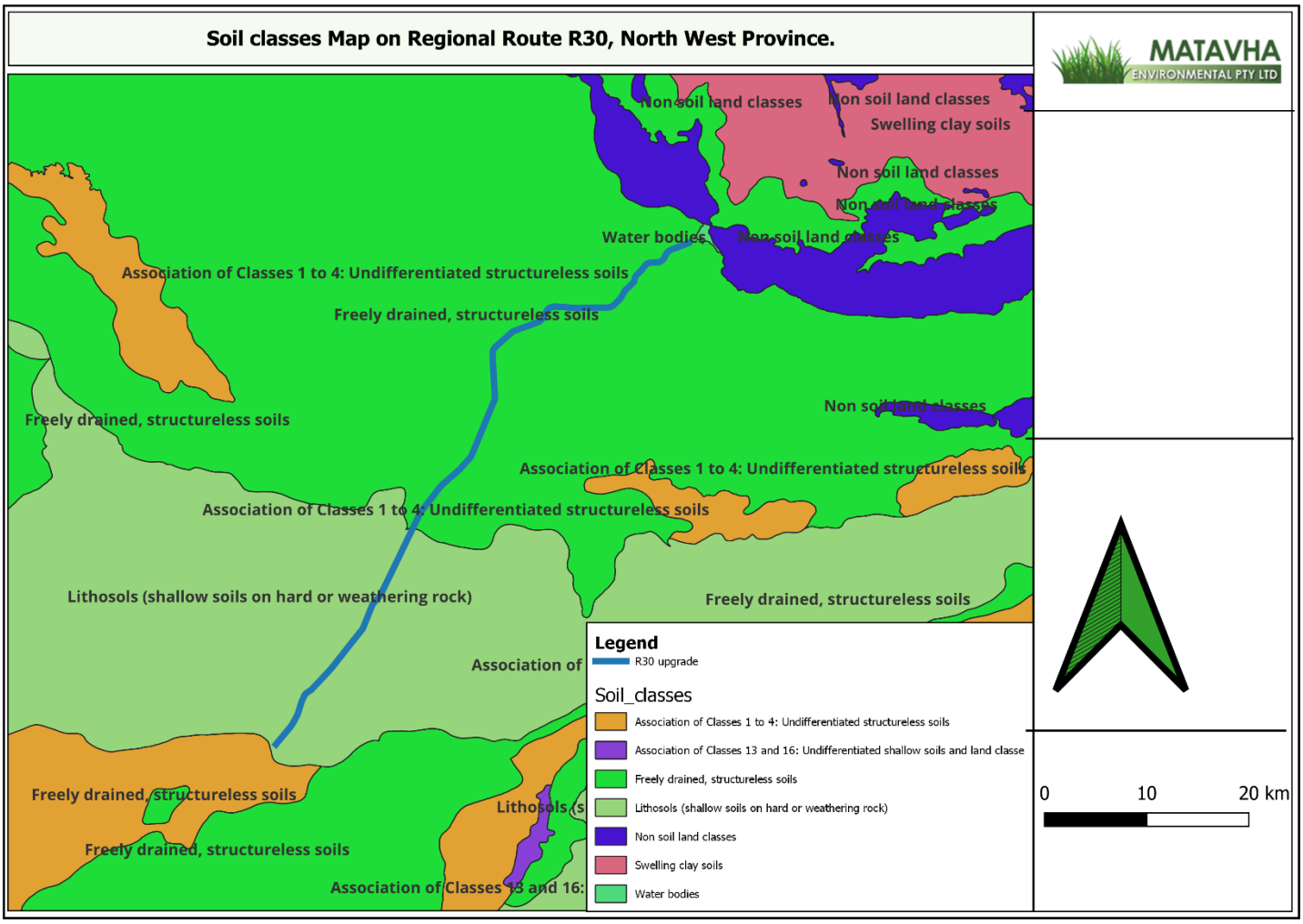


Figure 2: Soil Classification Map.

The Figure 3 below shows the vegetation type of the area as detected by the desktop study and is of different types such as Dry sandy highveld grassland, Rocky highveld grassland a mixed bushveld. the site visit on the project area shows that the vegetation type of the area has changed due to the migration of the different soil types that result in deterioration of the natural vegetation of the area to alien species.

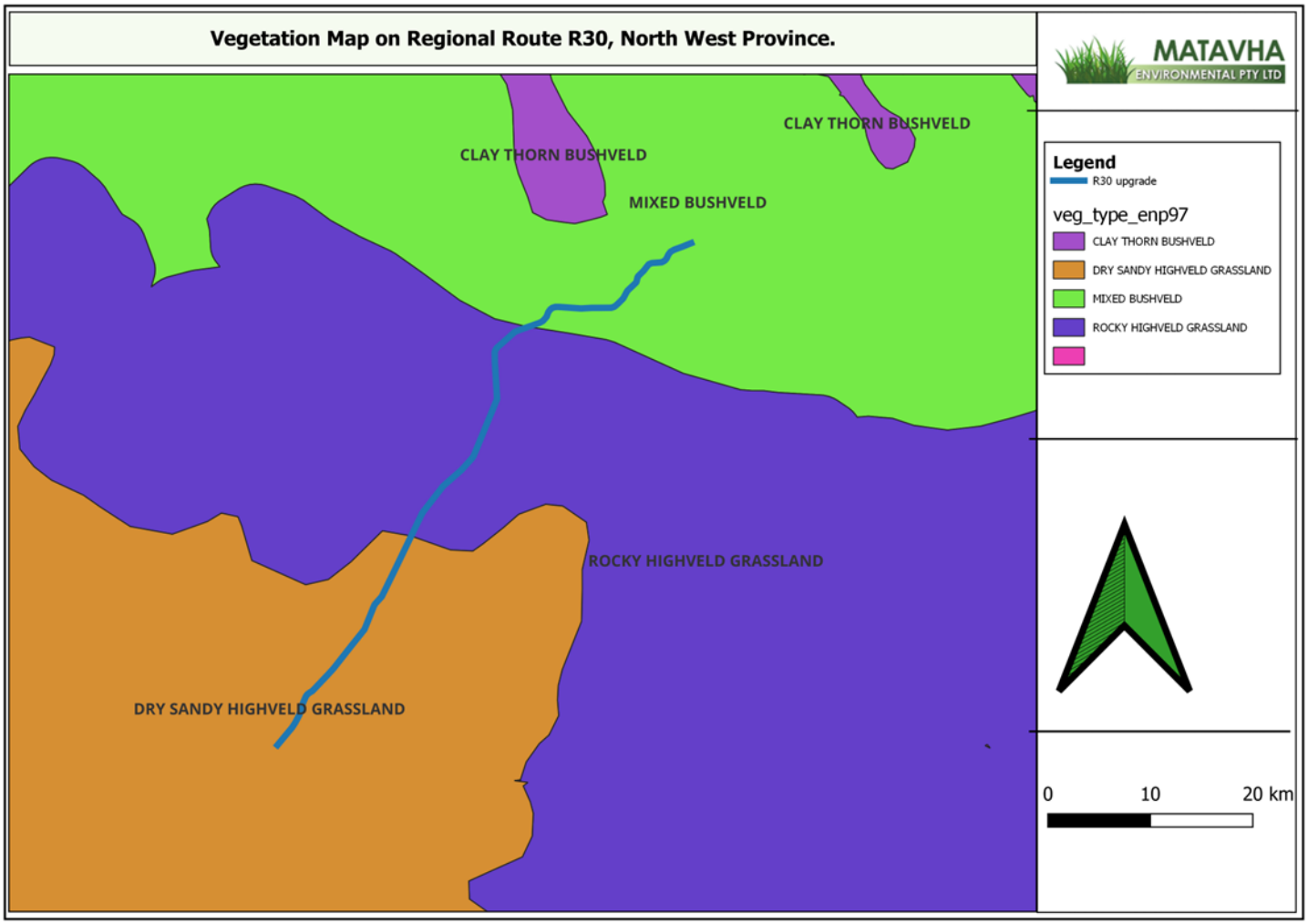


Figure 3: Vegetation Type map.

6.2 LAND USE AND LAND CAPABILITY.

The current land use of the area is road transportation R30, the side of the road shows the agricultural practices outside the road reserves area as seen in Figure 4 below. The land capability as classified during desktop study shown on Figure 5 below the land is characterised as moderate potential arable land and Non-arable: Grazing, Woodland of Wildlife. The site visit confirms the desktop study as the area is non arable, the area cannot support any type of agricultural practices, it is non grazing, non-woodland and non-wildlife, it cannot support wildlife as it is non woodland. The moderate potential arable land of the site has also been converted to non-arable land as many activities has been conducted to the site leading it to new state. More to this, the road upgrade will be confined to the approved R30 road and its reserves.

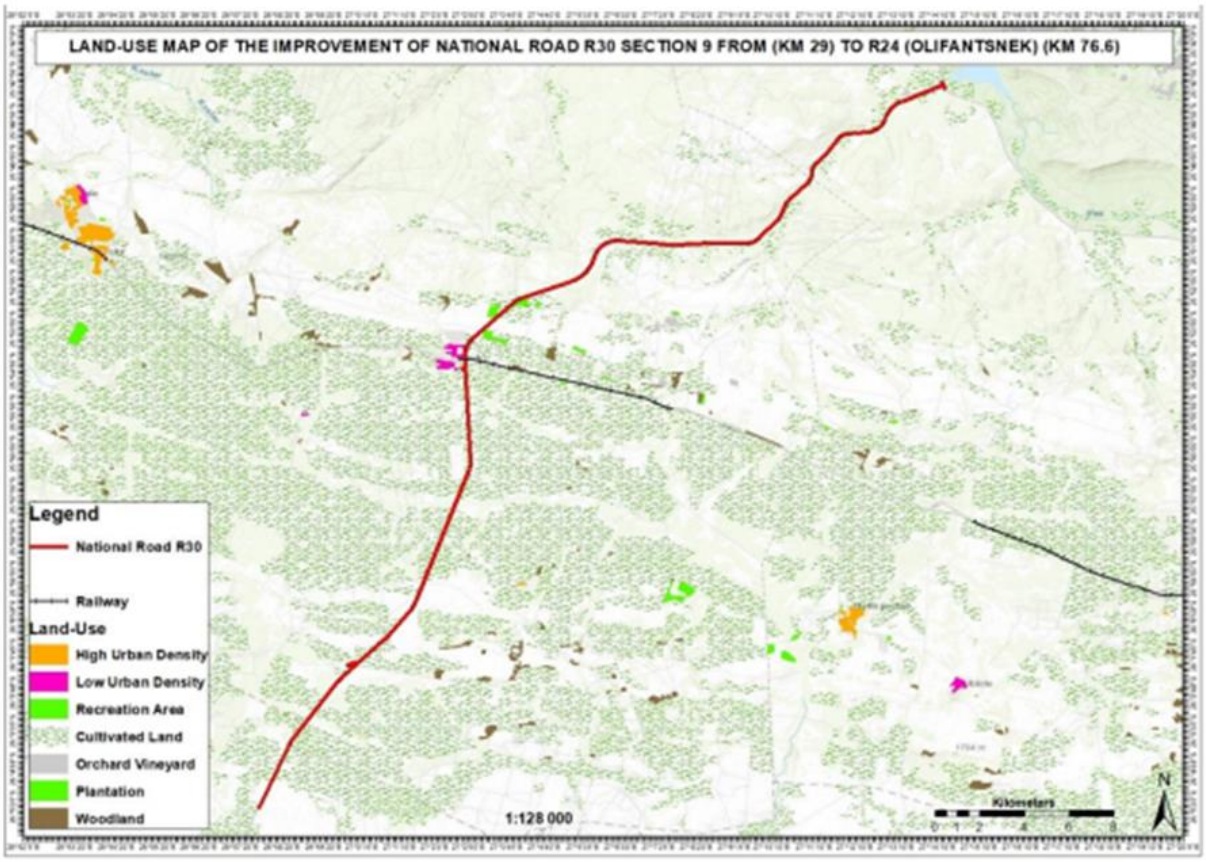


Figure 4: Land use Map of the site area.

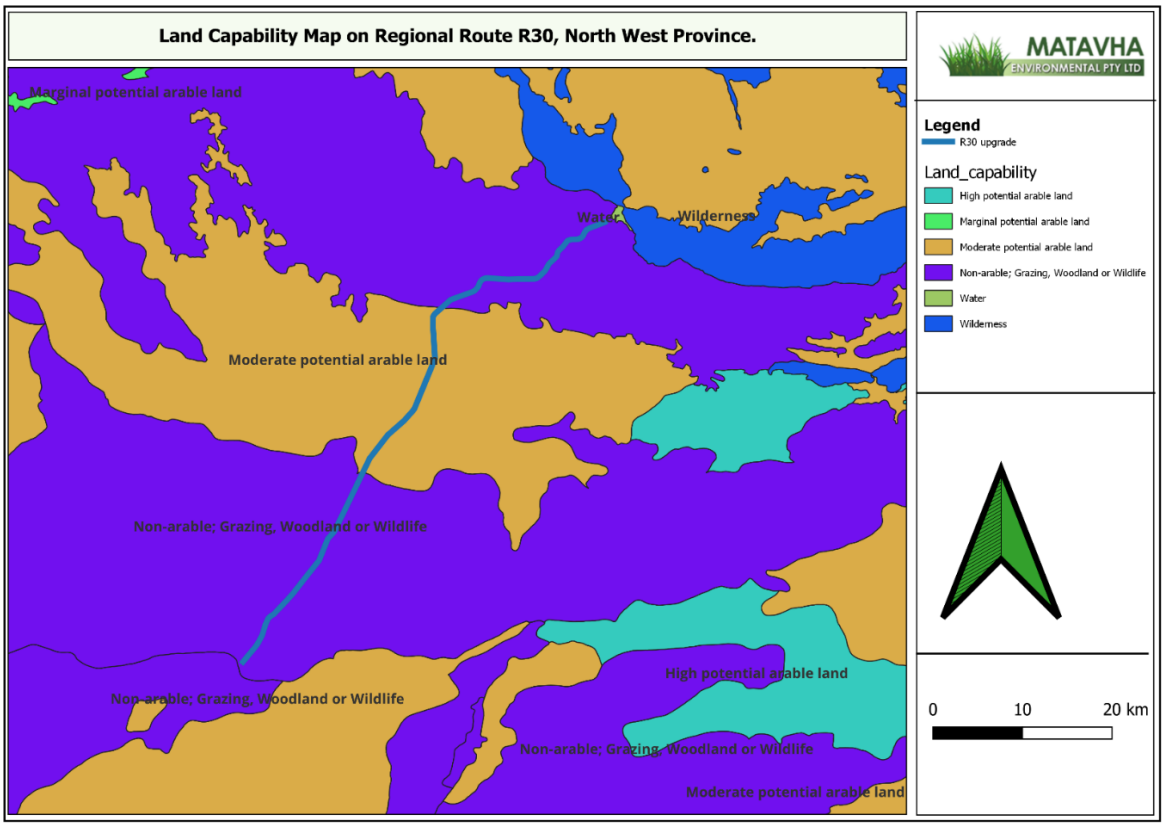


Figure 5: Land Capability map.

Table 2: Land Capability Classification (Scotney et al, 1987).

Land Capability Group	Land Capability Class	Increased intensity of use									Limitations
Arable	I	W	F	LG	MG	IG	LC	MC	IC	VIC	No or few limitations. Very high arable potential. Very low erosion hazard.
	II	W	F	LG	MG	IG	LC	MC	IC	-	Slight limitations. High arable potential. Low erosion hazard.
	III	W	F	LG	MG	IG	LC	MC	-	-	Moderate limitations. Some erosion hazards
	IV	W	F	LG	MG	IG	LC	-	-	-	Severe limitations. Low arable potential. High erosion hazard.
Grazing	V	W	-	LG	MG	-	-	-	-	-	Water course and land with wetness limitations.
	VI	W		LG	MG	-	-	-	-	-	Limitations preclude cultivation.
	VII	W	F	LG	-	-	-	-	-	-	Very severe limitations. Suitable only for natural vegetation.
Wildlife	VIII	W	-	-	-	-	-	-	-	-	Extremely severe limitations. Not

Land Capability Group	Land Capability Class	Increased intensity of use									Limitations
											suitable for grazing or afforestation.

6.3 LAND TYPE INFORMATION

A large section of the road consists of the Clastic sediments and minor carbonates and volcanics of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west, all of the Transvaal Supergroup (Vaalian). There is also some contribution from mafic Bushveld intrusive. Soils often stony with colluvial clay-loam but varied, including red-yellow apedal freely drained, dystrophic and eutrophic plinthic catenas, vertic and melanic clays, and some less typical Glenrosa and Mispah forms. Land types Ae, Ba, Ea, Bc, Ac and less typically Fb.

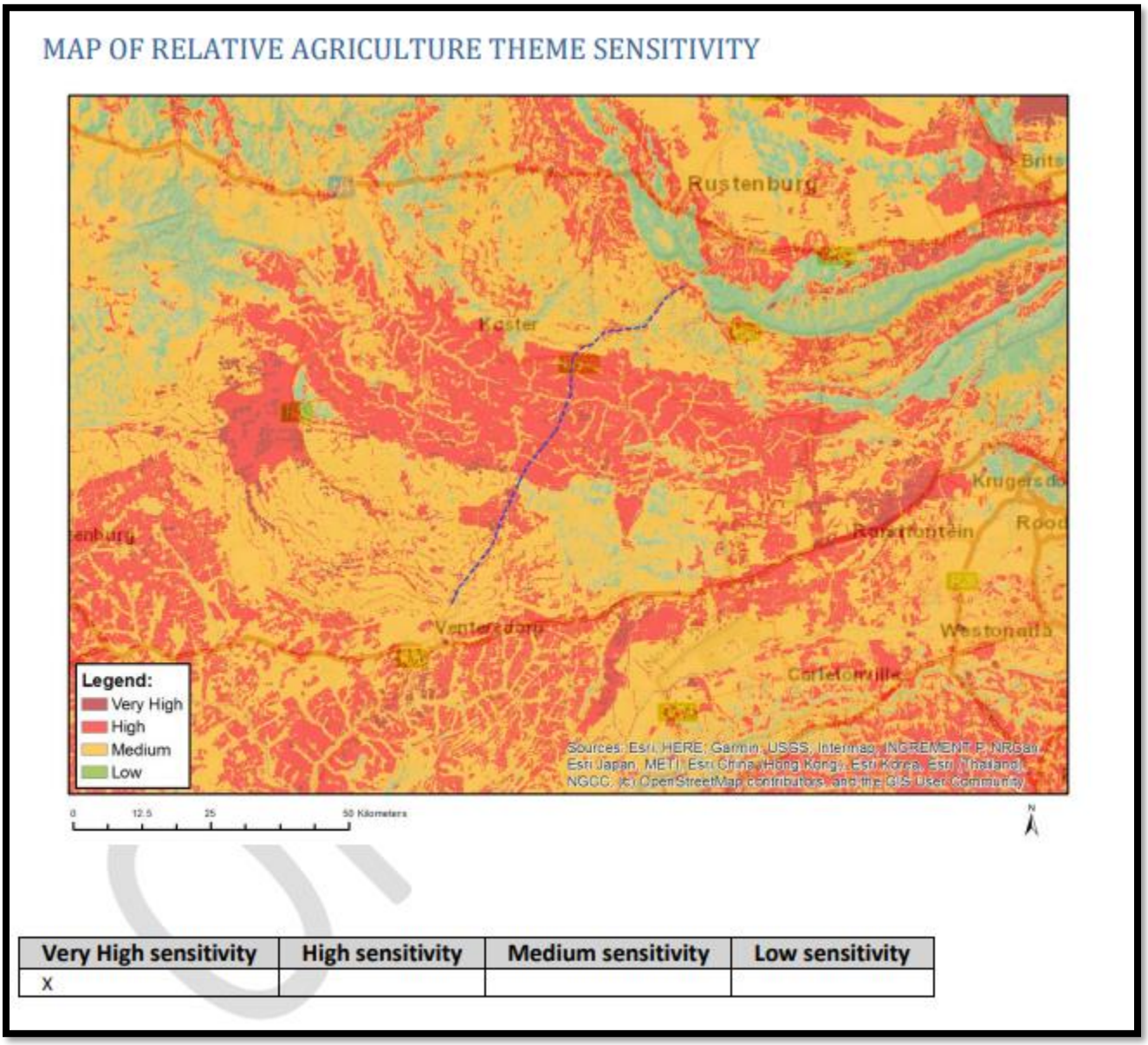
6.4 CLIMATE

The study site experiences strong seasonal summer-rainfall, warm-temperate region, with very dry winters. The Mean Annual Precipitation (MAP) is 654 mm, ranging between 570 mm and 730 mm, slightly lower in the western regions. The coefficient of variation of MAP is 28% in the west and 26–27% in the east and varies only slightly from 25% to 29% across the unit. The incidence of frost is higher in the west (30–40 days) than in the east (10–35 days). The climate diagram for Gm 11 Rand Highveld Grassland.

6.5 ENVIRONMENTAL SCREENING

The combined Agricultural Sensitivity of the project area was determined using the National Environmental Screening Tool (www.screening.environment.gov.za). The Agricultural Theme of the screening tool considers a combination of the national land capability raster data as well as the field crop boundaries as compiled by Department of Agricultural, Forestry and Fisheries (DAFF) (DAFF 2017, DAFF 2019). According to the DFFE screening tool the site area falls within very high sensitivity

in terms of Agriculture (See Figure 6 below), therefore the level of agricultural assessment required in terms of the protocol for disturbed sites of very high sensitivity is an Agricultural impact Study. The DFFE screening tool is a guideline, and it is up to the specialists to verify these results in the field, the field assessment results shows that the area is of low sensitivity at the area is deformed from its natural formation.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Figure 6: Sensitivity Map.

7. AGRICULTURAL ACTIVITIES

Northwest is South Africa's major producer of white maize. The areas around are fertile, mixed-crop farming land, with maize and sunflowers being the most important crops. The site area is entirely on

land that has grazing and farming as an agricultural land use (See



Figure 7).



Figure 7: Roadside Activities.

8. COMPLIANCE STATEMENT

The desktop study confirmed that the proposed R30 route development site is of a “high” Agricultural sensitivity, as classified by the DEA Screening Tool.

There are Three potential mechanisms of negative agricultural impact were identified as occupation of land, soil erosion, degradation, and dust generation. Two potential mechanisms of positive agricultural impact were identified as increased financial security for farming operations, improved security against stock theft and other crime. All of these are likely to have very low impact on future agricultural production potential and are therefore assessed as having very low significance.

It is the specialist’s opinion that the proposed development site is of low agricultural sensitivity and that the development at the proposed site will not significantly impact agricultural activities. In terms of agricultural sensitivity, the conclusion of this assessment is that the agricultural impact of the proposed development is acceptable because it offers a valuable opportunity for transportation facilities to be integrated with agricultural production in a way that it provides benefits to agriculture and leads to insignificant loss of future agricultural production potential. More to t*his, the proposed upgrade will take place on the existing R30 road and its approved road reserve, No green field will be poached by the proposed upgrade.*

It is the specialist’s opinion that although the proposed development is occurring on high agricultural sensitivity, The proposed development should thus be allowed to proceed at the identified site subject to recommendations provided.

9. CONCLUSION AND RECOMMENDATIONS

Matavha Environmental (Pty) Ltd was appointed to conduct an Agricultural Impact assessment for the proposed upgrade of the regional Route R30 in length of 76,6 km, which is located at section 9 Rustenburg local municipality of Northwest province. The proposed road upgrade activity is considered an acceptable project within the area of assessment. Considering that all the activities will take place within the boundary of the site area, I confirm that all reasonable measures have been taken to avoid or minimize fragmentation and disturbance of agricultural activities. It is my professional opinion that this application be considered favorably. The project infrastructure, where applicable, should all remain within the project assessment zone and is thus regarded as acceptable from an agricultural impact perspective. The activity should consider the following recommendations:

- Restrict the proposed development to the smallest footprint possible and do not disturb/alter areas outside the road reserve.
- Ensure that the road upgrade activities and associated infrastructure must be adequately fenced during the development.
- Ensure that access roads are kept clear, and that construction and operational activities do not interfere with agricultural activities.

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forestry, fisheries
& the environment

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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
AGRICULTURAL COMPLIANCE STATEMENT FOR THE PROPOSED UPGRADE OF REGIONAL ROUTE (R30) SECTION 9 ,LOCATED WITHIN BOJANALA DISTRICT MUNICIPALITY OF NORTHWEST PROVINCE.

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	AGRICULTURAL COMPLIANCE STATEMENT FOR THE PROPOSED UPGRADE OF REGIONAL ROUTE (R30) SECTION 9 ,LOCATED WITHIN BOJANALA DISTRICT MUNICIPALITY OF NORTHWEST PROVINCE
Specialist Company Name	MATAVHA ENVIRONMENTAL PYT(LTD)
Specialist Name	LUTENDO NDOU
Specialist Identity Number	9409025704085
Specialist Qualifications:	▪ Bachelor of Earth Sciences (Honors) in Mining and Environmental Geology
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Telephone	012 023 4121
Cell phone	072 688 7758
E-mail	INFO@MATAVHA.COM

2. DECLARATION BY THE SPECIALIST

I, LUTENDO NDOU 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

MATAVHA ENVIROMENTAL PTY(LTD)

Name of Company:

17 Apr 2024

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _ LUTENDO NDOU_____, 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

MATAVHA ENVIRONMENTAL PYT (LTD))

Name of Company

17 APRIL 2024

Date

Click or tap here to enter text.

Signature of the Commissioner of Oaths

17 Apr 2024

Date

SOUTH AFRICAN POLICE SERVICE
OFFICE OF THE STATION COMMANDER
GRIEKWASTAD
2024 -04- 13
SUPPORT HEAD
SOUTH AFRICAN POLICE SERVICE

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BUILDING SOUTH AFRICA THROUGH BETTER ROADS

THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED

SUB-CONTRACT SANRAL R.030-090-2016/1D-SS

SUB-SERVICES FOR A GEOTECHNICAL INVESTIGATION INCLUDING TEST PITTING, LABORATORY TESTING AND DRILLING FOR THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6*)*

GEOTECHNICAL INTERPRETATIVE REPORT

DATE: **FEBRUARY 2024**

CHIEF EXECUTIVE OFFICER
SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED
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Document Control						
Project name	Sub-services for a Geotechnical Investigation including test pitting, laboratory testing and drilling for the improvement of National Road R30 Section 9 From (Km 29) To R24 (Olifantsnek) (Km 76.6)					
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Client	South African National Roads Agency SOC Ltd					
Client contact	Naailah Mia	**Client reference**	R.030-090-2016/1-D-SS			
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Approval			
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Executive Summary

In 2014 Zutari (Pty) Ltd was appointed by the South African National Roads Agency SOC (Pty) Ltd under contract number R.030-090-2016/1 for Consulting Engineering services for Assessment, Detailed Design and Contract Documentation for the Partial Reconstruction of National Road R30 Section 9 from km 29 to R24 (Olifantsnek) (km 76.6). At that time the project progressed up to the development of the contract documentation but was suspended due to the feasibility of the project. In 2020 the project was re-packaged as an improvement project.

The geotechnical investigations are required to inform the preliminary design of the major culverts and bridges. The project has been sub-divided into two phases, namely Phase 1 and Phase 2. Phase 1, which is the current phase is focusing on geotechnical works for the bridge and culvert locations. Bridge B2920 and bridge B2230 are both proposed to be widened by 1000mm, whereas bridge 2147 is proposed to be a newly constructed bridge. Phase 2 entails the investigation for hard rock quarries along the route.

The geotechnical investigations included the excavation and profiling of six test pits at the various culvert positions in September 2023. Disturbed and undisturbed samples were taken for laboratory testing. The scope included rotary drilling of twelve boreholes (No. 4 per bridge) up to 20 metres where the core drilled was logged and sampled for soil and rock engineering properties.

Water rest levels were recorded after 24 hours of drilling in each borehole. SPT tests were conducted within the boreholes to determine the consistency of the soils at 1.5 m interval.

Bridge 2920

The ground profile underlying Bridge 2920 is characterized by alluvial deposits, non-engineered fill, pedogenic material, residual andesite, residual slate and slate bedrock.

It is proposed that Bridge 2920 be supported on piles relying on either skin friction or rock socket friction. An auger or “Down-The-Hole-Hammer” (DTH) percussion piling installation method is recommended. Temporary casing will be needed during piling due to the presence of groundwater. Supplementary geotechnical investigations are recommended at this bridge.

Bridge 2230

The ground profile underlying Bridge 2230 is characterized by non-engineered fill up to 1.95 m underlain by pedogenic material up to between 3.0 and 4.5 m. The pedogenic material is underlain by residual andesite up to between 8.35 and 9.0 m below natural ground level. The lowermost horizon encountered is andesite bedrock from a depth of 8.35 up to 20.31 m.

Testing of the andesite rock indicate that from about 15 m, andesite bedrock’s uniaxial compressive strength is hard rock to extremely hard rock.

It is proposed that Bridge 2230 be supported on piles relying on rock socket friction due to the relatively shallow bedrock elevation of between 8.3 m and 9 m below ground level. The type of piling installation method recommend for the foundation is a DTH percussion piles due to significant variability in rock hardness across the investigated boreholes. Temporary casing will be needed during piling due to the presence of groundwater.

Bridge 2147

The ground profile underlying Bridge 2147 encountered alluvium (terrace gravels) comprising of sands and gravels from surface down to depths ranging between 6.92m and 18.5 m, which is underlain by the completely weathered, very soft slate bedrock.

It is proposed that Bridge 2147 be supported on piles relying on rock socket friction. Due to the prevalence of boulders in the soil profile it is recommended to use a DTH percussion pile installation method. Temporary casing will be needed during piling due to the presence of groundwater. Bridge 2147 spans a non-perennial river and it is recommended that protective measures should be put in place to minimize the impact of scouring on the bridge foundation.

Box culvert at km 59.70 Underpass

The two test pits excavated at culvert at 59.70 underpass were characterized by engineered fill comprising of silty clay with abundant gravel and cobbles from surface to 0.5 m below ground level underlain by diabase rock at very shallow depths of 0.4 to 0.6 m below ground level. It is recommended that the culvert is conventionally founded on medium hard rock diabase.

Box culvert at km 65.88 Underpass

TP03 excavated at culvert at km 65.88 underpass was characterized by engineered fill from surface to 0.3 m below ground level, residual slate from 0.3 to 0.8 m below ground level, and slate bedrock from 0.8 to 2.1 m below ground level. It is recommended that the culvert is conventionally founded on very soft rock slate.

Box culvert at km 68.55 Underpass

Culvert at km 68.55 underpass TP04 is characterized by engineered fill from surface to 1.2 m in TP05, residual diabase from surface to 1.6 m at TP04, and diabase bedrock is encountered from 1.6 m. It is recommended that the culvert is conventionally founded on very soft rock slate. Supplementary investigations should be conducted prior to construction to confirm bedrock levels in the vicinity of TP05.

Box culvert at km 71.79 Underpass

Test pit TP06 Culvert at km 71.79 underpass is characterized by transported soils from ground level up to a depth of 1.8 m below ground level. It is recommended that the culvert is founded on an engineered soil raft supported on the boulders / very stiff silty clay matrix.

General

It is recommended that settlement and bearing capacity analysis be undertaken for all proposed box culvert structures once structural loads have been confirmed.

Corrosive ground conditions were determined from the pH and conductivity test. Protective measures need to be put in place for buried metal objects at all bridge and culvert structures.

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1 Introduction

1.1 Terms of reference

In 2014 Zutari (Pty) Ltd was appointed by the South African National Roads Agency SOC (Pty) Ltd under contract number R.030-090-2016/1 for Consulting Engineering services for Assessment, Detailed Design and Contract Documentation for the Partial Reconstruction of National Road R30 Section 9 from km 29 to R24 (Olifantsnek) (km 76.6). At that time the project progressed up to the development of the contract documentation but was suspended due to the feasibility of the project. In 2020 the project was re-packaged as an improvement project.

The geotechnical investigations are required to inform the preliminary design of the major culverts and bridges. The project has been sub-divided into two phases, namely phase 1 and phase 2. Phase 1, which is the current phase is focusing on geotechnical works for the bridge and culvert locations. Phase 2 entails the investigation for hard rock quarries along the route.

The three bridges along the route are named as follows:

- Bridge No. 2230 Jameson Street underpass (± km 51.281): Length = 30.4m.
- Bridge No. 2920 Derby Road over rail bridge (± km 51.433): Length = 22.8m.
- Bridge No. 2147 over the Commissiedrift Tributary 1 (± km 71.89): Length = 15.2m.

Bride B2920 and bridge B2230 are both proposed to be widened as part of the reconstruction of the R30 road whereas bridge B2147 is proposed to be a newly constructed bridge.

The four major culverts along the route are:

- Box culvert at km 59.70 Underpass.
- Box culvert at km 68.55 Underpass.
- Box culvert at km 65.88 Underpass.
- Box culvert at km 71.79 Underpass.

1.2 Project objectives

The objectives of the geotechnical investigations at the bridges and culverts were to:

- To identify the composition of soil and rock horizons.
- To determine mechanical properties of the horizons.
- To assess groundwater conditions at each bridge or culvert location.
- Assess excavatability of materials across site.
- Assess stability of open excavations or trenches.
- Laboratory testing to confirm the geotechnical properties of the materials on site.
- Indicate competent rock head levels suitable as founding levels for bridge foundations.
- Geotechnical considerations that may influence the proposed bridges and culverts' construction.
- Founding recommendations for the bridges indicating appropriate founding type and where piles are selected the appropriate pile types.

This geotechnical interpretive report presents all available factual field data, laboratory test results and geological and geotechnical information from the investigation.

1.3 Project location

The project is located on National Road R30 Section 9 from km 29 to R24 (Olifantsnek) km 76.6. The project stretches over a length of 47.6 kilometres on the R30 in the Northwest Province. The starting position is near the intersection of the R30 and Road D826 in the Kgetleng rivier Local Municipality. The

end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality. The site locations are shown in Figure 1 below.

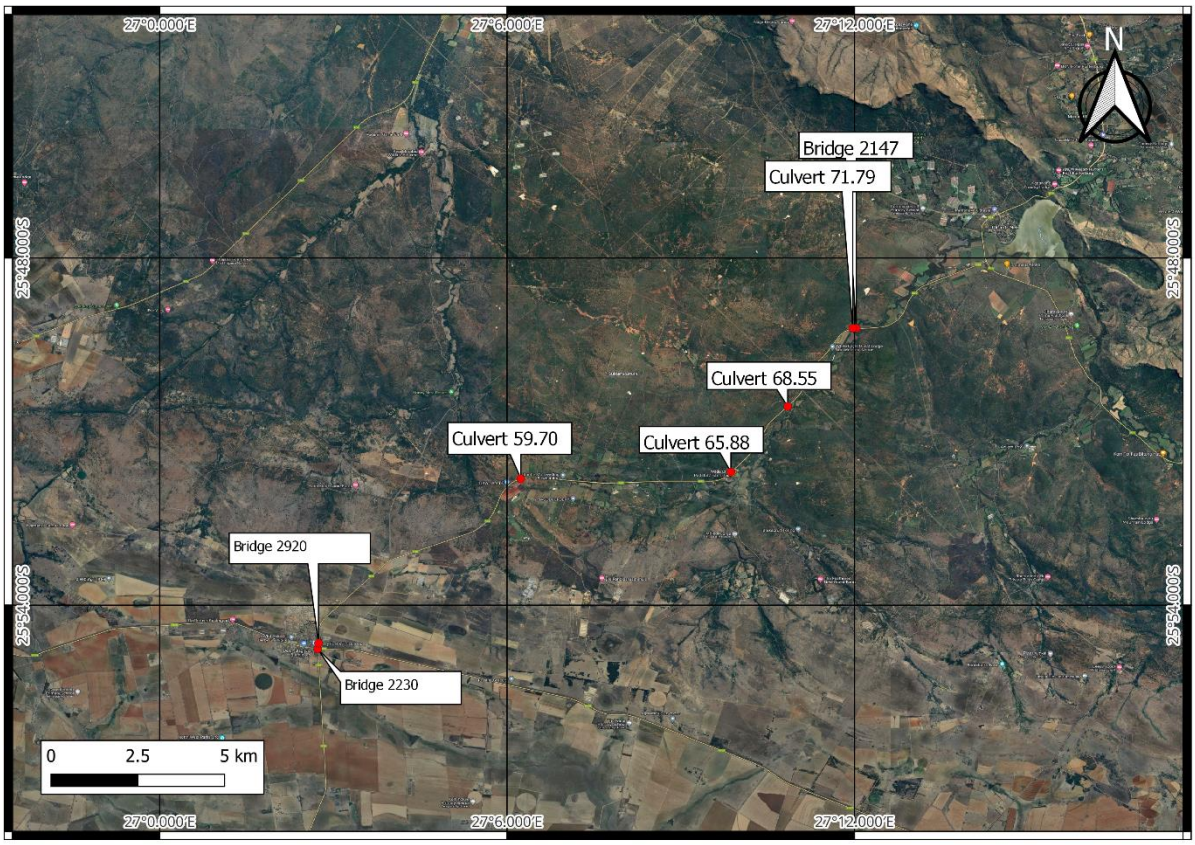


Figure 1: Site locality map of the R30 bridges and culverts

2 Available information

The following information was used for this investigation:

- 1:250 000 Sheet 2526 Rustenburg Geological Map.
- Zutari (2023): Draft preliminary design report. The improvement of national road R30 Section 9 from KM29 to R24 (Olifantsnek-KM76.6). Project NRA R.030-090-2016/1. The South African National Roads Agency SOC Limited.
- A site layout plan, showing the boundaries of the site and the proposed structures.
- Google Earth© Images.

3 Project environment

3.1 Topography, vegetation, and site conditions

The portion on the R30 road where the culverts and bridges are located can be described as gently sloping in most positions. The proposed new bridge at bridge No. 2147 over the Commissiedrift Tributary 1 (± km 71.89) is located along the Rooikloofspruit River which is a tributary of the Crocodile River (Figure 2).

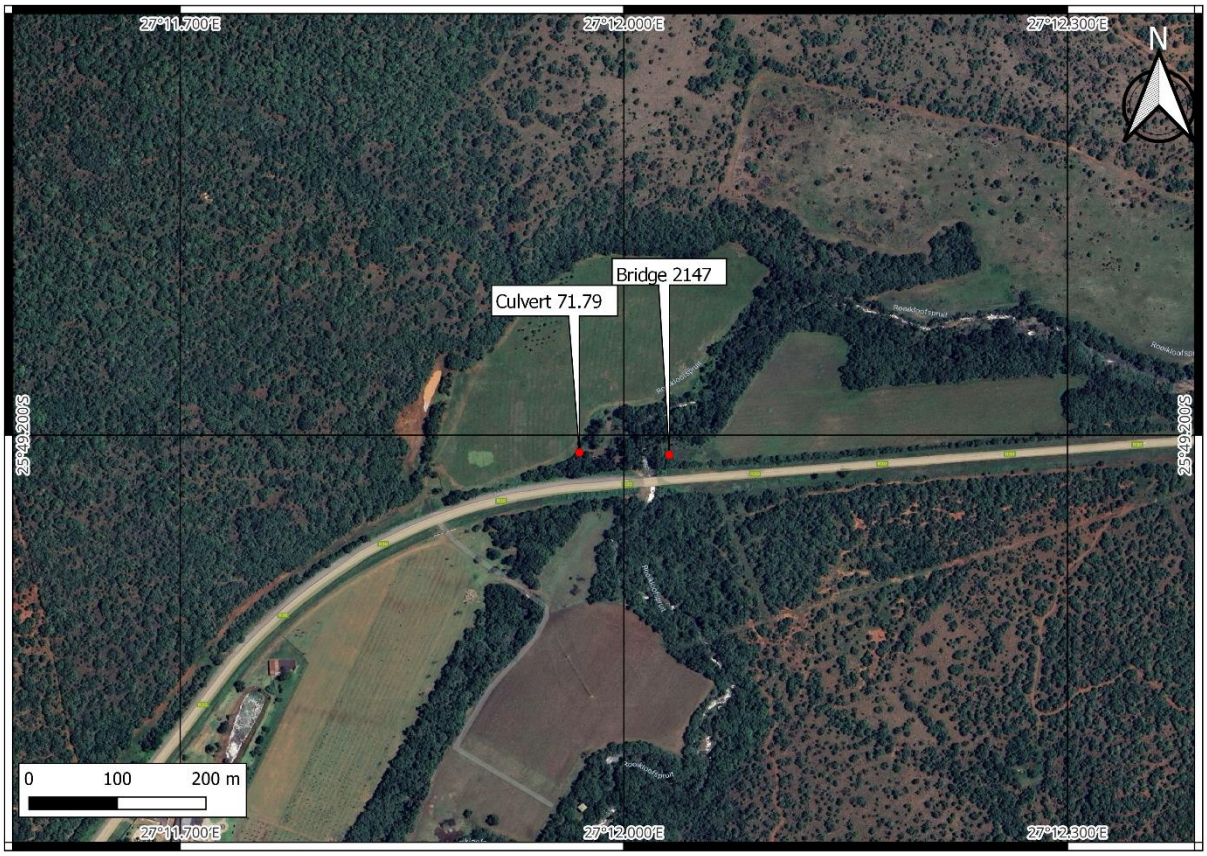


Figure 2: Site location of culvert km 71.79 and bridge 2147

Bridge No. 2230 crosses over the R509 road at a town named Derby. This bridge is close to local businesses within the area. Bridge No. 2920 is located over a railway which is 150 metre north of bridge No. 2230 (Figure 3).

The proposed culverts and bridges sites are sparsely covered by grass, shrubs, and trees except for 59.70 RHS underpass, 71.79 LHS and RHS underpass which are densely covered by trees (Figure 4 to Figure 6).



Figure 3: Site location of bridge 2920 and 2230



Figure 4: Site location of culvert at km 59.70

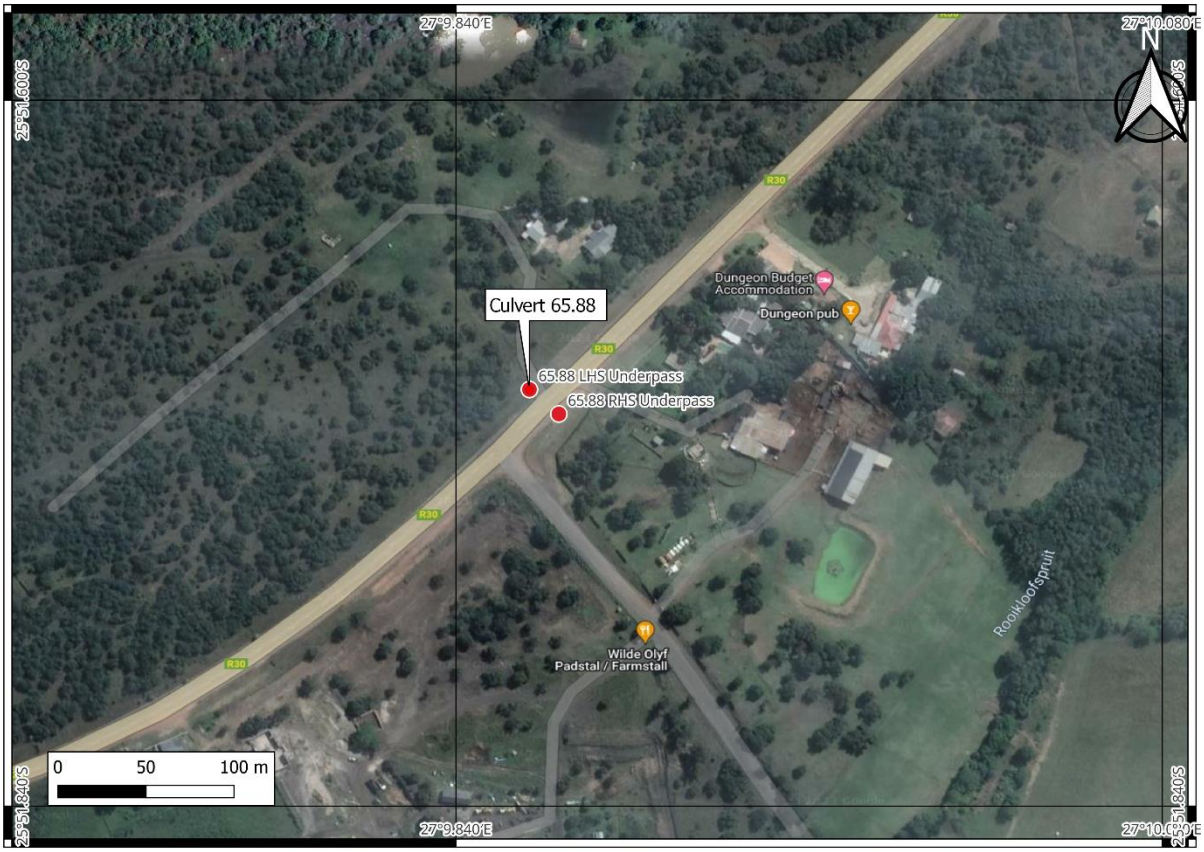


Figure 5: Site location of culvert at km 65.88



Figure 6: Site location of culvert at km 68.55

3.2 Climatic conditions

The towns of Derby and Olifantsnek located nearest to the site has warm summers and cold winters which the coldest month being July and the hottest months being October to January. The winter temperatures for Derby range from 6°C to a maximum of 20°C (Figure 7). The Derby summer temperatures range from 16°C to 30°C. The winter temperatures at Olifantsnek range between 2°C and 24°C. The Olifantsnek summer temperatures range from 17°C to 31°C (Figure 9). Derby receives most of rainfall in summer during the December period where the maximum precipitation is approximately 160 mm. Olifantsnek receives most of its precipitation in January.

The N-value of the area is between 2 and 5 which indicates moist climatic conditions(Figure 10). Chemical decomposition is the predominant weathering process.

