



forestry, fisheries & the environment

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

PROPOSED UPGRADE OF ROAD D1867 FROM KM 6+000 TO KM 16+900 SITUATED WITHIN UPHONGOLO LOCAL MUNICIPALITY, ZULULAND DISTRICT MUNICIPALITY, KWAZULU-NATAL AND MKHONDO LOCAL MUNICIPALITY, GERT SIBANDE DISTRICT MUNICIPALITY, MPUMALANGA

DRAFT BASIC ASSESSMENT REPORT (DBAR)

Submitted for commenting by stakeholders in terms of the 2014 Environmental Impact Assessment Regulations promulgated in accordance with the National Environmental Management Act 107 of 1998 (Act No. 107 of 1998), as amended

Prepared for



transport

Department:
Transport
Province of KwaZulu-Natal

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REPORT DETAILS & REVISION TRACKING TABLE

Project Title	Proposed upgrade of Road D1867 from Km 6+000 to Km 16+900 situated within uPhongolo Local Municipality, Zululand District Municipality, KwaZulu-Natal and Mkhondo Local Municipality, Gert Sibande District Municipality, Mpumalanga	
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Prepared for:	Ibhongo Consulting (Pty) Ltd	
On behalf of:	KwaZulu-Natal Department of Transport	
Prepared by:	Afzelia Environmental Consultants (Pty) Ltd	
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REVIEW OF THE DRAFT BASIC ASSESSMENT REPORT

This Draft Basic Assessment Report is available for commenting for a period of **30 days (excluding public holidays) from Monday 16/05/2022 until Monday 20/06/2022**. A copy of the Draft Assessment Report is available at strategic public place within the project area and upon request from Afzelia Environmental Consultants (Pty) Ltd.

The report is available for viewing at the following public place:

- Belgrade Thusong Service Centre

Please send your comments and queries before **20/06/2022** to:

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LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
BA	Basic Assessment
BID	Background Information Document
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Areas
CV	Curriculum Vitae
DALA	Department of Agriculture and Land Administration
DARDL	Department of Agriculture, Rural Development and Land
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DFFE	Department of Forestry, Fisheries, and the Environment
DBAR	Draft Basic Assessment Report
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DOT	Department of Transport
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECO	Environmental Control Officer
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
GNR	Government Notice Regulation
GPS	Global Positioning System
Ha	Hectares
I&APs	Interested and Affected Parties
IAIASa	International Association for Impact Assessment South Africa
IAP	Invasive Alien Plant
IAP2SA	International Association for Public Participation Southern Africa
IBA	Important Bird Areas
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
KZN BSP	KwaZulu-Natal Biodiversity Spatial Planning
MBCP	Mpumalanga Biodiversity Conservation Plan
MPRDA	Mineral and Petroleum Resources and Development Act
MPHRA	Mpumalanga Provincial Heritage Resource Authority
MOD	Moisture Density Relationship
MSDSs	Material Safety Data Sheets
MTPA	Mpumalanga Tourism and Parks Agency
MBSP	Mpumalanga Biodiversity Sector Plan
NEMA	National Environmental Management Act
NEMWA	National Environmental Management: Waste Act
NFEPA	National Freshwater Ecosystem Priority Area
NGP	New Growth Path
NPAES	National Protected Areas Expansion Strategy
NSBA	National Spatial Biodiversity Assessment
NSDP	National Spatial Development Perspective
NWA	National Water Act
PAES	Protected Areas Expansion Strategy
PPP	Public Participation Process
SABS	South African Bureau of Standards
SANS	South African National Standards
SACNASP	South African Council for Natural Scientific Professions

SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SCC	Conservation Concern
SDP	Spatial Development Plan
SHE	Safety, Health and Environmental
SIPs	Strategic Infrastructure Projects
SQRs	Sub-Quaternary Reaches
SUDS	Sustainable Urban Drainage Systems
TMH	Technical Methods for Highways
WMA	Water Management Area
WML	Waste Management Licence
WTW	Water Treatment Works
WUA	Water Use Authorisation
WUL	Water Use Licence

EXECUTIVE SUMMARY

SUMMARY OF PRINCIPAL OBJECTIVES

This report constitutes the Draft Basic Assessment Report (DBAR) which details the risk assessment of key environmental issues and impacts associated with the project, and documents Interested and Affected Parties (I&AP) issues and concerns. Furthermore, it determines the significance, duration and probability of the impacts occurring as a result of the proposed activities on the site, describes the public participation undertaken and identifies suitable measures to avoid, reverse, mitigate or manage identified impacts, including monitoring.