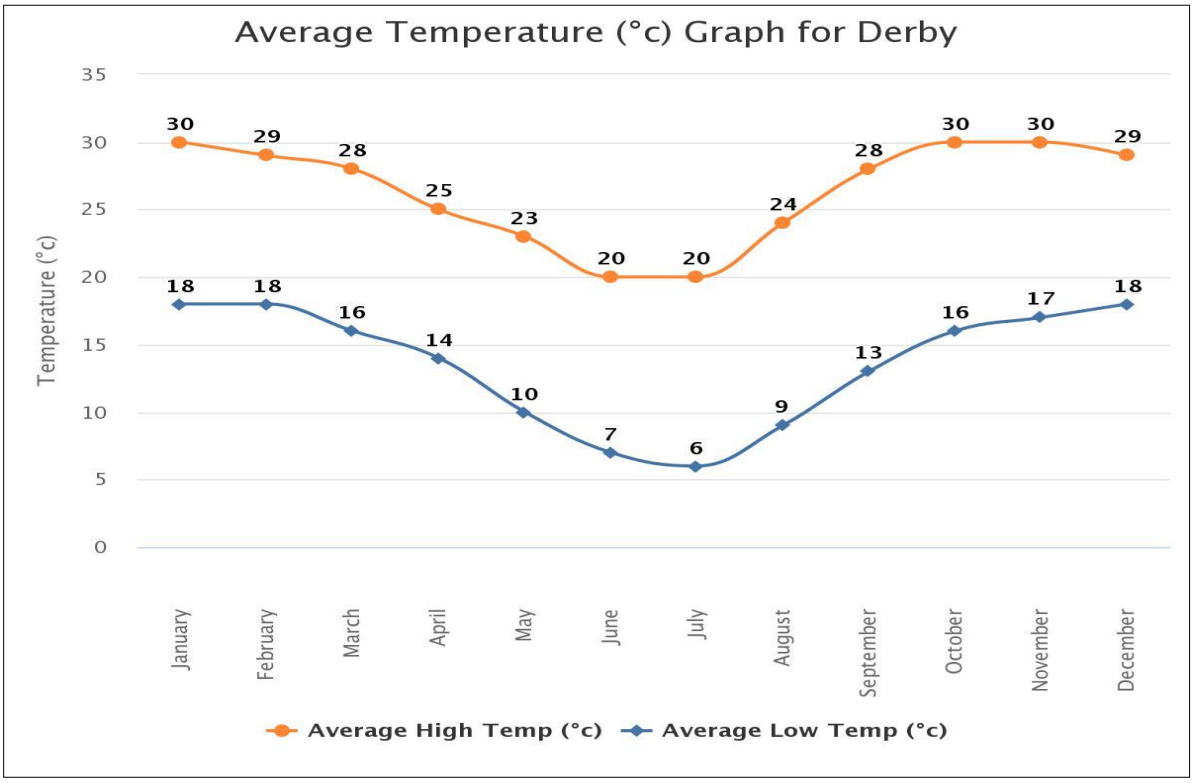


Figure 7: Average temperatures in Derby (World Weather Online)

(Source: Derby Annual Weather Averages - North-West, ZA (worldweatheronline.com)

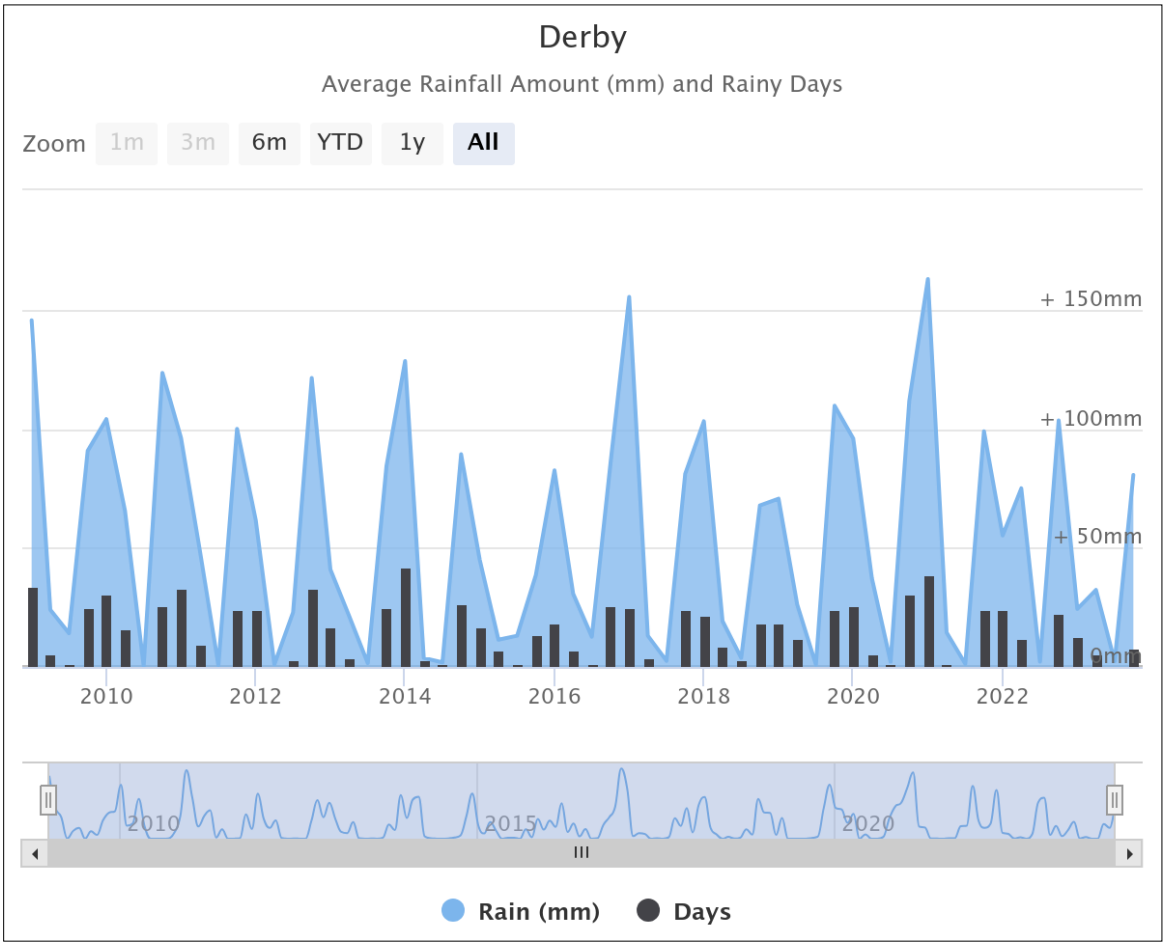


Figure 8: Annual precipitation of Derby, North West Province (World Weather Online)

(Source: Derby Annual Weather Averages - North-West, ZA (worldweatheronline.com))

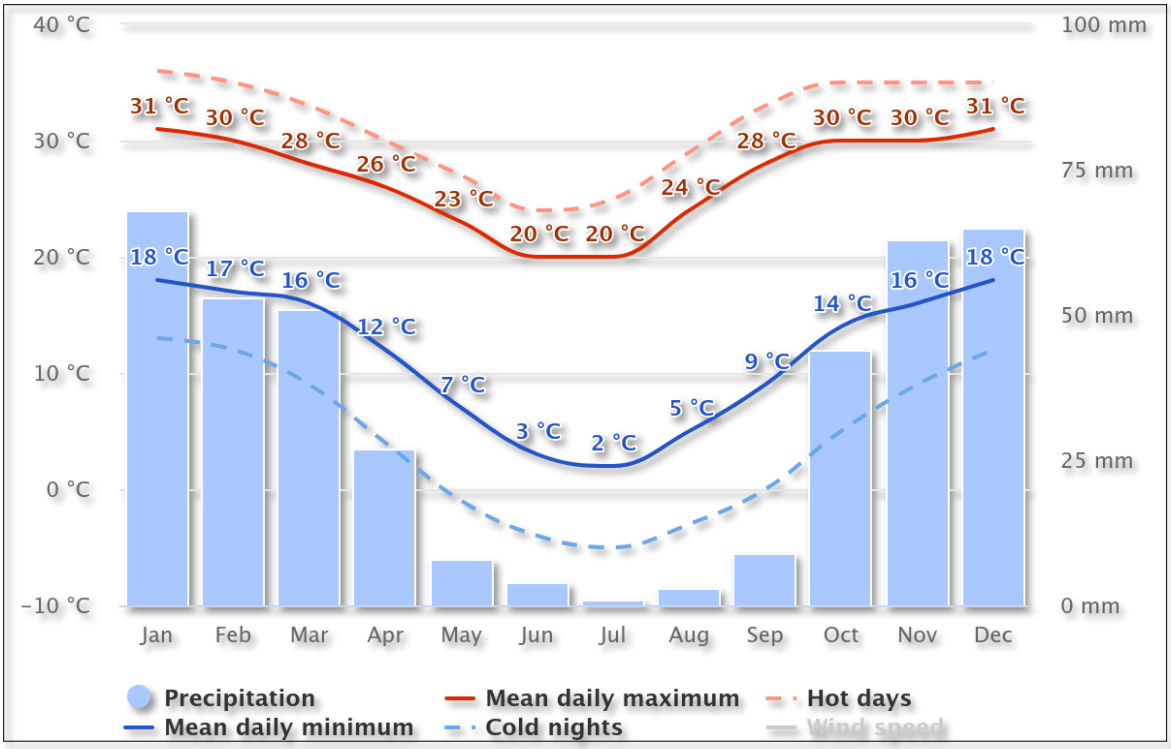


Figure 9: Olifantsnek average temperatures and precipitation (Meteoblue)

(Source: Olifantsnek average temperatures and precipitation-North West, ZA(Meteoblue))

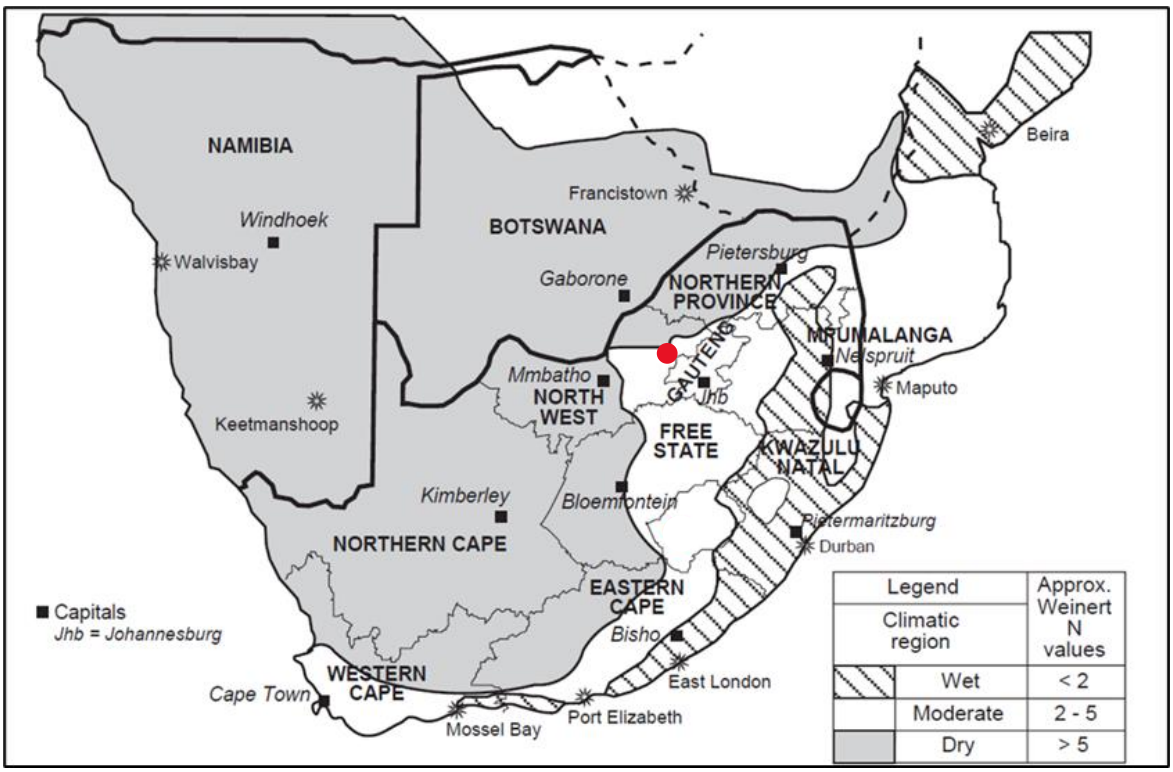


Figure 10: Weinert N-value map (Weinert, 1986)

4 Investigation methodology

The geotechnical Investigation was conducted using the following methods:

- Test pitting
- Rotary core drilling
- Laboratory testing

Geomechanics was contracted by Zutari to conduct the drilling of boreholes at the three bridge locations and test pits were excavated along the proposed culverts positions.

4.1 Test pitting

Fieldwork was conducted on the 27th and 28th of September 2023 where six test pits were excavated and profiled along the proposed culverts' positions. One of the test pits were not conducted at the culvert at km 71.79 due densely populated trees at the proposed culvert position. The other test pits at culvert at km 65.88 could be excavated due to ground services and access constraints. The inability to excavate these test pits will limit the information available to develop the geological or ground model of these culverts. Test pits were excavated using a Tractor Loader Backhoe (TLB) to a depth of 3m, or to refusal (whichever occurs first), or a depth at which the excavation sidewalls became unsafe. The test pits were profiled by a professional engineering geologist or professional geotechnical engineer in accordance with SAIEG (Dippenaar, Rooy, & Davis, 2024).

The test pits positions, groundwater seepage level and termination depths are summarized in Table 1 below.

Table 1: Test pit positions

Culvert name	Test Pit Position No	X Co-ordinates (S)	Y Co-ordinates (E)	Ground water seepage	Termination depth
Box culvert at km 59.70 Underpass	**TP 1**	- 25.863551°S	27.10393°E	None	0.5 m
	TP2	-25.863777°S	2 7.103939°E	None	0.6 m
Box culvert at km 65.88 Underpass	**TP3**	-25.861686°S	27.164388°E	None	2.1 m
Box culvert at km 68.55 Underpass	**TP4**	- 25.842683°S	27.180589°E	None	1.8 m
	TP5	-25.842782°S	27.180781°E	None	2.1 m
Box culvert at km 71.79 Underpass	**TP 6**	-25.8202°S	27.19944 °E	None	1.8 m

4.2 Rotary core drilling

A total of number of twelve (No. 12) boreholes were drilled at the proposed piers and abutments of the three bridges. Borehole drilling took place from the 8th to the 22nd of September 2023. The borehole positions, depth of terminations and water rest levels (taken after 24 hrs of drilling) are summarized in Table 2 below.

The boreholes were drilled at the proposed drilling depth of 20m. The termination criteria was based on drilling six (No. 6) metres into hard rock , proposed maximum depth of 20 m or six (No. 6) consecutive SPT-N values of greater or equal to thirty (No. 30) or refusal which is line with the CSRA specifications for drilling. The co-ordinates of the boreholes were determined using a hand-held GPS. Standard

Penetration Tests (SPT) were conducted at 1.5m interval within the boreholes to determine the consistency of the soils.

Borehole logging was conducted by professional engineering geologists from Zutari. The logging was in line with the SAIEG draft(Dippenaar, Rooy, & Davis, 2024) guidelines for soil and rock logging.

Table 2: Summary of borehole positions

Bridge no	Borehole Position No	X Co-ordinates (S)	Y Co-ordinates (E)	Water rest level (m)	Termination depth (m)
Bridge 2920	2920-BH01	-25.910853°S	27.045465°E	9.34	20.0 m
	2920-BH02	-25.910874°S	27.045724°E	19.6	20.2 m
	2920-BH03	-25.911037°S	27.045484°E	16.1	20.47 m
	2920-BH04	-25.910984°S	27.045724°E	9.45	20.0 m
Bridge 2230	2230-BH01	-25.912347°S	27.045387°E	7.43	19.5 m
	2230-BH02	-25.912361°S	27.045747°E	17.36	20.0 m
	2230-BH03	-25.912598°S	27.045478°E	16.6	20.06 m
	2230-BH04	-25.912609°S	27.045792°E	18.9	20.31 m
Bridge 2147	2147-A1	-25.820248°S	27.200050°E	6.04	20.0 m
	2147-A2	-25.820233°S	27.200528°E	18.00	20.0 m
	2147-P1	-25.820248°S	27.200190°E	7.14	20.0 m
	2147-P2	-25.820238°S	27.200389°E	4.5	20.0 m

4.3 Laboratory testing

Disturbed and non-disturbed soil samples were taken from the soil for testing at Geosure Laboratory to test various properties of the soil and rock samples. The table below summarises the laboratory tests that were conducted as well as the depths where they were taken.

Table 3: Laboratory tests samples taken at the bridge and culvert locations

Bridge No.	Test Position No.	Depth	Sample type	Test
Bridge 2920	2920-BH01	3.00-3.55	Shelby	pH, conductivity, and standard oedometer
	2920-BH02	3.00-3.55	Shelby	pH, conductivity, and standard oedometer
	2920-BH04	7.5-7.7	Shelby	pH, conductivity, and standard oedometer
	2230-BH01	6.0-6.55	Shelby	pH, conductivity, and standard oedometer
	2230-BH01	15.27-15.5	Shelby	pH, conductivity, and standard oedometer
	2230-BH02	13.5-13.82	Rock core	UCM

Bridge No.	Test Position No.	Depth	Sample type	Test
Bridge 2230	2230-BH02	16.5-16.73	Rock core	UCM
	2230-BH03	4.5-5.05	Shelby	pH, conductivity, and standard oedometer
	2230-BH03	18.11-18.48	Rock core	UCM
	2230-BH04	18.00-18.28	Rock core	UCM
Culvert at km 59.70 Underpass	km 59.70 LHS Underpass TP 1	0-0.2	Small disturbed	FI, pH, conductivity
	Km 59.70 RHS Underpass TP2	0.5-0.6	Bulk disturbed	FI, MOD, CBR, pH and conductivity
Culvert at km 65.88 Underpass	km 65.88 LHS Underpass TP3	0.8-2.1	Bulk disturbed	FI, MOD, CBR, pH and conductivity
Culvert at km 68.55 Underpass	68.55 LHS Underpass TP4	0-1.6	Bulk disturbed	FI, MOD, CBR, pH and conductivity
Culvert at km 71.79 Underpass	71.79 LHS Underpass TP 6	1.1-1.8	Bulk disturbed	FI, MOD, CBR, pH and conductivity
	71.79 LHS Underpass TP 6	1.1-1.8	Undisturbed	FI, pH, conductivity, and standard oedometer

Note:
FI = Foundation Indicator
MOD = Modified
CBR = California Bearing Ratio
UCM = Uniaxial Compressive strength with Young's Modulus and Poisson's ratio

5 Regional geology

According to the 1:250 000 Sheet 2526 Rustenburg Geological Map, the site is underlain by the sedimentary lithologies of the Pretoria Group of the Transvaal Supergroup, volcanic intrusions of the Hekpoort Formation of the Transvaal Supergroup as well as the younger Mokolian age diabase intrusions. The geology of the area can be summarised as follows from youngest to oldest:

- Alluvium (surface deposits) deposited near rivers as seen in Figure 11.
- The diabase intrusions that are intruded into the older Pretoria Group sedimentary lithologies.
- This is underlain by the Silverton Formation, Pretoria Group sedimentary and metamorphic rocks such as slate, shale and hornfels.
- Shale that is iron-rich and slate of the Strubenkop Formation, Pretoria Group was deposited prior to the Daspoort Formation of the Pretoria Group.
- The Hekpoort Formation of the Transvaal Supergroup which consists of andesite, basalt, agglomerate, and tuff which is the oldest succession according to the regional geology of the area.

Table 4: Expected geology for the bridges and culverts

Test Position number	Geology
Bridge 2930 and 2230	Andesite
Culvert at km 59.70	Diabase
Culvert at km 65.88	Slate
Culvert at km 68.55	Diabase
Culvert 71.79 and Bridge 2147	Surface deposits

The geological structures visible on site are lineaments and geological contacts at bridge No. 2930. A fault trending East to West is seen a few metres north of Culvert at km 65.88 Underpass and East to West fault at culvert 59.70 Underpass. An ENE to WSW trending fault is also seen at culvert at km 68.55 Underpass. Diabase dykes are visible near culvert at km 59.70 and culvert at km 68.55.

The excavation of test pits and drilling of boreholes revealed that the site is underlain by the following lithologies:

- Bridge 2920 encountered alluvium, pedogenic material(transported), residual andesite, residual slate, and slate rock.
- Bridge 2230 encountered pedogenic material, residual andesite, and andesite rock.
- Bridge 2147 encountered alluvium and slate bedrock.
- Culvert at km 59.70 encountered diabase rock.
- Culvert at km 65.88 encountered residual slate, and slate.
- Culvert at km 68.55 encountered residual diabase, and diabase rock.
- Culvert at km 71.79 encountered transported soil.

A detailed geological model of each bridge and culvert will be discussed in detail in section 7.

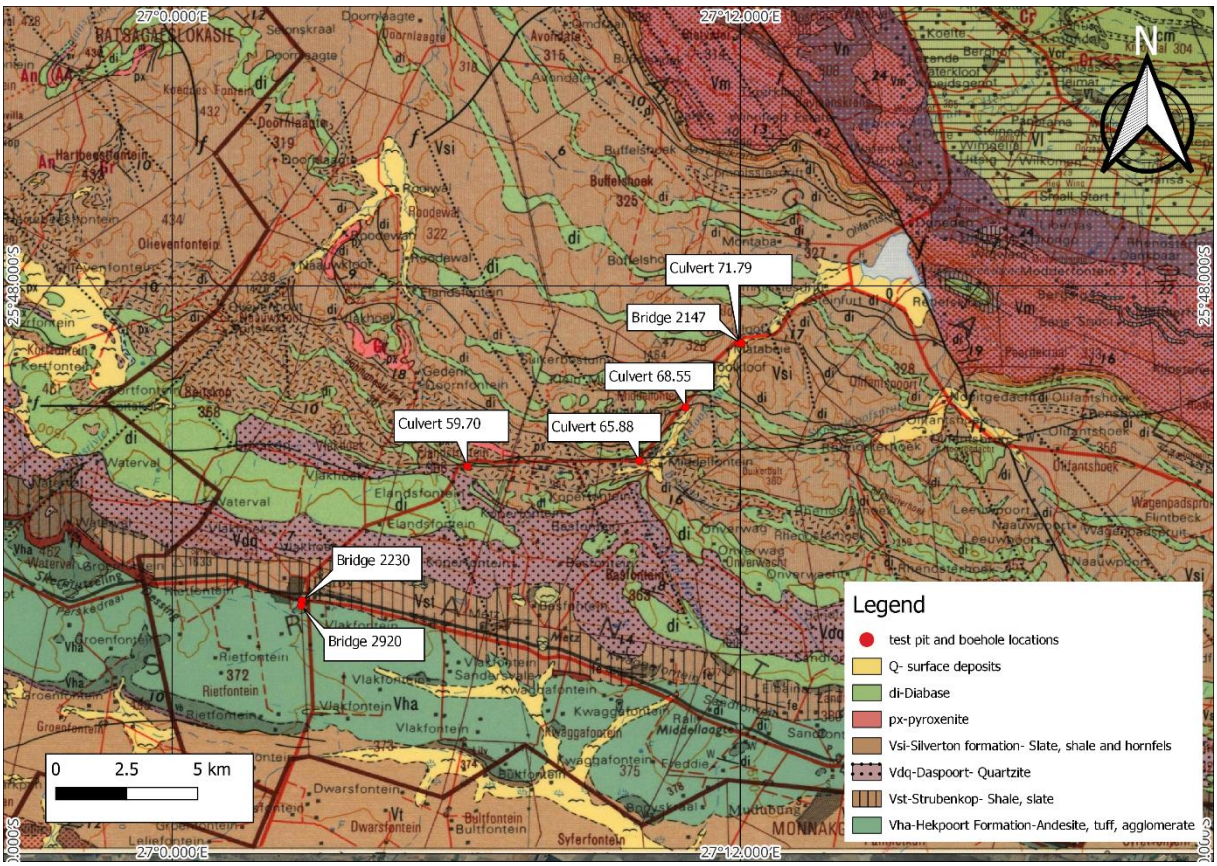


Figure 11: Regional geology of the R30 culverts and bridges (Extract of the CGS 1: 250 000 scale (Sheet: 2526) Rustenburg Geological map

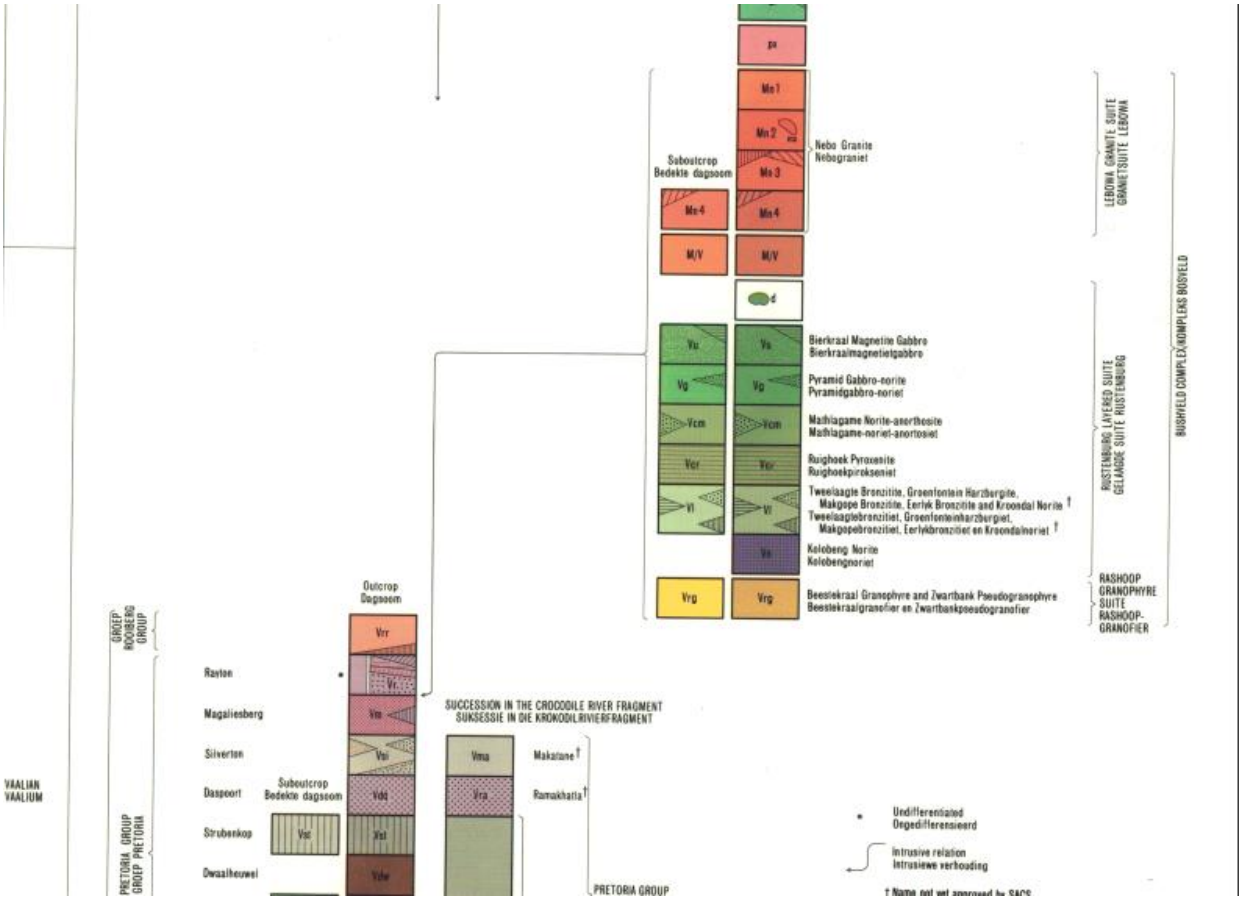


Figure 12: Geological legend extract from the Sheet 2526 Rustenburg Geological Map

6 Seismic activity

Seismic activity plays a very important role in stability of infrastructure. It is of outmost importance to check the zones of the area prior to development and to incorporate it into the designs. This is classified in the SANS 10160-4:2:217 where various seismic zones are shown. The site falls within Zone II which a peak ground acceleration (PGA) of greater than 0.1g which is considered as a high-level of hazard. The site is shown in red in Figure 13.

Structures built in this zone need to adhere to the specifications outlined in the SANS 10160-4: 2017. All structures need to be designed and built to withstand damage caused by seismic activities and damage due to localized collapse.

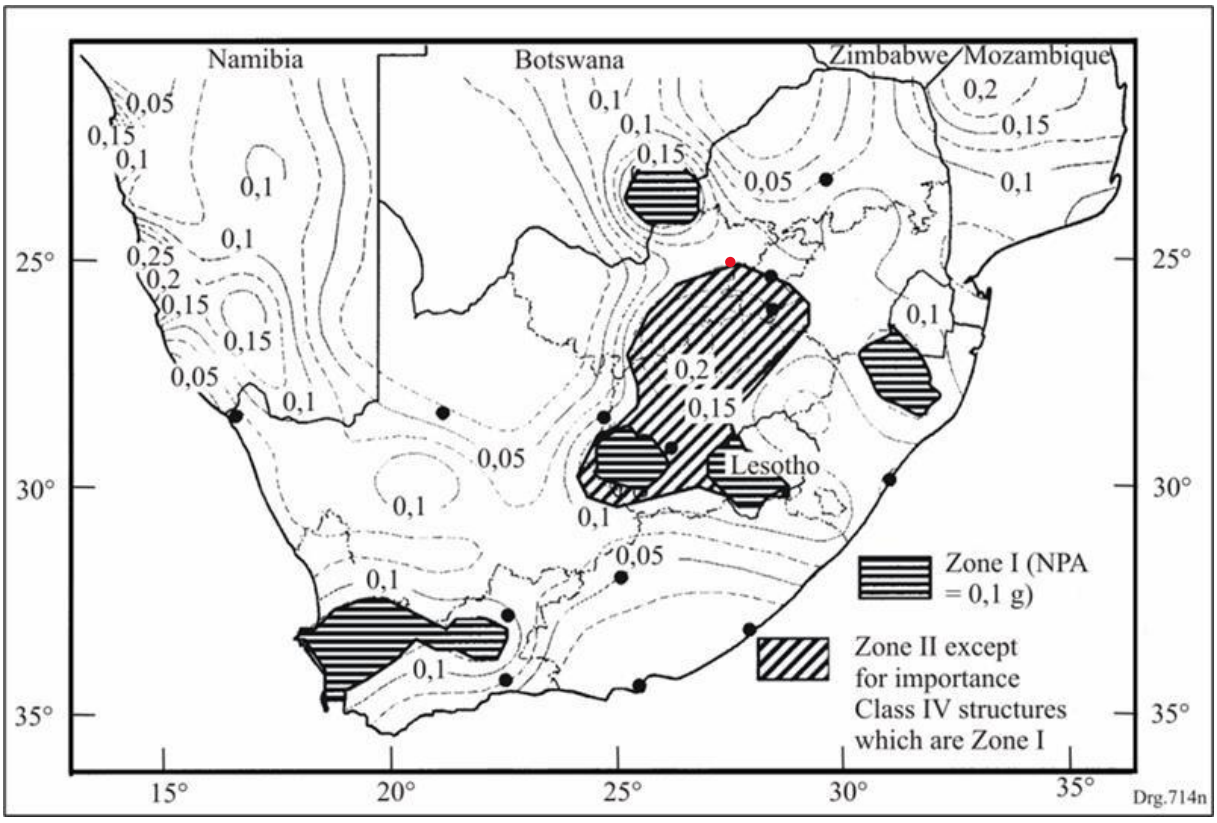


Figure 13: Seismic Hazard Map of Southern Africa (SANS 10160-4:2017)

7 Geotechnical assessments

7.1 Geological model

The geological model is derived from the soil profiles and borehole logs. A summary of the boreholes and soil profiles are outlined below. The detailed profiles and pictures are included in Appendix B and Appendix D.

7.1.1 Bridge 2920

A summary of the boreholes drilled for this bridge are summarised in Table 5 below:

Table 5: Bridge 2920 borehole summary

Borehole No.	Alluvium (m)	Non-engineered fill (m)	Pedogenic (m)	Residual Andesite (m)	Residual Slate (m)	Slate (m)	Water rest level (m)	Termination depth (m)
BH01	0-1.5				1.5-16.5	16.5-20.0	9.34	20
BH02		0-1.5		1.5-20.0			19.60	20
BH03	0-2.3		2.3-4.8		4.8-15.86	15.86-20.47	16.10	20.47
BH04		0-1.5	1.5-5.0		5.00-15.55	15.55-20.0	9.45	20

7.1.1.1 Non-engineered fill

BH02 and BH04 are underlain by a 1.5 m thick layer of non-engineered fill described as dark to reddish brown, silty sand with minor fine to medium gravels. The non-engineered fill was encountered on the eastern side of the bridge (BH02 and BH04) and the alluvium on the western side of the bridge (BH01 and BH03).

7.1.1.2 Alluvium

BH01 and BH03 are underlain by alluvium that has a thickness ranging from 1.5 to 2.3 m. This layer is described as dark brown, clayey silt with minor angular to sub-rounded gravels for BH01. BH03 encountered reddish brown speckled orange, brown and black, medium dense, ferruginised clayey silty sand with abundant angular to sub-rounded, fine to coarse gravel.

7.1.1.3 Pedogenic material (transported)

The pedogenic horizon was encountered underlying alluvium and non-engineered fill in BH03 and BH04 respectively. This layer is characterised by red, speckled black and orange, stiff , ferruginised silty clay with minor rounded to angular, fine to coarse gravel, and cobbles and was described as pedogenic material (of transported origin). Where it was encountered, it ranges between 1.5 and 5.0 m depth below natural ground level.

7.1.1.4 Residual andesite

BH02 has residual andesite from 1.5 to 20 m below the non-engineered fill horizon. The residual andesite can be described as red stained orange, stiff to very stiff, silty clay with occasional gravel and a corestone (0.4 m in diameter) at 18.00 m (BH02).

7.1.1.5 Residual slate

The alluvium is underlain by residual slate from 1.5 m depth with a thickness ranging between 10.5 to 15.00 m at BH01, BH03 and BH04. The residual slate is described as reddish brown, mottled orange, black and off-white, stiff to very stiff ferruginised, silty clay with abundant angular, fine to coarse slate gravels.

7.1.1.6 Slate bedrock

The lowermost horizon encountered in the boreholes consists of a reddish brown, orange and black, completely weathered, very fine grained, thinly laminated, very closely jointed, very highly fractured, very soft to soft rock, slate. This horizon is encountered in BH01, BH03 and BH04 at various depths ranging from 15.55 m up to 20.47 m below ground level.

7.1.2 Bridge 2230

A summary of the boreholes drilled for this bridge are summarised in

Table 6 below:

Table 6: Bridge 2230 borehole summary

Borehole No.	Non-engineered fill (m)	Pedogenic (m)	Residual Andesite(m)	Andesite (m)	Water rest level (m)	Termination depth (m)
BH01	0-0.91	0.91-4.5	4.5-9.0	9.0-19.5	7.43	19.5
BH02	0-1.1	1.1-4.5	4.5-8.85	8.85-20	17.36	20.0
BH03	0-1.95	-	1.95-8.53	8.53-20.06	16.60	20.06
BH04	0-1.5	1.5-3.0	3.0-8.35	8.35-20.31	18.90	20.31

7.1.2.1 Non-engineered fill

All boreholes exhibited non-engineered fill in the top horizon with the thickness ranging from surface to a maximum depth of 1.95 m. This layer is described as reddish brown to light brown, silty sand and gravelly silty sand, non-engineered fill.

7.1.2.2 Pedogenic material (residual andesite)

A pedogenic horizon underlies the engineered fill material in BH01, BH02 and BH04. This layer is characterised as reddish brown to light grey speckled/mottled black in places, firm to very stiff, silty clay, with minor fine to coarse, sub-rounded ferruginised nodules and gravels, pedogenic material (from residual andesite) except for BH04 where medium dense clayey sand was encountered. The layer ranges from a depth from 0.91 m to 4.5 m below natural ground level in BH01, BH02, BH03 and BH04.

7.1.2.3 Residual andesite

Residual andesite was encountered in all boreholes below the pedogenic material and engineered fill horizons. This layer is described as reddish brown to light grey stained orange, firm to very stiff silty clay with minor fine sub-rounded ferruginised nodules and gravels. The depth of this horizon is 1.95 m to 8.85 m below ground level.

7.1.2.4 Andesite bedrock

This horizon consists of brown, greenish grey, orange and black, completely weathered to highly weathered, very closely jointed, very highly fractured, massive, very soft rock to extremely hard rock and grey, occasionally stained brown, slightly weathered to unweathered, fine grained, massive, very closely to medium jointed, medium hard to extremely hard rock with depth. This was encountered in all boreholes from at various depths ranging from 8.35 m up to 20.31 m below natural ground level. The completely weathered to slightly weathered rock becomes moderately/medium weathered, medium hard rock at variable depths across the boreholes ranging from 10.34 m to 17.76 m below natural ground level. The completely weathered rock represents soil like behaviour. This transitions from slightly weathered to unweathered rock from depths ranging from 13.50 m to 20 m.

7.1.3 Bridge 2147

A summary of the boreholes drilled for this bridge are summarised below in the table below:

Table 7: Bridge 2147 borehole summary

Borehole No.	Alluvium (m)	Slate (m)	Water rest level (m)	Termination Depth (m)
BH-A1	0-5.8	5.8-20.0	6.04	20
BH-A2	0-6.10	6.10-20.0	18.00	20
BH-P1	0-18.5	18.45-20	7.14	20
BH-P2	0-6.92	6.92-20.0	4.5	20

7.1.3.1 Alluvium

The alluvial deposits (terrace gravels) comprise sands and gravel and are largely described as grey and brown, angular to sub-rounded gravel, cobbles, and boulders with silty sand for BH-A1 and BH-P1 . BH-A2 and BH-A3 comprises of dark brown to black, stiff to very stiff silty clay with minor angular to sub-angular-slate gravels. This horizon was encountered in all boreholes with a depth ranging from 0 to 18.45 m depth below natural ground level.

7.1.3.2 Slate

This horizon was encountered in all boreholes at various depths ranging from 5.8 m to 20 m below natural ground level. Slate bedrock in this horizon has various weathering states. This layer can be described as grey, yellowish, brown, and black, completely to highly weathered, very fine grained, thinly laminated, highly to very highly fractured, very closely to medium jointed, very soft rock.

7.2 Culvert at km 59.70 LHS underpass

A summary of the test pits excavated for this underpass are summarised in the table below:

Table 8: Test pit summary of culvert at km 59.70 underpass

Test Pit No.	Engineered fill(m)	Diabase (m)	Depth (m)
Culvert at km 59.70 LHS Underpass: TP 1	0-0.4	0.4-0.5	0.5
Culvert at km 59.70 RHS Underpass: TP2	0-0.5	0.5-0.6	0.6

7.2.1.1 Engineered fill

The engineered fill is the upper layer which can be described from surface as dry, reddish, and yellowish brown, very stiff, intact, silty clay with abundant gravel and cobbles. The material thickness ranges from 0.4 to 0.5 m, and it is understood that this is engineered fill from the road construction.

7.2.1.2 Diabase bedrock

The diabase layer underlies the engineered fill and was encountered as reddish brown and grey, highly weathered, massive, fine grained, very closely jointed to medium jointed, medium hard rock.

7.3 Culvert at km 65.88 LHS underpass

A summary of the test pit excavated for this underpass are summarised in the table below. Only one test pit was excavated at this culvert position due to encountering of underground services and general access limitations on site.

Table 9: Test pit summary of culvert 65.88 underpass

Test Pit No.	Engineered fill(m)	Residual Slate (m)	Slate (m)	Depth (m)
Culvert at km 65.88 LHS Underpass TP 3	0-0.3	0.3-0.8	0.8-2.1	2.1

7.3.1.1 Engineered fill

The engineered fill is the upper layer which can described as dry, yellowish brown, dense, silty sand with abundant gravel and cobbles. The thickness of this layer was encountered to be 0.3 m.

7.3.1.2 Residual slate

The residual slate horizon underlies the engineered fill and is described as dry to slightly moist, dark brown to black, stiff, intact, clayey silt with angular gravels and cobbles (micaceous). The depth of this layer ranges from 0.3 up to 0.8 m below ground level.

7.3.1.3 Slate bedrock

The slate rock underlies the residual slate and can be described as dark brown to black, completely to highly weathered, fine grained, thinly laminated, very soft rock.

7.4 Culvert at km 68.55 underpass

A summary of the test pit excavated for this underpass are summarised in the table below:

Table 10: Test pit summary of culvert at 68.55 underpass

Test Pit No.	Engineered fill(m)	Residual Diabase (m)	Diabase (m)	Depth (m)
Culvert at km 68.55 LHS Underpass: TP4	-	0-1.6	1.6-1.8	1.8
Culvert at km 68.55 RHS Underpass: TP5	0-1.2	-	-	1.2

7.4.1.1 Engineered fill

Test pit TP5 was excavated on a road fill embankment, hence the thick layer of fill material was encountered. The test pit was terminated at 1.2 m depth upon encountering ground services. This engineered fill horizon was described as slightly moist, yellowish brown, dense, silty sand with gravel and cobbles.

7.4.1.2 Residual diabase

The residual diabase was encountered in TP4 which was excavated on the cut side of the road reserve. The residual diabase comprise grey, orange and brown matrix supported gravel and cobbles in a matrix of moist, reddish-brown ferruginised, dense silty clay with minor ferricrete nodules. This layer was encountered from surface to 1.6 m depth below ground level.

7.4.1.3 Diabase bedrock

The diabase bedrock underlies the residual material and was encountered as dark grey and reddish-brown, completely weathered, massive, fine grained, very closely jointed, very soft rock.

7.5 Culvert at km 71.79 underpass

A summary of the test pit excavated for this underpass are summarised below in the table below. Only one test pit was excavated at this culvert position due to densely populated trees hampering access to the second test pit. The summary of the test pit excavated for this underpass is summarised in Table 11.

Table 11: Test pit summary of culvert at 71.79 underpass

Test Pit No.	Transported (m)	Depth (m)
Culvert at km 71.79 LHS Underpass: TP6	0-1.8	1.8

7.5.1.1 Transported

The material encountered at the footprint of this underpass up to 1.8 m was transported materials ranging in gravel content degree. The transported material encountered from surface to 1.1 m comprise slightly moist, yellowish to reddish brown, shattered, stiff, slightly sandy silty clay, while similar material was encountered with diabase and slate gravel, cobbles, and boulders (>200mm) up to 1.8 m depth. Refusal was encountered at 1.8 m on the diabase boulders.

7.6 SPT results

The Standard Penetration tests (SPT) was conducted in all boreholes at the three bridge sites. The SPT is conducted by driving a split spoon sampler into the ground using a 63.5 kg hammer. The hammer is mechanically lifted and dropped 762 mm. The SPT spoon is driven 450 mm into the ground and the

number of blows required for the final 300 mm of penetration (referred to as the N-value) is recorded on the borehole profile descriptions. A guideline for the relationship between the SPT N-values and consistency of the soil is given in Table 12.

Table 12: Correlation of SPT N-values with consistency (Brink, Partridge, & Williams, 1982)

N-Value	Cohesive material consistency	N-Value	Non-cohesive material consistency
< 2	Very soft	< 5	Very loose
2 – 4	Soft	5 – 10	Loose
4 – 8	Firm	10 – 30	Medium dense
8 – 15	Stiff	30 – 50	Dense
15 – 30	Very stiff	> 50	Very dense

7.6.1 Bridge 2920

The consistency of BH01 is very stiff from 1.5 to 15.45 m in the residual slate horizon. BH02 SPT N-value results indicates that the consistency of this borehole is very stiff in the residual diabase horizon. BH02 has a residual andesite silty clay horizon ranging from a depth of 1.5 to 6.45 m with a varying consistencies between stiff to very stiff. The upper alluvium horizon in BH03 consists of medium dense silty clayey gravels from 1.5 to 1.95 m. The pedogenic horizon in BH03 consists of stiff silty clay from a depth of 3.0 to 3.45 m. The residual slate horizon at BH04 had a consistency of medium dense to dense from a depth of 6.00 up to 15.55 m. The correlations between the SPT testing and consistencies for the various horizons are represented in the table below.

Table 13: The SPT N-value for bridge 2920

Borehole No.	Depth (m)		SPT N-value	Description of material encountered	Origin
	From	To			
2920 BH01	1.5	1.95	**22**	Very stiff silty clay	Residual slate
	3.55	4.00	**26**	Very stiff silty clay	Residual slate
	6.0	6.45	**26**	Very stiff silty clay	Residual slate
	7.5	7.95	**18**	Very stiff silty clay	Residual slate
	9.0	9.45	**31**	Very stiff silty clay	Residual slate
	10.5	10.95	**32**	Very stiff silty clay	Residual slate
	12.00	12.45	**40**	Very stiff silty clay	Residual slate
	13.5	13.95	**32**	Very stiff silty clay	Residual slate
	15.00	15.45	**39**	Very stiff silty clay	Residual slate
2920 BH02	1.5	1.95	**18**	Very stiff silty clay	Residual andesite
	3.55	4.00	**10**	Stiff silty clay	Residual andesite
	4.5	4.90	**13**	Stiff silty clay	Residual andesite
	6.0	6.45	**25**	Very stiff silty clay	Residual andesite

Borehole No.	Depth (m)		SPT N-value	Description of material encountered	Origin
	From	To			
2920 BH03	1.5	1.95	**11**	Medium dense clayey silty sand with gravel	Alluvium
	3.0	3.45	**11**	Stiff gravelly silty clay	Pedogenic
2920 BH04	6.00	6.45	**25**	Medium dense silty clayey gravels	Residual slate
	7.70	8.15	**34**	Dense silty clayey gravels	Residual slate
	9.00	9.45	**42**	Dense silty clayey gravels	Residual slate
	15.00	15.45	**48**	Dense silty clayey gravels	Residual slate

7.6.2 Bridge 2230

The results from the SPT indicate that the pedogenic and residual andesite horizon in BH01 exhibited a very stiff consistency. The residual andesite in BH02 consisted of a firm consistency between 6.55 and 7.00 m. BH03 encountered firm silty clay within the pedogenic material horizon and stiff to very stiff silty clay within the residual andesite horizon. BH04 encountered medium dense clayey sand in the upper pedogenic horizon from 1.5 m to 1.95 m. The lower residual andesite horizon ranging from a depth of 3.00 m to 7.95 m encountered firm to stiff, and very stiff sandy silt with depth. The correlations between the SPT testing and consistencies for the various horizons are represented in the table below.

Table 14: The SPT N-values for bridge 2230

Borehole No.	Depth (m)		SPT N-value	Description of material encountered	Origin
	From	To			
2230 BH01	1.5	1.95	**24**	Very stiff silty clay	Pedogenic
	6.55	7.00	**43**	Very stiff silty clay	Residual andesite
2230 BH02	1.5	1.95	**14**	Firm gravelly silty clay	Pedogenic
	6.0	6.45	**33**	Stiff silty clay	Residual andesite
2230 BH03	1.5	1.95	**8**	Firm silty clay	Pedogenic
	3.0	3.45	**19**	Very stiff silty clay	Pedogenic
	5.05	5.50	**15**	Stiff silty clay	Residual andesite
2230 BH04	1.5	1.95	**11**	Medium dense clayey sand	Pedogenic
	3.00	3.45	**13**	Stiff sandy silt	Residual andesite
	4.50	4.95	**8**	Firm sandy silt	Residual andesite
	6.00	6.45	**16**	Very stiff sandy silt	Residual andesite
	7.5	7.95	**19**	Very stiff sandy silt	Residual andesite

7.6.3 Bridge 2147

The consistency of the alluvium horizon at A1 is very stiff from a depth of 1.5 to 3.45 m. The alluvium horizon at P2 show SPT N-value results indicating that the consistency of this borehole is very stiff to stiff from a depth of 1.5 to 3.45 m. The correlations between the SPT testing and consistencies for the various horizons are represented in the table below.

Table 15: The SPT N-value for bridge 2147

Borehole No.	Depth (m)		SPT N-value	Description of material encountered	Origin
	From	To			
2147 A2	1.5	1.95	**17**	Very stiff clayey silt	Alluvium
	3.00	3.45	**18**	Very stiff clayey silt	Alluvium
2147 P2	1.5	1.95	**19**	Very stiff gravelly silty clay	Alluvium
	3.0	3.45	**12**	Stiff gravelly silty clay	Alluvium

7.7 Groundwater

No ground water seepage occurred during excavation of any of test pits at the culvert positions. Borehole drilling at the bridge positions revealed that there was groundwater encountered at various depths in all the boreholes. The water rest levels were measured from the boreholes after drilling to measure the static water level which is summarised in Table 16.

Table 16: Water rest levels recorded for the boreholes

Bridge No.	Borehole No.	Water rest level (m)
Bridge 2920	BH01	9.34
	BH02	19.60
	BH03	16.1
	BH04	9.45
Bridge 2230	BH01	7.43
	BH02	17.36
	BH03	16.6
	BH04	18.9
Bridge 2147	BH-A1	6.04
	BH-A2	18.00
	BH-P1	7.14
	BH-P2	4.5

8 Laboratory test results

Soil and rock samples were taken from the test pits and boreholes and were submitted to Geosure Laboratory for soil and rock testing. The soil samples from the test pits were subjected to foundation indicator tests, California Bearing Ratio (CBR) and pH &conductivity testing. The Shelby samples were subjected to pH, conductivity, and single oedometer testing. The rock samples were subjected to Unconfined Compressive Strength (UCS) testing including E-Modulus & Poisson's ratio determination.

8.1 Foundation indicator tests

The foundation indicator test which consists of particle size distribution, hydrometer analysis, Atterberg limits and linear shrinkage, were undertaken on samples recovered from the test pits and thin-walled ('Shelby') samples. The results of the tests are summarised in Table 17 below.

Table 17: Summarised foundation Indicator test results

Culvert No.	Test Pit No.	Depth (m)	Material	Soil Composition				Atterberg Limits			GM	USCS	Expansion Potential
				Clay (%)	Silt (%)	Sand (%)	Gravel (%)	LL (%)	PI (%)	LS (%)			
Culvert at km 59.70	TP01	0-0.2	Engineered fill: Clayey Silty gravel	4	30	21	45	31	10	5.0	1.52	GC	Low
	TP02	0.5-0.6 m	Diabase: Sandy Gravel	2	6	10	82	25	6	3.0	2.59	GP	Low
Culvert at km 65.88	TP03	0.8-2.1	Completely weathered Slate; Clayey Gravel	7	17	26	50	30	10	5.0	1.88	GC	Low
Culvert at km 68.55	TP04	0.0-1.6	Residual Diabase; Clayey Gravel	5	21	31	-43	40	17	8.5	2.18	GC	Low
Culvert at km 71.79	TP06	1.1-1.8	Transported Material; Sandy Silt	24	36	40	0	32	14	7.0	0.38	CL	Low to medium

Note:

LL	=	Liquid Limit
PI	=	Plasticity Index
LS	=	Linear Shrinkage
GM	=	Grading Modulus
USCS	=	Unified Soil Classification System
GC	=	Clayey gravel
GP	=	poorly graded gravel
Clay	=	<0.002 mm
Silt	=	0.002 to 0.05 mm
Fine sand	=	0.02-0.2 mm
Coarse sand	=	0.2-2 mm
Gravel	=	>2 mm

The tested engineered fill from TP01 at culvert 59.20 consists of 4% clay, 30% silt, 21% sand and 45% gravel. The material has a high liquid limit of 45% and a low plasticity index of 10%. According to the Van Der Merwe (1964) graph, the material has a low potential for expansiveness which indicates low heave potential. The Unified Soil Classification System (USCS) classified the material as clayey gravel (GC).