The project is intended to improve the degraded condition that the existing gravel road is in by replacing it with a black top surface and improve river crossing by constructing a new bridge crossing to replace the existing very old and deteriorated single lane bridge. This is likely to address current detrimental negative impacts which are emanating as a result of uncontrolled/poor stormwater measures. This will improve stormwater control off the upgraded road countering current negative impacts. The main objective of the project therefore is to minimise and prevent, where possible, the poor condition, continued erosion and degradation of the existing gravel road surface and reduce the impact of this erosion and sedimentation on the surrounding natural environment.

PROJECT OVERVIEW

Afzelia Environmental Consultants has been appointed by Ibhongo Consulting (Pty) Ltd on behalf of the (Applicant) KwaZulu-Natal (KZN) Department of Transport (DOT) to undertake an Environmental Impact Assessment (EIA) in the form of a Basic Assessment (BA) Process as well as a Water Use Authorisation (WUA) Application. The proposed project involves the upgrading of the existing gravel Road D1867 to a formalised blacktop surfaced road in terms of the Environmental Impact Assessment (EIA) Regulations (2014), as amended under the National Environmental Management Act (NEMA) (Act 107 of 1998).

KZN DOT proposes to continue with Phase two (2) of the upgrading of the existing Road D1867 from km 6+000 to Km 16+900. An EIA was undertaken for Phase 1 from Km 0+000 at the T-junction with National Road N2 to km 6+000 and construction of this phase has been completed. This section of the Road D1867 has a formal blacktop surfaced which was upgraded during Phase 1 of the project.

The current application of Road D1867 from Km 6+000 to Km 16+900 is approximately 10+900 Km in length and forms part of Phase two (2). This route section traverses through a mountainous terrain from Km 7+000 to Km 8+000 with no guardrail. The road along this portion is characterised by shallow cuts, sharp bends, steep gradients, and is in a poor condition. The road is also adversely affected by inclement weather conditions creating potholes and slippery conditions. In addition, at sharp bends and steep gradients; some deformation to the shape of the road has occurred on the gravel surface rendering the route unsafe for use especially for vehicular traffic. The existing road drainage system is unable to cope with the high intensity storm water runoff of water on steep gradients, which results in areas adjacent to the road being eroded, excessive scour and evidence of washaways, undercutting and gravel loss.

A portion of the road from km 6+800 to km 7+600 falls within Mpumalanga Province and the rest from Km 6+000 to Km 6+800 and from Km 7+600 to Km 16+900 under KwaZulu-Natal Province. The existing single lane bridge under the Mpumalanga Province section is very old, and the bridge structure has deteriorated to such a degree that significant maintenance is required to keep the bridge in service. In addition, the existing one lane bridge is functionally deficient as it's widths do not satisfy the current KZN DOT standards considering the amount of traffic that utilises the bridge. The project lies within privately-owned properties and Ingonyama Trust land. A 30m road reserve has been allowed for this project as per KZN DoT standards. The design was able to fit within the existing road reserve.

The proposed road upgrade D1867 and Mozana bridge links the community of Oranjedal, Tobolsk and Belgrade which is 50km west of Pongola as well as local schools to the N2 main road and provides a daily access route for commuters into the CBD of uPhongolo Local Municipality and the eDumbe Local Municipality. In view of the importance of the route, KZN DOT realised the need to construct a new bridge and upgrade the road to provide for a new, high-level, two-lane bridge with sidewalks and improved surfaced road and stormwater runoff control. It is possible that the upgrade of the road and

construction of the new bridge over the Mozana River may present the opportunity to now mitigate some of the abovementioned existing impacts.

The proposed Road D1867 is situated in Pongola passing through Ntumbane and Khiphunyawo Village in Ward 3 & 5 within the uPhongolo Local Municipality under Zululand District Municipality, KwaZulu-Natal, and Ezibawini Village within the UMkhondo Local Municipality under Gert Sibande District Municipality, Mpumalanga. The D1867 road links with N2-32 at Km 68, runs along the border and, for a short section, diverts into Mpumalanga, and intersects with Road D1869.

The geographical coordinates of the Road D1867's sites are shown in table below:

Table: Coordinates of the proposed sites.

Start	South	27°	16'	51,34"
	East	31°	14'	20,94"
Middle	South	27°	18'	42,75"
	East	31°	12'	49,68"
End	South	27°	20'	38,26"
	East	31°	11'	3,69"

The property affected by the proposed Road D1867 upgrade is reflected in the **Table** below:

Table: Property associated with the proposed Road D1867.