The tested transported material at TP06 (culvert 71.79) consists of 24% clay, 36% silt, 40% sand. The material has a moderate liquid limit of 32% and a low plasticity index of 8.5%. The Van der Merwe graph shows that the material has a low to medium expansive potential. The USCS classified the material as clay (CL).

The tested residual slate sampled at TP03 (culvert 68.55) consists of 7% clay, 17% silt, 26% sand and 50% gravel. The material has a moderate liquid limit of 30% and a low plasticity index of 10%. According to the Van der Merwe (1964) graph, the material has low potential of expansiveness. The USCS classified the material as clayey gravel (GC).

The tested residual diabase sampled at TP04 (culvert 68.55) graded as 5% clay, 21% silt, 31% sand and 43% gravel. The material has a high liquid limit of 40% and a moderate plasticity index of 17%. The Van der Merwe graph shows that the material has a low expansive potential. The USCS classified the material as a clayey gravel (GC).

The diabase sampled at TP02 (culvert 59.70) graded as 2% clay, 6% silt, 10% sand and 82% gravel. The material has a moderate liquid limit of 25% and a low plasticity index of 6%. According to the Van der Merwe (1964) graph, the material has low potential of expansiveness. The USCS classified the material as a poorly graded gravel (GP).

8.2 Standard oedometer (consolidation) tests

Undisturbed Shelby samples were collected for standard oedometer testing. The purpose of the test is to determine the consolidation characteristics of soils when subjected to changes in the applied effective stress. The method of testing is used to determine the magnitude of consolidation of a saturated or near-saturated specimen of soil in the form of a disc, confined laterally, subjected to vertical axial pressure, and allowed to drain freely from the top and bottom surfaces. Tests were executed with loading increments of 50, 100, 200, 400, 800 and 1600 kPa according to the British Standard (BS 1377: Part 5: 1990).

The resulting measurements at each stress increment are then used to determine the relationship between compression (strain) and the effective stress. The results of the oedometer tests performed are summarized, including the calculated values of Young's Modulus at the specific applied axial loads, in Table 18.

The interpreted values of Young's Modulus (E) from the laboratory results give an indication of the material's allowance to elastic deformation under load. The stiffer the material, the higher the values of E and lower the potential to change shape under elastic loads. Flexible material such as in-situ clay has a lower value of E and the higher the potential for the change shape under load.

Table 18: Single oedometer test results

Bridge/Culvert No.	Borehole/ Test Pit No.	Depth (m)	Dry Density (kg/m^3)	Initial void ratio (e_i)	Final void ratio at 1600 kPa	Moisture Content (%)*	Young's Modulus (E) (MPa)**					
						Initial	Final at 1600 kPa	Maximum in testing cycle	50 to 100 kPa	100 to 200 kPa	200 to 400 kPa	400 to 800 kPa
Bridge 2920	BH01	3.0-3.55	1624	0.614	0.104	12.9	4.0	21.0	0.7	1.3	3.1	5.2
	BH02	3.0-3.55	1509	0.729	0.213	18.0	8.1	26.0	1.1	1.5	2.5	4.9
	BH04	7.5-7.7	1318	0.980	0.187	22.7	7.1	32.8	0.6	1.4	2.1	4.2
Bridge 2230	BH01	6.0-6.55	1431	0.820	0.104	17.5	4.0	27.5	0.6	1.1	2.1	4.2
	BH03	4.5-5.05	1590	0.650	0.242	15.8	9.2	24.0	1.2	1.9	3.2	6.1
Culvert at km 71.79 underpass	TP06	1.1-1.8	1712	0.524	0.295	12.8	11.3	19.5	2.3	3.7	5.7	9.7

Note:

e_i	=	Initial void ratio
kg/m^3	=	Kilograms per metres cubed
MPa	=	Mega Pascals
Kpa	=	Kilo Pascals
*	=	Assumed specimen is fully saturated for phase relation calculations
**	=	Assumed a poisson ratio of 0.25 for stiff drained clays as per Tomlinson & Woodward (2015)

8.2.1 Bridge 2920

The tested residual slate displayed low stiffness characteristics indicated by low Young's modulus up to 800 kPa axial load. The material is expected to compress while it is subjected to high loads associated with bridge structures. The samples indicated expansion when saturated under the various loads.

8.2.2 Bridge 2230

The tested andesite material displayed low stiffness characteristics as indicated by the low Young's Modulus up to 800 kPa axial load. This material is therefore expected to compress when subjected to high foundation loads associated with the bridge structure.

8.2.3 Culvert at km 71.79 underpass

The tested transported material displayed low stiffness characteristics as indicated by the low Young's Modulus up to 800 kPa axial load. This material is therefore expected to compress when subjected to high foundation loads associated with the culvert structure.

8.3 Compaction and California Bearing Ratio

Bulk samples were taken for compaction tests where the moisture density relationship was determined. California Bearing ratio tests were conducted to determine the suitability of the soils for use in constructing layer works. Table 19 below shows the summary of the results.

The transported soil material sampled at TP06 (culvert at km 71.79) has moderate maximum dry density of 1901 kg/m^3 and a moderate moisture content of 12.7%. The results show a moderate swell value of 1.0% and a very low CBR value of 3.3% at 93% Mod AASHTO. The material classification could not be determined due to the CBR at 93% being less than 7% therefore it cannot be used for construction purposes.

The residual diabase material sampled at TP04 (culvert at km 68.55) has a moderate maximum dry density of 1976 kg/m^3 and moderate optimum moisture content of 10.2%. The results show a swell value of 1.7% and a low CBR value of 7.2% at 93% Mod AASHTO. The material COLTO classification could not be determined due to the swell at 100% Mod AASHTO exceeding 1.5% .

The diabase material sampled at TP02 (culvert at km 59.70) has a moderate maximum dry density of 2003 kg/m^3 and moderate optimum moisture content of 7.5%. The results show a swell value of 0% and CBR value of 26% at 93% Mod AASHTO. The material classified as G6 according to the COLTO classification therefore it can be used for construction purposes for the subbase layer.

The weathered slate material sampled at TP03 (culvert at km 65.88) has high maximum dry density of 2168 kg/m^3 and a moderate moisture content of 8.6%. The results show a very low swell value of 0.3% and low CBR value of 16% at 93%. The material classified as G7 material according to the COLTO classification therefore it can be used for construction purposes for the selected layer.

Table 19: Compaction test results

Culvert No.	Test Pit No.	Depth (m)	Origin	Compaction		California Bearing ratio (%)						PI (%)	Swell (%)	Class (COLTO)
				MDD (kg/m^3)	OMC (%)	100 (%)	98 (%)	97 (%)	95 (%)	93 (%)	90 (%)			
Culvert at km 59.70 Underpass	TP02	0.5-0.6	Diabase	2033	7.5	44	38	35	30	26	20	6	0.0	G6
Culvert at km 65.88 Underpass	TP03	0.8-2.1	Weathered slate	2168	8.6	40	31	27	21	16	11	10	0.3	G7
Culvert at km 68.55 Underpass	TP04	0.0-1.6	Residual diabase	1976	10.2	18	14	12	9.4	7.2	4.9	17	1.7	Can not be determined
Culvert at km 71.79 Underpass	TP06	1.1-1.8	Transported	1901	12.7	7.3	5.8	5.2	4.2	3.3	2.4	14	1.0	Can not be determined

Note: MDD = Maximum Dry Density
OMC = Optimum moisture content
Swell = Soaked at 100% Mod AASHTO compaction
COLTO = Committee of Land Transport Officials Guidelines (2009)

8.4 Uniaxial Compressive strengths

The Uniaxial Compressive Strength (UCS) tests including E-modulus and Poisson ratio were carried out to establish the mechanical properties and rock strengths. These tests were done in accordance with the International Society of Rock Mechanics (ISRM) specification. Table 20 below shows summary of the tests from bridge No. 2230. The other two bridges could not be tested due to insufficient core sizes for UCS testing.

Table 20: UCS Test Results

Borehole No.	Depth (m)	Diameter (mm)	Height (mm)	Density (g/cm3)	Failure load (kN)	UCS (MPa)	Rock hardness
BH01	15.27-15.5	49.92	124.25	2886	131.10	66.98	Hard Rock, Andesite
BH02	13.82-13.85	51.63	99.98	2794	349.30	166.84	Very Hard Rock, Andesite
BH03	16.5-16.73	51.65	126.86	2860	221.20	105.57	Very Hard Rock, Andesite
BH03	18.11-18.48	51.44	129.63	2883	529.40	254.74	Extremely Hard Rock, Andesite
BH04	18.00-18.28	51.26	126.19	2852	592.40	287.06	Extremely Hard Rock, Andesite

The andesite rock encountered in BH01 from 15.27 m of bridge 2230 can be described as hard rock. The other boreholes that the rock encountered from 13.85 to 20 m is very hard rock to extremely hard rock. Table 21 below provides guidelines for typical UCS values and strength classifications.

Table 21: Classification of rock hardness(ISRM,1985)

Classification	Range of minimum compressive strength (MPa)
Very soft rock	1 to 3
Soft rock	3 to 10
Medium hard rock	10 to 25
Hard rock	25 to 70
Very hard rock	70 to 200

8.5 Chemical tests (pH and conductivity)

The soil conductivity plays a significant role in the rate of corrosion of buried metal. The table below evaluates the soil conductivity and how to interpret it (Duligal, 1996). The pH and conductivity are assessed to provide an indication of the potential corrosiveness of the soil. The rate of corrosion depends on the pH value of soil. A higher pH value indicates alkaline conditions, and a low pH value indicates acidic conditions. The corrosion rate increases with decreasing pH values. An acidic environment with pH values lower than 6 is more corrosive than pH values between 6 and 8 or higher (Bradford, 1993).

The soil conductivity influences the corrosive nature of soil. Soil conductivity values of 50 mS/m and greater indicate extremely corrosive conditions. A Soil conductivity value of less than 10 mS/m generally indicates ground conditions that are not generally corrosive. The guideline below gives the interpretation of soil conductivity.

Table 22: Guideline values for interpretation of soil conductivity

Soil conductivity (mS/M)	Soil resistivity (Ohm.cm)	Corrosivity classification
More than 50	0-2000	Extremely corrosive
25-50	2000-4000	Very corrosive
20-25	4000-5000	Corrosive
10-20	5000-10000	Mildly corrosive
Less than 10	>10000	Not generally corrosive

The chemical test results are summarised in Table 23 below.

Table 23: Chemical tests results summary

Culvert/ Bridge No.	Test Pit/ Borehole No.	Depth(m)	pH	Soil Conductivity(mS/M)	Corrosivity classification
Culvert at km 59.70 Underpass	TP01	0-0.2	5.3	8.2	Corrosive
	TP02	0.5-0.6	5.8	11.8	Mildly corrosive
Culvert at km 65.88 Underpass	TP03	0.8-2.1	6.4	10.9	Mildly corrosive
Culvert at km 68.55 Underpass	TP04	0-1.6	7.1	5.3	Not generally corrosive
Culvert at km 71.79 Underpass	TP06	0-1.0	6.1	33.5	Extremely corrosive
	TP06	1.1-1.8	7.9	19.9	Corrosive
Bridge 2920	BH01	3.0-3.55	6.1	9.3	Mildly corrosive
	BH02	3.0-3.56	6.3	23.4	Corrosive
	BH04	3.00-3.57	6.1	2.9	Mildly corrosive
Bridge 2230	BH01	3.00-3.58	6.4	8.5	Mildly corrosive
	BH03	3.00-3.59	5.8	23.6	Very corrosive

The chemical tests results were analysed and interpretated based on the soil conductivity results.

The results from the material sampled at culvert at km 59.70 underpass indicate a pH range of 5.3 and 5.8 with the conductivity ranging between 8.2 to 11.8 mS/M which indicates the ground conditions to be corrosive. Protective measures need to be put in place to protect buried metal objects.

The results from the material sampled at culvert at km 65.88 underpass indicate a pH value of 6.4 with a conductivity of 10.9 mS/M which indicates ground conditions to be mildly corrosive for buried metal objects. Protective measures need to be put in place to protect buried metal objects.

The results from the material sampled at culvert at km 68.55 underpass indicate a pH value of 7.1 with a conductivity value of 5.3 mS/M which indicates the ground conditions to be mildly corrosive for buried metal objects.

The results from the material sampled at culvert at km 71.79 underpass indicates that the pH ranges between 6.1 to 7.9 and the conductivity ranges between 19.9 to 33.5 mS/M which indicates the ground conditions to be corrosive to extremely corrosive for metals objects. Protective measures need to be put in place to protect buried metal objects.

The results from the material sampled at bridge 2920 indicate that the pH ranges between 6.1 to 6.4 with the conductivity ranging between 2.9 to 23.4 mS/M which indicates ground conditions to be mildly corrosive to corrosive for buried metal objects. Protective measures need to be put in place to protect buried metal objects.

The results from the material sampled at bridge 2230 indicate a pH range between 5.8 to 6.4 with the conductivity ranging between 8.5 to 23.6 mS/M which indicates ground conditions to be mildly corrosive to very corrosive for metal objects. Protective measures need to be put in place to protect buried metal objects.

9 Geotechnical considerations

9.1 Expansiveness of soils

The soils sampled from the area designated for culverts were tested and show low expansive potential. These soils generally classify as clayey gravels (GC) and have low plasticity and low clay content. On the Casagrande Chart, the soils plot slightly above the A-line and are expected to behave as low plasticity clays. Additionally, the soils typically plot in the low region on the potential expansiveness graph, in accordance with van der Merwe (1984).

The clay (CL) tested at culvert at km 71.79 underpass reported low to medium expansiveness potential. The soils typically plot in the low to medium region on the Van der Merwe potential expansiveness graph.

9.2 Groundwater conditions / seepage

As mentioned in Section 7.7 no groundwater was encountered in the test pits excavated for the culverts. At the bridge sites however, groundwater was intersected at every bridge site during drilling. As a result, foundations for these structure will need to take this into consideration. The average water table levels at Bridge 2147, Bridge 2230 and Bridge 2920 are 7 m, 17 m and 13 m respectively.

9.3 Excavatability

The excavatability across site is determined by the performance of the TLB during test pit excavation as well the ground conditions encountered during rotary core drilling.

The site is characterised by shallow diabase and slate rocks within the area that is designated for culverts. Diabase rock was encountered from the depth of 0.4 m whilst refusal of the TLB at 2m was encountered for slate rock. Excavatability has been classified according to SANS 1200D:

Table 24: Excavatability of the Materials Encountered on Site

Bridge or Culvert number	Material Horizon	Excavation Class
Bridge 2920	Alluvium, Fill, Pedogenic material, Residual slate	Soft excavation
	Residual diabase	Boulder excavation Class B
	Slate rock	Hard excavation
Bridge 2230	Fill, residual andesite, pedogenic material	Soft excavation
	Andesite rock	Hard excavation
Bridge 2147	Alluvium	Soft excavation and Boulder excavation Class B
	Slate rock	Hard excavation
Culvert at km 59.70 Underpass	Engineered fill	Soft excavation
	Diabase rock	Hard excavation
Culvert at km 65.88 Underpass	Engineered fill, residual slate	Soft excavation
	Slate rock	Hard excavation
Culvert at km 68.55 Underpass	Engineered fill, residual diabase	Soft excavation
	Diabase	Hard excavation

Bridge or Culvert number	Material Horizon	Excavation Class
Culvert at km 71.79 Underpass	Transported soil	Soft excavation

9.4 Stability of excavations

Sidewalls were stable or semi-stable during fieldwork but the thinly laminated and very closely jointed slate dipping towards the excavations during construction may not be stable. The relic jointed slate in open excavation may tend to slide either by rotational toppling or planar failure where the faces develop parallel to the strike. Further slope battering or shoring may be required in such instances.

Also, the gravel, cobbles and occasional boulders encountered in the transported and residual soils may cause a concern during construction. Where the excavations intersect this horizon, there is a likelihood that ravelling, and spalling will occur within these gravely soils. This can result in undercutting of the overlying strata, and an associated risk of slope failure. The stability of these horizons will be further compromised when wet. Further slope battering or shoring may be required in such instances.

The clayey nature of diabase can prove to be unstable especially where perched groundwater is present.

During construction the excavated face will need to be logged by a competent engineering geologist or geotechnical engineer to confirm the stability of open excavations.

9.5 Seismic activity

According to SANS 10160-4:2017, the site is located inside Zone II which is classified as a ‘region of mining-induced and natural seismic active zone’. In addition to normal structural design requirements, specific design requirements related to seismic design needs to be adhered to.

9.6 Soil corrosivity

The material sampled at culvert at km 59.70 underpass indicates ground conditions to be corrosive for buried metal objects.

The material sampled at culvert at km 65.88 underpass, culvert at km 68.55 underpass, bridge 2920 and bridge 2230 results indicates ground conditions which are mildly corrosive for buried metal objects.

The material sampled at culvert at km 71.79 underpass indicates ground conditions to be corrosive to extremely corrosive for buried metal objects.

Protective measures need to be taken for the buried metal objects.

10 Recommendations

10.1 Founding recommendations

This section deals with the founding conditions of the No. 3 bridges and No. 4 culverts as documented in the preliminary design report, document No. 1001455 Rev 1 dated 2023/07/04.

Groundwater was encountered at all the bridge locations with a depth ranging between 6m and 9.3m below ground level. Bridge 2147 is located at the non-perennial Rooikloof Spruit drainage feature, whereas bridge 2920 spans a railway line and bridge 2230 spans the R509 road. Boulders were present in the boreholes drilled at bridge 2147 and at bridge 2920 boulders could be expected in the residual diabase horizon.

The pile design may adopt one of two design approaches namely a mobilized skin friction from the in-situ soils or relying on friction derived from a rock-socket for piles embedded into bedrock. Selection of the appropriate design approach is dependent on ground conditions and the depth of rock at each of the sites.

Owing to a range of ground conditions being prevalent at the three bridge sites, various suitable pile systems were considered. The selection of the most appropriate pile system should account for the site ground conditions (primarily), and the pile load characteristics. The type of piling installation methods proposed for the foundation include, auger and Down-the-Hole (DTH) percussion piles.

Auger piles have diameters between 300mm and 2500mm with working loads ranging between 200kN and 40000kN. The maximum depth an auger pile can reach is typically 50m, depending on rig configuration and pile diameter.

DTH percussion pile diameters range from 255mm to 1000mm, where special equipment is needed for diameters larger than 610mm. Typical working loads range between 300kN and 2500kN, with typical maximum depths of 30m that can be attained (Byrne et al., 2019).

10.1.1 Bridge 2920

Bridge 2920 consists of a three-span bridge with a total length of 31m. The intention is to widen the bridge by 1000mm to the western side. Figure 14 presents pictures of the existing structure as per document No. 1001455 Rev 1, dated: 2023/07/04.



Figure 14: Existing rail bridge 2920

The boreholes drilled at bridge 2920 encountered slate rock at depths ranging between 15.5m and 16.5m in BH01, BH03 and BH04, and described as completely weathered, very soft rock. Borehole BH02 encountered very stiff residual andesite material up to a borehole termination depth of 20m with

no hard bedrock encountered in the borehole. Boulders were however encountered at depth in this borehole. Figure 15 presents a summary of the borehole stratigraphy. The water table was encountered at a depth of 9m below ground level.

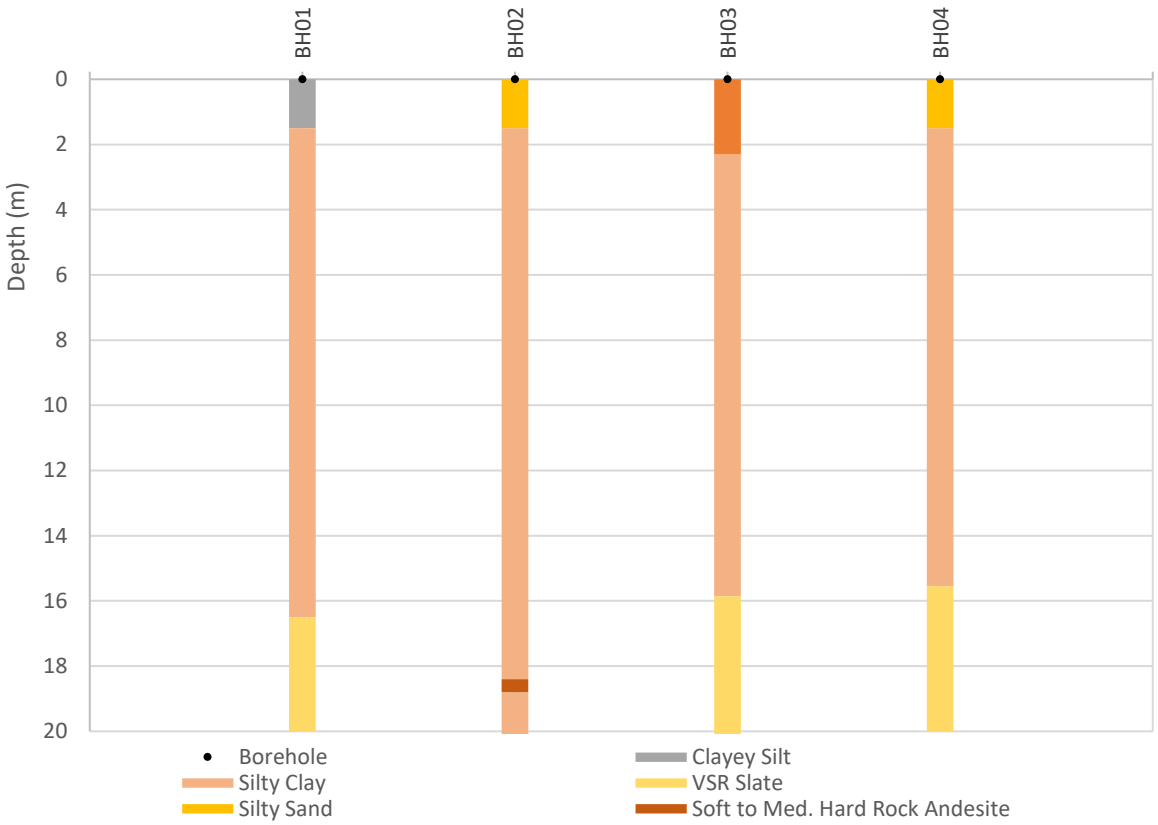


Figure 15: Borehole stratigraphy for bridge 2920

A summary of the ground conditions encountered at bridge 2920 is presented in Table 25.

Table 25: Summarised ground conditions of bridge 2920

Borehole No.	Location	Rockhead depth b.g.l (m)	Weathering	Rock/soil description	Water level b.g.l. (m)	Comments
BH01	2920	16.50	Completely weathered	Very soft rock slate	9.3	Boulders were prevalent at depth in the residual andesite in BH02. Presence of groundwater confirmed in all boreholes.
BH02	2920	Not encountered	N/A	Residual andesite	19.6	
BH03	2920	15.86	Completely weathered	Very soft rock slate	16.1	
BH04	2920	15.55	Completely weathered	Very soft rock slate	9.45	

Note: b.g.l. = below ground level

Selection of the appropriate pile type should take into consideration:

- Presence of groundwater, which can cause collapse during piling operations which will have to be managed and will require casing, depending on the selected pile type.
- The potential presence of boulders will place limitations on the types of piles that can be installed.

In addition, the following recommendations are made for Bridge 2920:

- Depth to bedrock was not established at Borehole BH02. It is recommended that skin friction and socketing into bedrock be conducted. Should this approach not be sufficient during the detail design phase, additional drilling will be conducted in the vicinity of Borehole BH02. This is necessary to determine depth rock for a rock-socket design if piles terminated in soil do not provide adequate resistance.
- Depending on the results of the additional drilling, DTH percussion piles or auger piles may prove to be the most appropriate piling systems for ground conditions at bridge 2920. This should be confirmed following completion of additional drilling.
- Adopting an approach whereby piles installed in the vicinity of BH02 is terminated in soils and remaining piles terminated in slate bedrock may result in an incompatibility in the settlement behaviour between piles terminated in these different material types. Differential settlement between piles socketed in rock and friction piles could arise due to the different methods of skin friction mobilisation. It is therefore advised to design for piles rely only on skin friction or rock-socket friction for this bridge structure. Pile termination depths should be commensurate with this design approach.

10.1.2 Bridge 2230

Bridge 2230 consists of a six-span bridge with a total length of 31m. It is envisaged to widen the bridge by 1000mm. Figure 16 presents pictures of the existing structure as per document No. 1001455 Rev 1, dated: 2023/07/04.



Figure 16: Existing underpass B2230

The No. 4 boreholes drilled at bridge 2230 encountered andesite rock that was intercepted at depths ranging between 8.35m and 9m below ground level. The UCS tests results on selected samples indicated that the rock, at depths between 13m and 19m below ground level, are classified as hard rock to extremely hard rock. The tactile rock descriptions at depths above 13m b.g.l. transition quickly from very soft rock, with thicknesses between 1.5 to 4.5m, to hard rock. Figure 17 presents the borehole stratigraphy with depth. The water table was encountered at a depth of 9m b.g.l.

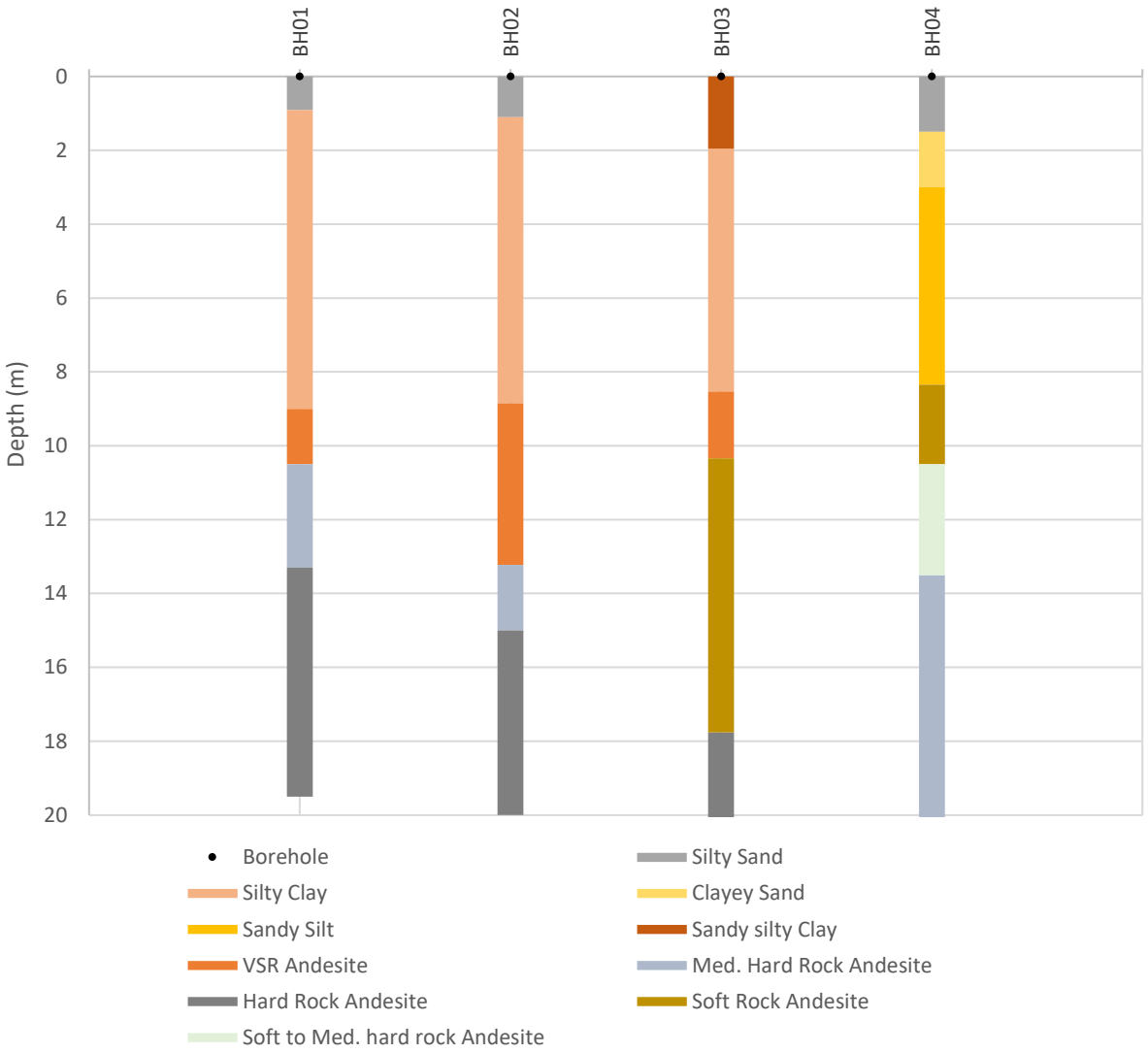


Figure 17: Borehole stratigraphy for bridge 2230

A summary of the ground conditions associated with bridge 2230 is presented in Table 26.

Table 26: Summarised ground conditions of bridge 2230

Borehole No.	Location	Rockhead depth b.g.l. (m)	Weathering	Rock description	Water level b.g.l. (m)	Comments
BH01	2230	10.50	Medium weathered	Medium Hard rock, andesite	7.4	No boulders encountered. Presence of groundwater confirmed in boreholes.
BH02	2230	13.23	Highly to moderately weathered	Very hard rock, andesite	17.4	
BH03	2230	10.34	Highly to moderately weathered	Soft to medium hard rock, andesite	16.6	
BH04	2230	13.50	Slightly to unweathered	Very hard rock, andesite	18.9	

Note: b.g.l. = below ground level

Pile selection should take into consideration:

- Presence of groundwater, which can cause collapse of pile excavations during piling operations will have to be managed and will require casing, depending on the selected pile type.
- The variable hardness of the andesite rock.

The following recommendations are made for bridge 2230:

- It is recommended that a rock socket pile design be adopted for bridge 2230 given the relatively shallow bedrock elevation.
- The type of piling installation method recommended for the foundation is a DTH percussion pile type. The pile type is recommended owing to significant variability in rock hardness with depth and in the various boreholes.
- Presence of groundwater will limit effective end-bearing resistance to be derived from any piles terminated in rock. It is recommended that end-bearing resistance is not considered in the pile design.

10.1.3 Bridge 2147

Bridge 2147 consists of a single-span bridge with a length of 15.2m. It is envisaged to replace the bridge. Figure 18 presents pictures of the existing structure as per document No. 1001455 Rev 1, dated: 2023/07/04.



Figure 18: Existing bridge 2147

From the No. 4 of boreholes conducted at bridge 2147 structure No.3 revealed bedrock, described as completely to highly weathered, very soft rock slate from a depth of approximately 7m below ground surface up to the borehole termination depth of 20m. Borehole BH-P1 encountered very soft rock slate from a depth of 18.45m. Instances of boulder horizons of varying thickness was encountered in No.3 of the No.4 boreholes. SPT tests were conducted in No. 2 of the boreholes up to a depth of 3m. Figure 19 presents the borehole stratigraphy with depth. The water table was encountered at a depth of 6m below ground level.

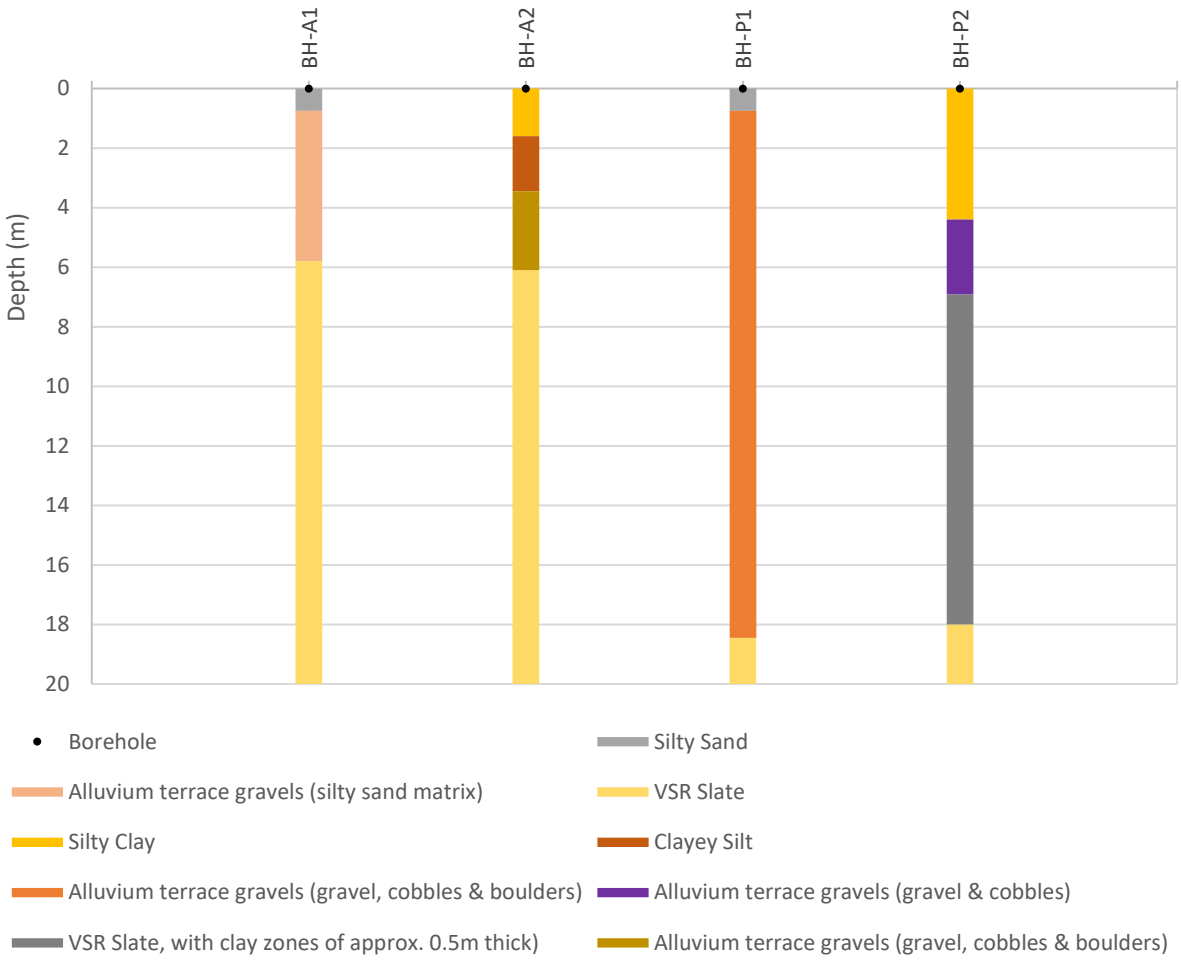


Figure 19: Borehole stratigraphy for bridge 2147

A summary of the founding conditions associated with bridge 2147 is presented in Table 27.

Table 27: Summarised founding conditions of bridge 2147

Borehole No.	Location	Rockhead depth b.g.l. (m)	Weathering	Rock description	Water level b.g.l. (m)	Comments
BH-A1	2147	5.80	Completely to highly weathered	Very soft rock Slate	6.0	Boulders present in ground profile. Presence of groundwater confirmed in boreholes.
BH-A2	2147	6.10	Completely to highly weathered	Very soft rock Slate	18.0	
BH-P1	2147	18.45	Completely to highly weathered	Very soft rock slate	16.1	
BH-P2	2147	6.92	Completely to highly weathered	Very soft rock slate	9.4	

Note: b.g.l. = below ground level

Pile selection should take into consideration:

- Presence of groundwater, which can cause collapse of pile excavations during piling operations will have to be managed and will require casing, depending on the selected pile type.
- Presence of boulders.

The following recommendations are made for bridge 2147:

- It is recommended that a rock socket pile design be adopted for bridge 2147 given the relatively shallow bedrock elevation.
- Due to boulder predominant horizons at bridge 2147, it is recommended that a DTH percussion pile installation method be adopted.
- Presence of groundwater will limit effective end-bearing resistance to be derived from any piles terminated in rock. It is recommended that end-bearing resistance is not considered in the pile design.

Bridge 2147 spans a non-perennial river and pier scour protection should be taken in consideration if applicable in the design.

10.1.4 Culvert at km 59.70 underpass

TP01 and TP02 revealed that medium hard diabase rock was intersected at 0.4 m and 0.6 m below ground level. Table 28 provides a description of the material encountered at the test pit termination depth and Figure 20 provides an indication of the test pit stratigraphy.

Table 28: Summarised test pit termination material

Test Pit No.	Location	Bedrock depth b.g.l. (m)	Comments
TP01	Underpass 59.7	0.4	Medium hard rock diabase
TP02	Underpass 59.7	0.6	Medium hard rock diabase

Note: b.g.l. = below ground level

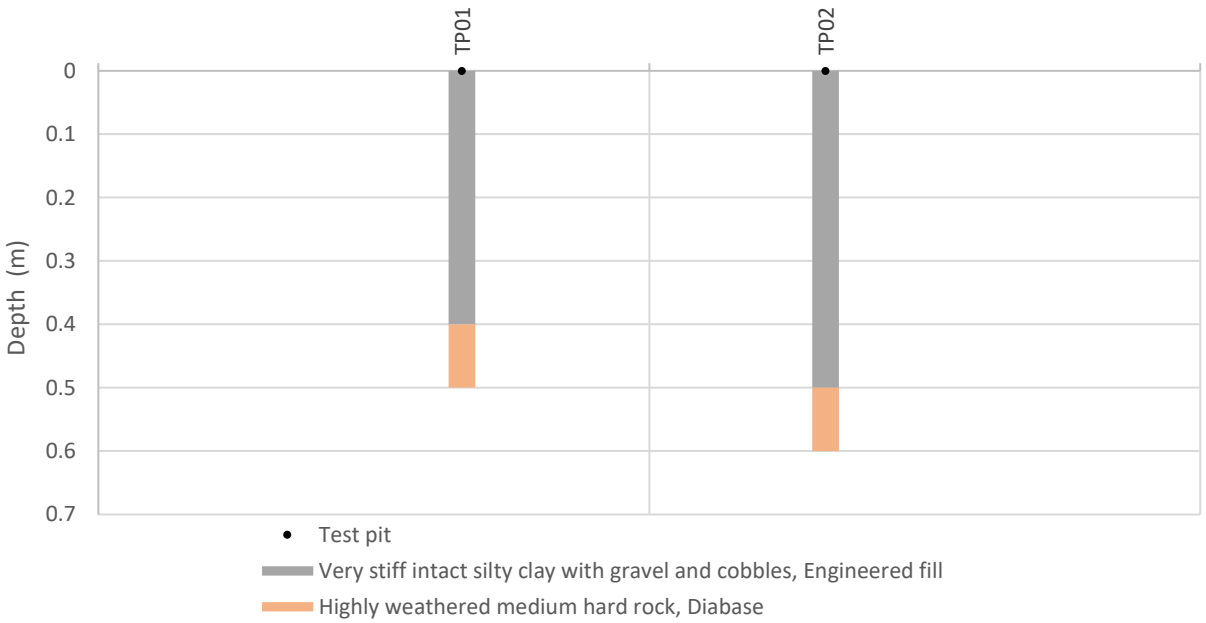


Figure 20: TP01 and TP02 stratigraphy

Recommendations:

- It is recommended that the culvert is conventionally founded on medium hard rock diabase encountered at depths ranging between 0.4m and 0.6m in the test pits.
- Settlement and bearing capacity analysis to be undertaken once structural loads have been confirmed.

10.1.5 Culvert at km 65.88 underpass

TP03 revealed that very soft rock slate was encountered at a depth of 0.8m below ground level. Table 29 provides a description of the material encountered at the test pit termination depth and Figure 21 provides an indication of the test pit stratigraphy.

Table 29: Summarised test pit termination material

Test Pit No.	Location	Bedrock depth b.g.l. (m)	Comments
TP03	Underpass 65.88	0.8	Very soft rock slate

Note: b.g.l. = below ground level

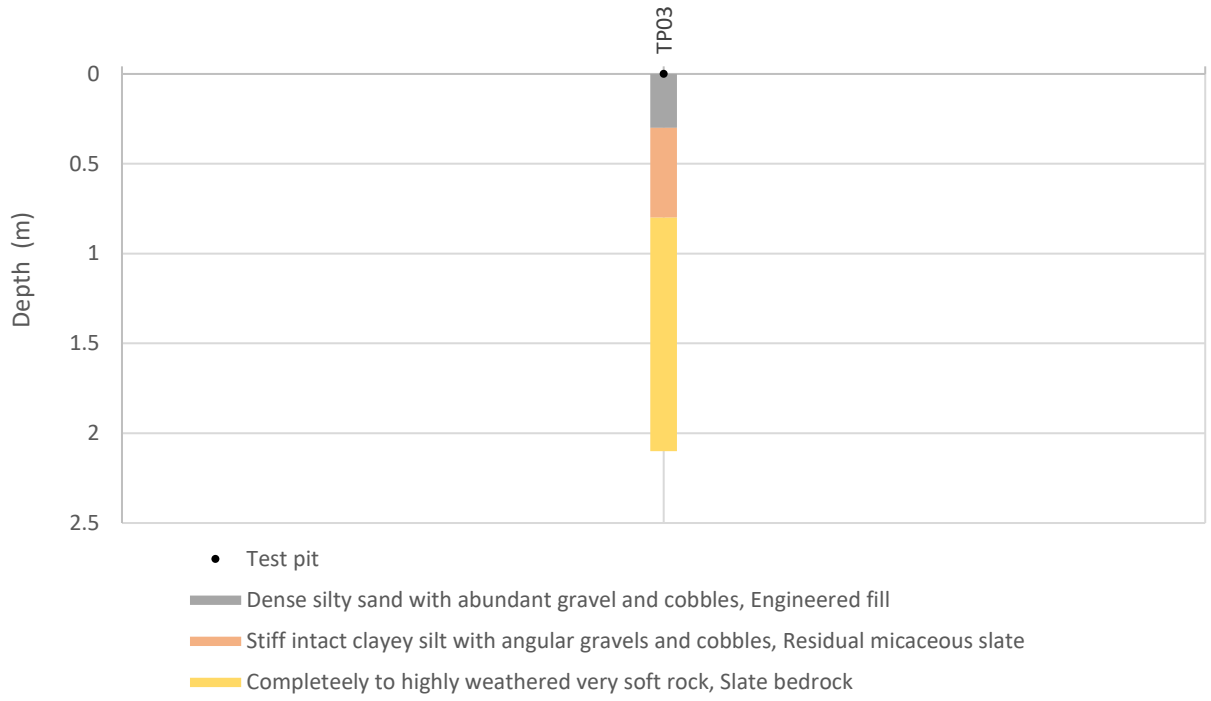


Figure 21: TP03 stratigraphy

Recommendations:

- It is recommended that the culvert is conventionally founded on very soft rock slate encountered at depth of approximately 0.8m in the test pit.
- Settlement and bearing capacity analysis to be undertaken once structural loads have been confirmed.

10.1.6 Culvert at km 68.55 underpass

TP04 revealed that very soft rock diabase was encountered at a depth of 1.6m below ground level. TP05 was terminated at a depth of 1.2m below ground level due to services being encountered during the investigation.

Table 30 provides a description of the material encountered at the test pit termination depth and Figure 22 provides an indication of the test pit stratigraphy.

Table 30: Summarised test pit termination material

Test Pit No.	Location	Bedrock depth b.g.l. (m)	Comments
TP04	Underpass 68.55	1.60	Very soft rock diabase
TP05	Underpass 68.55	None	Services encountered

Note: b.g.l. = below ground level

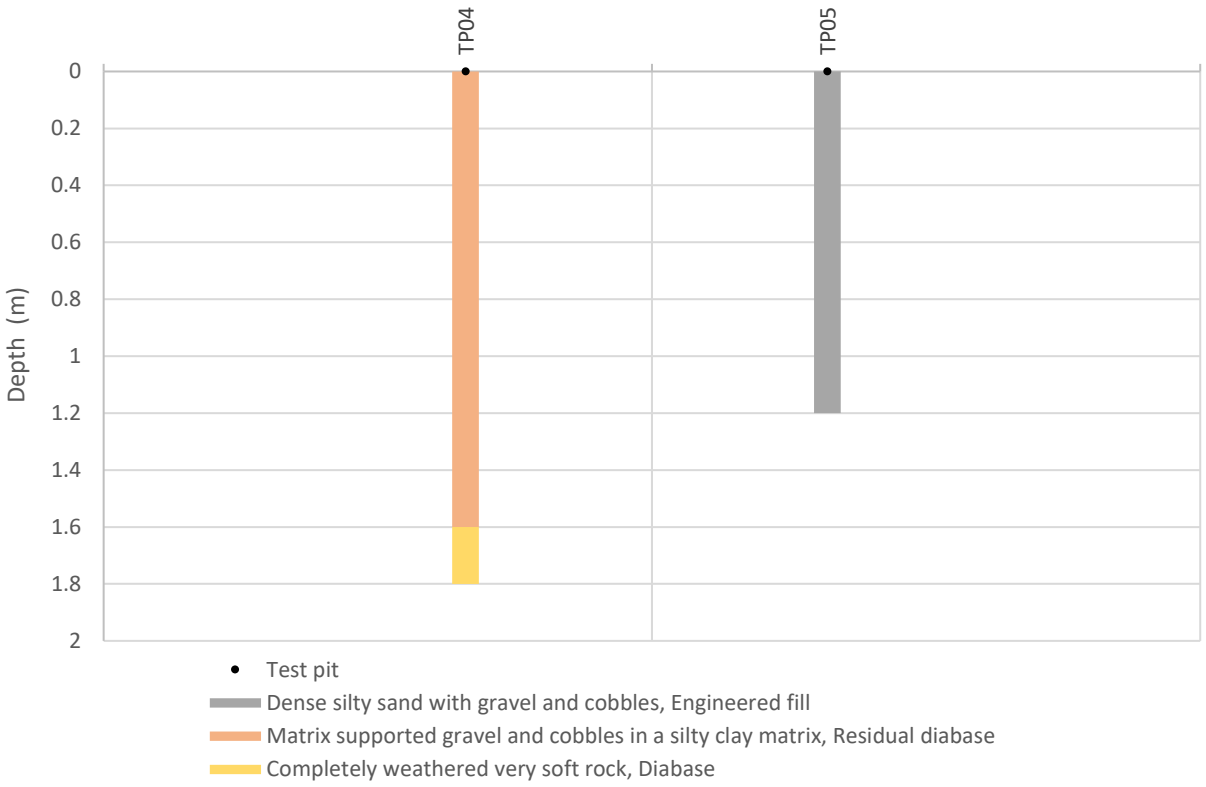


Figure 22: TP04 and TP05 stratigraphy

Recommendations:

- It is recommended that the culvert is conventionally founded on very soft rock slate encountered at depth of approximately 1.6m in test pit TP04.
- Supplementary investigations should be conducted prior to construction to confirm bedrock levels in the vicinity of TP05.
- Settlement and bearing capacity analysis to be undertaken once structural loads have been confirmed.

10.1.7 Culvert at km 71.79 underpass

No rockhead was reached during test pit excavations at TP06. The nearby boreholes revealed that rock could be expected to occur between 5.8m and 18.45m below ground level. Table 31 provides a description of the material encountered at the test pit termination depth and Figure 23 provides an indication of the test pit stratigraphy.

Table 31: Summarised test pit termination material

Test Pit No.	Location	Bedrock depth b.g.l. (m)	Comments
TP06	Underpass 71.79	Depth of refusal, 1.8m	Partial refusal on matrix supported boulders in a very stiff silty clay matrix

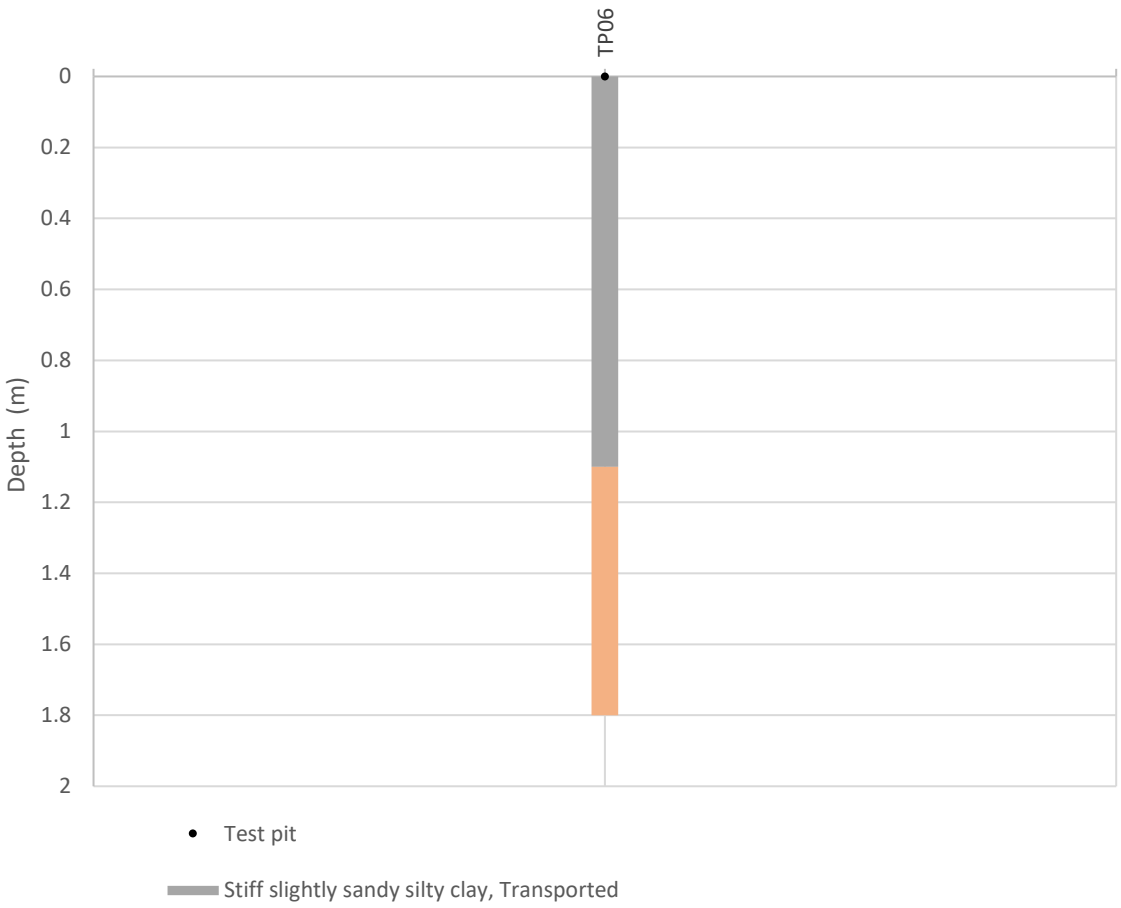


Figure 23: TP06 stratigraphy

Recommendations:

- It is recommended that the culvert is founded on an engineered soil raft supported on the boulders / very stiff silty clay matrix.
- Settlement and bearing capacity analysis to be undertaken once structural loads have been confirmed.

10.2 Erosion and scour in proximity to foundations

No erosion was observed on any of the bridges during fieldwork; however, it should be noted that the alluvial material encountered in BH-A1 of bridge 2147 is susceptible to erosion and scouring when the area receives heavy rainfalls. It is recommended that protective measures should be put in place to minimize the impact of scouring on the bridge foundation. The use of rock amour, gabion walls or similar protection measures which line the abutments and pier foundations will ensure stability and long-term serviceability.

10.3 Soil corrosivity

The sampled material test showed results that indicate ground conditions that are mildly corrosive to extremely corrosive for buried metal objects. Protective measures such as protective coatings (barrier coatings and primer application for steel), galvanizing (application of zinc to the surface of steel) and metallizing need to be utilized to minimize the corrosion of buried metal objects (Tinnea, 2012). BRE and DIN testing can be conducted in the next phase of this investigation to receive sufficient information regarding the soil corrosivity.

11 Conclusions

The geotechnical investigation comprised rotary core borehole drilling, test pitting, in-situ testing (SPTs) and laboratory testing on representative samples from the boreholes and test pits.

Bridge 2920 is characterized by alluvial deposits, fill, pedogenic material, residual diabase, residual slate, and slate bedrock. Samples of the residual slate obtained from BH01 and BH04 were subjected to oedometer testing. Young's Moduli (E) ranging between 0.6 MPa to 5.2 MPa were reported under axial pressures of 50 to 800 kPa. The results denote low stiffnesses which indicates that these soils will be subject to significant settlement under load.

The residual diabase tested at bridge 2290 BH02 has similar low stiffness values as the residual slate and will likewise be subject to significant settlement under load. Similar results were obtained from testing undertaken on samples retrieved from BH01 and BH03 at bridge 2230.

It is recommended that the three bridges be founded on piled foundations. The choice between a friction pile or rock socket pile will be based on the required capacity of the pile and depth at which bedrock is encountered. The piling methods proposed include auger and DTH percussion boreholes and is dependant on ground conditions at each bridge. Groundwater is expected to influence piling operations at each of the bridges and temporary casing is recommended for all the piling methods. Further geotechnical investigations are proposed at specific locations.

The Young's Moduli of samples retrieved from the test pits at the culvert at km 71.79 shows low stiffness values that will be subject to significant settlement under load.

The two test pits excavated at culvert at km 59.70 underpass were characterized by engineered fill and diabase rock at shallow depths of up to 0.5 m. The diabase classified as G6 material according to the COLTO classification meaning that it can be re-used for construction purposes.

Samples retrieved from TP03 excavated at culvert 65.88 underpass was characterized as engineered fill, residual slate, and slate bedrock. The weathered slate classified as G7 material according to the COLTO classification which can be re-used during construction.

Samples retrieved from TP04 at the culvert at km 68.55 is characterized as engineered fill, residual diabase, and diabase rock. The COLTO classification for the residual diabase material could not be determined during laboratory testing due to the swell value being very low.

The culvert at km 71.79 Underpass (TP06) is characterized by transported soils up to a depth of 1.8 m. This material classified as being poorer than G10 material according to the COLTO classification and is therefore deemed unsuitable for re-use as construction material.

The expected excavation classification of horizons encountered at bridge 2920 for alluvium, non-engineered fill, pedogenic material and residual slate encountered is Soft Excavation. Boulder Excavation class B is expected for residual diabase owing to the presence of corestones (encountered from 18.00 to 18.40 m) in BH02. Hard excavation is expected for slate bedrock from a depth of 15.55 to 20m.

Soft excavation conditions are expected for fill, alluvium, pedogenic material and residual diabase material from a depth of 0 to 9m for bridge 2230 and to a depth of 18.5 m for bridge 2147. Hard excavation is expected from 9m up to 20 m for andesite bedrock at bridge 2230 and from 5.8 m up to 20 m for slate bedrock at bridge 2147.

Soft excavation is expected for engineered fill, transported material, residual diabase, and residual slate at culvert at km 59.70 underpass, culvert at 65.88 underpass, culvert at 68.55 underpass and culvert at km 71.79 underpass. Hard excavation is expected for diabase bedrock and slate bedrock all the culverts.

The sidewalls of the test pits may have been stable, however thinly laminated slate may not be stable during the construction phase.

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13 Limitations of the report

1. Zutari Ground Engineering has prepared this report for use by the bridge design colleagues and SANRAL. The report has not been prepared for use by parties other than Zutari and SANRAL.

2. There are always some variations in subsurface conditions across a site due to geological conditions that cannot be defined fully even by exhaustive investigation. Hence, it is possible that the measurements and values obtained from sampling and testing during the investigation may not represent the extremes of conditions which exist within the site. The precision with which subsurface conditions are identified depends on the method of investigation, the frequency and recovery of samples, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions at locations other than the investigation positions may vary from conditions at the investigation locations.

3. Further, subsurface conditions, including groundwater levels can change over time. The groundwater conditions described in this report refer only to those observed at the place and time of observation noted in the report. These conditions may vary seasonally or as a consequence of construction or agricultural activities in the area. This should be borne in mind, particularly if the report is used after a protracted delay or a period of protracted climatic conditions.

4. Should conditions exposed at the site during subsequent investigation or construction works vary significantly from those provided in this report, we request that Zutari Ground Engineering be informed and have the opportunity to review any of the findings or conclusions of this report. It is highly recommended that during construction the site conditions be inspected by a representative of Zutari Ground Engineering to confirm the geotechnical interpretations in this design.

5. The investigation logs represent the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are not often distinct, but rather are transitional and have been interpreted. The soil / rock descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice, as stated. Classification and identification of soil involves judgement, and Zutari Ground Engineering infers accuracy in the classification and identification methods to the extent that is common in current geotechnical practice, and within the limitations of the ground investigation that was performed.

6. It is recommended that further geotechnical input from Zutari Ground Engineering should be sought as the project moves into the next phase to confirm that the geotechnical assumptions made in this report are compatible with the structural performance requirements and are being applied appropriately.

7. The borehole logs and test pit represent the subsurface conditions at the specific test location only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice, as stated in this report. Classification and identification of soil involves judgement, and the Zutari Ground Engineering Group infers accuracy in the classification and identification methods to the extent

that is common in current geotechnical practice, and within the limitations of the ground investigation that was performed.

Appendix A: Summary of soil and rock profile description terminology

STANDARD DESCRIPTIONS USED IN SOIL PROFILING

1. MOISTURE CONDITION	
Term	Description
Dry	
Slightly moist	Requires addition of water to reach optimum moisture content for compaction
Moist	Near optimum content
Very Moist	Requires drying to attain optimum content
Wet	Fully saturated and generally below water table

2. COLOUR
The Predominant colours or colour combinations are described including secondary coloration described as banded, streaked, blotched, mottled, speckled or stained.

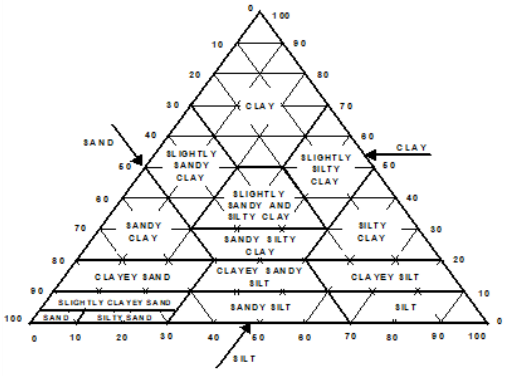
3. CONSISTENCY			
3.1 Non-Cohesive Soils		3.2 Cohesive Soils	
Term	Description	Term	Description
Very Loose	Crumbles very easily when scraped with geological pick	Very soft	Easily penetrated by thumb. Sharp end of pick can be pushed in 30 - 40mm. Easily moulded by fingers.
Loose	Small resistance to penetration by sharp end of geological pick	Soft	Pick head can easily be pushed into the shaft of handle. Moulded by fingers with some pressure.
Medium Dense	Considerable resistance to penetration by sharp end of geological pick	Firm	Indented by thumb with effort. Sharp end of pick can be pushed in up to 10mm. Can just be penetrated with an ordinary spade.
Dense	Very high resistance to penetration to sharp end of geological pick. Requires many blows of hand pick for excavation.	Stiff	Penetrated by thumbnail. Slight indentation produced by pushing pick point into soil. Cannot be moulded by fingers. Requires hand pick for excavation.
Very Dense	High resistance to repeated blows of geological pick. Requires power tools for excavation	Very Stiff	Indented by thumbnail. Slight indentation produced by blow of pick point. Requires power tools for excavation.

4. STRUCTURE	
Term	Description
Intact	Absence of fissures or joints
Fissured	Presence of closed joints
Shattered	Presence of closely spaced air-filled joints giving cubical fragments
Micro-shattered	Small scale shattering with shattered fragments the size of sand grains
Slickensided	Polished planar surfaces representing shear movement in soil
Bedded Foliated	Many residual soils show structures of parent rock.

5. SOIL TYPE	
5.1 Particle Size	
Term	Size (mm)
Boulder	>200
Pebbles	60 – 200
Gravel	60 – 2
Sand	2 – 0,06
Silt	0,06 – 0,002
Clay	<0,002

6. ORIGIN	
6.1 Transported Soils	
Term	Agency of Transportation
Colluvium	Gravity deposits
Talus	Scree or coarse colluvium
Hillwash	Fine colluvium
Alluvial	River deposits
Aeolian	Wind deposits
Litoral	Beach deposits
Estuarine	Tidal – river deposits
Lacustine	Lake deposits
6.2 Residual soils	
These are products of in-situ weathering of rocks and are described as e.g. Residual Shale	
6.3 Pedocretes	
Formed in transported and residual soils etc. calcrete, silcrete, manganocrete and ferricrete.	

5.2 Soil Classification



SUMMARY OF DESCRIPTIONS USED IN ROCK DESCRIPTION

1. WEATHERING

Term	Symbol	Diagnostic Features
Residual Soil	W5	Rock is discoloured and completely changed to a soil in which original rock fabric is completely destroyed. There is a large change in volume.
Completely Weathered	W5	Rock is discoloured and changed to a soil, but original fabric is mainly preserved. There may be occasional small corestones.
Highly Weathered	W4	Rock is discoloured, discontinuities may be open and have discoloured surfaces, and the original fabric of the rock near the discontinuities may be altered; alteration penetrates deeply inwards, but corestones are still present.
Moderately Weathered	W3	Rock is discoloured, discontinuities may be open and will have discoloured surfaces with alteration starting to penetrate inwards, intact rock is noticeably weaker than the fresh rock.
Slightly Weathered	W2	Rock may be slightly discoloured, particularly adjacent to discontinuities, which may be open and will have slightly discoloured surfaces, the intact rock is not noticeably weaker than the fresh rock.
Unweathered	W1	Parent rock showing no discolouration, loss of strength or any other weathering effects.

2. HARDNESS

Classification	Field Test	Compressive Strength Range MPa
Very Soft Rock	Can be peeled with a knife. Material crumbles under firm blows with the sharp end of a geological pick.	1 to 3
Soft Rock	Can be scraped with a knife, indentation of 2 to 4 mm with firm blows of the pick point.	3 to 10
Medium Hard Rock	Cannot be scraped or peeled with a knife. Hand held specimen breaks with firm blows of the pick.	10 to 25
Hard Rock	Point load tests must be carried out in order to distinguish between these classifications	25 - 70
Very Hard Rock	These results may be verified by uniaxial compressive strength tests on selected samples.	70 - 200
Extremely Hard Rock		>200

3. COLOUR

The predominant colours or colour combination are described including secondary colouration described as banded, streaked, blotched, mottled, speckled or stained.

4. FABRIC

4.1 Grain Size		4.2 Discontinuity Spacing		
Term	Size (mm)	Description for: Bedding, foliation, laminations	Spacing (mm)	Descriptions for joints, faults, etc.
Very Coarse	>2,0	Very Thickly Bedded	> 2000	Very Widely
Coarse	0,6 – 2,0	Thickly Bedded	600 – 2000	Widely
Medium	0,2 – 0,6	Medium Bedded	200 – 600	Medium
Fine	0,06 – 0,2	Thinly Bedded	20 – 200	Closely
Very Fine	< 0,06	Laminated	6 – 20	Very closely
		Thinly Laminated	<6	

5. ROCK NAME

Classified in terms of origin:	
IGNEOUS	Granite, Diorite, Gabbro, Syenite, Diabase, Dolerite, Trachyte, Andesite, Basalt.
METAMORPHIC	Slate, Quartzite, Gneiss, Schist,
SEDIMENTARY	Shale, Mudstone, Siltstone, Sandstone, Dolomite, Conglomerate, Tillite, Quartzite, Limestone.

6. STRATIGRAPHIC HORIZON

Identification of rock type in terms of stratigraphic horizons.

Appendix B: Borehole logs

Appendix C: Borehole core photos

Appendix D: Soil profiles

Appendix E: Test pit Photographs

Appendix F: Laboratory test results

Appendix G: Detailed drawings

Ultimately, the only wealth that can sustain any community, economy or nation is derived from the photosynthetic process - green plants growing on regenerating soil.

ALLAN SAVORY

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THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED

PROJECT NRA R.030-090-2016/1

THE IMPROVEMENT OF NATIONAL ROAD R30 SECTION 9 FROM (KM 29) TO R24 (OLIFANTSNEK) (KM 76.6)

PRELIMINARY DESIGN REPORT

JULY 2023

Prepared for:
South African National Roads Agency SOC Ltd
58 Van Eck Place
Mkondeni

Prepared by:
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Targeted Enterprise:
Letsatsi Consulting (Pty) Ltd

Targeted Enterprise:
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Quality Control Sheet

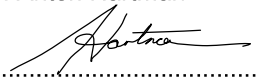
CLIENT:	South African National Roads Agency SOC Ltd
CONSULTANT:	Zutari (Pty) Ltd
PROJECT DESCRIPTION:	Assessment, Detailed Design, Contract Documentation and Monitoring of the Partial Reconstruction of National Road R30 Section 9 from km 29 to R24 (Olifantsnek) (km 76.6)
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Version No.	Date	Issued to	Checked and approved by		Signature
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			DS5 - Geometrics	Willem Davel	

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..... 04 July 2023 .....

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6 TRAFFIC INFORMATION

6.1 Introduction

The purpose of this chapter is to provide an overview of the traffic analysis of the project road which includes a discussion of the current traffic patterns and future traffic projections, and a capacity analyses which informed the proposed road upgrade and rehabilitation requirements. The chapter also provides an analysis of pedestrian and public transport activity along some critical intersections / road link sections of the project road.

Traffic forecasts and capacity analyses were conducted over the design and construction period (assumed to be 2022 to end of 2026) plus a 20-year horizon period (assumed to be from 2027 to end of 2047).

6.2 Available data

The available traffic data was obtained from SANRAL's Comprehensive Traffic Observations (CTO) for the following stations as shown in Figure 6-1 below:

- CTO station 19224 located just north of Derby; and
- CTO station 19223 located on the south of Derby, both along the project road section; while
- CTO station 19207 located just north of Ventersdorp, not on the project road section but still on the R30.

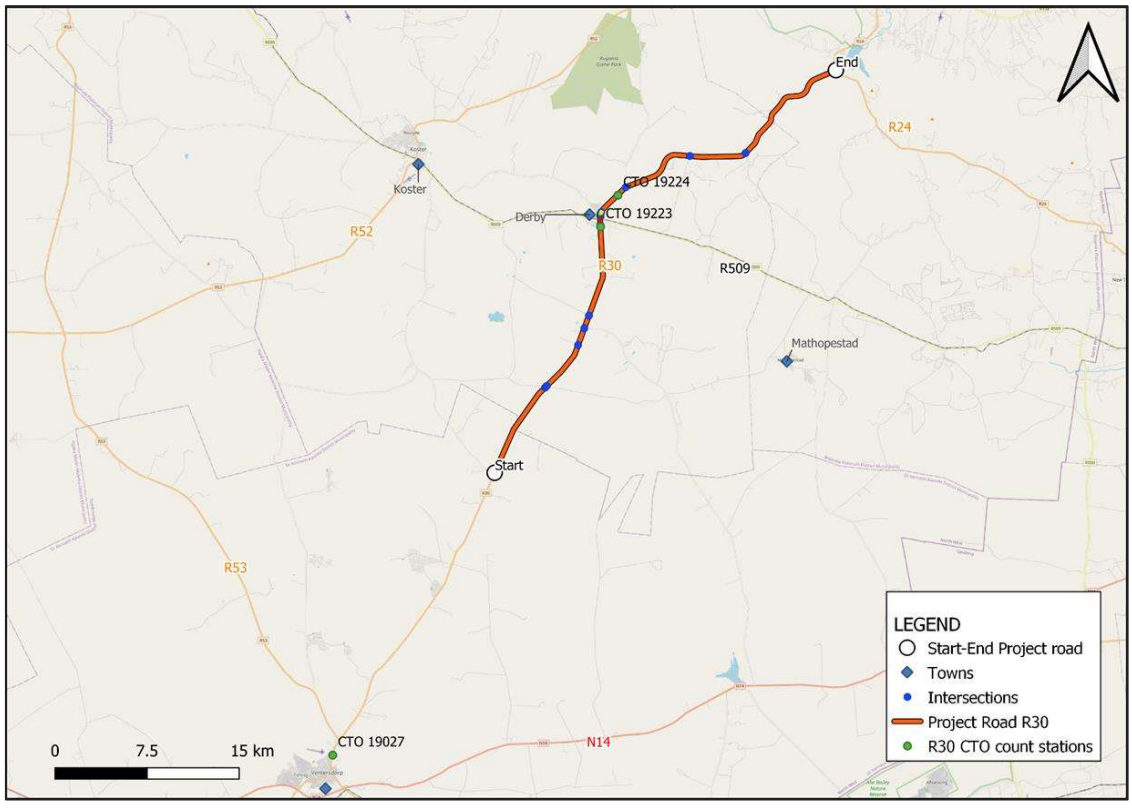


Figure 6-1: Location of permanent traffic counting stations

The CTO data received from SANRAL had varying durations for the different CTO stations which rendered the data, to some extent, uncomprehensive to derive Annual Average Daily Traffic (AADT)

volumes. The number of days for the traffic count data collection ranged from 2 to 20 days as shown in Table 6-1

Table 6-1: Most recent traffic information from relevant station

CTO	Last date surveyed	Full days counted			
		2015	2017	2018	2019
19223	2019-04-16	13	20	2	18
19224	2018-08-24	13	18	12	n/a
19027	2019-09-04	14	14	n/a	1

The Annual Daily Traffic (ADT) and Average Daily Truck Traffic (ADTT) data presented in Table 6-2 is from 2015 to 2019 (except 2016) recorded at all 3 CTO stations. However, CTO 19224 and 19027 have missing data for 2019 and 2018 respectively.

Table 6-2: Traffic count data recorded

Year	ADT			ADTT		
	CTO 19223	CTO 19224	CTO 19027	CTO 19223	CTO 19224	CTO 19027
2015	2668	3143	3699	381	420	494
2017	2652	3077	3634	384	430	448
2018	2216	2998		410	451	n/a
2019	2362	n/a	3428	370	n/a	633

Table 6-2 shows that traffic volumes along the project road decreased between 2015 and 2019:

- by 11% at CTO 19223, 5% at CTO 19224 and 7% at CTO 19027
- generally, CTO 19027 had higher traffic volumes followed by CTO 19224 and then CTO 10223
- in 2019, CTO 19027 had ADT volumes of about 3430 vehicles of which 18% were heavy vehicles
- in comparison, CTO 19223 experienced lower ADT of about 2360 vehicles of which 15% were heavy vehicles.

6.3 Obtaining new traffic data

To augment the SANRAL CTO data, twelve-hour (12-hr) classified traffic counts and 12-hr pedestrian counts were carried out by DC Traffic Data (Pty) Ltd, appointed by Zutari, at the designated locations indicated in Table 6-3 below. Location 7 is not an intersection but an area of interest for pedestrians walking along the R30 vehicular bridge over the R509 which currently does not have designated sidewalks. Pedestrian counts were also conducted at Locations 8, 9 and 11.

The traffic counts were carried out on Wednesday 6 April 2022 for the typical mid-week daytime (06h00 – 18h00) using video technology-based data collection methods. The following vehicle classification was used in accordance with the South African Standard Traffic Data Collection Format (TMH14,2018):

- Light vehicle - Length ≤ 4.9m
- Short heavy vehicle - Length ≤ 10.0m
- Medium heavy vehicle - 10.0m < Length ≤ 16.8m
- Long heavy vehicle - Length > 16.8m

Table 6-3: Location of Counting Stations

Intersection/location	Km distance	Intersecting Road	Description	Count Type
1	32.260	D1822	T-junction right	Vehicle
2	36.560	D2694	T-junction left	Vehicle
3	36.745	D2698	T-junction right	Vehicle
4	42.450	D2697	T-junction right	Vehicle
5	43.550	D2696	T-junction left	Vehicle
6	51.130	D47/2	T-junction left	Vehicle, pedestrian
7	51.395	R509	Overpass	Pedestrian
8	51.850	Robert Street	Street left	Vehicle, pedestrian
9	51.965	Kerk Street	Street left	Vehicle, pedestrian
10	52.080	Bree Street	Street left	Vehicle, pedestrian
11	52.190	D1616/ North Street	T-junction left	Vehicle, pedestrian
12	55.040	D667	T-junction left	Vehicle
13	61.318	S9	T-junction right	Vehicle
14	65.990	D1075	T-junction right	Vehicle

6.3.1 Existing vehicle traffic patterns

The traffic volume figures for the surveyed intersections are attached in **Appendix K**.

The following observations can be deduced from the traffic count data:

- The 12-hour traffic volumes along the R30 ranged between 950 and 2300 vehicles in both directions (50:50 average directional split) with the highest volume along the sections in Derby Town. The section between D47/2 and Roberts streets carried the highest traffic volumes.
- The classified traffic counts indicate a heavy vehicle percentage split ranging between 12-17% with the lowest percentage split (6%) at intersection 5 (km 43.55).
- Most of the traffic counted (12-hr count) at the intersections were through traffic along the R30 and very low traffic volumes (less than 100 for both directions) were counted along the minor roads, except for the following minor roads:

  D47/2, road to Koster and Magaliesburg at intersection 6 – 1196 vehicles (both direction);
  D2697, road to Welverdiend at intersection 4 - 270 vehicles (both direction); and
  Roberts Street – 240 vehicles (both direction) at intersection 8

6.3.2 Existing pedestrian activity

Figure 6-2 show the 12-hr pedestrian volumes profiles for the pedestrian count locations.

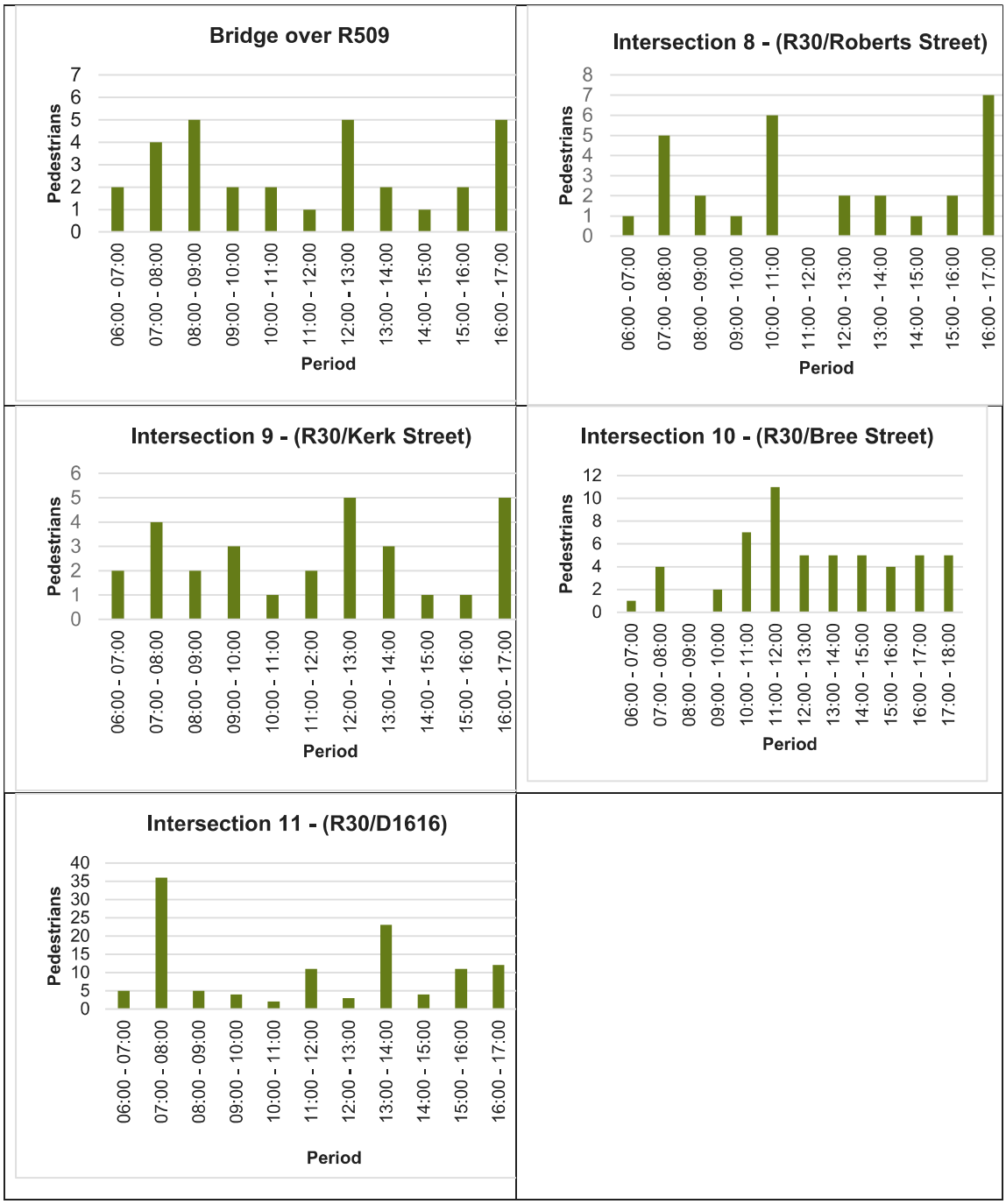


Figure 6-2: Pedestrian profiles

The following observations can be made from the 12-hr pedestrian counts:

- Most pedestrian trips were made in the morning between 06:45 to 07:45 and in the evening between 17:00 and 18:00.
- At the intersections of R30 with Robert Street, Kerk Street and Bree Street (intersection 8,9 and 11 respectively), pedestrians were observed waiting for public transport in the vicinity of the intersections as these roads provide access to the town of Derby.
- The highest number of pedestrians were counted at intersection 11 (R30/North Street) as opposed to the other intersections. This is because North Street links to the high-density

residential area in Derby. The pedestrian volumes counted during the 12-hr period are discussed below:

An estimate of 140 pedestrians were recorded at Intersection 11 (R30/North Street) of which 70% were male, 9% of females and the rest were children. The highest number of pedestrians counted in an hour were 11. About 100 pedestrians were counted crossing the R30 (east-south movement).

Approximately 55 pedestrians were counted at Location 10 (R30/Bree Street) all of which were male. The highest pedestrians counted in an hour were 11. Thirty-one (no. 31) pedestrians were counted crossing the R30 during the 12-hr period of the count.

Approximately 35 pedestrians were counted at Intersection 8 of which 94% were male, 6% female and the rest children. The highest pedestrians counted in an hour were 7 persons. No pedestrian was counted crossing the R30.

A total of about 30 pedestrians were counted at Intersection 9 of which 84%,10%, 6% were male, female and children respectively. The highest pedestrians counted in an hour were 5 persons, while 5 pedestrians were seen crossing the R30 during the 12-hr period of the count.

Approximately 30 pedestrians were counted at Location 7 (R30 bridge over R509) of which 94% were male and 3% were female and the rest children. The highest pedestrians counted in an hour were 4 persons. One pedestrian was counted crossing the R30 during the 12-hr period of the count.

6.4 Future Traffic Growth Rates

6.4.1 Forecast period

The base year for the predicted traffic was taken as 2022. An estimated 5-year period to construction completion was assumed along with a 20-year horizon period as mentioned in the earlier sections. Therefore, the forecast for this project was conducted for the year 2047.

6.4.2 Traffic forecasting approach

Various factors contribute to traffic growth which include socio-economic factors (e.g., population growth, gross domestic product (GDP), employment rates, growth of commercial and industrial development) and increased capacity/upgrades on a road which may attract traffic volumes from other alternative roads (i.e., induced demand).

For this project, consideration was given to the historic traffic growth trends along the project road which were compared to the population growth, GDP growth of the province and the local district municipality to establish a relationship between these factors and traffic growth. Consideration was also given to the prospect of spatial development growth along the project road corridor extracted from the district municipality spatial development framework (SDF) and the integrated development plan (IDP) of the local and district municipalities.

6.4.3 Historic traffic trends

The CTO station 19223 and 19224 were the best indicators of the historic growth on the project road. This is because these CTO stations are located on the project road as opposed to CTO station 19027 which falls outside of the project road. The CTO station 19224 is located between the North of Derby and Rustenburg, while CTO station 19223 is between Derby and Ventersdorp towards Klerksdorp.

It should be noted that due to the inconsistency and low number of days counted per year at the CTO stations as illustrated in Table 3 1 (as low as 1 day) the data may be to a certain degree unreliable, but this is the best available indication of the historic traffic trends.

The traffic growth for station 19224 was generally higher than for station 19223 which is displayed in the year-on-year traffic growth rate in Table 6-4.

Table 6-4: Traffic growth rate

Year	ADT annual growth rate			ADTT annual growth rate			ADLT annual growth rate		
	CTO 19223	CTO 19224	CTO 19207	CTO 19223	CTO 19224	CTO 19207	CTO 19223	CTO 19224	CTO 19207
2015-2016	-4.0%	-1.5%	-1.9%	0.0%	2.2%	6.2%	-4.8%	-2.1%	-3.4%
2016-2017	3.6%	-0.6%	0.1%	0.8%	0.2%	-14.6%	4.1%	-0.7%	2.9%
2017-2018	-16.4%	-2.6%	-1.9%	6.8%	4.9%	6.3%	-20.4%	-3.8%	-3.4%
2018-2019	6.6%	-1.5%	-3.8%	-9.8%	2.2%	33.0%	10.3%	-3.4%	-9.2%
Average annual growth rate (2015 – 2019)	-2.6%	-1.5%	-1.9%	-0.4%	1.9%	6.2%	-2.1%	-2.0%	-2.6%

A comparison of the two stations showed that:

- The average annual increase for heavy vehicles at CTO station 19223 was -0,4% while CTO station 19224 recorded an average annual increase of 1.9% between 2015 and 2019. As mentiontioned due to the location of CTO 19207 the high heavy vehicle growth rate recorded at that station was not a good representative of the traffic on the R30, as the location of this station is away from the project road;
- The light vehicles showed an annual increase of -2.1% and -2.0% at CTO station 19223 and CTO station 19224, respectively, between 2015 and 2019; and
- The total average annual percentage increase for CTO station 19223 and 19224 is -2,6% and -1,5% respectively.

Table 6-5 illustrates further historic growth trends of the CTO data.

Table 6-5: Traffic growth rate summary

From (Year)	To (Year)	Growth Rate		
		Total	Heavy Vehicles	Light Vehicles
Counting Station 19223				
2015	2017	-0.3%	0.39%	-0.42%
2015	2018	-5.3%	2.15%	-6.81%
2015	2019	-4.0%	0.0%	-4.8%
Counting Station 19224				
2015	2017	-1.06%	1.18%	-1.42%
2015	2018	-1.50%	2.20%	-2.11%
2015	2019	-1.5%	2.2%	-2.1%
Counting Station 19027				
2015	2017	-0.9%	-4.9%	-0.3%
2015	2018	-0.9%	-4.9%	-0.3%
2015	2019	-1.9%	6.2%	-3.4%

Table 6-5 shows that:

- Overall, the project road experienced a traffic decline over the 4 years of -1,5% to -4%;

- The heavy vehicles seem to show slight positive growth, more so at CTO station 19224 (between 0% and 2%)
- Light vehicles seem to show a decrease which may be connected to the GDP of the district municipality (discussed later in this report); and
- CTO station 19224 seems to demonstrate constantly negative growth for light vehicles and constantly positive heavy vehicles. While station 19223 fluctuates quite significantly.

6.4.4 Population growth trend

The section of the R30 under investigation, traverses through Kgetlengrivier Local Municipality (KLM) in the Bojanala Platinum District Municipality (BPDM), North West Province.

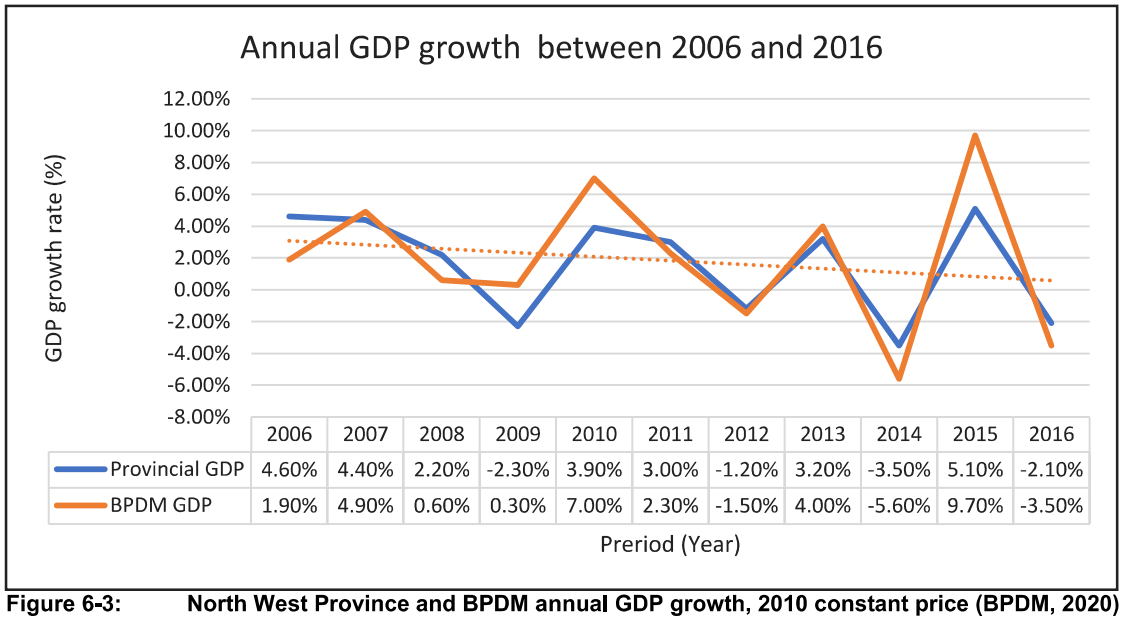
According to the BPDM SDF (2016), the KLM is classified as a rural municipality (consisting of three urban centres Derby, Koster and Swartruggens) with a small population concentration (population of 100 000 to 150 000 people). The BPDM IDP 2019/20 estimated the KLM population at about 58 000 in 2016. The IDP indicated that the municipality had been experiencing an average annual population growth rate of 3.2% between 2006 and 2016 and the BPDM SDF (2016) estimated a positive population growth of 2.6% per annum for the long term.

In contrast, the BPDM experienced lower annual average population growth rates between 2006 and 2016 of 2.5% per annum and was projected to grow at an average annual rate of 1.5% in the short term. The provincial population has been growing at an annual average growth rate of 1.5% since 2014 and is expected to continuate at a similar growth rate in the short term.

The negative traffic growth trend on the project road does not correlate with either the local and district municipality or the provincial population growth trends.

6.4.5 GDP growth trend

Figure 6-3 shows the GDP growth rates for the North West Province and BPDM from 2006 to 2016.



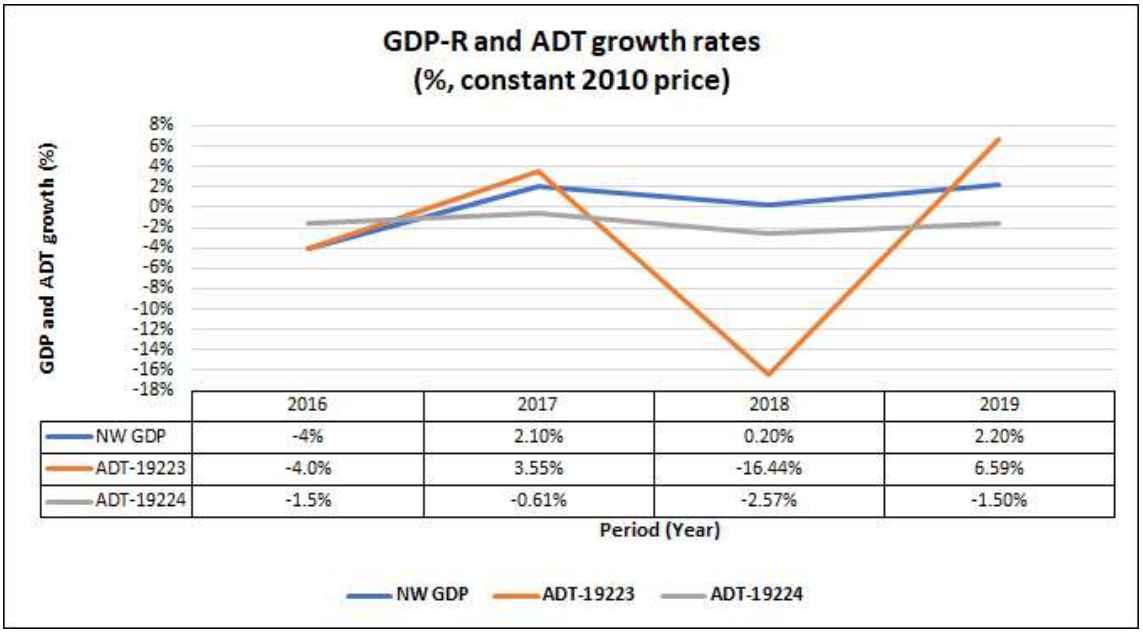
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Provincial GDP	4.60%	4.40%	2.20%	-2.30%	3.90%	3.00%	-1.20%	3.20%	-3.50%	5.10%	-2.10%
BPDM GDP	1.90%	4.90%	0.60%	0.30%	7.00%	2.30%	-1.50%	4.00%	-5.60%	9.70%	-3.50%

Figure 6-3: North West Province and BPDM annual GDP growth, 2010 constant price (BPDM, 2020)

Figure 6-3 shows that the GDP of the province and the district municipality have been fluctuating over the years, however overall, a downward trend has been experienced since 2006. Overall, the provincial GDP grew at an annual average of 1.57% per annum and BPDM at 1.83% between 2006 and 2016, This figure further shows that the district municipality GDP and the provincial GDP follow a similar trend.

6.4.6 GDP and traffic volumes trend analysis

From Figure 6-4, a rudimentary relationship between the GDP and the traffic can be drawn. An analysis of the data was done based on the available limited traffic data and provincial real GDP (GDP-R) from 2016 to 2019.



	2016	2017	2018	2019
NW GDP	-4%	2.10%	0.20%	2.20%
ADT-19223	-4.0%	3.55%	-16.44%	6.59%
ADT-19224	-1.5%	-0.61%	-2.57%	-1.50%

Figure 6-4: Traffic growth rates trend compared to real GDP growth rates trend

GDP Source: North West Province Economic Data Report 2020

Figure 6-4 shows that the traffic growth trend mostly follows that of the provincial GDP, i.e., when the GDP declines, the traffic volumes also decline and with increased GDP traffic volumes also increase. However, a regression analysis of the few data points indicates a poor statistical correlation between the provincial GDP and traffic volumes.

6.4.7 Overall economic performance and outlook

The BPDM SDF (2016) indicates that the R30 is situated along the Eastern Development Belt and joins primary nodes of Klerksdorp and Rustenburg which are high priority development areas and therefore have the potential to influence a positive traffic growth on the project road. However, the SDF further notes that the R30 is not a major corridor and is not prone to major future development. The key roads along the Eastern Development Belt are the R509, N14 and R53 which link priority development nodes to the country's economic hub of Gauteng. Figure 6-5 highlights the various development corridors along the Eastern Development Belt.

6.4.8 Conclusion

The historic traffic growth trend (taken from CTO 19223 and CTO 19224) indicated that the heavy vehicles along the project road seem to display a slight growth particularly in the north of Derby between 0% and 2% while the light vehicles seem to show a decrease in volume. This appears to be connected to the provincial and district municipality which was generally on a downward trend. It is anticipated that GDP would recover and prospects of development growth along the Eastern Development Belt may have an impact on traffic growth along the R30, though not significant. Taking all into account, it is assumed that the light vehicle growth will still be modest, i.e., not higher than 2%. Therefore, a 2% growth rate for light and heavy vehicles is thus proposed for the purpose of projecting future traffic for the design period.

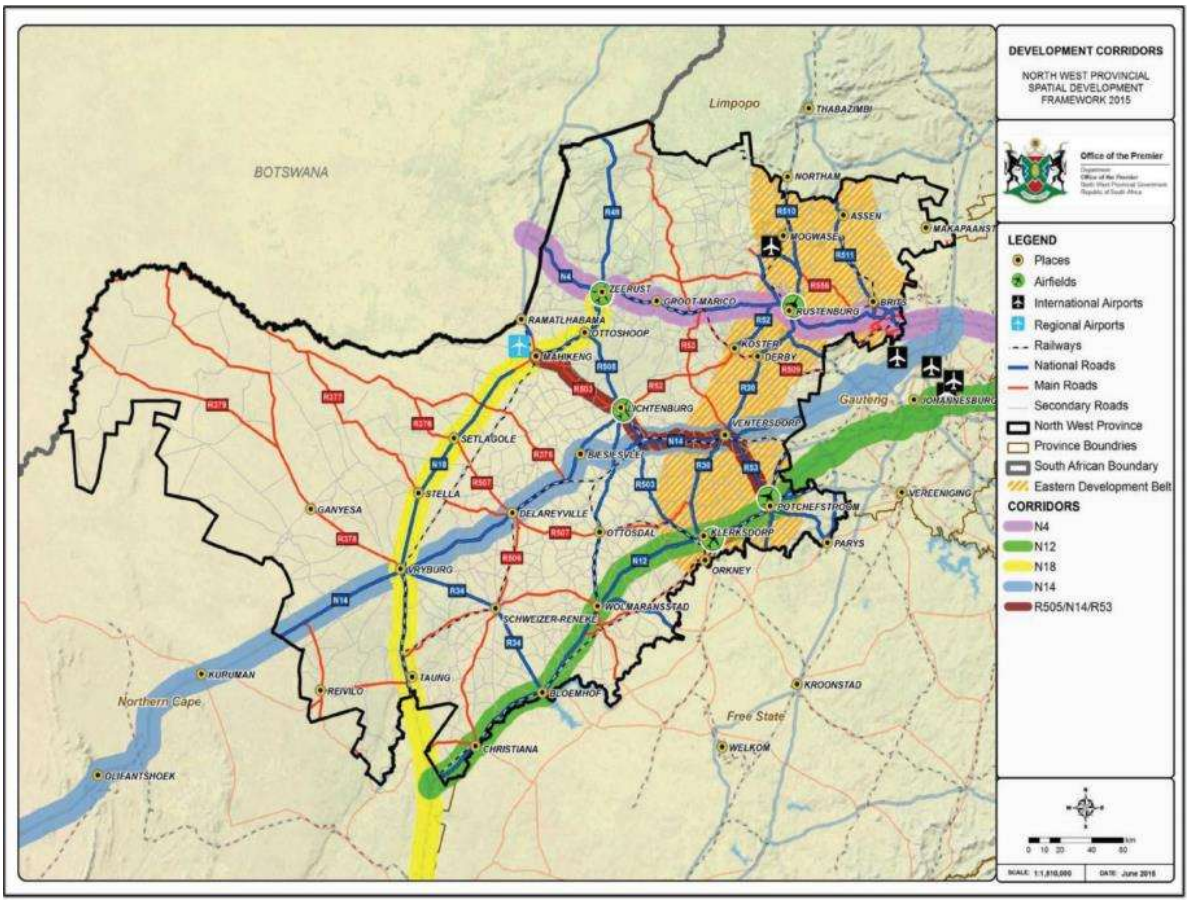


Figure 6-5: Development corridor and zones (SDF, 2016)

6.5 Estimated future traffic volumes on project road

The 2022 ADT for the project road was calculated using the 12-hour traffic count data. The 12-hour traffic counts were converted to 24-hour counts using a night-time expansion factor of 1.37 calculated from the available CTO station 19224 data. This was used to forecast the traffic of each section as shown in Table 6-6.

The capacity analysis took into considerations SANRAL's proposal to close three intersections along the project road in Derby (Intersections 8-R30/Roberts Street, 9-R30/Kerk Street and 10-R30/Bree Street), to meet intersection spacing standards for a Class 3 Road and promote the mobility function of the road. Traffic volumes currently using these intersections were redistributed to Intersection 11 (R30/North Street).

Table 6-6: Traffic Forecast projected for 2047

Location, Between Intersections:	Section	North Bound (12-hr volumes)	South Bound (12-hr volumes)	Total (12-hr volumes)	ADT (2022)	Projected ADT (2047)
Ventersdorp & Intersection 1	S0	580	571	1151	1586	2602
1 & 2	S1	585	575	1160	1599	2623
2 & 3	S2	494	474	968	1334	2189
3 & 4	S3	582	579	1161	1600	2625
4 & 5	S4	772	617	1389	1914	3141
5 & 6	S5	827	619	1446	1993	3269
6 & 11	S6	1062	1097	2159	2975	4882
11 & 12	S7	956	989	1945	2681	4398
12 & 13	S8	939	970	1909	2631	4316
13 & 14	S9	932	972	1904	2624	4305
After Intersection 14	S10	1025	1045	2070	2853	4680

The following can be deduced from Table 6-6:

- The traffic on the project road is approximately evenly distributed in each direction (north bound and south bound) with an approximate 50:50 directional split.
- Section 6 (km 51.13 to km 52.19) has the highest projected traffic volumes of approximately 4 880 vehicles per day, this is the section of the road connecting the south and north of Derby and runs over the R509.
- The projected traffic for Section 0 (km 0.0 to m 29.0) is the lowest with projected ADT of 2602 vehicles followed by Section 1 (km 29.0 to km 32.26). Section 0 does not form part of the project road.

6.6 Capacity analysis

The capacity analysis of the project road was carried out using the Highway Traffic Model (HTM) software, which is a MS Excel-based Software application that allows for the analysis of various aspects of the traffic system. This was developed by SANRAL.

The Software is used to determine the Level of Service (LOS) that the road section provides. It also uses various statistical techniques to model the flow of traffic and its effect on the environment. One of the models includes the use of the platooning effect to estimate the distribution of free-flow speed in a traffic stream.

The HTM software was developed to analyse traffic conditions in South Africa and has been calibrated to represent the country's traffic environment. The calibration confirmed that the HTM software is more effective in modelling local conditions than the United States (US) Highway Capacity Manual (Transport Research Board).

The main inputs used for analysis of the R30 were:

- X and Y coordinates of the road section
- Definition of the road section
- Traffic volume data
- Percentage heavy vehicle composition
- Locations, length and barrier/centreline types
- Lane configurations

6.6.1 Assessment years evaluated

The following assessment years were evaluated:

- 2022 baseline traffic (observed).
- 2027 future traffic demand (estimate).
- 2037 future traffic demand (estimate); and
- 2047 future design year traffic demand (estimate).

6.6.2 Performance criteria

The model categorises the road sections between four levels of service (LOS). The permitted LOS for a road section is dependent on the road class. The SANRAL LOS criteria is stipulated in Table 6-7. The R30 is Classified as a Class 2 Road, as it is a key regional route. However, the majority of the project road section functions as a Class 3 medium highway in rural areas.

Table 6-7: SANRAL LOS criteria for upgrade

Class 1 and 2 Strategic/Major Highways in rural areas		
Sections over which overtaking is allowed		
	Normal day peak hour	**LOS B**
	30th Highest hour	**LOS C**
Sections with barrier lines		
	Normal day peak hour	**LOS A**
	30th Highest hour	**LOS B**
Class 3 to 5 Medium to Minor Highways in rural areas		
Sections over which overtaking is allowed		
	Normal day peak hour	**LOS C**
	30th Highest hour	**LOS D**
Sections with barrier lines		
	Normal day peak hour	**LOS B**
	30th Highest hour	**LOS C**

6.6.3 30th highest hour

Using the estimated ADT calculated from the 12-hr count, the 30th-highest hour was calculated for each traffic section. The following equation was adopted to estimate the flow between the highest and 1030th highest hour as recommended in the Geometric Guideline (South African National Roads Agency Limited, 2002):

$$\boldsymbol{Q_n = 0.072ADT(\frac{N}{1030})^{\beta}}$$ Equation 1

Where:

Q_N - Two- directional flow in N-th hour of year (veh/h)

ADT - Average daily traffic (veh/day)

N - hour of year

β - peaking factor

N was set to 30 as this is the desired peak hour while β was adopted from the Geometric Design Guidelines published by SANRAL (not dated) as -0.22. With the available ADT, the 30th-highest hourly data was obtained and used as input into the HTM model.

6.7 Analysis results (existing scenario)

Table 6-8 presents the results of the analysis for the overall LOS of the project road. The comprehensive output of the model can be shared on request.

Table 6-8: Project road capacity analysis results

Year	Normal Day Peak Hour						30th Highest Peak Hour					
	LOS A	LOS B	LOS C	LOS D	LOS E	Total	LOS A	LOS B	LOS C	LOS D	LOS E	Total
2022	99.3%	0.7%	0.0%	0.0%	0.0%	100.0%	57.5%	40.1%	2.3%	0.0%	0.0%	100.0%
2027	95.1%	4.9%	0.0%	0.0%	0.0%	100.0%	41.4%	49.9%	8.7%	0.0%	0.0%	100.0%
2037	80.9%	19.1%	0.0%	0.0%	0.0%	100.0%	9.2%	70.3%	20.3%	0.3%	0.0%	100.0%
2047	63.2%	36.8%	0.0%	0.0%	0.0%	100.0%	7.5%	49.8%	32.4%	10.2%	0.0%	100.0%

The above results indicate that 90% of the project road is expected to operate at a LOS C or better and about 10% at LOS D in 2047. Based on the LOS performance criteria, only the sections with barrier lines and operating at LOS D or worse should be upgraded.

Table 3-9 indicates the sections of road which fall within the LOS D. The HTM criteria highlights the discrepancy between sections which permit overtaking and sections that do not permit overtaking. According to the manual the sections which do not permit overtaking, only accommodate traffic up to LOS C. The sections with barrier lines and a LOS higher than C are considered unacceptable and require upgrading of the road profile. The total length of road requiring upgrading is 4,6km. The sections of road which require this upgrade are presented in the Table 3-9.

Table 6-9: Road sections to be upgraded with overtaking lanes.

Section	Section with LOS D (m)	Barrier lines section (m)	Direction of Upgrade	Length of Upgrade (m)
S6	51130 – 51280	51160-52180	Both Direction	1020
S7	53600 - 53780	None		0
S8	55040 - 57460	55060 - 55500 55960 - 56200 56940 - 57140	South Bound South Bound South Bound	880
S8	57480 - 58020	57480 - 57570 57570 - 58020	North Bound Both Direction	540
S8	58040 - 58460	58040 - 58460	North Bound	420
S8	58480 - 58820	58480 - 58560 58560 - 58720 58800 - 58820	North Bound South Bound Both Direction	260
S8	58840 - 61300	58840 - 58920 58920 - 59100 59100 - 60080 61160 - 61300	North Bound North Bound North Bound North Bound	1380
S9	62240 - 62440	62260 - 62360	North Bound	100

6.8 Analysis results (proposed upgrade)

The current road width varies from 3.3m to 3.7m while the shoulders, surfaced and gravel, varies from 1.1m to 3.0m and 3.3m to 3.7m respectively. It was decided to conduct a sensitivity test to assess the

model's sensitivity to the effect of shoulder widths. This is because the HTM software considers the use of the shoulder by slower vehicles to allow other vehicles to pass which is common in the South African context.

Figure 6-6 and Figure 6-7 show the cross section used for the sensitivity testing of a 3,7m road width and a 3m surfaced shoulder for the single lane arrangement and a 3,7m road width and a 1m surfaced shoulder for cross-section with a climbing lane.

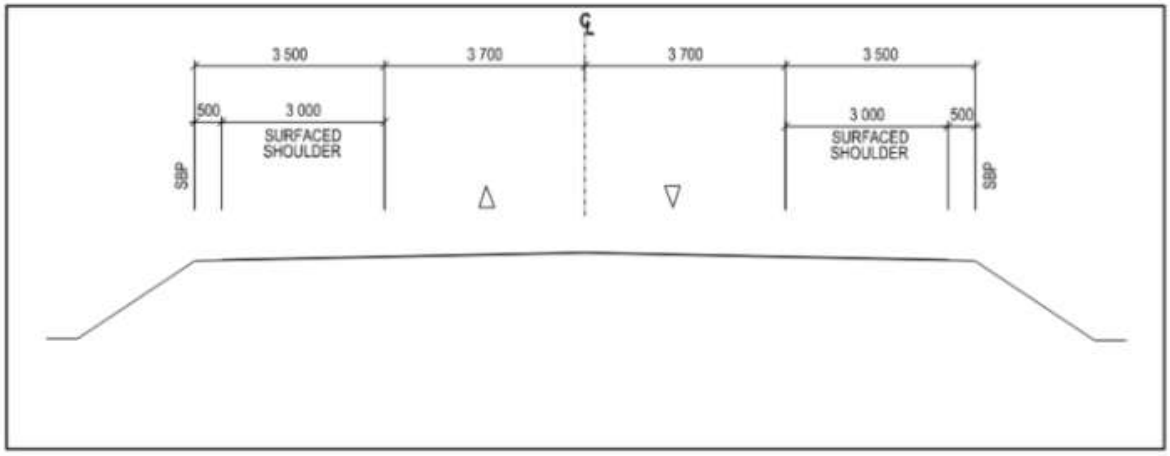


Figure 6-6: Proposed cross-section of road R30

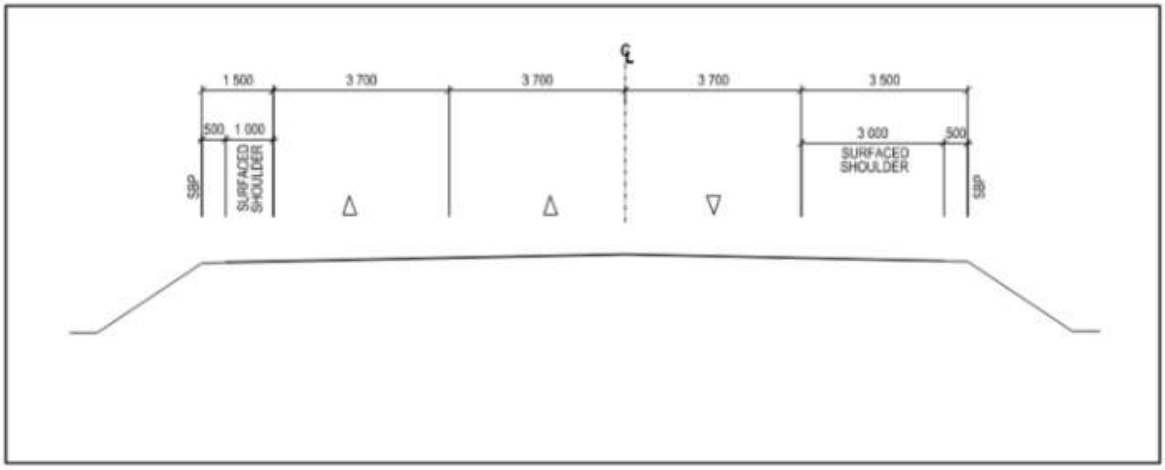


Figure 6-7: Proposed cross-section of road R30 with climbing lanes

The HTM capacity analysis results showed improved operating conditions whereby the entire project road is expected to operate at LOS C or better by 2047 as shown in Table 6-10. This suggests that the proposed upgrade suffices in improving the operational condition of the project road and no additional lanes are required.

Table 6-10: Project road capacity

Year	Normal Day Peak Hour						30th Highest Peak Hour					
	LOS A	LOS B	LOS C	LOS D	LOS E	Total	LOS A	LOS B	LOS C	LOS D	LOS E	Total
2022	100%	0.0%	0.0%	0.0%	0.0%	100%	82.3%	17.7%	0.0%	0.0%	0.0%	100%
2027	100%	0.0%	0.0%	0.0%	0.0%	100%	78.4%	21.6%	0.0%	0.0%	0.0%	100%
2037	98.8%	1.2%	0.0%	0.0%	0.0%	100%	48.3%	48.3%	3.4%	0.0%	0.0%	100%
2047	92.3%	7.7%	0.0%	0.0%	0.0%	100%	15.1%	71.1%	13.8%	0.0%	0.0%	100%

6.9 Capacity analysis for intersections

This section presents the capacity analysis of the intersections along the project road.

6.9.1 Performance criteria

The performance criteria for all the intersection in consideration is presented in Table 6-11 below. The LOS, delay and volume/capacity (V/C) ratios have been defined in accordance with the Highway Capacity Manual 2010 (HCM 2010).

Operation at LOS D or worse or at a v/c ratio of more than 0.95, is regarded as operating at capacity and therefore requires intervention where possible.

Table 6-11: Performance criteria

Level of Service	Control delay Per Vehicle (Seconds(d))	
	Signal and Roundabouts	Stop and Give-Way/Yield Signs
A	d≤10	d≤10
B	10<d≤20	10<d≤15
C	20<d≤35	15<d≤25
D	35<d≤55	25<d≤35
E	55<d≤80	35<d≤50
F	d>80	d≤50

6.9.2 Intersections configuration

All the intersections analysed are currently 3-legged intersections (T-junctions) and are priority-controlled intersections where priority is given to the R30 as the major road and the side roads/minor roads are stop controlled.

Except for the 3 intersections discussed below, each leg at the rest of intersections has one full length approach lane as well as one receiving lane:

- **Intersection 04 (R30/ D2697 Road to Welverdiend)**:

Southern Leg (R30): This leg has 2 approach lanes comprising of one short 90m through lane and one full length lane shared by through and right-turn movements. The leg has two receiving lanes.
Eastern Leg (D2697 Road to Welverdiend): This leg has one approach lane as well as one receiving lane.
Northern Leg (R30): This leg has 2 approach lanes comprising of one short 90m shared through/right-turn lane and one full length through lane. The leg has two receiving lanes.

- **Intersection 06 (30/R D47/2 Road to Koster):**

  Southern Leg (R30): This leg has one approach lane allowing for through and left-turn movements. The leg has two receiving lanes, one of which is a short 15m lane.
  Northern Leg (R30): This leg has 2 approach lanes comprising of one short 30m through lane and one full length lane that allows through and right-turn movements. The leg has one receiving lanes.
  Western Leg (D47/2 Road to Koster): This leg has one approach lane as well as one receiving lane.

- **Intersection 14 (R30/ D1075 Road to Boors)**:

  Southern Leg (R30): This leg has one approach lane allowing for through and right-turn movements. Furthermore, this leg has two receiving lanes, one of which is a short 30m lane.
  Eastern Leg (D1075 Road to Boors): This leg has one approach lane as well as one receiving lane.
  Northern Leg (R30): This leg has 2 approach lanes comprising of one short 30m left-turn lane and one full length through lane. Furthermore, this leg has one receiving lane.

6.9.3 Capacity analysis results

12-hour traffic counts were conducted on the 6th of April 2022 at these intersections. From these counts, the AM and PM peak hours were identified and analysed using SIDRA intersection software.

Using growth rates obtained in the previous sections, the 2022 traffic volumes were forecasted up to 2047.

As discussed earlier in this report, Intersections 8-R30/Roberts Street, 9-R30/Kerk Street and 10-R30/Bree Street are planned to be closed and traffic currently using these intersections was redistributed to intersection 11 for the future scenario. The following scenarios were tested:

- Scenario 1: 2022 (Existing) traffic conditions
- Scenario 2: 2047 (Future) traffic conditions with Intersections 8-R30/ Roberts Street, 9-R30/ Kerk Street and 10-R30/ Bree Streetclosed and traffic redistributed to Intersection 06 and 11

The SIDRA analysis results are shown in **Appendix L**.

The intersection capacity analysis results indicated that all intersections are currently operating at good LOS A and well below capacity with v/c ratios of less than 0.1 during both the AM and PM peak hour.

The growth in traffic up to 2047 is expected to have a negligible impact as the intersections are still expected to operate at good LOS A except for Intersection 03 (R30/D2698) and Intersection 14 (R30/D1075) which are expected to operate at LOS B on the minor road movements.

Based on the analysis result, no road upgrades are required at any of the intersection. However, it is recommended that the existing short lanes at intersections be upgraded to SANRAL standards (minimum length for a short lane at an intersection should be 60m length with a 60m taper).

6.10 Impact of access road closures on Derby community

In addition to the road closures of Roberts Street, Kerk Street and Bree Street along the R30, existing informal accesses to individual properties shown in Figure 6-8 will also have to be closed to maintain the line of “no access”.

Given the current road network, three (3) properties shown in Figure 6-8 will not have alternative access should the current accesses off the R30 be closed. Figure 6-8 also shows potential alternative access roads to the 3 properties as follows:

- Access to two properties to the west of the R30 can be provided by a new mid-block access road off Kerk Street, along the rear end of the properties. However, land acquisition for the new mid-block access road would be required; and
- A new access road as a fourth leg at Intersection 11 (R30/North Street).

In both instances, SANRAL will have to engage with the affected property owners and the owners of the land to be acquired for the construction of new roads, should the access options be adopted.

6.11 Pedestrian needs assessment

A notable number of pedestrians along the project road in Derby were observed:

- To access public transport vehicles travelling along the R30;
- To access the R509 and then public transport vehicles travelling along R509; and
- To access either the northern or southern parts of Derby separated by the railway line and the R509.

Figure 6-9 shows the pedestrian desire line.

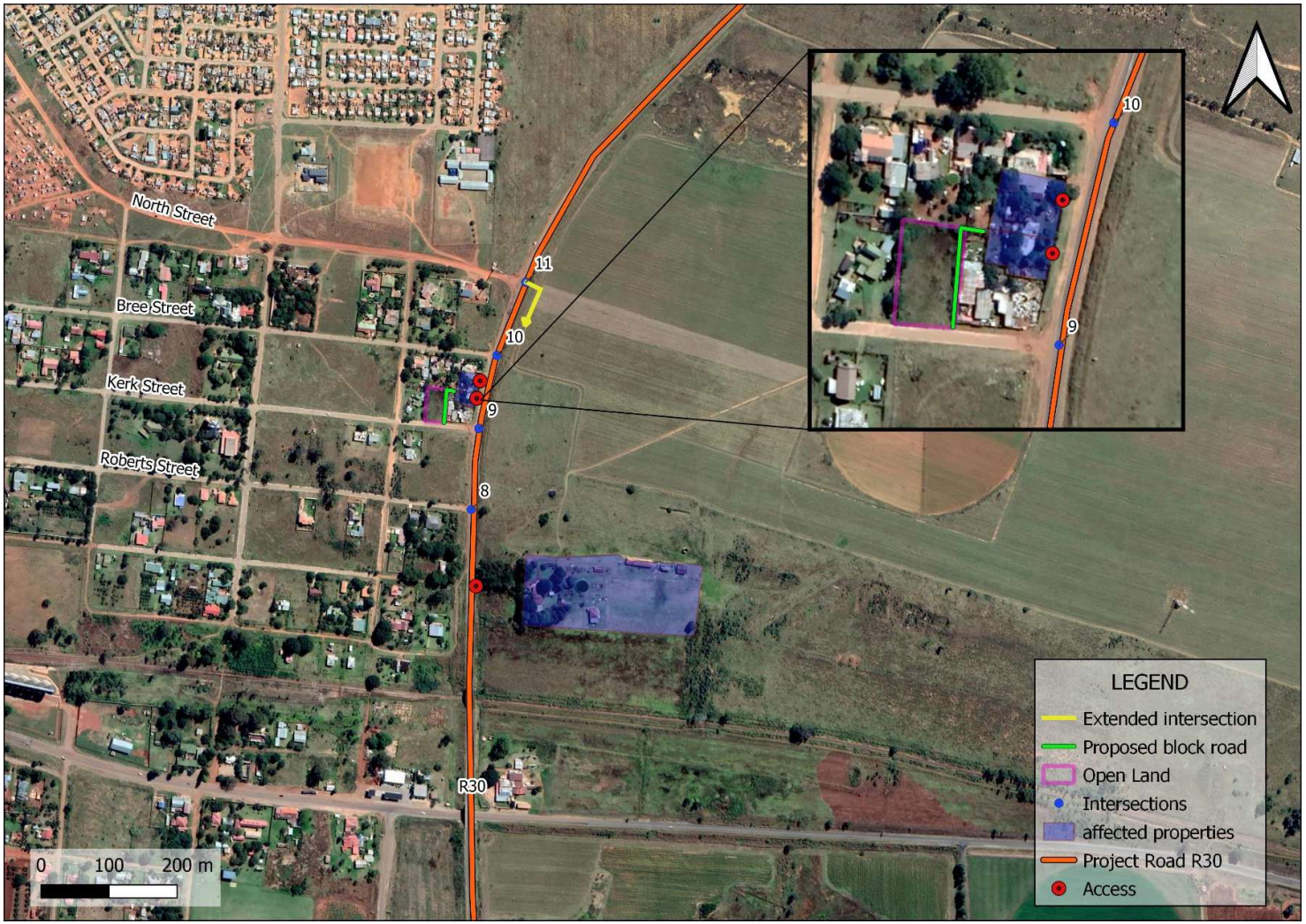


Figure 6-8: **Affected properties and possible alternative access options.**

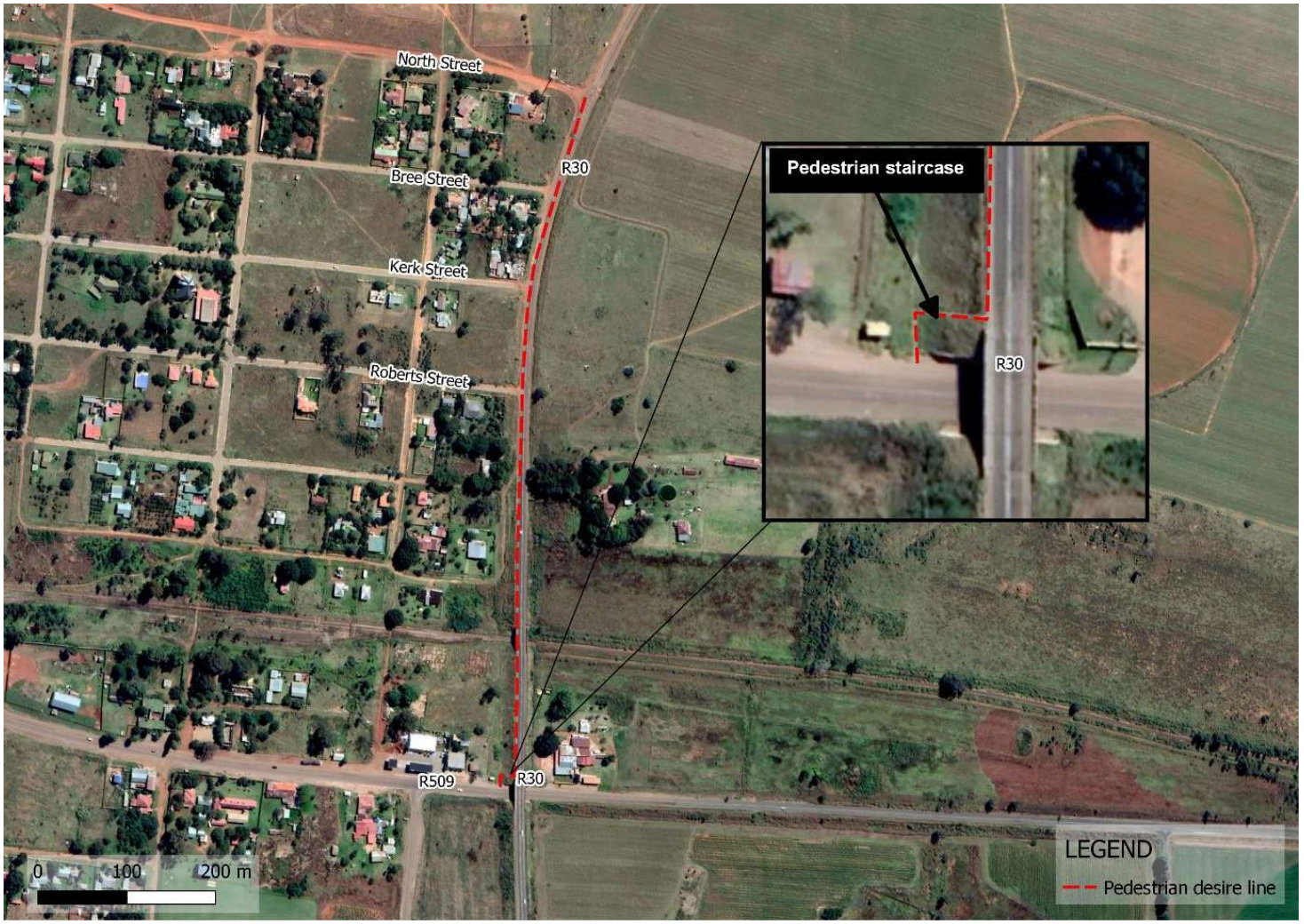


Figure 6-9: Pedestrians desire lines

Figure 6-10 below, shows images taken during a site visit, indicating that there are no sidewalks/footways on either side of the R30 in the town of Derby. Pedestrians were observed walking along the road verges and along the shoulder at the R30 bridge over R509. Pedestrians were also observed using the existing staircases at the R30 Bridge over R509 which provides a pedestrian link from the R30 to the R509.



Road verges along R30, at its intersection with North Street.



R30 shoulder at the bridge over R509



Road verges along R30, at its intersection with Roberts Street.

Figure 6-10: Images of the R30 verges near Derby

Table 6-12 shows a summary of pedestrian volumes discussed in Section 3.2.1.

Table 6-12: Summary of pedestrian volumes along the project road

Location	Pedestrian flows along both sides of R30 per day	Pedestrian flows crossing the R30 during peak hour
Location 7 (R30 bridge over R509)	37	0
Intersection 8 (R30/ Roberts Street)	38	1
Intersection 9 (R30/ Kerk Street)	32	3
Intersection 10 (R30/ Bree Street)	54	5
Intersection 11 (R30/North Street)	141 of which 100 crossed the R30	34

SANRAL's Guidelines for Pedestrian and Public Transport Facilities on National Roads (2017) provides guidelines for providing pedestrian grade separation and footways for urban and rural freeways as shown in Table 6-13.

Table 6-13: Warrants for paved pedestrian footways

Type of facility	Side of road	Average Daily traffic (ADT)	Pedestrian Flow (per day)	
			Design speed or speed limit <80 km/h	Design speed or speed limit >80 km/h
Footways	On one side	400-1400	300	200
		>1400	200	120
	Both sides	700	1000	600
		>1400	1000	400
Grade separation for Class 2 or 3 Road (Arterial)	■ Assume spacing between intersections > 1000 m, posted speed limit 80 km/h, 100 km/h or 120 km/h. ■ Grade separation: 500vph, 50 peds/hour within 500 m along road rule applies if topography allows. ■ If grade separation not warranted: Yield, Staged crossing with median, raised crossing, traffic signal alternatives			

Source: SANRAL's Guidelines for Pedestrian and Public Transport Facilities on National Roads (2017)

Based on the above pedestrian volumes criteria, only intersection 11 (R30/ North Street) meets the requirement for footways along one side of the road. And, although grade separation is not warranted, the criteria allow for the provision of a pedestrian crossing in the vicinity of the intersection given the number of pedestrians crossing the R30 in an hour (34 pedestrians).

Notwithstanding the above, and considering the factors listed below, it is recommended that a footway be provided along the western side of the R30 from Intersection 11 (R30/ North Street) to Intersection 6 (R30/D47/2), including the R30 bridge over R509:

- The R509 and the railway line are barriers that bisect the town of Derby thus reducing the cohesion of the two parts of Derby and limit access to land uses such as schools, shops, and other local amenities. Apart from using the R30 bridge over R509 (the only grade separation in the town), pedestrians cross the R509 and the railway line at grade.
- The new footway will provide a continuous, coherent, and safe pedestrian route as this seems to be an important pedestrian connection. Although the current pedestrian volumes are low, it is anticipated that the volumes would increase as the town population increases.

In addition to the footway, the following pedestrian and public transport infrastructure are recommended:

- Pedestrian crossing along both R30 approaches with yield control for vehicles (and associated required road signage) at the intersection of R30 and North Street.
- Public transport lay-bys on both sides of the R30 at the intersection of R30 and North Street.

6.12 Design traffic loading

6.12.1 Structural Analysis and Design Period

SAPEM (SANRAL, 2014) recommends that the structural analysis period be equal to the functional period for which the road will have to deliver its functional service, thus 20 years is selected as SAPEM states that the structural design period for a Category B road should be 20 years.

6.12.2 Equivalent 80kN factor (E80)

As mentioned at the onset of this chapter information was obtained from SANRAL for the following Comprehensive Traffic Observations (CTO) stations:

- CTO station 19224 located just north of Derby;
- CTO station 19223 located on the south of Derby, both along the project road section; and
- CTO station 19207 is located just north of Ventersdorp, not on the project road section but still on the R30

The information obtained from the above-mentioned stations presented an Equivalent 80 kN (E80) load factor for a short, medium, and long heavy vehicle. A split between the different heavy vehicles were also presented. Based on this information, a weighted E80 factor was calculated at each counting station and is presented in Table 6-14.

Table 6-14: Calculation of E80 factor

Year	Station	HV Composition			Contribution to Weighted E80's/HV			Weighted E80's/HV
		Short	Med	Long	Short	Med	Long	
					0.5	2.1	3.9	
2019	19223	54	14	32	0.27	0.29	1.25	1.81
2018	19224	50	13	36	0.25	0.28	1.418	1.95
2019	19027	56	13	31	0.28	0.27	1.21	1.76

No data is available after 2019. It can also be argued that the stations do not represent the entire length of road under consideration.

6.12.3 Sensitivity analysis

To determine the variation in traffic loading due to the uncertainty of the magnitude in the traffic growth rate and the E80 factor, a sensitivity analysis was conducted by varying the growth rate between 2% and 4% and the E80 factor between 1.0 and 3.5. Table 6-15 to Table 6-17 present the sensitivity analysis for the data at the various counting stations. A directional factor was applied to the data and the tables are a summary of the design traffic.

Table 6-15: Sensitivity analysis of traffic volumes at counting station 19223

Traffic Growth rate (%)	Equivalent 80 kN factor					
	1.0	1.5	2.0	2.5	3.0	3.5
2.0	3,670,000	3,923,000	4,198,000	4,495,000	4,816,000	5,164,000
2.5	4,587,000	4,904,000	5,247,000	5,618,000	6,020,000	6,454,000
3.0	5,504,000	5,885,000	6,297,000	6,742,000	7,224,000	7,745,000
3.5	6,421,000	6,866,000	7,346,000	7,865,000	8,428,000	9,036,000
4.0	7,339,000	7,846,000	8,395,000	8,989,000	9,631,000	10,327,000

Table 6-16: Sensitivity analysis of traffic volumes at counting station 19224

Traffic Growth rate (%)	Equivalent 80 kN factor					
	1.0	1.5	2.0	2.5	3.0	3.5
2.0	2,341,000	3,512,000	4,682,000	5,852,000	7,023,000	8,193,000
2.5	**2,519,000**	**3,778,000**	**5,038,000**	**6,297,000**	**7,556,000**	**8,816,000**
3.0	2,712,000	4,068,000	5,424,000	6,780,000	8,136,000	9,492,000
3.5	**2,922,000**	**4,383,000**	**5,844,000**	**7,305,000**	**8,765,000**	**10,226,000**
4.0	3,150,000	4,725,000	6,300,000	7,875,000	9,450,000	11,025,000

Table 6-17: Sensitivity analysis of traffic volumes at counting station 19027

Traffic Growth rate (%)	Equivalent 80 kN factor					
	1.0	1.5	2.0	2.5	3.0	3.5
2.0	2,673,000	4,010,000	5,346,000	6,683,000	8,019,000	9,355,000
2.5	2,862,000	4,293,000	5,724,000	7,155,000	8,586,000	10,017,000
3.0	3,067,000	4,600,000	6,133,000	7,667,000	9,200,000	10,733,000
3.5	3,288,000	4,932,000	6,576,000	8,220,000	9,864,000	11,508,000
4.0	3,528,000	5,292,000	7,055,000	8,819,000	10,583,000	12,347,000

As highlighted in the assessment report additional traffic data was obtained and was used to determine the specific estimated design traffic per uniform section, refer to the next section.

6.12.4 Estimated design traffic loading per uniform section

The base year traffic volumes established in section 6.3 were used to determine the base year traffic loading for the various road segments together with the following parameters:

- LEF = 2.5 E80's per heavy vehicle;
- 50 / 50 directional split in heavy vehicle traffic;
- Realistic heavy vehicle growth rate = 2.0 %
- Based on the heavy vehicle percentage split ranging between 12-17%, 15% was adopted

The cumulative forecasted growth from the base year traffic yields the total estimated design traffic loading over the structural design period as depicted in Table 6-18.

Table 6-18: Classification of traffic loading for the project road sub-sections

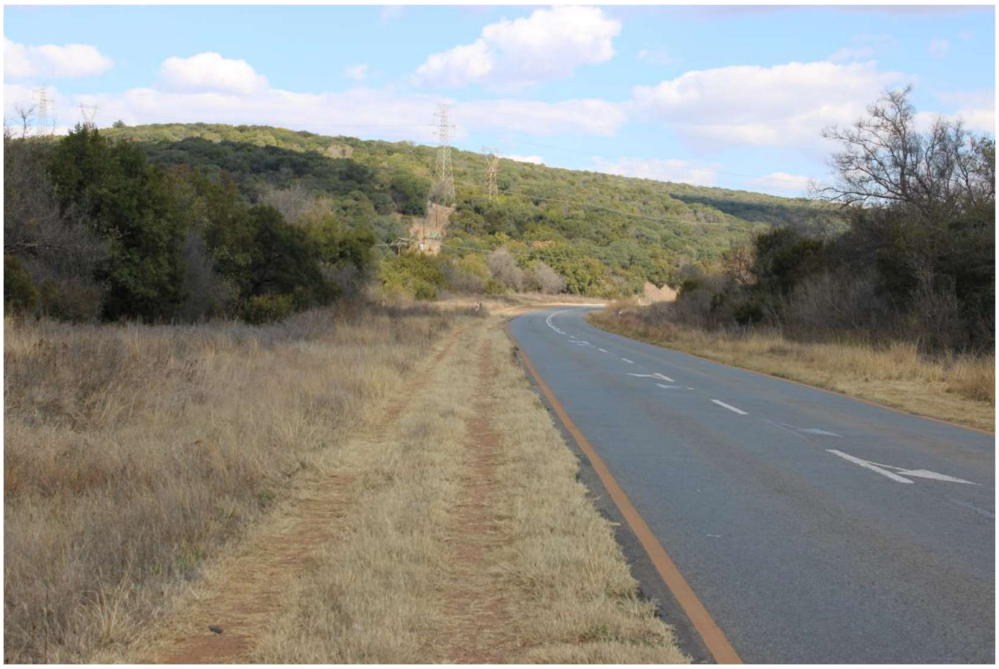
Sub-Section	km		ADT	ADT / Lane	ADTT	AADTT	MESA	Traffic Class
Ventersdorp & Intersection 1	29.00	32.26	1586	793	127	46,312	3.3	ES10
1 & 2	32.26	36.56	1599	799.5	128	46,691	3.6	ES10
2 & 3	36.56	36.75	1334	667	107	38,953	3.0	ES3

Sub-Section	km		ADT	ADT / Lane	ADTT	AADTT	MESA	Traffic Class
3 & 4	36.75	42.45	1600	800	128	46,720	3.6	ES10
4 & 5	42.45	43.55	1914	957	154	55,889	4.0	ES10
5 & 6	43.55	51.13	1993	997	160	58,196	4.2	ES10
6 & 11	51.13	52.19	2681	1341	215	78,286	5.6	ES10
11 & 12	52.19	55.04	2975	1488	238	86,870	6.2	ES10
12 & 13	55.04	61.32	2631	1316	211	76,826	5.5	ES10
13 & 14	61.32	65.99	2624	1312	210	76,621	5.5	ES10
After intersection 14	65.99	76.00	2853	1427	229	83,308	6.0	ES10

Based on the information presented in Table 6-18 the traffic class of the road generally falls within an ES10 pavement class. The specific traffic class per uniform section is as follows:

- Uniform Section 1 (km 29.00 to 51.80) – 4.2 MESA
- Uniform Section 2 (km 51.80 to 61.80) – 6.2 MESA
- Uniform Section 3 (km 61.80 to 72.10) – 5.5 MESA
- Uniform Section 4 (km 72.10 to 76.00) – 6.0 MESA

CIVIL AVIATION COMPLIANCE STATEMENT: FOR THE PROPOSED UPGRADE OF NATIONAL ROAD R30 SECTION 9 FROM (GOEDGEVONDEN) KM 29 TO R24 (OLIFANTSNEK) KM 76.6, THREE BRIDGES AND SEVEN MAJOR CULVERTS, IN THE NORTHWEST PROVINCE WITHIN THE BOJANALA MUNICIPALITY, IN KGETLENGRIVIER LOCAL MUNICIPALITY AND RUSTENBURG LOCAL MUNICIPALITY



Report prepared by:	**Report Prepared for:**
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January 2026

CIVIL AVIATION COMPLIANCE STATEMENT

THE PROPOSED UPGRADE OF NATIONAL ROAD R30 SECTION 9 FROM (GOEDGEVONDEN) KM 29 TO R24 (OLIFANTSNEK) KM 76.6, THREE BRIDGES AND SEVEN MAJOR CULVERTS, IN THE NORTHWEST PROVINCE WITHIN THE BOJANALA MUNICIPALITY, IN KGETLENGRIVIER LOCAL MUNICIPALITY AND RUSTENBURG LOCAL MUNICIPALITY.

This compliance statement is applicable for the upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6). The starting position is near the intersection of the R30 and Road D826 at Goedgevonden in the Kgetlengrivier Local Municipality. The end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality in Northwest Province. This compliance statement has been prepared by the registered Environmental Assessment Practitioner (EAP) for the project.

The sensitivity rating for the site is as follows:

Table 1: Identified sensitivity in terms of the national web-based screening tool for the development

Identified Specialist Assessment	Identified Sensitivity		Comment
	By DFFE Screening Report	By EAP	
Civil Aviation Assessment	High Sensitivity	Low Sensitivity	Dangerous and restricted airspace as demarcated

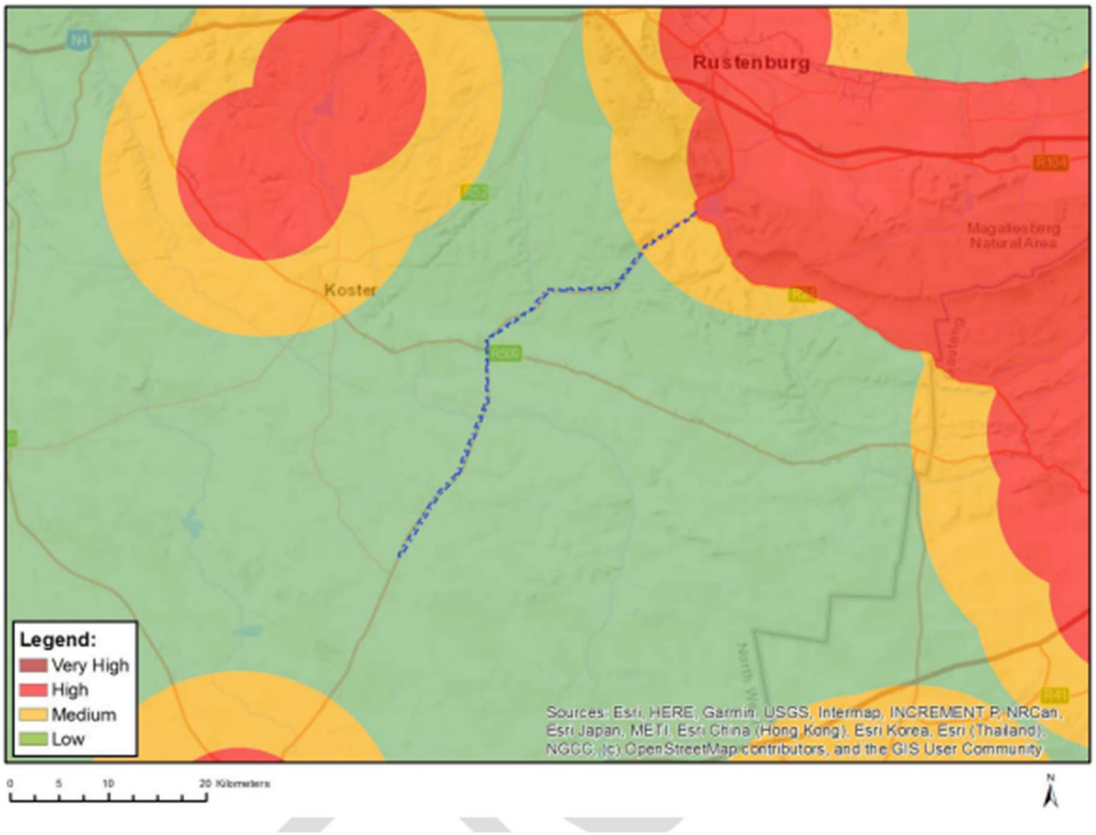


Figure 1: Map of Relative Aviation Theme Sensitivity

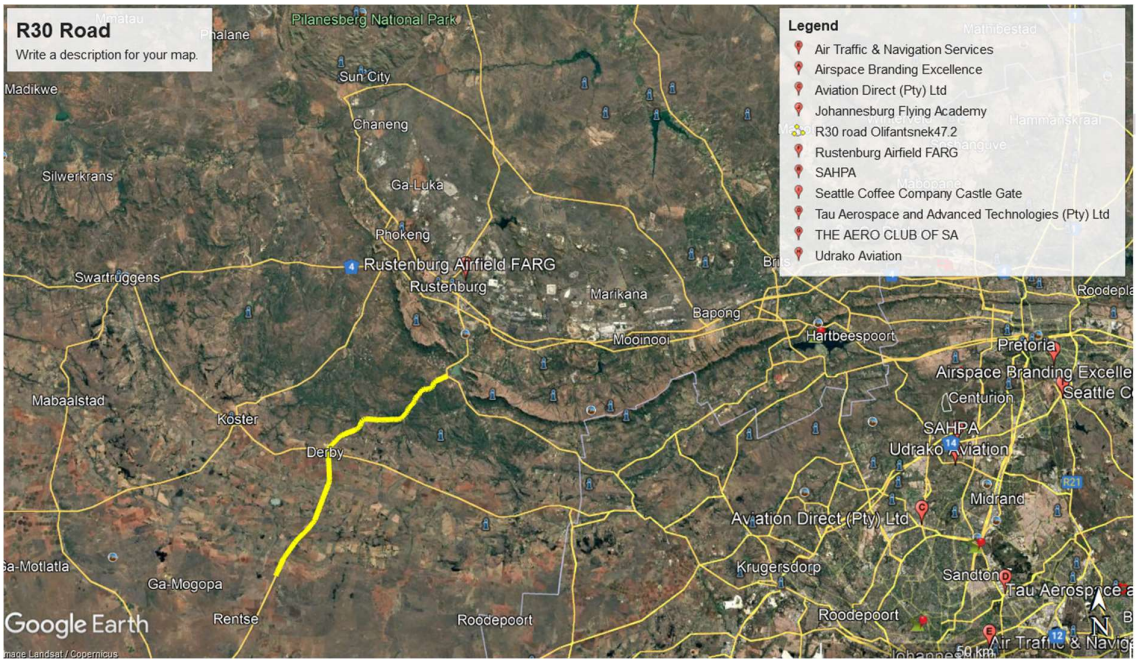


Figure 2: Map showing Airfields around

A high sensitivity rating has been indicated by the DFFE screening tool due to the proximity to a Dangerous and restricted airspace as demarcated. This indicates a low potential for negative impacts on

the civil aviation installation, and a high potential for mitigation of impacts. The R30 is located far from the airfields. The proposed R30 road upgrade is a linear project that will occur on existing road reserves. The proposed will not affect major civil aviation aerodrome and aviation radar structures. This theme is therefore rated low by the EAP. A Civil Aviation Compliance Statement will however be compiled by the EAP and will also be submitted to South African Civil Aviation Authority (SACAA) for comments. The proposed development would, however, not negatively affect any civil activity at the landing strip given that:

- The proposed development will not comprise any telecommunication structures that may have potential to interfere with navigation / communication

The proposed development will not have an unacceptable impact on the airfield. No further investigation of this theme is deemed necessary during the EIA process.

During the public participation for the EA Application, the South African Civil Aviation Authority (SACAA) will be consulted and invited to comments on the project.

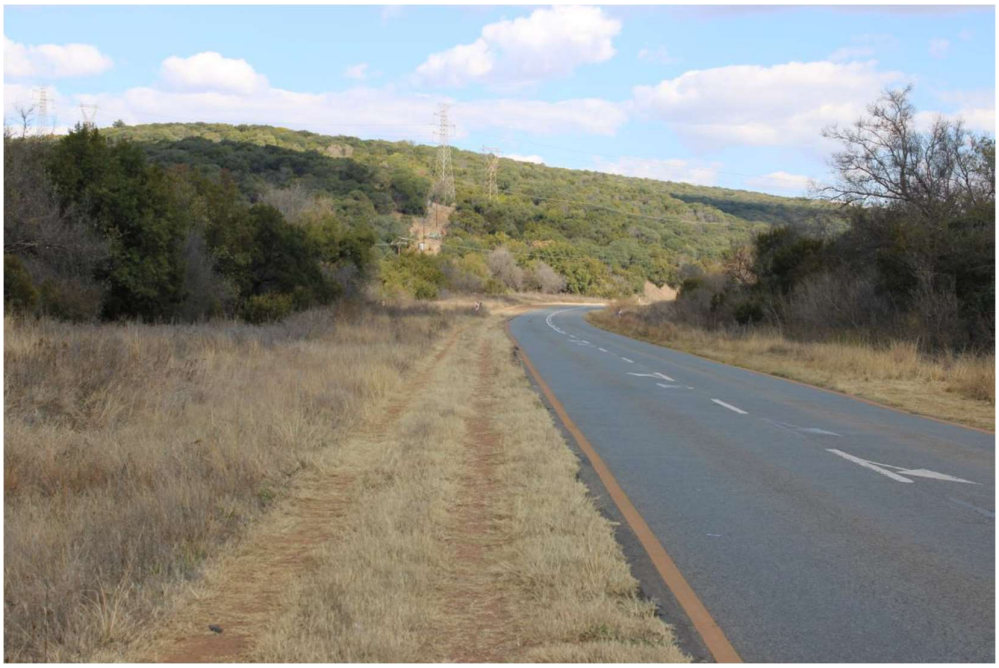
Drafted by EAP



Amukelani Khosa

EAPASA REG No: 2022/4943

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME PROPOSED UPGRADE OF NATIONAL ROAD R30 SECTION 9 FROM (GOEDGEVONDEN) KM 29 TO R24 (OLIFANTSNEK) KM 76.6, THREE BRIDGES AND SEVEN MAJOR CULVERTS, IN THE NORTHWEST PROVINCE WITHIN THE BOJANALA, IN KGETLENGRIVIER LOCAL MUNICIPALITY AND RUSTENBURG LOCAL MUNICIPALITY.



Report prepared by: Consultants: Earthlink Environmental Services Tel: 071 878 8295 Email: kgakile@earthlinkenvironmental.co.za	Report Prepared for: Zutari On Behalf of: The South African National Roads Agency SOC Ltd
Earthlink Environmental Services In rhythm with nature	ZUTARI IMPACT. ENGINEERED. SANRAL SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD

January 2026

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APPLICANT: SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD (SANRAL)

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ABBREVIATIONS

BA	**Basic Assessment**

BAR	**Basic Assessment Report**
DEAT	**Department of Environmental Affairs and Tourism**
DWS	**Department of Water and Sanitation**
EA	**Environmental Authorisation**
EAP	**Environmental Assessment Practitioner**
EIA	**Environmental Impact Assessment**
ECO	**Environmental Control Officer**
EMPr	**Environmental Management Programme**
EO	**Environmental Officer**
GA	**General Authorisation**
GNR	**Government Notice Regulation**
IEM	**Integrated Environmental Management**
NEMA	**National Environmental Management Act, 1998 (Act No. 107 of 1998)**
NWA	**National Water Act, 1998 (Act No. 36 of 1998)**
SANRAL	**South Africa National Roads Agency Soc Limited**

ABBREVIATIONS

Contractor	The main contractor as engaged by SANRAL for the construction of the subject infrastructure, including all Subcontractors and service provides appointed by the main contractor of his own volition for the execution of parts of the Works. “Contractor” also includes any other contractor engaged by SANRAL directly in connection with any part of the construction operations, which is not a nominated sub-contractor to the main contractor.
Environment	Our surroundings, including living and non-living elements, e.g. land, soil, plants, animals, air, water and humans. The environment also refers to our social and economic surroundings, and our effect on our surroundings.
Environmental Control Officer	A person who is responsible for the monitoring of the implementation of the requirements of Environmental Authorisation (EA) and Environmental Management Programme (EMPr).
Environmental Officer	A person who is responsible for the implementation of the requirements of EA and EMPr.
Environmental Impact	An environmental change caused by some human act.
Environmental Impact Assessment (EIA)	An EIA refers to the process of identifying, predicting, and assessing the potential positive and negative social, economic and biophysical impacts of a proposed development. The EIA includes an evaluation of alternatives; recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts; as well as proposed monitoring measures.
Impact	A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.
Indigenous species	Plants and animals that are naturally found in an area.
Integrated Environmental Management (IEM)	A way of managing the environment by including environmental factors in all stages of development. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed developments.
Method Statement	Setting out in detail how the management actions contained in an EMPr will be implemented, in order to ensure that the environmental objectives are achieved.
Mitigation	Measures designed to avoid, reduce or remedy adverse impacts.

Proponent.	Developer. Entity which applies for environmental approval and is ultimately accountable for compliance to conditions stipulated in the EA and requirements of the EMPr.

SECTION 1: INTRODUCTION

1-1 BACKGROUND INFORMATION

South African National Road Agency SOC Limited (SANRAL) proposes to upgrade Road R30 section 9, between Goedgevonden (km 29) and Olifantsnek (km 76.6). The starting position is near the intersection of the R30 and Road D826 at Goedgevonden in the Kgetlengrivier Local Municipality. The end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality. Road R30 is currently a single-carriageway road with one (1) lane per direction. The road cross-section varies considerably, with gravel shoulders provided up to km 63.000 and surfaced shoulders predominantly thereafter.

The project is aimed at improving the road geometry by adding surfaced shoulders and rehabilitating the existing pavement structure to enable it to carry a 20 year design traffic load.

The major aspects of this project include the following:

- Increasing road reserve width from 32 m to 50m
- Strengthening the existing pavement
- General widening of the existing road cross section for climbing lanes and 2.5m surfaced shoulders
- Substantial vertical and horizontal geometric improvements
- Widening of river bridge and some major and minor culverts
- Widening of the existing agricultural underpass
- Possible horizontal re-alignment of the road between Km 77 to 78 and Km 95 to 97
- Possible 6.5m wide temporary deviation to accommodate two-way traffic during construction.
- Opening of one hard-rock quarry and re-entry into 6 potential borrow pits
- Stockpile areas and vegetation clearance outside road reserve in excess of one hectare.

Table 1: Coordinates of the Road.

Start Point	Middle Point	End Point
26^0 05' 31.47" S; 26^0 57' 43.55" E	25^0 54' 21.10"S; 27^0 2' 44.12"E	25^0 48' 07.38"S; 27^0 14' 16.14"E

Structures Along the National Road R30 to be upgraded:

Three Bridges Along the R30 Road:

- Bridge B2230 Jameson underpass (km 51.281): Length= 30.4m
- Bridge B2920 (km 51.433) Derby Road over rail bridge: Length=22.8m
- Bridge B2147 (Km 71.89) over the commissiedrift Tributary: Length=15.2m

Bridge B2230 and Bridge B2920 will be widened to accommodate the new cross section, while Bridge B2147 will have to be replaced due to its hydraulic capacity.

Table 2: Coordinates of Bridges

Bridge Name	Coordinates
Bridge B2230 Jameson underpass (km 51.281): Length= 30.4m	25^0 54' 44.98"S; 27^0 2' 44.10"E
Bridge B2920 (km 51.433) Derby Road over rail bridge: Length=22.8m	25^0 54' 39.29"S; 27^0 2' 44.15"E
Bridge B2147 (Km 71.89) over the commissiedrift Tributary: Length=15.2m	25^0 49' 13.88"S; 27^0 12' 1.13"E

There are also seven (7) major drainage culverts located at regular intervals along the route. Six (6) structures will be widened to accommodate the new cross section while one structure will have to be replaced.

Table 3: Coordinates of Culverts

Culverts	Coordinates
C0451	25^0 58' 9.44"S; 27^0 2' 28.96"E
C0428	26^0 3' 14.91"S; 26^0 59' 0.06"E
C02903	26^0 3' 11.94"S; 26^0 59' 2.44"E
C0452	25^0 55' 22.07"S; 27^0 2' 46.12"E
C0453	25^0 51' 51.44"S; 27^0 7' 12.06"E
C0454	25^0 49' 57.09"S; 27^0 11' 12.10"E
C0455	25^0 48' 55.25"S; 27^0 12' 51.84"E

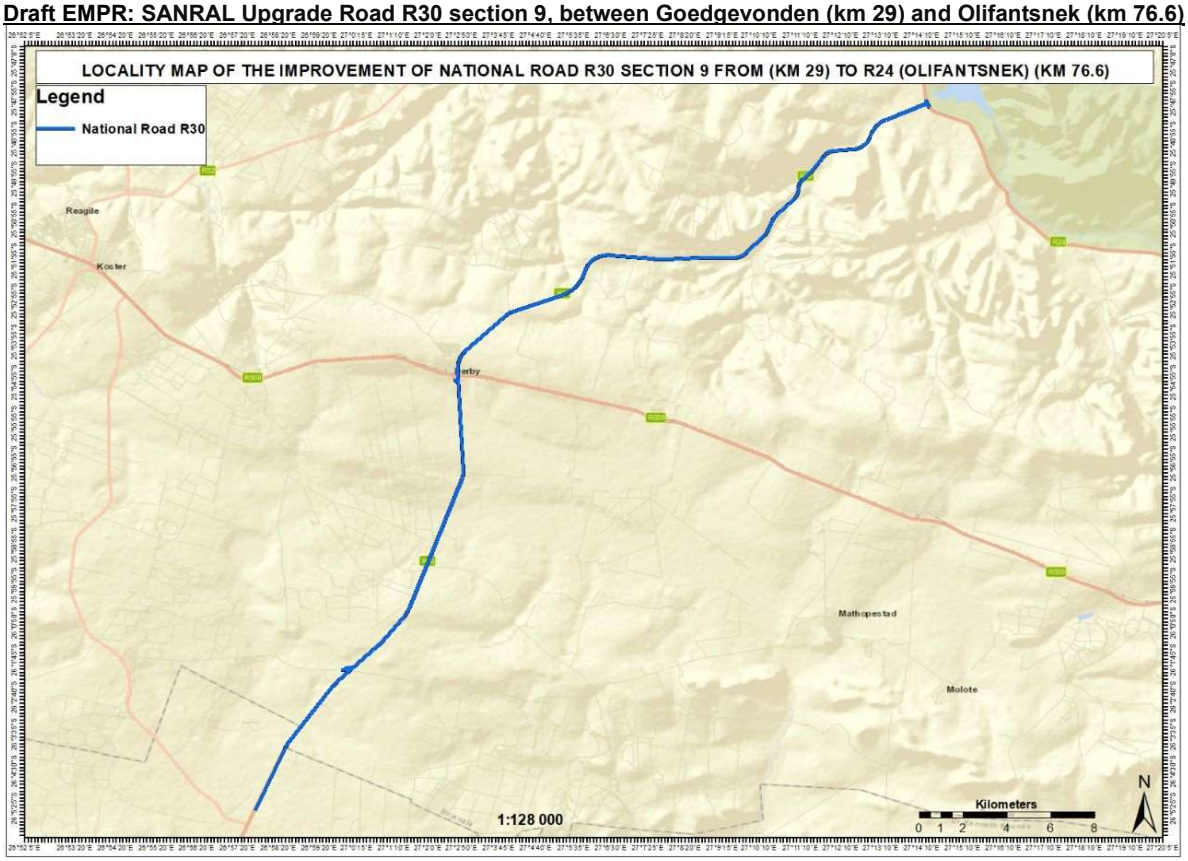


Figure 1: Locality Map of the proposed R30 road to be upgraded.

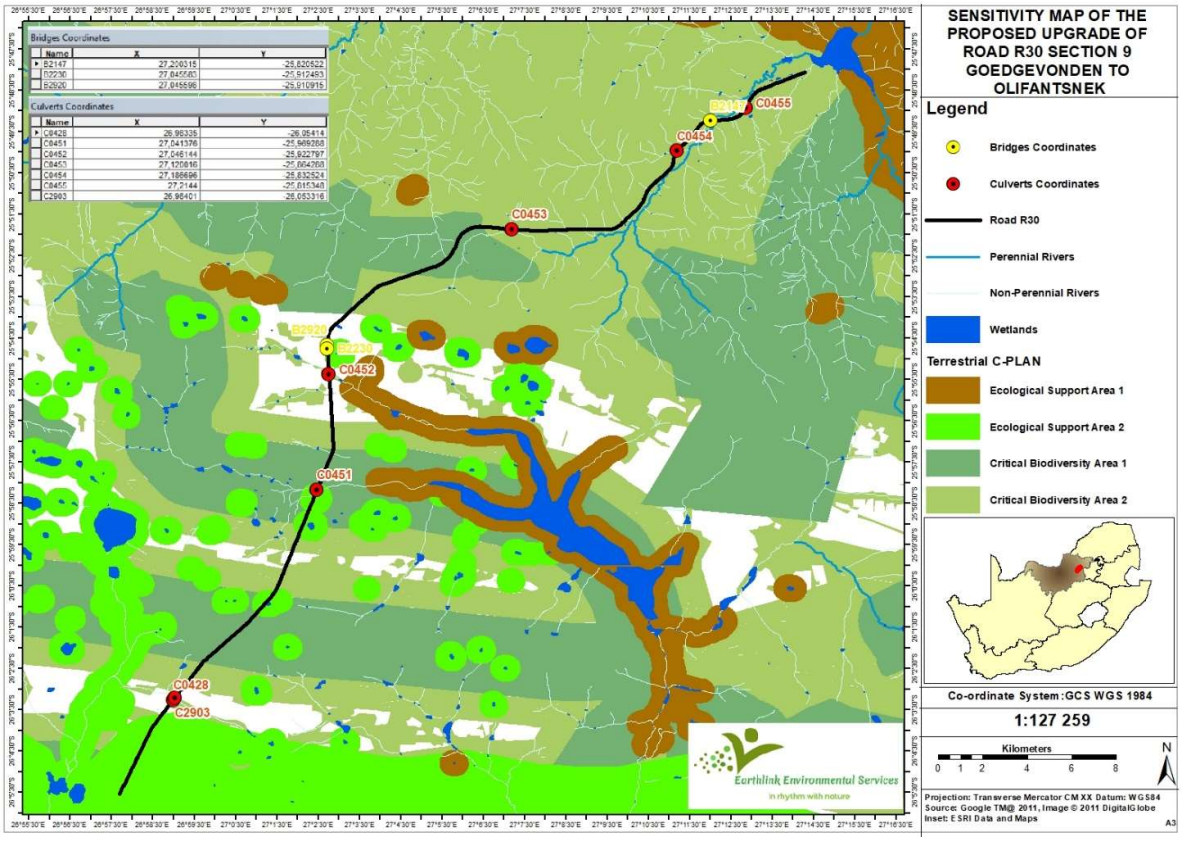


Figure 2: Sensitivity map with structures along the R30 Road

Table 4: Description of the property

Farm Name (s) and Numbers	• Vlakfontein 977 JQ • Rietfontein 372 JQ • Vlakhoek 323 JQ • Elandsfontein 366 JQ • Koperfontein 364 JQ • Middelfontein 361 JQ • Roodekloof 326 JQ • Commissiesdrift 327 JQ • Klippan 140 IP • Leliefontein 138 IP • Groenfontein 498 JP
Portion number (s)	• Portion 0 of Farm Vlakfontein • Portion 0 of Farm Rietfontein • Portion 0 of Farm Vlakhoek • Portion 0 of Farm Elandsfontein • Portion 0 of Farm Koperfontein • Portion 0 of Farm Middelfontein • Portion 0 of Farm Roodekloof • Portion 0 of Farm Commissiesdrift • Portion 0 of Farm Klippan • Portion 0 of Farm Leliefontein • Portion 0 of Farm Groenfontein
Province	• Northwest Province
District Municipality	• Bojanala District Municipality
Local Municipality	• Rustenburg Local Munucipality • Kgetlengrivier Local Municipality
Ward number/s	• Kgetlengrivier Ward 3 and 8 • Rustenburg Ward 36
Nearest town (s)	• Rustenburg and Ventersdorp

1-2 PURPOSE AND OBJECTIVES OF THE EMPR

This Environmental Management Programme (EMPr) has been compiled in terms of generally acceptable environmental practices and policies.

1-2.1 Purpose of the Environmental Management Programme

The EMPr has been compiled to provide recommendations and guidelines in order to minimise the environmental impacts during the construction phase and should be used for compliance monitoring during the construction phase of the proposed R30 road upgrades. This EMPr informs all relevant parties of the legal requirements for the construction and operation of the R30 road which would have been upgraded, with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

This EMPr has been compiled in accordance with Appendix 4 of GNR. 982.

EMPr is defined as *"an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the project phases are prevented and that the positive benefits of the projects are enhanced". Impacts range from those incurred during start up (e.g. site clearing) and through to those incurred during the construction activities themselves (erosion, pollution of watercourses, noise, dust etc.)"*.

The purpose of this EMPr is therefore to ensure that undue or reasonably avoidable adverse impacts of the proposed road upgrades are prevented and that the positive impacts are enhanced during the road.

1-2.2 Objectives of the Environmental Management Programme

This EMPr has been compiled to provide recommendations and guidelines in order to minimise the environmental impacts during the construction phase and should be used for compliance monitoring during the construction phase of the proposed R30 road upgrades.

This EMPr informs all relevant parties [the Project Co-ordinator, the Contractor (s) and all other staff employed by SANRAL at the site as to their duties in the fulfilment of the legal requirements for the R30 road upgrades. with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

Specifically, the objectives of this EMPr can be articulated as follows:

- To give effect to the construction related requirements.
- To give effect to the environmental commitments to the various role players.
- To ensure that these requirements/ commitments are expressed in a manner that is accessible to all parties and is binding upon those responsible for project implementation.
- To ensure that sufficient resources are allocated to the project budget in order to give effect to the environmental requirements / commitments, and to ensure that the scale of EMPr-related interventions is consistent with the significance of identified impacts.
- To provide a coherent and pragmatic framework for the implementation of the requirements, ranging from the roles and responsibilities of the key project participants to the auditing and

reporting of compliance;

- To facilitate appropriate and proactive response to unforeseen events or changes in project implementation; and
- To ensure that the construction phase of the project does not result in undue or reasonably unavoidable adverse environmental impacts, and that any potential environmental benefits are enhanced.

The EMPr is compiled in accordance with the Integrated Environmental Management (IEM) philosophy which aims to achieve a desirable balance between conservation and development (Department of Environmental Affairs and Tourism (DEAT, 2004)). IEM is a key instrument of the NEMA. NEMA promotes the IEM of activities that may have a significant effect on the environment, while IEM prescribes a methodology for ensuring that environmental management principles are fully integrated into all stages of the development process. It advocates the use of several environmental management tools that are appropriate for the various levels of decision-making. One such tool under the NEMA Chapter 5 is an EMPr.

The IEM guidelines encourage a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

1-3 SCOPE OF THE EMPR

The scope of the EMPr must ensure that the objectives outlined above will be addressed. In order to achieve the above objectives, the scope of an EMPr should include the following:

- Definition of the environmental management objectives to be realised during the construction phase in order to enhance benefits and minimise adverse environmental impacts.
- Description of the detailed actions needed to achieve these objectives, including how they will be achieved, by whom, by when, with what resources, with what monitoring/verification, and to what target or performance level. Mechanisms must also be provided to address changes in the project implementation, emergencies or unexpected events, and the associated approval processes.
- Clarification of institutional structures, roles, communication and reporting processes required as part of the implementation of the EMPr.
- Description of the link between the EMPr and associated legislated requirements.
- Description of requirements for record keeping, reporting, review, auditing and updating of the EMPr.

The scope of the EMPr is principally determined by the key documentation related to the EIA process, notably the Draft Basic Assessment Report (BAR).

1-3.1 Structure of an EMPr

An EMPr focuses on sound environmental management practices, which should be undertaken to minimise adverse impacts on the environment through the lifetime of a development. In addition, an EMPr identifies which measures will be in place or will be actioned to manage any incidents and emergencies that may occur during all phases of the R30 road upgrades. However, this EMPr has been developed particularly for the R30 road upgrades. This EMPr provides specifications that should

be adhered to, in order to minimise adverse environmental impacts associated with the R30 road upgrades.

According to Appendix 4 of GNR. 982, as amended, an EMPr must include:

(1) An EMPr must comply with section 24N of the Act and include─

(a) details of– (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae.

(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;

(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;

(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including─ (i) planning and design; (ii) preconstruction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;

(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to — (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;

(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(i) an indication of the persons who will be responsible for the implementation of the impact management actions;

(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;

(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;

(m) an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and

(n) any specific information that may be required by the competent authority.

1-3.2 Legal Requirements

The Contractor must identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the construction phase of the project must be complied with, even during design and implementation phases.

Following are the legislation applicable to the proposed road upgrades:

- The Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996);
- National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA);
- National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PA);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM: BA);
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA);
- National Environmental Management: Waste Management Act, 2008 (Act No. 59 of 2008) (NEM: WA);
- National Water Act, 1998 (Act No. 36 of 1998) (NWA);
- National Forests Act, 1983 (Act No. 43 of 1983);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- Environment Conservation Act, 1989 (Act No. 73 of 1989) (ECA);
- National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998);
- Hazardous Substances Act, 1973 (Act No. 15 of 1973);
- National Heritage Resources Act, 1999 (Act No. 25 of 1999 (NHRA));
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA);
- National Building Regulations and Standards Act, 1977(Act No. 103 of 1977) (SABS 0400);
- National Road Traffic Act, 1996 (Act No. 93 of 1996); and
- All relevant provincial legislation, municipal by-laws and ordinances.

1-4 SPECIFICATION STRUCTURE AND APPLICATION

These specifications are not exclusive and could, within reason, be expanded on or amended at any time during the contract by the Environmental Control Officer (ECO).

1-4.1 Method statements

Environmental practitioners are not specialists with regard to construction techniques. Therefore, so as not to hinder construction activities by stipulating elaborate, costly and/ or ineffective mitigation measures, the environmental specification is underpinned by a series of Method Statements, within which the Contractor is required to outline how they propose to mitigate any identified environmental risks. For example, if the specification states that “cement contaminated water shall not be allowed to

contaminate the soil or adjacent watercourse", the Method Statement compiled by the Contractor would be required to outline how he or she intends to achieve this requirement.

In terms of the environmental specifications for the proposed project, the Contractors must submit various written Method Statements to the Engineer and ECO as requested in the Specification. For the purposes of the environmental specifications, a Method Statement is defined as "a written submission by the Contractor to the Engineer in response to the Specification or a request by the Engineer, setting out the materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting the Method Statement, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- Construction procedures;
- Materials and equipment to be used;
- Getting the equipment to and from site;
- How the equipment/ material will be moved while on site;
- How and where material will be stored;
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- Timing and location of activities;
- Compliance/ non-compliance with the Specifications; and
- Any other information deemed necessary by the Engineer.

The environmental specifications set very stringent requirements in terms of the provision of Method Statements and the commencement of the activities they cover:

- Any Method Statement required by the Engineer or the specification must be produced within the timeframes specified by the Engineer or the specification (typically two weeks);
- The Contractor may not commence the activity covered by the Method Statement until it has been approved, except in the case of emergency activities and then only with the consent of the Engineer;
- The Engineer may require changes to a Method Statement if the proposal does not comply with the specification or if the proposed methodology carries an unreasonable risk of excessive damage to the environment;
- Approved Method Statements must be readily available on the site and must be communicated to all relevant personnel;
- The Contractor is required to carry out the activities covered by the Method Statement in accordance with the proposed approach; and
- Approval of the Method Statement does not absolve the Contractor from their obligations or responsibilities in terms of the Contract.

The following specific method statements must be drawn up as part of this EMPr:

- Emergency spills, accidental leaks and fire procedures;
- Cement and concrete batching;
- Management of hazardous materials (including oils and chemicals);

- Solid waste management;
- Dust control management;
- Crew camps and construction lay down areas;
- Handling of stockpiles;
- Clearance of vegetation during construction

1-4.2 Site documentation

The following is a list of documentation that must be held on site and must be made available to the ECO on request:

- This EMPr;
- Site daily diary / instruction book / incident reports with incident registers;
- Copies of Environmental Officer (EO) and ECO reports (management and monitoring);
- Complaints register; and
- Method statements.

1-4.3 Pro forma documentation

1-4.3.1 Prior to the commencement of upgrading activities

The following pro forma documentation are to be filled out and is binding to the EMPr and project contract and includes *inter alia*:

- Declaration of understanding by the Proponent;
- Declaration of understanding by the Engineer;
- Declaration of understanding by the Contractor;
- Method statements; and
- ECO / Engineer approval for method statements.

1-4.3.2 During construction activities

The following attached pro forma documentation are to be filled out and maintained. These are binding to the EMPr and project contract. They include *inter alia*:

- Amended Method Statements;
- ECO / Engineer approval for amended method statements;
- Environmental incidents; and

SECTION 2: ON-SITE IMPLEMENTATION

The implementation of the impact management actions and an indication of the persons who will be responsible for the implementation of the impact management actions.

This EMPr is specifically compiled for the period of time prior to commencement of, and activities associated with road upgrades of the above-mentioned activities.

1-5 ENVIRONMENTAL ROLES AND RESPONSIBILITIES

In order for the EMPr to be successfully implemented, all the role players involved in the project need to co-operate. Role players must clearly understand their roles and responsibilities in the project. They must also be professional, form respectful and transparent relationships, and maintain open lines of communication.

1-5.1 South African National Roads Agency Soc Ltd (SANRAL)

SANRAL has the overall accountability and responsibility for environmental management during the construction and maintenance of the R30 road. Further it is their responsibility to ensure that the conditions of the relevant licenses and the mitigation measures in this EMPr are communicated to, implemented and complied with by the Contractors.

During construction Designated Environmental Officer, will be responsible for:

- Ensuring all conditions of the approvals / licences and EMPr are adhered to.
- Implementing actions to be taken in the event of incidents or public complaints.
- Distribution of copies of the EMPr to the project team, including Contractors and Sub-Contractors.
- Ensuring that measures are taken to address any problems in the implementation of the EMPr.
- Commenting on Method Statements submitted by the Contractors.
- Ensuring any on-site monitoring reports are completed timeously and that the audit results are communicated to all relevant personnel.

1-5.2 Consulting Engineers

SANRAL will appoint Consulting Engineers who will fulfil the role of Project Co- Coordinator/ Project Managers on behalf of SANRAL.

Consulting Engineers will be responsible and accountable for ensuring that all parties involved in the implementation of the standing EMPr are compliant. The Consulting Engineers will therefore be responsible for overall management of project and EMPr implementation. The following tasks will fall within their responsibilities:

- Be familiar with the recommendations and mitigation measures of this EMPr and implement these measures.
- Monitor site activities on a regular basis for compliance.
- Conduct internal audits of the construction site against the EMPr.
- Confine the construction site to the demarcated area.

- Rectify transgressions through the implementation of corrective action.

The Consulting Engineers will also have ability to issue site instructions and in some instances, variation orders to the contractor.

They will also be responsible for the appointment of an Environmental Officer (EO) who will be responsible for monitoring all the contractors' activities on site for compliance with the EMPr.

The Consulting Engineers will ensure that there is always a representative on site (Engineer Representative) who will fulfil their duties in their absence.

1-5.3 Environmental Control Officer (To be appointed by SANRAL)

The ECO will be independently appointed by SANRAL. The ECO will be expected to be present on site prior to any site establishment.

The ECO will be responsible for the following:

- Conduct regular site visits to be able to report on compliance to relevant environmental legislation and respond to any environmental issues;
- Report compliance and non-compliance issues to SANRAL;
- Advise the Contractor on environmental issues within the defined work areas;
- Review access and incidents records that may pertain to the environment and reconcile the entries with the observations made during site inspection, monitoring and auditing;
- Recommend corrective action when required for aspects of noncompliance with the EMPr; and
- Take immediate action on site where clearly defined and agreed "no-go" areas are violated or in danger of being violated and to inform SANRAL of the occurrence immediately and to take action.

1-5.4 Contractor

The Contractor will be responsible for the overall execution of the activities during construction phase including the implementation and compliance with recommendations and conditions of the EMPr. The Contractor must therefore ensure compliance with the EMPr at all times and maintain an environmental register which keeps a record of all environmental incidents which occur on the site during construction. The Contractor is also responsible for the implementation of corrective actions issued by the ECO and SANRAL within a reasonable or agreed period of time.

1-5.5 The Authorities

The authorities that should be involved include the DFFE. The authorities may be required to perform the following roles:

- Review Monitoring and Audit reports, if required;
- Review whether there is compliance by the Applicant and Contractor with the terms of the EMPr and permit/license conditions. Whenever necessary, the authorities should assist the Applicant in understanding and meeting the specified requirements; and
- The authorities may perform random controls to check compliance. In case of persistent non-compliance, the Applicant will be required to provide an action plan with corrective measures,

and have it approved by the authorities.

1-5.6 Project Environmental Contact Details

Proponent: SANRAL	
Ms. Mirriam Mosia Regional Manager mosiam@nra.co.za 38 Ida Street, Menlo Park, Pretoria, Gauteng, 0081, South Africa 012 426 6200/081 013 2534	SANRAL SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD Reg.No.1998/009584/30
Consulting Engineers	

Environmental Control Officer: Earthlink Environmental Services	
Ms. Kgakile Mapaulo Project Manager kgakile@earthlinkenvironmental.co.za 572 24th Rd, Withok Estates, Brakpan, 1541 071 878 8295	Earthlink Environmental Services In rhythm with nature
Contractor	
Not Appointed yet.	
Post Construction: SANRAL	
Ms. Mirriam Mosia Regional Manager mosiam@nra.co.za 38 Ida Street, Menlo Park, Pretoria, Gauteng, 0081, South Africa 012 426 6200/ 081 013 2534	SANRAL SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD Reg.No.1998/009584/30

The method of monitoring the implementation of the impact management actions

The frequency of monitoring the implementation of the impact management actions

The time periods within which the impact management actions must be implemented

The Contractor should ensure that his/ her employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations.

Awareness training programmes should be targeted at all levels of employment.

The ECO must conduct regular audits. The audits are to verify the projects compliance with the EMPr and conditions of the EA. Monthly audits must be undertaken until the end of the construction phase and then every 2 months for the rehabilitation phase if so required.

Before any upgrade and rehabilitation activities commence, the appointed independent ECO must first compile a checklist based on the contents of this EMPr and conditions of the EA and communicate it to SANRAL. The ECO must at the request of the DFFE forward audit reports to the Department at a frequency determined by the DFFE, which must be stipulated in the EA.

As per GNR. 326 of the EIA Regulations 2014, as amended, Regulation 34.

(1) The holder of an environmental authorisation must, for the period during which the environmental authorisation and EMPr, and where applicable the closure plan, remain valid—

(a) ensure that the compliance with the conditions of the environmental authorisation and the EMPr, and where applicable the closure plan, is audited; and

(b) submit an environmental audit report to the relevant competent authority.

(2) The environmental audit report contemplated in sub regulation (1) must—

(a) be prepared by an independent person with the relevant environmental auditing expertise.

(b) provide verifiable findings, in a structured and systematic manner, on (i) the level of performance against and compliance of an organisation or project with the provisions of the requisite environmental authorisation or EMPr and, where applicable, the closure plan; and (ii) the ability of the measures contained in the EMPr, and where applicable the closure plan, to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity;

(c) contain the information set out in Appendix 7; and

(d) be conducted and submitted to the competent authority at intervals as indicated in the environmental authorisation.

(3) The environmental audit report contemplated in subregulation (1) must determine—

(a) the ability of the EMPr, and where applicable the closure plan, to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis and to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and

(b) the level of compliance with the provisions of environmental authorisation, EMPr and where applicable, the closure plan.

(4) Where the findings of the environmental audit report contemplated in subregulation (1) indicate—

(a) insufficient mitigation of environmental impacts associated with the undertaking of the activity; or

(b) insufficient levels of compliance with the environmental authorisation or EMPr and, where applicable the closure plan; the holder must, when submitting the environmental audit report to the competent authority in terms of subregulation (1), submit recommendations to amend the EMPr or closure plan in order to rectify the shortcomings identified in the environmental audit report.

(5) When submitting recommendations in terms of subregulation (4), such recommendations must have been subjected to a public participation process, which process has been agreed to by the competent authority and was appropriate to bring the proposed amendment of the EMPr and, where applicable the closure plan, to the attention of potential and registered interested and affected parties, including organs of state which have jurisdiction in respect of any aspect of the relevant activity and the competent authority, for approval by the competent authority.

(6) Within 7 days of the date of submission of an environmental audit report to the competent authority, the holder of an environmental authorisation must notify all potential and registered interested and affected parties of the submission of that report, and make such report immediately available—

(a) to anyone on request; and

(b) on a publicly accessible website, where the holder has such a website.

(7) An environmental audit report must contain all information set out in Appendix 7 to these Regulations.

Appendix 7 of GNR 326 provides with the objectives of the environmental audit report, and are as follows:

(a) report on—(i) the level of compliance with the conditions of the environmental authorisation and the EMPr, and where applicable, the closure plan; and (ii) the extent to which the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan achieve the objectives and outcomes of the EMPr, and closure plan;

(b) identify and assess any new impacts and risks as a result of undertaking the activity;

(c) evaluate the effectiveness of the EMPr, and where applicable, the closure plan;

(d) identify shortcomings in the EMPr, and where applicable, the closure plan; and

(e) identify the need for any changes to the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan.

Content of environmental audit reports

(1) An environmental audit report prepared in terms of these Regulations must contain—

(a) details of the—(i) independent person who prepared the environmental audit report; and (ii) expertise of the independent person that compiled the environmental audit report;

(b) a declaration that the independent auditor is independent in a form as may be specified by the competent authority.

(c) an indication of the scope of, and the purpose for which, the environmental audit report was prepared;

(d) a description of the methodology adopted in preparing the environmental audit report;

(e) an indication of the ability of the EMPr, and where applicable, the closure plan to— (i) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis; (ii) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and (iii) ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;

(f) a description of any assumptions made, and any uncertainties or gaps in knowledge;

(g) a description of any consultation process that was undertaken during the course of carrying out the environmental audit report;

(h) a summary and copies of any comments that were received during any consultation process; and

(i) any other information requested by the competent authority.

1-6 NON-COMPLIANCE

The mechanism for monitoring compliance with the impact management actions

A copy of the EMPr must be kept on site at all times during the road upgrade period. The EMPr will be binding on all contractors operating on the site and must be included within the Contractual Clauses.

In terms of the Section 28 of the NEMA, *"those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (The 'polluter pays' principle)".*

The Contractors should act immediately when notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment should be recorded in a dedicated register and the response noted with the date and action taken.

It is recommended that the Contractor institute penalties through internal measures, such as issuing warnings, conducting re-training, removing repeat offenders from site, and implementing wage deductions where appropriate.

In addition, the Environmental Control Officer (ECO), through external audits, may report non-compliance to the DFFE.

These measures apply to the following less serious violations, as well as any others identified during the course of the works, as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere except at designated facilities.

1-6.1 Provisions for addressing non-conformance.

Ultimately, the key to effective environmental management during the construction phase is ensuring that the requirements of the EMPr are adequately and appropriately implemented on site. Accordingly, monitoring performance and addressing non-compliance are key attributes of any environmental interventions.

The Contractor is deemed NOT to have complied with the EMPr if:

- Within the boundaries of the site there is evidence of contravention of the EMPr confirmed and verified by the ECO;
- Environmental damage ensues due to non-compliance of EMPr requirements;
- The Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time, and
- The Contractor fails to respond to complaints to the satisfaction of the complainant in line with requirements of this EMPr which could lead to a fine

The cost to be incurred to rectify non-compliances must be incurred by the Contractor ("The polluter's pays principle".

1-6.2 Emergency Preparedness

The Contractor should compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the construction period. Such activities may include, *inter alia*:

- Accidental discharges of polluting substances to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental fires.
- Accidental spillage of hazardous substances.
- Accidental toxic emissions into the air.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans should include:

- Emergency organisation and responsibilities, accountability and liability.
- A list of key personnel and contact details.
- Details of emergency services available (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

1-6.3 Administration

Before the Contractor begins the upgrade activities, the Contractor should give to the ECO a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of impacted environment.

The Contractor may provide such information in advance of any or all upgrade activities provided that new submissions are given to the ECO whenever there is a change or variation to the original.

The ECO may provide comment on the methodology and procedures proposed by the Contractor but he will not be responsible for the Contractor's chosen measures of impact mitigation and emergency/disaster management systems.

1-6.4 House Keeping

The Contractor should undertake "good housekeeping" practices during upgrade. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods to include the care for and preservation of the environment within which the construction is situated.

1-6.5 Record Keeping

The ECO will continuously monitor the Contractor's adherence to the approved impact prevention procedures and the ECO should issue to the Contractor a notice of non-compliance whenever transgressions are observed. The ECO should document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance should be documented and reported to SANRAL in a monthly report.

1-6.6 Document Control

The Contractor will be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.
- Every document should identify the personnel and their positions, who was responsible for drafting and compiling the document, who reviewed and recommended approval, and who finally approved the document for distribution.
- All documents should be dated, provided with a revision number and reference number,

filed systematically, and retained for a five-year period.

The Contractor should ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMPr are performed. All documents must be made available to the ECO and other independent external auditors.

An environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work; and risks must be dealt with in order to avoid pollution or the degradation of the environment.

1-7 AWARENESS TRAINING

Contractors should ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations.

An ECO may be contracted to provide training and to ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMPr.

The environmental training should, as a minimum, include the following:

- Environmental legal requirements and obligations.
- The importance of conformance with all environmental policies.
- The environmental impacts, actual or potential, of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures.
- The mitigation measures required to be implemented when carrying out their work activities.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the construction of main access roads, approach roads or construction camps.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.

The EO will be responsible for ensuring that everyone on site is given an environmental awareness induction which outlines the requirements of the EMPr as a management tool to protect the environment.

SECTION 3: ENVIRONMENTAL MANAGEMENT MEASURES

The point of departure for this EMPr is to ensure a pro-active rather than re-active approach to environmental performance by addressing potential problems before they occur. This will limit corrective measures needed during the construction phase of the project. Therefore, the purpose of an EMPr is to provide management measures that must be implemented by the Proponent, Engineers and Contractors to ensure that the potential impacts of the proposed development are minimised. It must also be ensured that the EMPr is maintained and upheld as a dynamic document in order for the project team to add or improve on issues that might be considered left out or not relevant to the project. In such instances, the approving authority may authorise the ECO to make such changes.

The sections below form the core mitigation measures appropriate to the **pre-construction, construction and operational phases.**

3.1. Pre-construction phase

Table 5: Pre-construction Phase

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
PHASE OF THE DEVELOPMENT: PRE-CONSTRUCTION PHASE				
Legal and policy compliance	All necessary authorisations, permits and licenses must be obtained for the implementation of the activity.	• The development must comply with relevant legislation (municipal by-laws etc.). • All applications for licences in respect of protected trees must be obtained from the relevant authority • WUA must be obtained from the DWS. • Mining Permits must be obtained from DMRE	Proponent/ Developer	To be undertaken prior to the start of construction phase. Once- off
Preparation of Method Statements	To control methods of works on site	• Relevant Method Statements must be compiled by the Contractor and adhered to by relevant project team members.	Contractor	Once-off
General	To prevent environmental degradation through educating the construction team	• An environmental incident management reporting procedure must be implemented. • Every effort should be made to avoid potential impacts on the environment.	Developer/ contractor	Once- off

3.2. Construction Phase

Table 6: Construction Phase

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
• PHASE OF THE DEVELOPMENT: CONSTRUCTION PHASE				
Dangerous and toxic materials	• Prevention of pollution of soil and ground water	• Materials such as fuel, oil, paint, herbicide and insecticides must be sealed and stored in caged areas or under lock and key, as appropriate, in well-ventilated areas.	Contractor and ECO	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	resources • Minimise chances of transgression of the acts controlling pollution and ensure safety of workers.	• Sufficient care must be taken when handling these materials to prevent pollution. Training on the handling of dangerous and toxic materials must be conducted for all staff prior to the commencement of construction. • Storage areas must display the required safety signs depicting "no smoking", No naked lights" and "Danger" containers must be clearly marked to indicate contents as well as safety requirements. • The contractor must supply a method statement for the storage of hazardous materials at tender stage. • All pollutants on site, including waste materials and construction debris must be handled and disposed of in a manner that does not cause contamination of stormwater runoff by, e.g. bunding storage areas that contain hazardous substances, etc. • Good housekeeping practices must be employed to prevent contamination of stormwater runoff. • Clean up spills in bunded areas, remove and dispose of safely from the bunded area as soon as possible after detection.		
Oils and Chemicals	• Prevention of pollution of soil and ground water resources • Minimise chances of transgression of the acts controlling pollution and ensure	• The contractor must provide method statements for the "handling & storage of oils and chemicals", "fire", and "emergency spills procedures". • These substances must be confined to specific and secured areas, and in a way that does not pose a danger of pollution even during times of high rainfall. • These areas must be imperviously bunded with adequate containment (at least 1.5 times the volume of the fuel) for potential spills or leaks.	Contractor and ECO	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	safety of workers	• Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised. • The surface area of the drip trays will be dependent on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing. • The depth of the drip tray must be determined considering the total amount/ volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle. • Spill kits must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site. Spill kits must be made up of material/product that is in line with environmental best practice (example for consideration SUNSORB is a recommended product that is environmentally friendly). • All spilled hazardous substances must be contained in impermeable containers for removal to a licensed hazardous waste site, (this includes contaminated soils, and drenched spill kit material). • All construction vehicles should be kept in good working conditions.		
Stockpiles	• Minimise scaring of the soil surface and land features • Minimise disturbance and loss of soil	• All stockpiles must be placed in designated areas designed to minimize runoff and must be enclosed by berms. Stockpiles must also only be stored for the minimum amount of time necessary. • All stockpiled material must be easily accessible without any environmental damage. • All temporarily stockpiled material must be stockpiled in such a	Contractor and ECO	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	• Minimise construction footprint • Minimise sedimentation of nearby drainage lines • Maintain the integrity of topsoil for landscaping and rehabilitation • Containment of invasive plant growth • Minimise contamination of storm water run-off	way that the spread of materials are minimised. • Stockpiles are to be stabilised prior to the loss of soils due to erosion. • Soils from different horizons must be stockpiled such that topsoil stockpiles do not get contaminated by sub-soil material. • No plant, workforce or any construction related activities may be allowed onto the topsoil stockpiles. • Topsoil stockpiles must be clearly demarcated as no-go areas. • Stockpiles must not be higher than 2m to avoid compaction thereby maintaining the soil integrity and chemical composition.		
Cement (if Applicable)	• Minimise the possibility of cement residue entering into the surrounding environment • Minimise pollution of soil and ground water resources	• The contractors must provide and maintain a method statement for "cement and concrete batching". The method statement must provide information on proposed storage, and disposal of cement, packaging, tools and plant. • The mixing of concrete must only be done at specifically selected sites on mortar boards or similar structures to contain run-off into soils, streams and natural vegetation. • Cleaning of cement mixing and handling equipment must be carried out using suitable equipment, such as wash bays with impermeable	Contractor and ECO	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		• surfaces and portable cleaning trays, to prevent contamination of the surrounding environment. • All empty cement bags containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility. • Remedial action must be taken in the event of any concrete spills to prevent environmental contamination. While minor concrete spills are expected on projects involving concrete handling, formal investigations are not required unless spills are significant, repeated, or indicate negligence. • The visible remains of concrete, either solid, or from washings, must be physically removed immediately and disposed of as waste in bins or skips and then to a registered landfill site. • Cement batching areas must be located in consultation with the Engineer, the DEO and ECO.		
Bulk Storage of Fuel	• Prevention of pollution of soil and ground water resources in the immediate and surrounding environments.	• Bulk fuel storage tanks on the site shall be on an impervious surface with an appropriate bunding and be able to contain at least 110% of the volume of the tanks. • Bulk fuel storage tanks shall be located such that they do not pose a high risk in terms of water pollution (e.g. no less than 32m from watercourses • Bulk fuel storage tanks shall be placed so that they are out of the way of traffic, so that the risk of the tanks being ruptured or damaged by vehicles is minimised. • The storage of diesel and/or dangerous goods may be as required, provided that all necessary safety and environmental protection measures are in place e.g. storage must be in	Contractor and ECO	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		approved containers or tanks with proper labelling, and the storage must have adequate bunding capacity to contain spills		
Eating areas and camp followers	• Control potential influx of vermin and flies • Neat work place and hygienic environment • Minimise negative social impacts to local residents and businesses	• The contractors must provide and maintain a method statement for construction of lay down areas. • The Contractor must, in conjunction with the DEO, designate restricted eating areas for eating during working hours. Adequate closed refuse bins must be provided and cleaned on a daily basis. • No fires are to be lit outside of a facility designed to contain fires. • The adequacy and positioning of these structures must be determined in consultation with the DEO. • The feeding, or leaving of food, for stray or other animals in the area is strictly prohibited. • Camp followers/ informal traders must not be allowed within or immediate to construction site for safety and security. Designated trading zones must be allocated to a specific area outside the construction site where they can operate without obstructing construction activities or creating safety hazards • Litter (even if originating outside the camp but within the site boundary) and concrete bags, etc. must be picked up daily and put into suitably closed bins.	Contractor and ECO	Mitigation measures to be monitored as and when required
Toilets and Ablution Facilities	• Minimise potential of diseases on site • Minimise potential to	• The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one toilet must be provided per 30 persons per gender • Sanitary arrangements must be to the satisfaction of the ECO.	Contractor and ECO	Mitigation measures to be monitored as daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	pollute soils, water resources and natural habitats	Toilets must be of the chemical type unless connected to a municipal sewer system or using a conservancy tank or similar. The contractor must keep the toilets in a clean, neat and hygienic condition. The contractor must supply toilet paper at all toilets at all times. • Toilets provided by the contractor must be easily accessible. All toilets will be located within the contractor's camp and not within sensitive areas. Should toilets be needed elsewhere, their location must first be approved by the DEO or ECO. • The contractor (who must use reputable toilet-servicing company) must be responsible for the cleaning, maintenance and servicing of the toilets. The contractor (using reputable toiletservicing company) must ensure that all toilets are cleaned and emptied weekly. • Mobile toilets must be secured to the ground and have a sufficient locking mechanism operational at all times. • Ensure proper sanitation is achieved which will encourage the workforce to utilise toilets provided and not the surrounding habitat		
Solid Waste Management	• To keep the site neat and tidy • Reduce visual impact • Control potential influx of vermin and flies thereby minimising the	• The contractors must provide and maintain a method statement for "solid waste management". The method statement must provide information on proposed licensed facility to be utilised and details of proposed record keeping for auditing purposes. • Waste must be separated into recyclable and non-recyclable waste. • Any illegal dumping of waste must not be tolerated, this aspect must be closely monitored and reported on; proof of legal	Contractor and ECO	Mitigation measures to be monitored daily.

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	potential of diseases on site and the surrounding environment • Minimise potential to pollute soils, water resources and natural habitats	dumping must be able to be produced on request. • Bins must be clearly marked for ease of management. • All refuse bins must have a secured lid so that animals cannot gain access. • Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's wastes generated on the site. • All solid wastes, including chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site. The contractor is to provide proof of such to the EO and ECO. • Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site. • A skip, with a cover, must be used to contain refuse from campsite bins, rubble and other construction material.		
Workshop equipment, maintenance and storage	• Prevent pollution of the environment • Minimise chance of transgression of the acts controlling pollution • Disposal of hazardous substances in an appropriate manner	• All maintenance and washing of vehicles and equipment must take place in an area that is equipped with a bund wall and grease trap oil separator. During servicing of vehicles/equipment, a suitable drip tray must be used, especially where emergency repairs are done outside the workshop/ camp laydown area. Leaking equipment must be repaired immediately/ be removed from site to facilitate repair. All wastes must be collected and removed to an appropriate registered waste site. • Workshop areas must be monitored for oil and fuel spills and such spills must be cleaned and remediated to the satisfaction of the EO or Engineer Representative. Cleaning and remediation must be done with products that are in line with best	Contractor and ECO to check if mitigation measures are being properly implemented.	Mitigation measures to be monitored daily.

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		environmental practice i.e. SUNSORB • A method statement is required from the Contractor, tendering for the project to show procedures for dealing with possible emergencies that can occur, such as fire, accidental leaks and spillage. • The Contractor must be in possession of an emergency spill kit that is complete and available at all times on site. The Contractor must ensure that senior and other relevant members of the workforce are trained in dealing with spills by using emergency spill kits. • The following must be applied: o All contaminated soil/yard stone shall be removed and disposed of as hazardous waste at a registered facility or placed in containers to be taken to one central point where bio-remediation can be done. o A specialist Contractor shall be used for the bio-remediation of contaminated soil where the required remediation material and expertise is not available on site. o All spills of hazardous substances must be reported to the DEO, Engineer Representative or ECO.		
Crew Camps	• Minimise water pollution • Minimise dust fallout • Minimise unwarranted environmental	• The contractors must provide and maintain a method statement for "Crew camps and construction lay down areas". • Accommodation for members of the workforce is not permitted on site. • Dedicated wash areas must be situated 30m away from watercourses, areas of shallow groundwater.	Contractor and ECO is to check if mitigation measures are being properly implemented.	Mitigation measures to be monitored as and when required

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	damage outside the footprint • Maintain a clean and healthy working environment • Minimise impact to surrounding environment	• The contractor's camp must be monitored for dust fallout and dust suppression applied as required. This may include the laying of gravel. • The contractor must provide labourers plastic bags to clean up the contractor's camp and construction site on a daily basis. These areas must then be inspected by the contractor to ensure compliance with this requirement. • The contractor is responsible for cleaning the contractor's camp and construction site of all structures, equipment, residual litter and building materials at the end of the construction period and, the topsoil restored in areas where landscaping is to take place.		
Fires	• Minimise risk of fires • Minimise destruction of natural fauna and flora • Maintain safety on site • Conduct management review of fire preparedness and response before onset of fire season	• The contractors must provide and maintain a method statement for "fire management", clearly indicating where and for what fires will be utilised plus details on the fuel to be utilised. • Absolutely no burning of waste is permitted. • Fires within designated areas must be small in scale so as to prevent excessive smoke being released into the air. • No wood is to be collected, chopped or felled for fires from private or public property as well as from no-go or sensitive areas within the site and any surrounding natural vegetation. • Adequate fire extinguishers must be provided and maintained on-site during all road construction activities. These must be easily accessible, suitable for the types of fire risks associated with the construction work and regularly inspected. Personnel should be trained in their use	Contractor and ECO	Mitigation measures to be monitored as and when required

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
Crime, Safety and Security	• Reduce the risk of potential incidences • Minimise the potential impact on the environment	• Staff must regularly be informed of the necessary safety procedures and be competent in the work they are employed to do. • Security personnel must be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities, facilities for cooking and heating so that open fires are not necessary. • The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc. • The contractor must ensure that lists of all emergency telephone numbers/ contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site. • The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.	Contractor and ECO	Mitigation measures to be monitored as and when required
Visual Impact	• Minimise littering on site • Prevent adverse health effects on	• The site must be managed properly, and all rubbish and rubble disposed of a registered waste disposal facility. • Excess soil and bedrock should be disposed of at an appropriate facility. A certificate of disposal must be obtained for any waste that is disposed of.	Contractor and ECO	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	workers and the surrounding community • Maintain a peaceful environment for the community during construction	• Refuse bins must be provided on site and these must be emptied regularly. Waste must not remain on site for more than 2 weeks. • The construction camp must be properly screened and located closer to the access road. • Indigenous plants or trees must be retained, as far as possible, to provide screens to make the construction site less visually intrusive. • Construction activities should be limited to daylight hours as far as possible. However, if necessary for project progress, work outside of daylight hours may be permitted, provided it is justified and approved in advance. Any after-hours work must comply with noise and safety regulations • Should overtime/night work be authorised, the Contractor shall be responsible to ensure that lighting, noise and other impacts does not cause undue disturbance to neighbouring residents. In this situation low flux and frequency lighting shall be utilised and low noise impacts are undertaken as far as practicable. Where avoidance of overtime/night is not possible, neighbouring residents must be notified in writing, at least 7 calendar days in advance.		
Noise Impact	• Minimise noise pollution from construction activities • Prevent adverse health effects on workers and the	• To help mitigate the effects of noise levels, PPE should be made available to on-site individuals working in regions where the threshold exceeds the ambient 8-hour noise levels (75dBA). • Construction work must only be done during regular business hours (weekdays, 7 a.m. to 5 p.m., excluding holidays) unless otherwise approved by the Engineer and SANRAL and after consultation with adjacent residents. • On-site signage should be installed to alert the public to construction	Contractor and ECO	Mitigation measures to be monitored daily.

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	surrounding community • Ensure compliance with local noise regulations and standards • Mitigate impacts on nearby sensitive receptors, such as schools, hospitals, and residential areas • Maintain a peaceful environment for the community during construction	operations. • If construction must proceed after regular business hours, the neighbours must be informed. • The CLO is required to notify the neighbourhoods of any anticipated noise disturbances outside of regular business hours. • Wherever possible, it is necessary to enclose stationary noisy equipment (such as compressors, generators, etc.) with acoustic coverings, screens, or sheds. The usage of portable acoustic shields is required when noisy equipment is not stationary (for example drills, angle grinders, and chipping hammers). • The Contractor is required to take action to prevent workers from lingering and making unnecessary noise disturbances (e.g whistling, playing music) in the vicinity. When feasible, the Contractor or his subcontractors must transport workers to and from the site using their own vehicles. • In areas where construction will be taking place near residential and/or business property make use of noise reduction techniques such as sound barriers. • Avoid undertaking construction activities after daylight hours. In instances when this is not possible ensure that potentially affected parties are informed. • If blasting is required ensure that potentially affected parties are informed at least seven (7) calendar days prior to any blasting taking place.		
Traffic Impact	• Minimise Traffic during construction • To ensure that public roads around the site are safe and the flow	• Develop and implement a traffic management plan. The traffic management plan should be inclusive of traffic management measures for alternative routes. • Ensure there is suitable road signage, including the use of the variable messaging	Contractor and ECO is to check if mitigation measures	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
	of traffic is not disrupted	• System informing road users of construction activities and potential delays. • Where possible, separate fast- and slow-moving traffic into specific lanes. • During peak periods (morning and evening) stack heavy duty vehicles and allow through during non-peak times. • Do not allow heavy duty vehicles onto alternative routes. • Encourage road users to avoid the affected section of road during peak hours (Particularly the communities who have alternatives routes to consider). • Make use of local radio stations, newspapers, and social media to inform the public well in advance of any road closures or extended delays. • Construction vehicles must not dispose of soil or other material on roads. Where this occurs, the material must immediately be removed before the end of the working day	are being properly implemented	
Air Quality Impact	• Minimise Air pollution during construction	• The liberation of dust into the surrounding environment shall be effectively controlled using inter alia, water spraying and/or other dust-allaying agents such as dust nets. • Regular and effective damping down of working areas must be carried out to avoid dust pollution. • Machinery or equipment used on site must not constitute a pollution hazard regarding air pollution via excessive exhaust fumes. This shall be inspected regularly by the contractor and rectified immediately.	Contractor and ECO	Mitigation measures to be monitored daily

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
Degradation and/ or Destruction of wetland Habitats	• Reduce the risk of potential degradation of wetland habitats Minimise the potential impact on the environment	• Any construction activities in or within a delineated buffer zone of a water resource may only take place after the necessary water use license has been obtained. • Where wetlands may be encroached upon by proposed activities, the edge of the wetland must be clearly demarcated in the field with pegs or poles that will last for the duration of the construction phase, color-coded as follows: • Construction machinery and associated vehicles are not allowed to enter wetlands. Strictly no re- fuelling of vehicles or machinery will be allowed to take place in any area close to a wetland. • During and after construction areas of exposed soil can easily erode and subsequently end up in the wetlands. A well-designed storm water system must be put in place to avoid erosion into wetlands. Natural runoff from the natural terrestrial habitat surrounding the wetlands should however not be restricted unnecessarily. • The use of potential pollutants (paint, chemicals, etc.) during construction and operational phases must be strictly controlled and a high quality of management and supervision concerning such materials must be enforced, especially close to wetland buffer zone areas. • Sanitary facilities must be made available to construction workers to prevent urine and human waste entering the wetlands.	Contractor and ECO	Mitigation measures to be monitored on regular basis
Loss of Indigenous Fauna and Flora Diversity	• Reduce the risk of potential loss of indigenous fauna and flora.	• Destruction of natural wetland vegetation must be avoided at all costs. • Development of an alien invasive management plan. Alien and invasive vegetation control must take place throughout all	Contractor and ECO is to check if mitigation measures	Mitigation measures to be monitored on regular basis

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
Associated with Wetlands		development phases to prevent loss of habitat of indigenous fauna and flora. • Movement of vehicles and construction workers in wetlands and buffer zones must be strictly prohibited. No harvesting of plants or animals is allowed. • Any specimens of protected plant species known to occur in the wetlands and the delineated buffer zone and may potentially be impacted by the construction activities, are to be fenced off for the duration of the activity. • Include environmental awareness aspects into the site induction program to ensure all staff are aware of the location and importance of wetland habitats. • Establish emergency response measures and a clearly defined chain of communication to rapidly deal with any unforeseen impacts to wetlands, e.g. spills. • No stockpiling of materials may take place within wetland/ watercourse areas and temporary construction camps and infrastructure should be located outside the wetland footprint. • Regular cleaning up of the wetland areas should be undertaken to remove litter. • Design and implement a construction stormwater management plan that aims to minimise the concentration of flow and increase in flow velocity, as well as minimising sediment transport off site. • Where practically possible, the major earthworks should be undertaken during the dry seasons (roughly from April to August) to limit the erosion during rainfall. • Store and handle potentially polluting substance and waste in	are being properly implemented.	

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		designated bunded facilities. • Waste should be regularly removed from the construction site by suitably equipped and qualified operators or contractors appointed on site and disposed of in approved facilities. • Locate temporary waste and hazardous substance storage facilities a minimum of 100m from any wetland edge • Keep sufficient quantities of spill clean-up material on site.		
Introduction of Alien Invasive Species	• Reduce the risk of potential loss indigenous of species.	• Implementation of an Alien Invasive Management Programme. • Ongoing alien plant control must be undertaken, particularly in the disturbed areas as these areas will quickly be colonised by invasive alien species, especially in the riparian zone, which is particularly sensitive to AIP infestation. • Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden. • Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas. • After construction activities, re-vegetate any exposed surfaces and mulch re-vegetated areas. Select appropriate species for wetland and terrestrial areas and ensure species diversity is enhanced, with species commonly found in the natural wetland area.	Contractor and ECO	Mitigation measures to be monitored on a regular basis
Pollution of Water Resource and Soils	• Reduce the risk of potential loss of species.	• Demarcate wetland areas to avoid unauthorised access. • No washing of any equipment 50 meters to a watercourse is permitted. • No releases of any substances that could be toxic to fauna or faunal habitats within the channels or any watercourses is	Contractor and ECO	Mitigation measures to be monitored on a regular basis

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		permitted. • Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil must be removed, and the affected area rehabilitated immediately. • Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency. • Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control. • The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks. All contractors and employees should undergo induction which is to include a component of environmental awareness.		
Sedimentation and Soil Erosion	• Reduce the risk of potential loss of species.	• Implement a stormwater management plan • Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place. • Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. Erosion control measures	Contractor and ECO	Mitigation measures to be monitored on a regular basis

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		must be employed where required. • Riparian vegetation bordering on drainage lines, wetlands and rivers will be considered environmentally sensitive and impacts on these habitats should be avoided. • If erosion has taken place, rehabilitation will commence as soon as possible.		
Destruction, further loss of habitat and fragmentation of the vegetation Community	• Reduce the risk of potential loss of habitat.	• Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. • All areas outside of the direct footprint that were disturbed by the geological sampling must be rehabilitated and restored to a natural state. • Rehabilitation of the disturbed areas must be made a priority. Any disturbed area must be revegetated with plant and grass species which are endemic to this vegetation type. • All activities must be restricted too within the low/medium sensitivity areas. No unnecessary loss of high sensitivity areas should be permitted. • All construction/operational and access must make use of the existing roads. • All laydown, chemical toilets etc. should be restricted to low/medium sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. • Construction impacts associated with the proposed project must be contained within the footprint of the demarcated areas as	Contractor and ECO	Mitigation measures to be monitored on regular basis

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		indicated on the final approved project layout plan. • Prior to construction, the final road alignment, road reserve and development footprint area must be demarcated on site to ensure that construction impacts are contained within this area. If necessary, these areas may be fenced or, alternatively, nearby sensitive areas are to be fenced to prevent access. • Minimise the impacted area and clear only what is required • Avoid erosion, manage alien invasive species establishment, ensure the re-establishment of natural vegetation • Employ stormwater management measures		
Loss of species of special concern (SSC)	• Reduce the risk of potential loss of species.	• Conduct a site walkdown to identify any SSC within the project area prior to site clearance • Minimise the impacted area and clear only what is required • Tag and avoid all Red Data plants • No removal or relocation of Plant SSC without prior approval from the competent authority • Restricting blasting and operation of machinery to daylight hours	Contractor and ECO	Mitigation measures to be monitored on regular basis

3.3. Operational Phase

Table 7: Operational Phase

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
PHASE OF THE DEVELOPMENT: OPERATION PHASE				

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
Impact of freshwater sources	• Manage water resources	• During routine road maintenance operations, clear all channels located upstream of the road crossings of any debris and sediment build-up, particularly at the culverts and bridge structures where flows maybe impeded; and • Remove any invasive alien plants occurring in the river channels at the river crossings and the road reserve on an ongoing basis.	Developer (SANRAL)	On going
Increased impervious area (Hardened surfaces)	• Manage stormwater flows and pollution to watercourses. • Address increased runoff volumes at source	• Attenuation of stormwater from the road upgrade is important to control the velocity of runoff towards the stream. Attenuation structures must be placed between the road upgrade and the stream i.e. stormwater must not be directly deposited into the stream. • Disturbed area in the watercourse as a result of road maintenance must be rehabilitated as soon as maintenance in an area is complete or near complete and not left until the end to be rehabilitated (progressive rehabilitation). • Bank erosion must be monitored at regular intervals during the operational phase in order to assess whether further riverbank protection/stabilisation works are required. • Ensure the stream banks are well maintained and vegetated to prevent any scouring of the supporting structures. • Grass must be allowed to lengthen and thicken naturally to facilitate reduction in runoff velocity and volume, increase sediment deposition within the buffer zone and increase infiltration of stormwater. • Areas sensitive to erosion must be identified and monitored to ensure that erosion risks are minimised. • Watercourse crossings must be regularly checked to ensure	Developer (SANRAL)	On going

ENVIRONMENTAL RISK OR ISSUE	MANAGEMENT OBJECTIVE	MITIGATION MEASURE	RESPONSIBILITY	FREQUENCY OF ACTION
		they are not being degraded or causing degradation and that, openings (under or at a culvert opening) are kept clear to avoid impeding flows to downstream areas. This minimises erosion. • Stockpiled topsoil must be replaced following construction activities and be shaped to match the natural topography of the site. All stripped topsoil must be appropriately replaced on the site.		
Road user safety and traffic accommodation	• Improve overall road user safety and accommodate future anticipated traffic volumes	• Ensure the safety and traffic accommodation measures as indicated in the proposed project design are implemented as planned; and • Ensure that a Routine Road Maintenance Programme is implemented along the proposed project route.	Developer (SANRAL)	

SECTION 4: DETAILS OF THE PERSON/ COMPANY WHO PREPARED THE EMPR

Earthlink Environmental Services was appointed as the Independent Environmental Assessment Practitioner (EAP) and has adequate experience within the required Environmental Impact Assessment (EIA) field to facilitate the required Assessment Process.

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Amukelani Caroline Khosa: B-Tech Degree in Environmental Sciences, Tshwane University of Technology (TUT), 2022 National Diploma in Environmental Sciences, Tshwane University of Technology (TUT), 2018

Amukelani Khosa is an Environmental Consultant at Earthlink Environmental Services. She possesses a Baccalaureus Technologiae (B-Tech) in Environmental Sciences from Tshwane University of Technology (2022). She has Six (6) years of experience in the Environmental management field as Environmental Assessment Practitioner (EAP) from different environmental consulting companies. She has undertaken more than 14 various environmental projects (including but not limited to EIAs, WULAs, Section 24G applications and ECO services).

She is the EAP for the proposed project.

SECTION 5: CONCLUSION

This EMP and associated Basic Assessment have been compiled to meet regulatory requirements under the National Environmental Management Act (Act No. 107 of 1998) [NEMA] and its associated 2010 EIA Regulations.

This EMP comprehensively addresses the potential construction and operational phases impacts of all relevant aspects related to road upgrade activities on the site and has been informed inter alia through the undertaking of specialist assessments over the site. The EMP allows for continuous improvement through regular monitoring and reporting to IAPs and relevant spheres of Local, Provincial, and National Government.

2025-10-0025 PRE-APPLICATION MEETING- UPGRADE OF NATIONAL ROAD R30 SECTION 9 FROM KM 29 TO R24 (OLIFANTSNEK) KM 76.6, THREE BRIDGES AND SEVEN MAJOR CULVERTS, IN THE NORTHWEST PROVINCE

From Trisha Rene Pillay <tpillay@dffe.gov.za>
To Coenrad Agenbach <CAGENBACH@dffe.gov.za>, Chauke <chauke@earthlinkenvironmental.co.za>, amu@earthlinkenvironmental.co.za <amu@earthlinkenvironmental.co.za>, Kgakile <kgakile@earthlinkenvironmental.co.za>, Maropeng Mamabolo <MAMamabolo@dffe.gov.za>, MMamohale Kabasa <MKabasa@dffe.gov.za>, amuckhosa@gmail.com <amuckhosa@gmail.com>
Date 2025-10-27 09:22

Part 1.1.3.ics (~8 KB) EIA Pre-Application Meeting Form-R30 SECTION 9 (km 29 to 76.6).pdf (~4.7 MB)

Dear Colleagues

Kindly avail yourself for this meeting. Earthlink Environmental Services you are requested to prepare a comprehensive presentation which details the proposed development (i.e. project description, listed activities, specialist studies, public participation process etc.).

Kind Regards,

Ms. Trisha Pillay
Specialised Environmental Officer: Priority Infrastructure Projects
Registered Environmental Assessment Practitioner: 2021/3791
Integrated Environmental Authorisations
Department of Forestry, Fisheries and the Environment
Private Bag X447
Pretoria
0001
☎ (083) 650 5511
tpillay@dffe.gov.za

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

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From: EIA Applications <EIAApplications@dffe.gov.za>
Sent: Monday, 20 October 2025 12:12
To: Trisha Rene Pillay <tpillay@dffe.gov.za>
Cc: Coenrad Agenbach <CAGENBACH@dffe.gov.za>; Chauke <chauke@earthlinkenvironmental.co.za>; amu@earthlinkenvironmental.co.za; Kgakile <kgakile@earthlinkenvironmental.co.za>
Subject: 2025-10-0025

Dear Trisha.

Please note that you have been allocated an application:

Type of Application: Pre-Application Meeting Request;
Reference Number: 2025-10-0025;
Date Received: 20/10/2025;
Action Required: Decide on meeting request.

Kindly let Ephron know which date the meeting is to be held, if it will be set

EIA Applications
Integrated Environmental Authorisations
Department of Forestry, Fisheries and the Environment

Please note that this email is for the receipt and processing of online applications only, and is not monitored for responses. All queries must be directed to EIAadmin@dffe.gov.za.

You are advised that this mailbox has a 48 hour response time.

Please note that this mailbox has a 5mb mail limit. No zip files are to be attached in any email

---

From: chauke@earthlinkenvironmental.co.za <chauke@earthlinkenvironmental.co.za>
Sent: Monday, 20 October 2025 07:45
To: EIA Applications <EIAApplications@dffe.gov.za>; EIA Applications <EIAApplications@dffe.gov.za>
Cc: 'amu' <amu@earthlinkenvironmental.co.za>; Kgakile <kgakile@earthlinkenvironmental.co.za>
Subject: Upgrade Of National Road R30 Section 9 From Km 29 To R24 (Olifantsnek) Km 76.6, Three Bridges And Seven Major Culverts, In The Northwest Province

Dear Sir/ Madam.

Please find attached the Pre-Application request form and appendices for the following project:

- Upgrade Of National Road R30 Section 9 From Km 29 To R24 (Olifantsnek) Km 76.6, Three Bridges And Seven Major Culverts, In the Northwest Province.

Regards,

CHAUKE HLAHLA WISDOM (Cert.Sci.Nat &Can.Eap)
Junior Environmental Consultant
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+27 10 634 2349
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572, 24th Road, Withok Estates, Brakpan, 1541
Earthlink Environmental Services

COPY OF THE PRE-APPLICATION MEETING MINUTES

DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT PRE-APPLICATION MEETING MINUTES

PROJECT TITLE: UPGRADE OF NATIONAL ROAD R30 SECTION 9 FROM KM 29 TO R24 (OLIFANTSNEK) KM 76.6, THREE BRIDGES AND SEVEN MAJOR CULVERTS, IN THE NORTHWEST PROVINCE WITHIN THE BOJANALA AND DR KENNETH KAUNDA DISTRICT MUNICIPALITIES, IN JB MARKS LOCAL MUNICIPALITY KGETLENGRIVIER LOCAL MUNICIPALITY AND RUSTENBURG LOCAL MUNICIPALITY.

Venue: Microsoft Teams Virtual Meeting on Thursday, 30 October 2025 from 10:00 to 11:00

	Name	Organisation	Email address
Attendees present:	Chauke Hlahla Wisdom (CW) Amukelani Khosa (AK) Trisha Rene Pillay (TP) Maropeng Mamabolo (MM) Coenrad Agenbach (CA)	Earthlink Environmental Services (Pty) Ltd (Earthlink) Earthlink Department of Forestry, Fisheries and Environment (DFFE) DFFE DFFE	chauke@earthlinkenvironmental.co.za amu@earthlinkenvironmental.co.za tpillay@dffe.gov.za MAMamabolo@dffe.gov.za CAGENBACH@dffe.gov.za
Apologies:	None		
Objectives of the meeting:	• To Introduce Earthlink [Environmental Assessment Practitioner (EAP)]. • Provide project background of the R30 National road section 9 upgrade. • Present comprehensive presentation which detailed the proposed development (i.e. project description, Project Major Aspects, listed activities, specialist studies, and public participation process.		

AGENDA ITEMS	**ACTION**
1. WELCOME AND INTRODUCTION	**Trisha Rene Pillay**
Trisha Rene Pillay welcomed all attendees to the meeting. All the attendees introduced themselves.	
2. OBJECTIVES OF THE MEETING	**HLAHLA WISDOM CHAUKE**
The objectives of the meeting are as detailed above.	
3. DISCUSSION	**ALL**
All attendees introduced themselves at the start of the meeting. **TP** asked whether the applicant, SANRAL, would be joining the meeting. **AK** responded that SANRAL would not be attending the meeting. **CW** presented the project and addressed all the objectives of the meeting. He clarified that the project had previously been refused because the Final Basic Assessment Report (BAR) submitted to the department included an Agricultural Compliance Statement that was not part of the initial Draft Basic Assessment Report (DBAR). **TP** sought clarification on the reason for refusal of the previous application, the outcome of the appeal, and the decision from the Minister.	

CW explained that the Minister's decision on the appeal was that a new application must be submitted, essentially the outcome of the appeal was to reapply for environmental authorisation through a new submission.

TP inquired whether the Minister's decision upheld the refusal, or if the applicant had been instructed to submit additional information, and what the final outcome of the appeal was.

CW indicated that the Ministers outcome was to reapply again, he further asked if AK wants to add a response on the question raised by Trisha

AK indicated that she does not have anything to add, what CW said was correct.

TP asked whether the development would occur within the existing route and road servitude, and if all works will remain within that servitude.

TP asked about the re-entry of six potential borrow pits, whether a separate application will be submitted to the DMRE, or is in progress, or if an existing authorisation is in place.

CW confirmed that the Final Basic Assessment Reports for the borrow pits have been submitted to the DMRE.

TP asked whether the aquatic compliance statement will be conducted by a qualified aquatic specialist.

AK confirmed that all specialist reports are conducted by qualified and professionally registered SACNASP specialists.

TP highlighted that a Site Sensitivity Verification Report (SSVR) must be included when submitting the Draft Basic Assessment Report. She indicated that the SSRV should either confirm or dispute the sensitivity ratings that have already been presented by CW, and it must include a motivation explaining why particular specialist studies are not undertaken.

TP if the Environmental Assessment Practitioners (EAPs) team and DFFE team had any questions regarding the presentation.

AK and **CW** responded that they do not have any questions

CA and **MM** responded that they do not have any question, they are covered.

TP the meeting by noting that she would share the meeting minutes, recording, and transcription with the EAP team. The EAPs are to compile the official minutes and return them for review and approval. She emphasized that the approved minutes must be submitted with the application for Environmental Authorisation.

4. CLOSURE **Trisha Rene Pillay**

- Trisha Rene Pillay closed the meeting at 10:35.

Mr Chauke H.W (Compiler)

Environmental consultant: Earthlink Environmental

DFFE official Signature

EAP Name: Amukelani Khosa

Earthlink Environmental Services

SITE SENSITIVITY VERIFICATION REPORT

Proposed upgrade of National Road R30 section 9 from km 29 to R24 (Olifantsnek) km 76.6, three bridges and seven major culverts, in the Northwest Province within the Bojanala and Dr Municipality, in Kgetlengrivier Local Municipality and Rustenburg Local Municipality.

Prepared by:

Earthlink Environmental Services

Applicant:

South African National Roads Agency SOC Limited

Competent Authority:

Department of Forestry, Fisheries, and the Environment

SITE SENSITIVITY VERIFICATION REPORT(SSV)

This Site Sensitivity Verification Report was undertaken in terms of the Protocols for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes (referred to "the Protocols" hereafter) as per Government Notice No. 320 (published in Government Gazette No. 43110 on 20 March 2020)1. These Protocols, effected as on the 9th of May 2020, must be complied with for every new application submitted after the effective date. According to the Protocols, the EAP must verify the current use of the proposed site for development as well as the site's environmental sensitivity, in accordance with the DFFE Screening Tool Report, to determine the need for specialist inputs in relation to the themes (and proposed specialist assessments) included in the Protocols.

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Figure 2: Sensitivity Map of the proposed road to be upgraded. 5

1. INTRODUCTION

South African National Road Agency SOC Limited (SANRAL) proposes to upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6). The starting position is near the intersection of the R30 and Road D826 in the Kgetlengrivier Local Municipality. The end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality. Road R30 is currently a single-carriageway road with one (1) lane per direction. The road cross-section varies considerably, with gravel shoulders provided up to km 63.000 and surfaced shoulders predominantly thereafter.

The project is aimed at improving the road geometry by adding surfaced shoulders and rehabilitating the existing pavement structure to enable it to carry a 20 year design traffic load.

The major aspects of this project include the following:

- Increasing road reserve width from 32 m to 50m
- Strengthening the existing pavement
- General widening of the existing road cross section for climbing lanes and 2.5m surfaced shoulders
- Substantial vertical and horizontal geometric improvements
- Widening of river bridge and some major and minor culverts
- Widening of the existing agricultural underpass
- Possible horizontal re-alignment of the road between Km 77 to 78 and Km 95 to 97
- Possible 6.5m wide temporary deviation to accommodate two-way traffic during construction.
- Opening of one hard-rock quarry and re-entry into 6 potential borrow pits
- Stockpile areas and vegetation clearance outside road reserve in excess of one hectare.

2. PROJECT LOCATION

South African National Road Agency SOC Limited (SANRAL) Proposed to upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6). The starting position is near the intersection of the R30 and Road D826 in the Kgetlengrivier Local Municipality. The end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality.

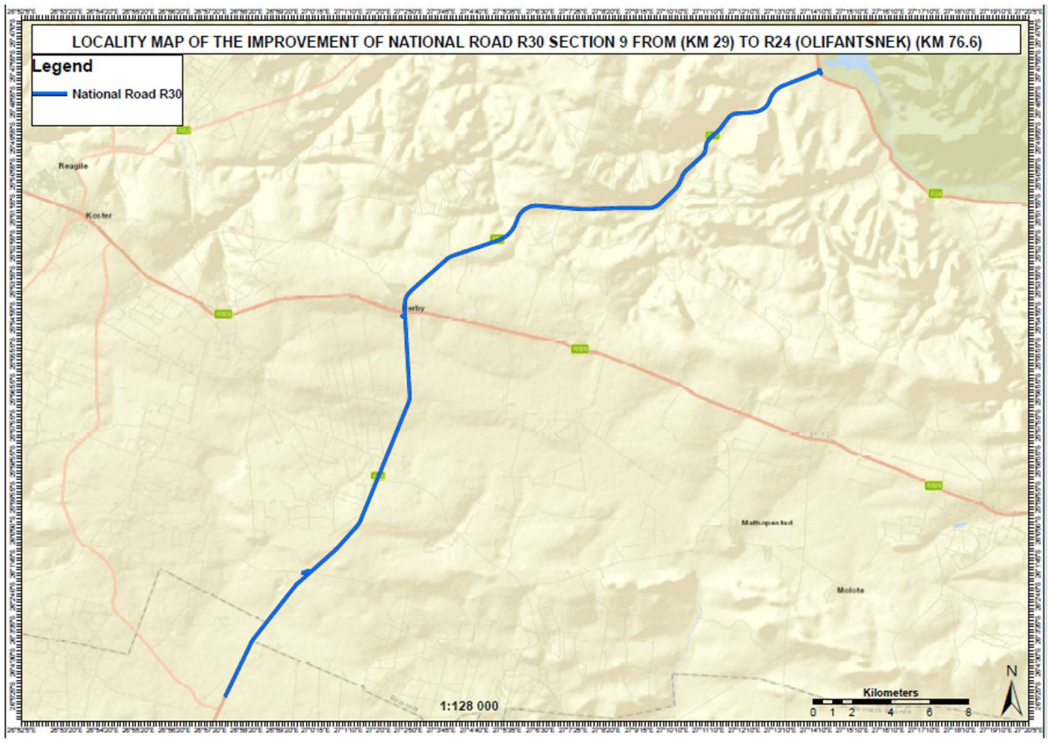


Figure 1: Locality Map of the proposed R30 road to be upgraded.

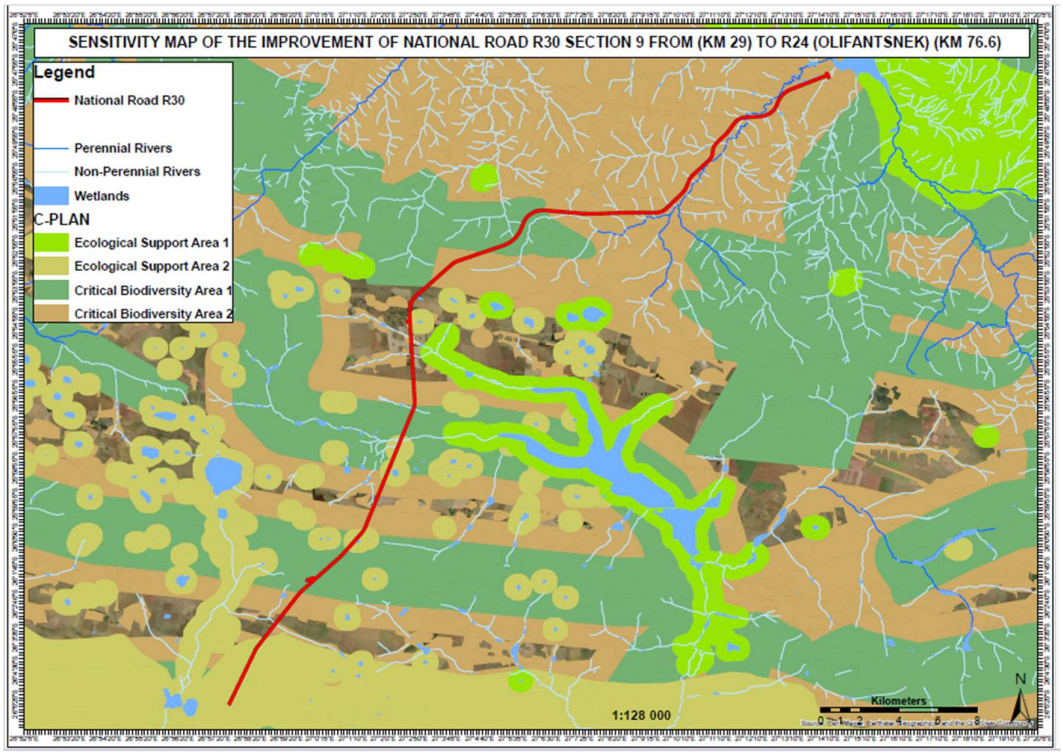


Figure 2: Sensitivity Map of the proposed road to be upgraded.

3. SCREENING TOOL RESULTS

The following environmental themes and their associated sensitivities were identified in the Screening Tool Report generated from the Department of Forestry, Fisheries, and the Environment (DFFE) national web. The screening tool is attached in this report as the **Appendix 1.**

According to the screening tool report, various specialist studies were identified and recommended to be undertaken as part of the environmental process.

Table 1: DFFE Screening tool Results

Theme	Very high sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Palaeontology Theme	X			
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Table 2: Themes and associated sensitivity as per the DFFE Screening Tool.

Theme	DFFE Screening	EAP Rating (Agree/ Disagree)	Motivation
Agriculture Theme	Very high Sensitivity	High (Agree to compliance statement to be undertaken)	The screening report has been generated on the DFFE website. The Agricultural Theme received very high sensitivity. The area is located on high agricultural land, and it is characterised by mixed used farming. The farms are in the close proximity of the R30 road to be upgraded. The roads upgrade may have the potential to impact the agricultural activities around the area. The agricultural assessment is deemed necessary to be undertaken for the proposed project. **The Agricultural Compliance Statement is attached on the BAR.**
Animal Species Theme	High Sensitivity	Medium (Agree for study to be included in the terrestrial study)	The screening report has been generated on the DFFE website. The Animal Theme received high sensitivity. Animals were spotted on site during the onsite inspection. Terrestrial Biodiversity Assessment has been undertaken which includes both the fauna and flora **Terrestrial Assessment Report has been attached to the Basic Assessment Report.**
Aquatic Biodiversity Theme	Very high Sensitivity	High (Agree for the study to be undertaken, the road passes through rivers and wetlands)	The screening report has been generated on the DFFE website. The Aquatic Biodiversity Theme received very high sensitivity The R30 National Road to be upgraded crosses Rooikloofspruit (river crossing) and there are also associated wetlands which may be impacted by the proposed. The upgrade of the road may have potential to impact aquatic biodiversity. The area is also located within the Critical Biodiversity Area (CBA) and Ecological Support Area (ESA).

			The aquatic Biodiversity assessment is therefore deemed necessary for the proposed upgrade.
Archaeological and Cultural Heritage Theme	Low Sensitivity	Low (Disagree but the report is required in terms of Section 38(1) of the National Heritage Resources Act of 1999, since the proposed development will exceed 5000m^2 in extent)	The screening report has been generated on the Department of Forestry, Fisheries and the Environment (DFFE) website. The Archaeological and Cultural Heritage Theme received Low sensitivity. A Heritage Impact Report is still required in terms of Section 38(1) of the National Heritage Resources Act of 1999, since the proposed development will exceed 5000m2 in extent. Due to the size of the proposed development, the potential for impacts on heritage resources exists. **A Heritage Impact Assessment is attached to the BAR.**
Civil Aviation Theme	High Sensitivity	Low (Disagree, not necessary to be undertaken upgrades will not impact Civil aviation)	The screening report has been generated form the DFFE website. The civil aviation theme received high sensitivity. There are airports identified, Rustenburg airfield, Linchenburg Airport, zeerust airport and Potchefstroom airport which are far from the proposed road to be upgraded. The proposed development is not expected to have any impact on (or be impact by) any nearby civil aviation aerodromes, the EAP is of the opinion that the sensitivity associated with this theme should be reduced to 'low'. **No further investigation of this theme is deemed necessary during the EIA process, However the Civil aviation compliance statement is compiled by the EAP.**

Defence Theme	Low Sensitivity	Low (Disagree, upgrades will not impact any defence activities)	The screening report has been generated from the DFFE website. The Defence Theme received Low sensitivity. Since the nature of the proposed development., the upgrade of an existing National Road R30, it is not expected to have any impact on (or be impact by) any aspects associated with the Defence Theme, the EAP is of the opinion that no further investigation of this theme is deemed necessary during the EIA process.
Palaeontology Theme	Very high Sensitivity	High (Agree, rocks identified which could be signs of paleontology remains)	The screening report has been generated from the DFFE website. The palaeontology theme was identified as having a very High sensitivity according to the Screening Tool Report. Due to the possibility of paleontological finds (e.g. fossils) being present within the proposed development area, it was deemed necessary by the EAP that a paleontological specialist be consulted to provide input into the BAR. **The paleontological specialist compiled a desktop Palaeontological Assessment. The report has been attached to the BAR.**
Plant Species Theme	Medium Sensitivity	Low (Agree, to be included in the terrestrial impact assessment)	The screening report has been generated on the DFFE website. The Plant Theme received medium sensitivity. Terrestrial biodiversity will be conducted at the high level. The flora study was also included as part of the terrestrial biodiversity report. **Terrestrial Assessment Report has been attached to the BAR**
Terrestrial Biodiversity Theme	Very High Sensitivity	High (Agree, terrestrial biodiversity is deemed necessary to be undertaken)	The screening report has been generated on the DFFE website. The Terrestrial Biodiversity Theme received high sensitivity. The area is characterized by the indigenous vegetation. Animals were spotted on site during the onsite inspection. The area is also characterized by mixed-use farming, where there are animals and plants. The majority of the site is classified as Moderately modified, with certain sections of the Road falling

			under Critical Biodiversity Areas and Ecological Support Areas. The full study of the Terrestrial Assessment (Flora and Fauna) is deemed necessary to be undertaken for the proposed project. **Terrestrial Assessment Report has been attached to the BAR.**

In addition to the above themes and related specialist studies, the screening tool report also identified and recommended the following specialist assessments:

1. Landscape/Visual Impact Assessment
2. Noise Impact Assessment
3. Traffic Impact Assessment
4. Geotechnical Assessment
5. Socio-Economic Assessment
6. Ambient Air Quality Impact Assessment

A motivation is provided in the table below, detailing why these additional studies will or will not be conducted as part of the Basic Assessment Process.

Table 3:Specialist assessments identified as per the DFFE Screening Tool.

No	Proposed Specialist Assessment	Verification of Site Sensitivity and Motivation on The Need for Specialist Investigation	Specialist to be conducted (Yes or No)
1	Landscape/Visual Impact Assessment	The project consists of upgrade of an already road there will not be any significant change to the landscape and visuals of the surroundings. The level of landscape and visual impact is expected to be so low that the landscape and visual assessment is deemed unnecessary. Any potential landscape or visual impacts and corresponding mitigation measures will be outlined in the Environmental Management Programme (EMPr).	No
2	Noise Impact Assessment	During the construction phase, noise impacts from construction activities, including heavy machinery, bridge widening, and temporary deviations, are anticipated in the short term. Any potential noise impacts and corresponding mitigation measures will	No

		be outlined in the Environmental Management Programme (EMPr) and will be short term limited to the construction phase. The project area is far from residential areas, schools, hospitals. Construction will also be restricted working hours. A noise impact assessment will not be required **A noise impact assessment is deemed unnecessary.**	
3	Traffic Impact Assessment	A traffic assessment was undertaken by the engineering team to inform the preliminary design of the project. The proposed is for the existing road which requires upgrading and maintenance. SANRAL have already identified the need to this project upgrade. Traffic was discussed in the Preliminary Design report. A traffic impact assessment is extracted from the Preliminary Design report and is attached to this BAR.	Yes
4	Geotechnical Assessment	The project includes road widening and widening of river bridge and some major and minor culverts. A geotechnical assessment is attached to the BAR.	Yes
5	Socio-Economic Assessment	Due to the scale and nature of the project a socio-economic impact assessment is not required. The socio-economic impacts will be assessed further in the Basic Assessment Report. Any negative socio-economic impacts envisaged will be addressed in the EMPr. The proposed road improvement has the potential to benefit the society on a socio-economic level.	No

		Lastly, as part of the Public Participation Process Interested and Affected parties (I&APs) will have the right to comment on the Draft Basic Assessment Report raising any concerns they might have in this regard, and their comments will be incorporated into the Final BAR by the Environmental Assessment Practitioner.	
6	Ambient Air Quality Impact Assessment	It is unnecessary to conduct an ambient air quality impact assessment for the proposed R30 project, as it will only result in minimal dust and vehicle emissions being released into the atmosphere. Any air quality or dust issues during construction will be addressed by effectively implementing the relevant provisions of the EMPr. **No additional input is deemed necessary.**	No

4. ON-SITE ASESSMENT

A site visit was conducted on 13 April 2023 and the Environmental Assessment Practitioner (EAP) personally inspected the location, and few photographs were taken to get an impression of the site sensitivities at high level.

Table 4: The starting position is near the intersection of the R30 and Road D826 in the Kgetlengrivier Local Municipality.

Photo Plate: The starting position is near the intersection of the R30 and Road D826 in the Kgetlengrivier
 

Table 5: Middle points of the R30 road to be upgraded.

Photo Plate: Middle points of the proposed R30 road upgrade
 

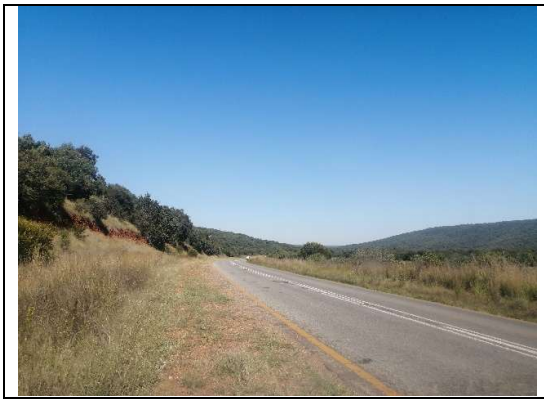
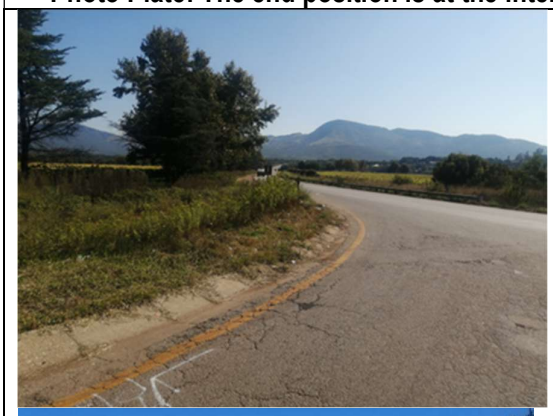
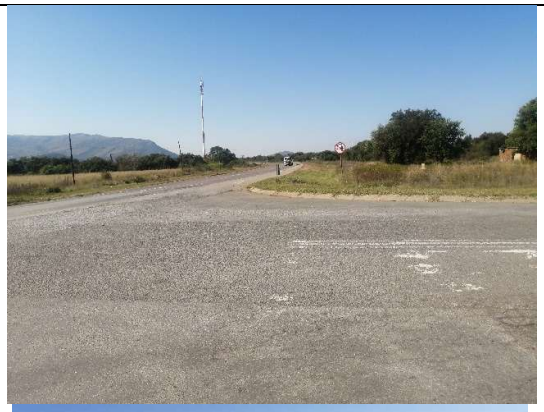
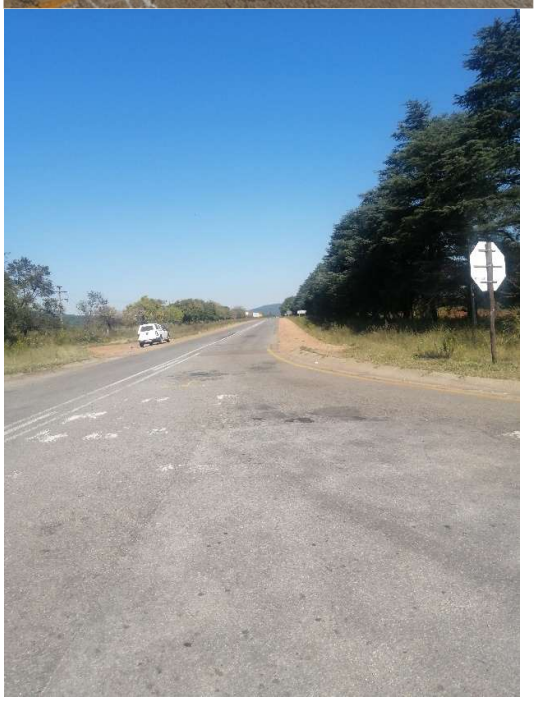
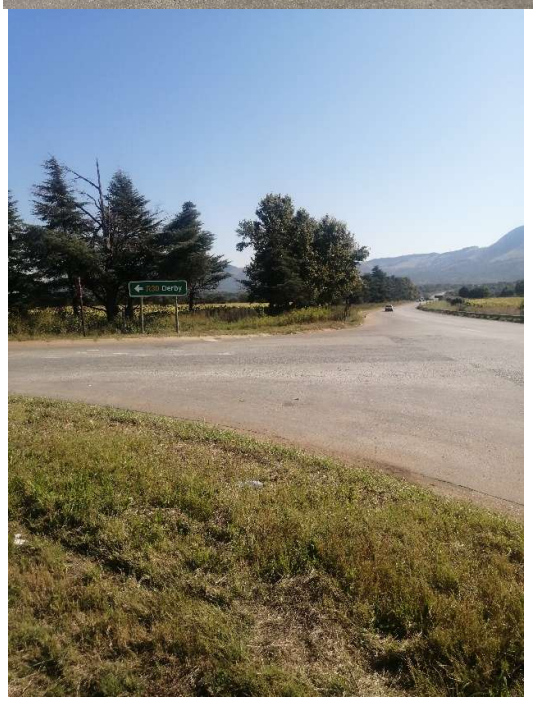



Table 6: Start point of the R30 road to be upgraded. The end position is at the intersection of the R30 and the R24 at Olifantsnek in the Rustenburg Local Municipality

Photo Plate: The end position is at the intersection of the R30 and the R24 at Olifantsnek

5. CONCLUSION

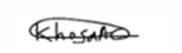
A Screening Tool Report which was generated for the proposed development yielded several themes that were considered as having very high, high, medium and low sensitivity. Overall, due consideration has been given to the potential impact of the proposed development on the recorded sensitivity themes and those that are not 'low' have been addressed via specialist assessments or compliance statements.

It is the opinion of the EAP that all factors regarding the above-mentioned themes were considered in this site sensitivity verification report and that the development will not have a significant impact on the recorded sensitivities other than those detailed in the BAR.

Based on the outcome of this Site Sensitivity Verification report, no additional Compliance Statements or Assessments for the abovementioned themes should be required other than those presented as part of the BAR

We trust you find this in order.

Kind Regards,



Amukelani Khosa
Environmental Assessment Practitioner
EAPASA Reg: 2022/4943

Appendix 1: Screening Report

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number:

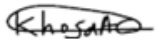
Project name: Proposed to upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6)

Project title: Proposed to upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6)

Date screening report generated: 02/08/2023 12:13:10

Applicant: SANRAL

Compiler: Amukelani Khosa of Earthlink Environmental Services

Compiler signature: 
.....

Application Category: Infrastructure|Transport Services|Roads|Public

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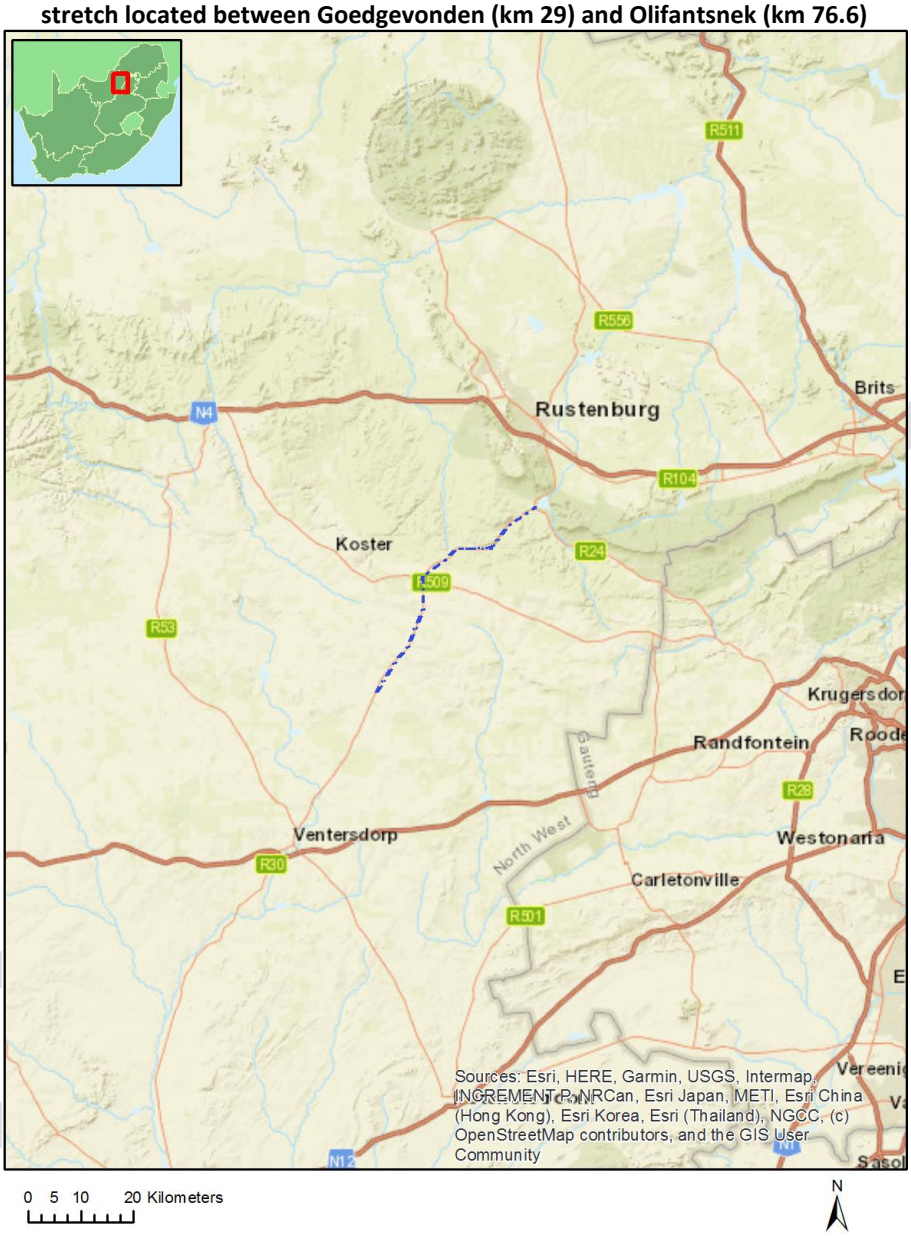
MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY 18

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Proposed Project Location

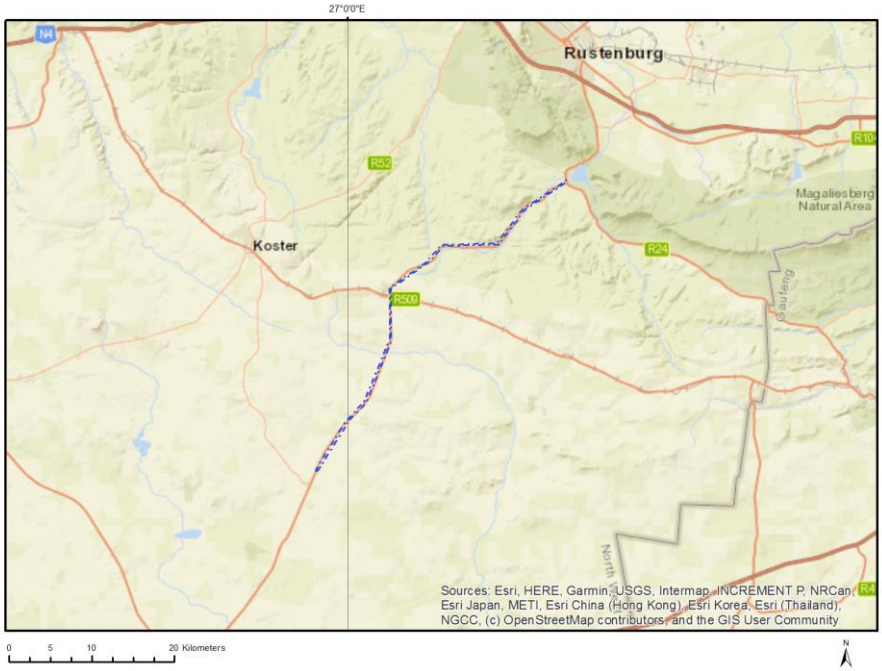
Orientation map 1: General location

General Orientation: Proposed to upgrade Road R30 section 9, a 47.6-kilometer stretch located between Goedgevonden (km 29) and Olifantsnek (km 76.6)



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Map of proposed site and relevant area(s)



Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	DERBY	55	0	25°54'22.02S	27°2'43.92E	Erven
2	DERBY	53	0	25°54'20S	27°2'44.03E	Erven
3	DERBY	50	0	25°54'21.51S	27°2'41.47E	Erven
4	DERBY	57	0	25°54'24.68S	27°2'43.88E	Erven
5	DERBY	58	0	25°54'25.69S	27°2'43.71E	Erven
6	DERBY	51	0	25°54'20.12S	27°2'42.76E	Erven
7	DERBY	61	0	25°54'23.65S	27°2'41.26E	Erven
8	DERBY	62	0	25°54'25.18S	27°2'41.1E	Erven
9	DERBY	157	0	25°54'31.22S	27°2'42.92E	Erven
10	DERBY	57	1	25°54'25.2S	27°2'44.74E	Erven
11	DERBY	58	1	25°54'25.89S	27°2'44.62E	Erven
12	DERBY	59	0	25°54'23.76S	27°2'42.39E	Erven
13	DERBY	49	0	25°54'20.01S	27°2'41.62E	Erven
14	DERBY	52	0	25°54'21.63S	27°2'42.61E	Erven
15	DERBY	60	0	25°54'25.29S	27°2'42.23E	Erven
16	DERBY	54	0	25°54'20.99S	27°2'43.98E	Erven
17	DERBY	56	0	25°54'23.67S	27°2'43.95E	Erven
18	DERBY	147	0	25°54'27.4S	27°2'42.1E	Erven
19	DERBY	149	0	25°54'27.54S	27°2'43.15E	Erven
20	DERBY	150	0	25°54'29.07S	27°2'43E	Erven
21	DERBY	153	0	25°54'30.95S	27°2'43.95E	Erven
22	DERBY	151	0	25°54'27.66S	27°2'44.14E	Erven
23	DERBY	154	0	25°54'31.71S	27°2'43.9E	Erven
24	DERBY	156	0	25°54'33.25S	27°2'43.81E	Erven
25	DERBY	148	0	25°54'29.1S	27°2'41.89E	Erven
26	DERBY	158	0	25°54'32.75S	27°2'42.77E	Erven
27	DERBY	160	0	25°54'32.67S	27°2'41.92E	Erven

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28	DERBY	295	0	25°54'43.63S	27°2'43.95E	Erven
29	DERBY	301	0	25°54'43.36S	27°2'41.59E	Erven
30	DERBY	145	0	25°54'27.04S	27°2'41.02E	Erven
31	DERBY	152	0	25°54'29.19S	27°2'44.05E	Erven
32	DERBY	155	0	25°54'32.47S	27°2'43.85E	Erven
33	DERBY	275	0	25°54'34.83S	27°2'42.45E	Erven
34	DERBY	277	0	25°54'34.92S	27°2'43.23E	Erven
35	DERBY	277	1	25°54'34.85S	27°2'43.66E	Erven
36	DERBY	282	0	25°54'38.18S	27°2'43.07E	Erven
37	DERBY	279	0	25°54'35.01S	27°2'44.08E	Erven
38	DERBY	290	0	25°54'40.16S	27°2'42.01E	Erven
39	DERBY	281	0	25°54'38.29S	27°2'44.11E	Erven
40	DERBY	294	0	25°54'42.21S	27°2'44.03E	Erven
41	DERBY	274	0	25°54'36.16S	27°2'41.45E	Erven
42	DERBY	278	1	25°54'36.01S	27°2'43.59E	Erven
43	DERBY	293	0	25°54'40.37S	27°2'44.36E	Erven
44	DERBY	296	0	25°54'42.11S	27°2'43.44E	Erven
45	DERBY	300	0	25°54'41.95S	27°2'41.73E	Erven
46	DERBY	273	0	25°54'34.74S	27°2'41.6E	Erven
47	DERBY	280	0	25°54'36.43S	27°2'43.99E	Erven
48	DERBY	283	0	25°54'38.09S	27°2'42.21E	Erven
49	DERBY	291	0	25°54'40.24S	27°2'42.86E	Erven
50	DERBY	298	0	25°54'42.03S	27°2'42.58E	Erven
51	DERBY	502	0	25°54'39.08S	27°2'41.57E	Erven
52	DERBY	632	0	25°54'15.14S	27°2'43.94E	Erven
53	DERBY	159	0	25°54'31.14S	27°2'42.08E	Erven
54	DERBY	161	0	25°54'31.05S	27°2'41.23E	Erven
55	DERBY	276	0	25°54'36.25S	27°2'42.3E	Erven
56	DERBY	278	0	25°54'36.34S	27°2'43.14E	Erven
57	DERBY	292	0	25°54'40.31S	27°2'43.67E	Erven
58	DERBY	297	0	25°54'43.53S	27°2'43.29E	Erven
59	DERBY	299	0	25°54'43.45S	27°2'42.44E	Erven
60	KOPERFONTEIN	364	0	25°51'25.76S	27°8'5.29E	Farm
61	GROENFONTEIN	498	0	25°56'33.92S	26°58'30.73E	Farm
62	ALMORO	173	0	26°6'52.3S	26°59'58.2E	Farm
63	VLAKHOEK	323	0	25°52'31.65S	27°3'45.42E	Farm
64	VLAKFONTEIN	977	0	25°54'25.62S	27°3'10.53E	Farm
65	LELIEFONTEIN	138	0	26°1'17.1S	26°59'9.03E	Farm
66	ROODEKLOOF	326	0	25°49'8.09S	27°11'47.47E	Farm
67	MIDDELFONTEIN	361	0	25°51'17.72S	27°10'3.74E	Farm
68	ELANDSFONTEIN	366	0	25°51'6.85S	27°6'9.63E	Farm
69	RIETFONTEIN	372	0	25°56'4.71S	27°1'15.42E	Farm
70	RUIMSIG	2	0	26°4'39.27S	27°1'13.75E	Farm
71	KLIPPAN	140	0	26°5'37.8S	26°56'10.64E	Farm
72	COMMISSIESDRIFT	327	0	25°47'5.83S	27°13'23.93E	Farm
73	VLAKFONTEIN	373	0	25°56'33.91S	27°4'37.25E	Farm
74	DWARSFONTEIN	1	0	25°59'59.46S	27°3'24.19E	Farm
75	DWARSFONTEIN	1	51	25°58'9.66S	27°2'29.42E	Farm Portion
76	RUIMSIG	2	1	26°4'2.12S	26°59'38.08E	Farm Portion
77	LELIEFONTEIN	138	9	26°0'16.47S	27°0'53.32E	Farm Portion
78	LELIEFONTEIN	138	3	26°1'29.96S	27°0'32.31E	Farm Portion
79	LELIEFONTEIN	138	2	26°1'33.01S	26°59'27.3E	Farm Portion
80	LELIEFONTEIN	138	42	26°1'18.2S	27°0'52.71E	Farm Portion
81	LELIEFONTEIN	138	43	26°0'45.62S	27°1'22.25E	Farm Portion
82	LELIEFONTEIN	138	18	26°3'13.75S	26°59'32.19E	Farm Portion
83	LELIEFONTEIN	138	31	26°1'0.2S	27°1'21.77E	Farm Portion
84	ROODEKLOOF	326	22	25°49'30.87S	27°11'37.12E	Farm Portion
85	ROODEKLOOF	326	17	25°49'37.59S	27°11'40.91E	Farm Portion
86	VLAKHOEK	323	71	25°53'43.5S	27°4'7.21E	Farm Portion
87	ROODEKLOOF	326	10	25°48'44.09S	27°11'46.43E	Farm Portion

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88	COMMISSIESDRIFT	327	61	25°47'58.95S	27°14'20.5E	Farm Portion
89	LELIEFONTEIN	138	0	26°2'22.05S	26°59'40.43E	Farm Portion
90	VLAKHOEK	323	75	25°53'36.07S	27°3'42.51E	Farm Portion
91	ROODEKLOOF	326	8	25°49'2.1S	27°10'58.95E	Farm Portion
92	ROODEKLOOF	326	15	25°49'14.84S	27°10'21.46E	Farm Portion
93	KLIPPAN	140	4	26°4'35.04S	26°57'48.8E	Farm Portion
94	ALMORO	173	4	26°5'18.91S	26°58'26.34E	Farm Portion
95	ROODEKLOOF	326	19	25°49'56.46S	27°11'12.56E	Farm Portion
96	ROODEKLOOF	326	20	25°49'46.56S	27°11'22.32E	Farm Portion
97	ROODEKLOOF	326	27	25°48'50.8S	27°12'54.23E	Farm Portion
98	ROODEKLOOF	326	11	25°48'54.65S	27°12'55.35E	Farm Portion
99	ROODEKLOOF	326	7	25°48'38.37S	27°11'12.47E	Farm Portion
100	ROODEKLOOF	326	21	25°49'39.33S	27°11'30.57E	Farm Portion
101	ROODEKLOOF	326	26	25°49'3.37S	27°12'45.99E	Farm Portion
102	ROODEKLOOF	326	3	25°49'10.11S	27°12'37.74E	Farm Portion
103	COMMISSIESDRIFT	327	49	25°48'36.77S	27°13'59.14E	Farm Portion
104	ROODEKLOOF	326	16	25°49'22.64S	27°11'58.3E	Farm Portion
105	COMMISSIESDRIFT	327	82	25°48'21.64S	27°13'30.68E	Farm Portion
106	COMMISSIESDRIFT	327	84	25°48'7.07S	27°14'8.78E	Farm Portion
107	MIDDELFONTEIN	361	80	25°51'45.2S	27°9'49.02E	Farm Portion
108	MIDDELFONTEIN	361	10	25°51'44.28S	27°9'56.68E	Farm Portion
109	COMMISSIESDRIFT	327	58	25°48'3.99S	27°13'40.24E	Farm Portion
110	COMMISSIESDRIFT	327	83	25°48'16S	27°13'44.14E	Farm Portion
111	ROODEKLOOF	326	6	25°49'31.01S	27°12'18.56E	Farm Portion
112	KOPERFONTEIN	364	23	25°51'49.51S	27°8'16.73E	Farm Portion
113	KOPERFONTEIN	364	2	25°50'10.09S	27°7'56.99E	Farm Portion
114	ELANDSFONTEIN	366	47	25°51'23.17S	27°5'28.64E	Farm Portion
115	ELANDSFONTEIN	366	66	25°50'8.26S	27°7'25.56E	Farm Portion
116	ELANDSFONTEIN	366	80	25°51'57.6S	27°6'0.06E	Farm Portion
117	RIETFONTEIN	372	44	25°58'10.58S	27°1'49.56E	Farm Portion
118	VLAKFONTEIN	373	56	25°54'41.27S	27°3'2.6E	Farm Portion
119	ROODEKLOOF	326	2	25°49'55.25S	27°12'2.92E	Farm Portion
120	COMMISSIESDRIFT	327	1	25°48'28.99S	27°13'32.86E	Farm Portion
121	ELANDSFONTEIN	366	74	25°51'42.46S	27°6'28.68E	Farm Portion
122	ELANDSFONTEIN	366	7	25°51'55.8S	27°6'42.37E	Farm Portion
123	ELANDSFONTEIN	366	37	25°52'4.24S	27°5'47.08E	Farm Portion
124	ELANDSFONTEIN	366	1	25°53'10.33S	27°5'6.44E	Farm Portion
125	ELANDSFONTEIN	366	75	25°52'54.28S	27°4'55.47E	Farm Portion
126	ELANDSFONTEIN	366	86	25°51'48.97S	27°6'40.76E	Farm Portion
127	MIDDELFONTEIN	361	9	25°51'48.75S	27°9'35.76E	Farm Portion
128	MIDDELFONTEIN	361	42	25°51'49.3S	27°9'52.36E	Farm Portion
129	MIDDELFONTEIN	361	34	25°51'54.37S	27°9'36.49E	Farm Portion
130	ELANDSFONTEIN	366	59	25°50'22.14S	27°6'49.56E	Farm Portion
131	ELANDSFONTEIN	366	50	25°51'38.72S	27°6'17.11E	Farm Portion
132	RIETFONTEIN	372	23	25°56'26.97S	27°2'32.35E	Farm Portion
133	RIETFONTEIN	372	80	25°57'49.39S	27°2'37.35E	Farm Portion
134	RIETFONTEIN	372	81	25°57'22.62S	27°2'48.21E	Farm Portion
135	VLAKFONTEIN	373	66	25°54'58.16S	27°2'45.25E	Farm Portion
136	VLAKFONTEIN	373	30	25°56'9.98S	27°2'55.16E	Farm Portion
137	ELANDSFONTEIN	366	41	25°51'44.39S	27°6'42.78E	Farm Portion
138	ELANDSFONTEIN	366	25	25°51'59.79S	27°6'5.49E	Farm Portion
139	ELANDSFONTEIN	366	85	25°51'47.79S	27°6'26.05E	Farm Portion
140	RIETFONTEIN	372	79	25°58'33.97S	27°2'18.97E	Farm Portion
141	VLAKFONTEIN	373	29	25°54'55.58S	27°2'57.2E	Farm Portion
142	MIDDELFONTEIN	361	41	25°51'51.93S	27°9'46.4E	Farm Portion
143	MIDDELFONTEIN	361	1	25°50'47.34S	27°9'54.77E	Farm Portion
144	ELANDSFONTEIN	366	89	25°51'49.56S	27°6'55.64E	Farm Portion
145	ELANDSFONTEIN	366	53	25°53'47.93S	27°4'24.36E	Farm Portion
146	ELANDSFONTEIN	366	82	25°51'48.86S	27°6'16.25E	Farm Portion
147	ELANDSFONTEIN	366	84	25°51'47.07S	27°6'24.34E	Farm Portion

Disclaimer applies

148	KOPERFONTEIN	364	60	25°51'43.38S	27°8'48.15E	Farm Portion
149	KOPERFONTEIN	364	61	25°51'32.68S	27°8'22.43E	Farm Portion
150	KOPERFONTEIN	364	41	25°52'2.57S	27°7'55.7E	Farm Portion
151	GROENFONTEIN	498	36	25°59'16.21S	27°1'30.8E	Farm Portion
152	KOPERFONTEIN	364	12	25°51'7.08S	27°8'11.91E	Farm Portion
153	ELANDSFONTEIN	366	69	25°52'28.54S	27°5'12.82E	Farm Portion
154	ELANDSFONTEIN	366	88	25°51'49.35S	27°6'50.31E	Farm Portion
155	ELANDSFONTEIN	366	87	25°51'48.58S	27°6'44.91E	Farm Portion
156	ELANDSFONTEIN	366	27	25°51'50.51S	27°6'21.03E	Farm Portion
157	ELANDSFONTEIN	366	71	25°51'44.01S	27°6'10.31E	Farm Portion
158	ELANDSFONTEIN	366	72	25°51'54.45S	27°5'22.46E	Farm Portion
159	ELANDSFONTEIN	366	81	25°51'50.75S	27°6'10.02E	Farm Portion
160	ELANDSFONTEIN	366	83	25°51'48.2S	27°6'19.72E	Farm Portion
161	VLAKFONTEIN	373	49	25°54'44.25S	27°3'1.34E	Farm Portion
162	RIETFONTEIN	372	18	25°58'2.45S	27°2'14.93E	Farm Portion
163	RIETFONTEIN	372	22	25°56'3.9S	27°2'43.4E	Farm Portion
164	RIETFONTEIN	372	70	25°57'46.49S	27°2'46.76E	Farm Portion
165	VLAKFONTEIN	977	0	25°54'24.57S	27°3'9.97E	Farm Portion
166	ELANDSFONTEIN	366	42	25°51'45.72S	27°6'50.34E	Farm Portion
167	ELANDSFONTEIN	366	79	25°52'11.39S	27°5'51.56E	Farm Portion
168	ELANDSFONTEIN	366	73	25°52'1.09S	27°6'28.22E	Farm Portion
169	MIDDELFONTEIN	361	84	25°50'55.06S	27°10'29.26E	Farm Portion
170	KOPERFONTEIN	364	9	25°51'23.9S	27°8'56.2E	Farm Portion
171	RIETFONTEIN	372	65	25°54'49.06S	27°2'42E	Farm Portion
172	VLAKFONTEIN	373	65	25°56'19.13S	27°2'49.7E	Farm Portion
173	VLAKFONTEIN	977	1	25°53'58.74S	27°3'7.39E	Farm Portion
174	DERBY	635	0	25°54'14.93S	27°2'38.87E	Public Place

Development footprint[1] vertices:
No development footprint(s) specified.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/2/414	Solar PV	Approved	10.8
2	14/12/16/3/3/1/431	Solar PV	Approved	20.2
3	12/12/20/2283/AM2	Solar PV	Approved	21.2
4	12/12/20/2145	Solar PV	Approved	21.3
5	12/12/20/2283	Solar PV	Approved	21.2
6	12/12/20/2283/AM3	Solar PV	Approved	21.2

Environmental Management Frameworks relevant to the application

No intersections with EMF areas found.

[1] "development footprint", means the area within the site on which the development will take place and incudes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Disclaimer applies

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is: **Infrastructure|Transport Services|Roads|Public**.

Relevant development incentives, restrictions, exclusions or prohibitions

The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

Incentive, restriction or prohibition	Implication
Strategic Transmission Corridor-Northern corridor	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Combined_EGI.pdf
Air Quality-Waterberg-Bojanala Priority Area	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/gg39489_nn1207a.pdf
South African Conservation Areas	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/SACAD_OR_2023_Q1_Metadata.pdf

Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme	X			
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

Based on the selected classification, and the known impacts associated with the proposed development, the following list of specialist assessments have been identified for inclusion in the assessment report. It is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the site situation.

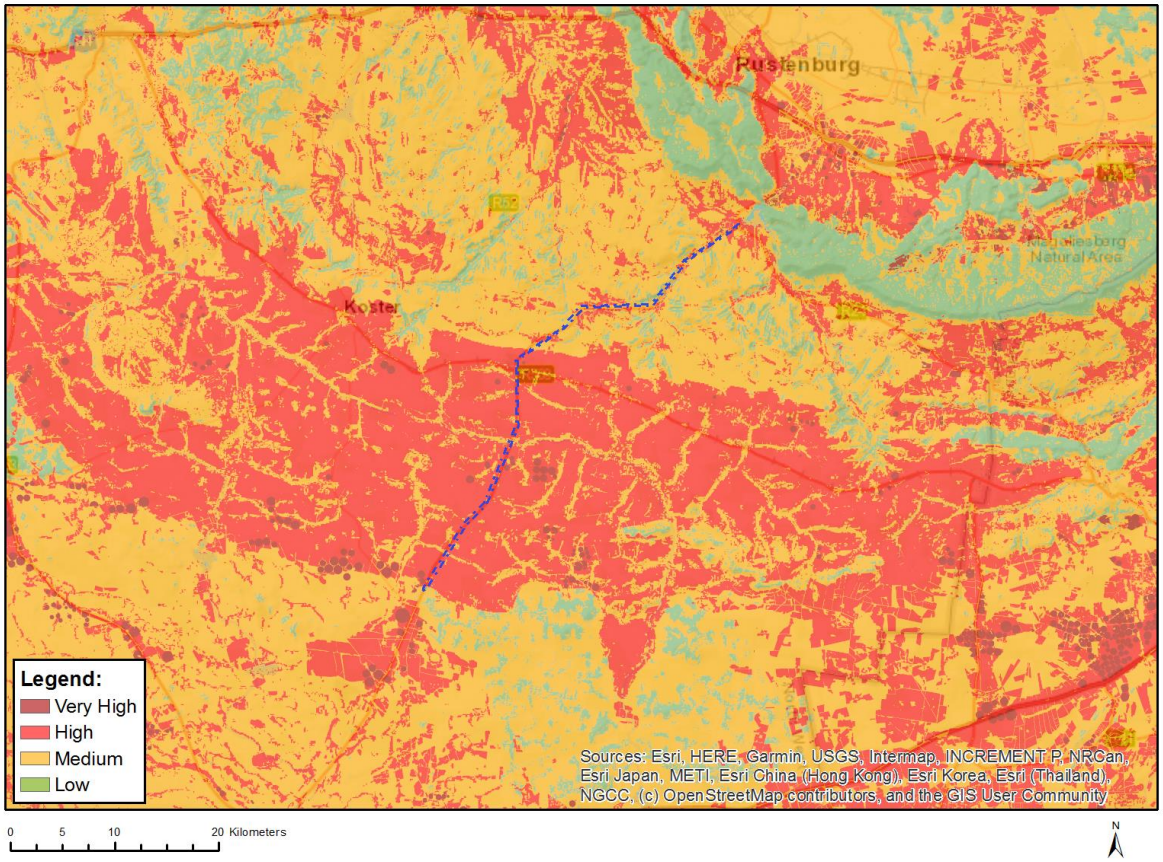
No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
2	Landscape/Visual Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
3	Archaeological and Cultural Heritage Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
4	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
5	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
6	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
7	Noise Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Noise_Impacts_Assessment_Protocol.pdf
8	Traffic Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
9	Geotechnical Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
10	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
11	Ambient Air Quality Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
12	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
13	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

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Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

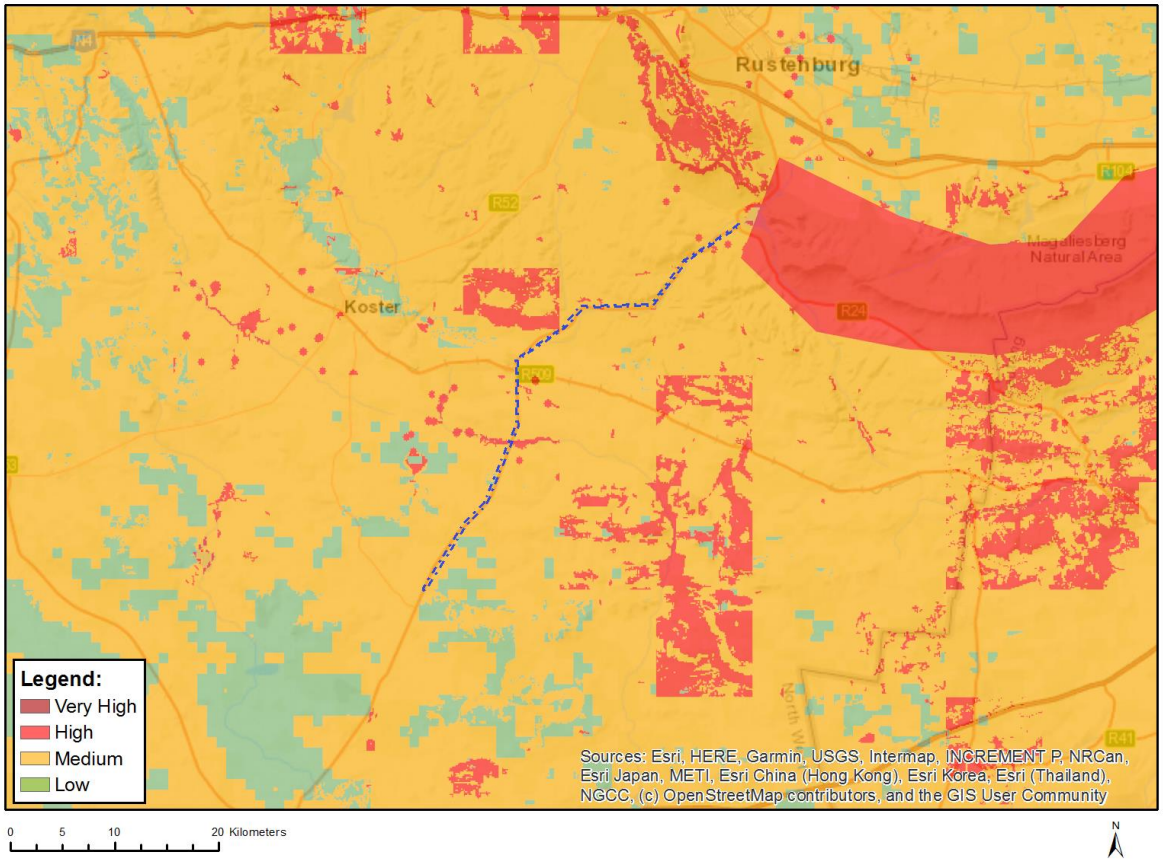


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
High	Old Fields;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Old Fields;Land capability;09. Moderate-High/10. Moderate-High
Low	Land capability;01. Very low/02. Very low/03. Low-Very low/04. Low-Very low/05. Low
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
Very High	Pivot Irrigation;Land capability;09. Moderate-High/10. Moderate-High

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



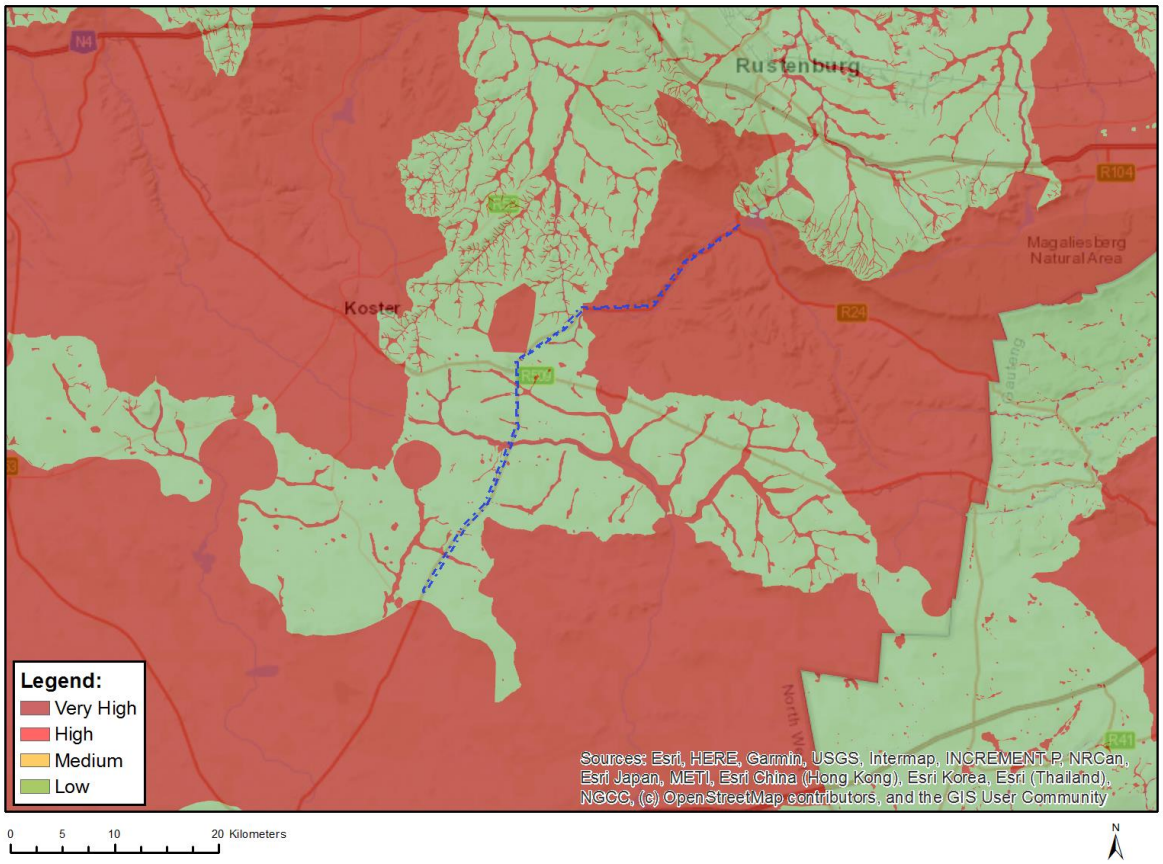
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Circus ranivorus
High	Aves-Polemaetus bellicosus
Low	Subject to confirmation
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Tyto capensis
Medium	Aves-Aquila verreauxii
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Dasymys robertsii
Medium	Mammalia-Ourebia ourebi ourebi
Medium	Reptilia-Kinixys lobatsiana

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY



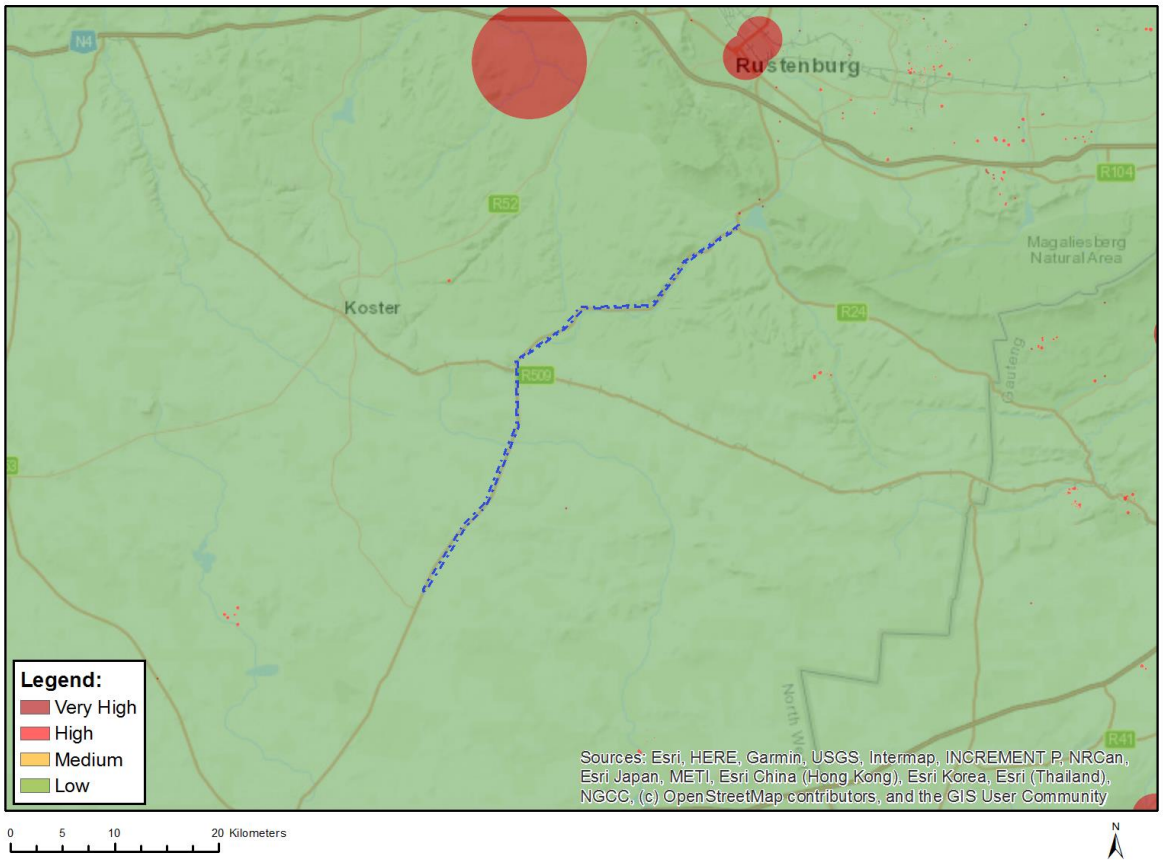
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Very High	CBA 1
Very High	CBA 2
Very High	ESA 1
Very High	ESA 2
Very High	Rivers_C
Very High	Wetlands_Central Bushveld Bioregion (Seep)
Very High	Wetlands_Central Bushveld Bioregion (Valley-bottom)
Very High	Wetlands_Dry Highveld Grassland Bioregion (Seep)
Very High	Wetlands_Mesic Highveld Grassland Bioregion (Seep)

Disclaimer applies

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY



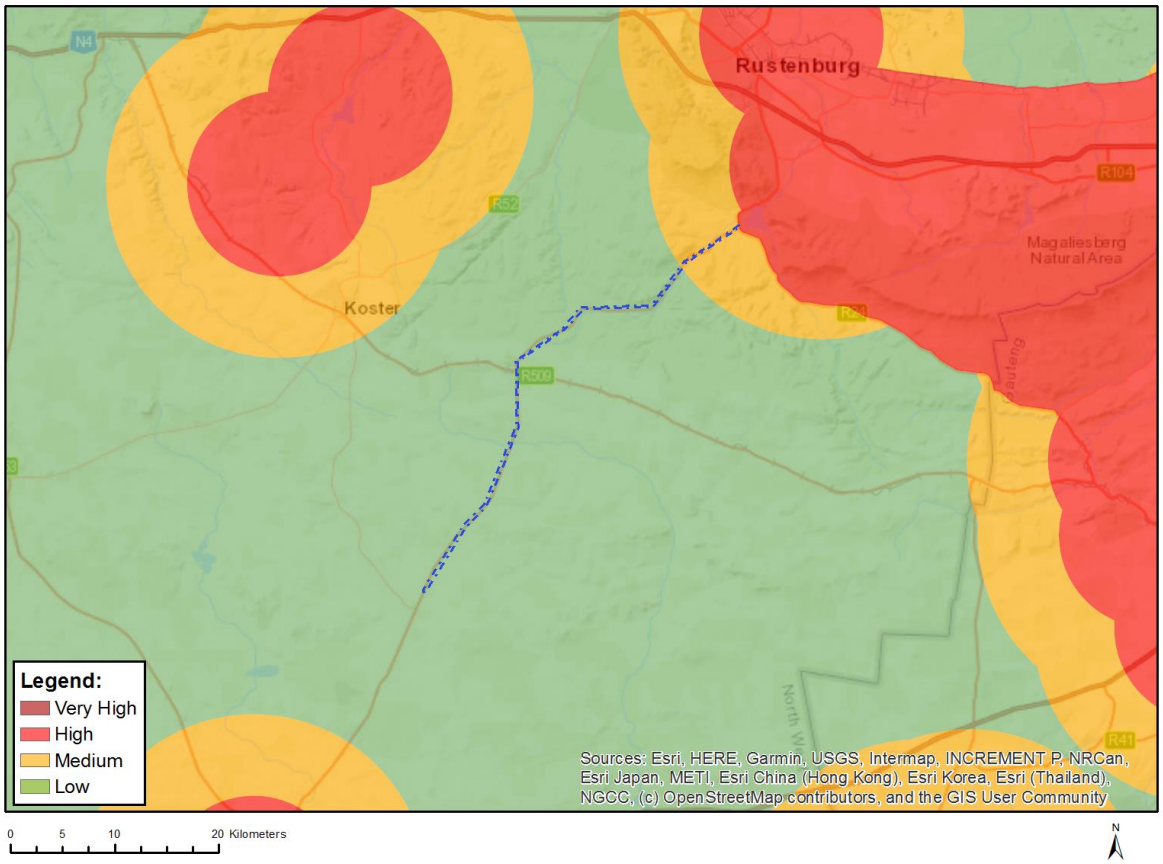
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity

Disclaimer applies

MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY

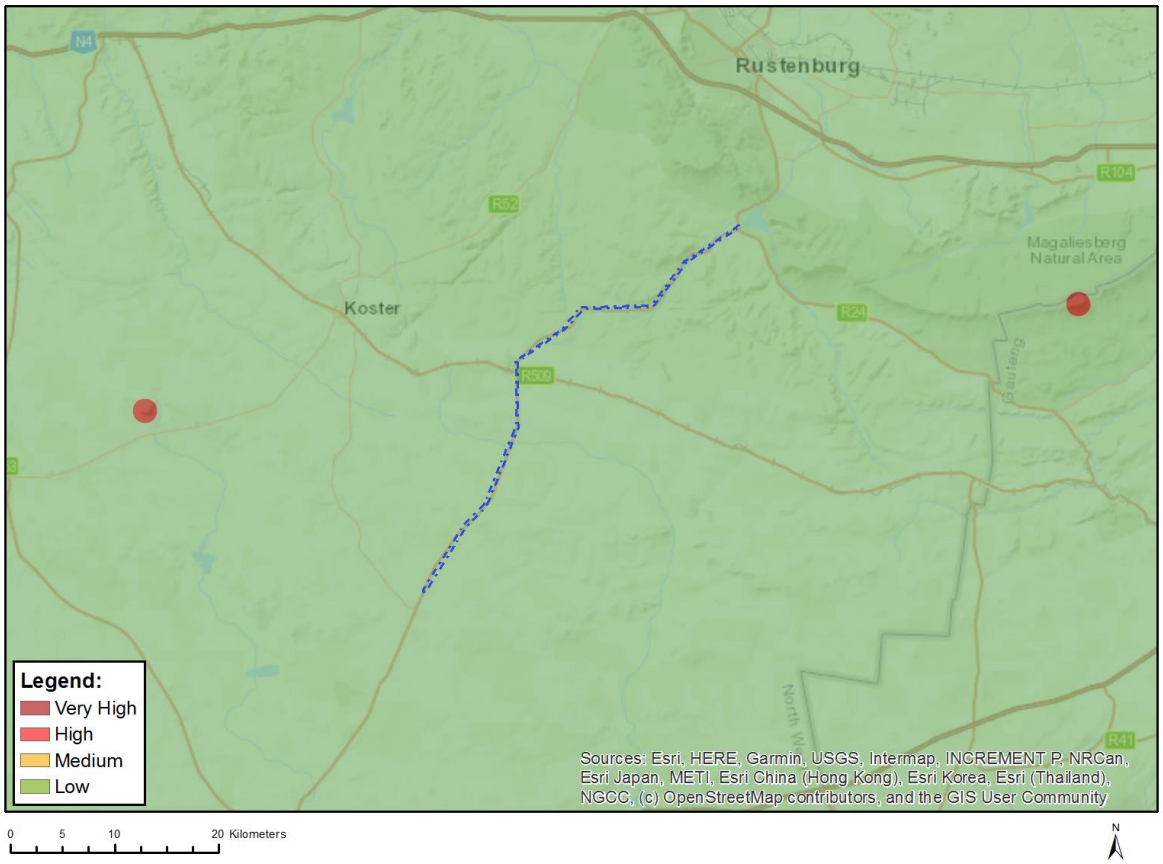


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Dangerous and restricted airspace as demarcated
Low	Low sensitivity
Medium	Between 8 and 15 km of other civil aviation aerodrome

MAP OF RELATIVE DEFENCE THEME SENSITIVITY



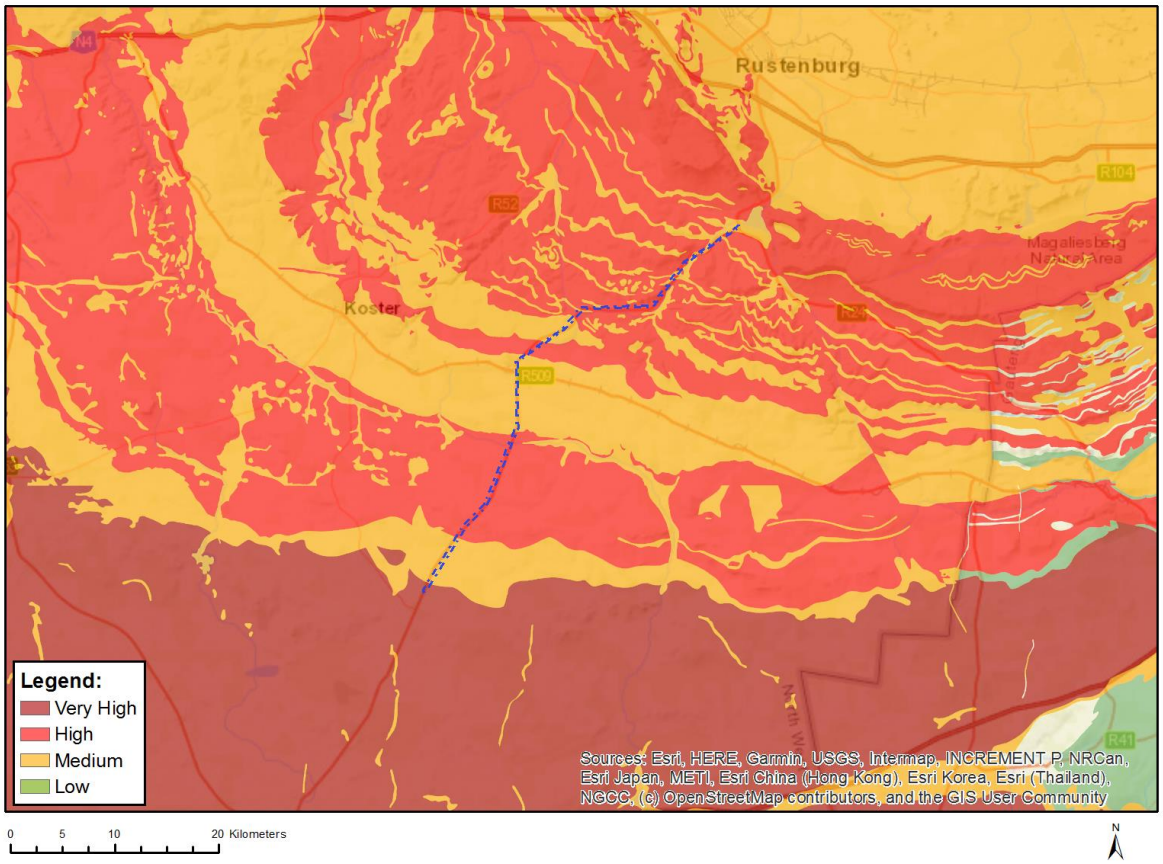
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

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MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

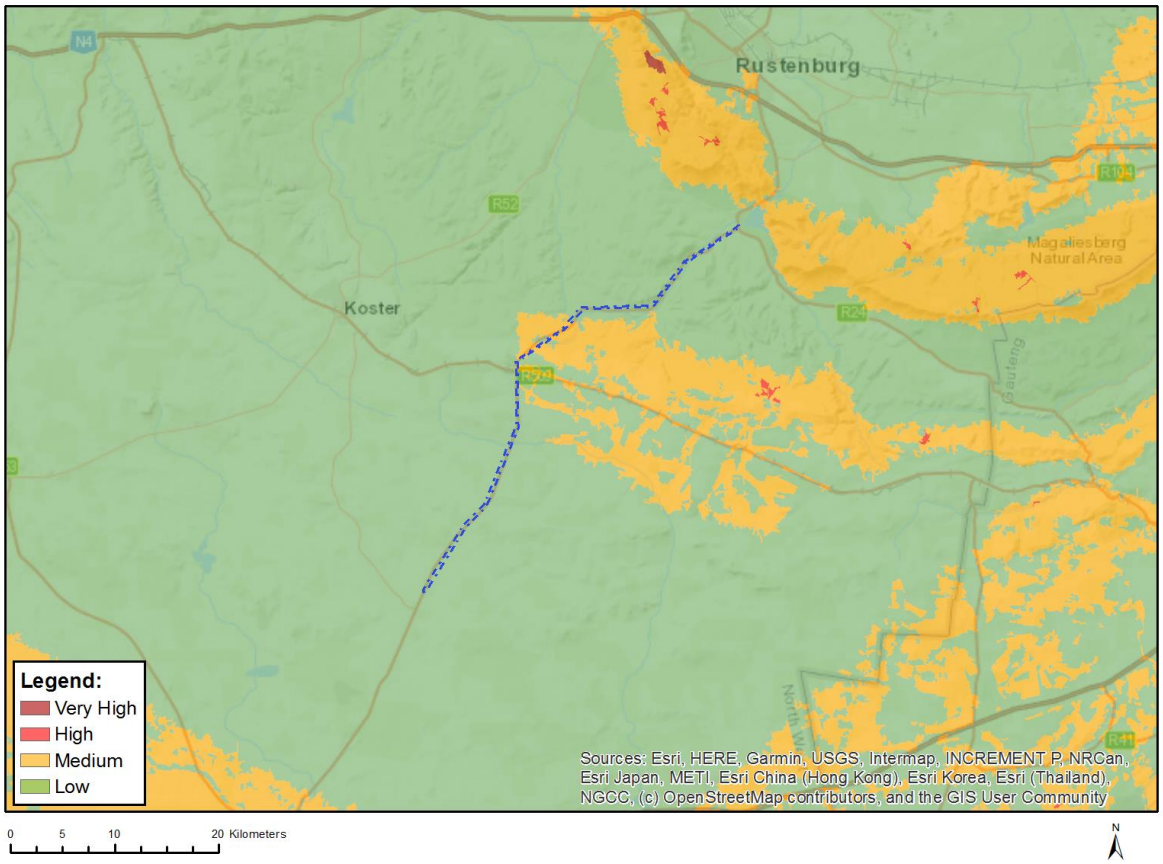


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Features with a High paleontological sensitivity
Low	Features with a Low paleontological sensitivity
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

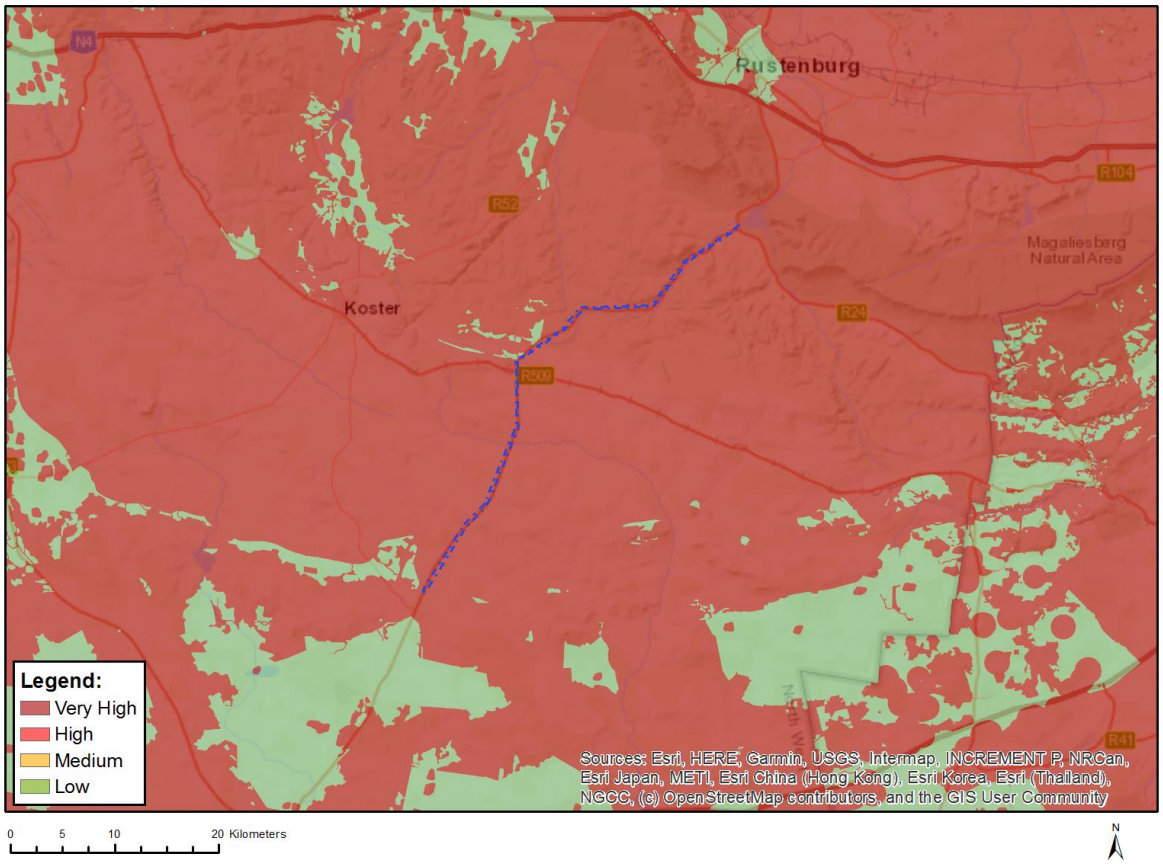
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 733
Medium	Prunus africana

Disclaimer applies
02/08/2023

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	CBA 1
Very High	CBA 2
Very High	ESA 1
Very High	ESA 2
Very High	National Protected Area Expansion Strategy (NPAES)
Very High	VU_Rand Highveld Grassland

Disclaimer applies