Property Name	Surveyor-General Cadastral Code No.	Title Deed Reference No.	Owner
Portion 1 of Belgrade Farm No. 27	N0HU0000000002700001	T17260/1961PN	South African Dev. Trust-Trustees
Portion 3 of Belgrade Farm No. 27	N0HU0000000002700003	T17260/1961PN	South African Dev. Trust-Trustees
Portion 0 of Simdlangetsha Farm No. 16956	N0HU00000001695600000	T30537/2003	Ingonyama Trust Board-Trustees
Portion 1 of Simdlangetsha Farm No. 16956	N0HU00000001695600001	T30537/2003	Ingonyama Trust Board-Trustees
Portion 10 of Simdlangentsha Farm No. 16956	N0HU00000001695600010		Ingonyama Trust Board-Trustees
Portion 1 of Welkom Farm No. 26	T0HU0000000002600001	T81504/2000	Vulindlela Communal Property Association
Portion 1 of Oranjedal Farm No. 18354	N0HU00000001835400001	A3562/1911	Ingonyama Trust Board-Trustees

PROJECT DESCRIPTION

According to the Inception Report and Method statement for the road, both compiled by Ibhongo Consulting (Pty) Ltd, the proposed upgrade of D1867 project comprises of the construction of earthworks, layer works, ancillary works and surfacing from gravel to blacktop including road widening, re-alignment of sections, storm water drainage, and major drainage structures as well as the construction of Mozana Bridge.

The existing Road D1867 is approximately 7.5m wide and 10.9 km long with a road reserve of 30m. The project entails the upgrading and widening from 7.5m to 8.5m wide surfaced Type 4 Low Standard Secondary Road with a carriageway width consisting of 2 x 3.5m lanes and a 1.5m concrete paved footway. The design speed on the road is 60km/h.

The proposed upgrade will start from KM 6+000 of the existing Road D1867 at the approximate GPS coordinates: 27°16'51.34" S and 31°14'20.94" E and ends at the T-junction with Road D1869 at KM 16+900 of the existing Road D1867

at the approximate GPS coordinates: 27°20'38.26" and 31°11'3.99" E. The total length of the road upgrade is 16,5 Km. A portion of the road from km 6+800 to km 7+600 falls within Mpumalanga Province and the rest from Km 6+000 to Km 6+800 and from Km 7+600 to Km 16+900 under KwaZulu-Natal Province.

According to the Bridge Design Report and Mozana Bridge Method statement, both compiled by Ibhongo Consulting (Pty) Ltd, the existing bridge structure at chainage Km 7+220 has deteriorated to the degree that significant maintenance is required to keep the bridge in service. The recommended preferred build alternative consists of replacing the existing one-lane bridge with a two-lane bridge constructed southeast of the existing bridge at about Km 7.2 at Global Positioning System (GPS) coordinates: 27°17' 14.1" S, 31°13' 47.5" E. The proposed Mozana bridge deck will be 56m long continuous slab with 4 spans of 14m length. The bridge deck will be 11.12m to accommodate 2 x 3.5m wide lanes with shoulders of 0.75m wide on both sides of the bridge and a 1.5m foot sidewalk on the south edge of the bridge. The total physical footprint of the bridge is approximately 622,72m². More than 10 cubic metres of soil, and other material will be excavated, removed, or moved during construction of the bridge.

The proposed bridge will be constructed while traffic is maintained on the existing bridge for use as a bypass during the construction of the new route. The existing bridge will not be removed following construction of the new bridge as farmers within the area will utilise it as a crossing for their livestock. Bollards will be constructed in the existing bridge approaches to prevent vehicular traffic gaining access to the old bridge. The new bridge will be in the Province of Mpumalanga because surrounding terrain does not allow a road realignment to place the structure within the boundaries of KwaZulu-Natal Province. As the entire road is considered KwaZulu-Natal responsibility, the new bridge will be considered as an asset of KwaZulu-Natal infrastructure.

The new bridge is designed for a 1:10 return flood to pass under the deck soffit. The abutments and three piers are founded directly on the rock within the riverbed and anchored with dowels. The GPS coordinates of the abutments and two piers are provided in the **Table** below from the direction of the start point of the road:

Table: New Bridge coordinates.

Structure	Latitude	Longitude
Abutment (E)	27° 17' 13.12" S	31° 13' 49.44" E
Pier (D)	27° 17' 13.35" S	31° 13' 48.98" E
Pier (C)	27° 17' 13.58" S	31° 13' 48.54" E
Pier (B)	27° 17' 13.83" S	31° 13' 48.11" E
Abutment (A)	27° 17' 14.09" S	31° 13' 47.70" E

A 250mm thick approach slabs will be constructed under the roadway of the bridge. The approach slabs will be supported on the abutments at one end and rest on the fill towards the other end. The following are the specifications of the approach slab to be utilised in the construction of the bridge:

- The slab will extend 4.5m from the curtain wall of the road centreline, with a fall of 100mm.
- The slab will be kept 100mm clear of the wingwall faces to prevent fouling of the wall, should settlement take place.
- The top of the supporting rib will be 800mm below the finished road at the carriageway centreline.
- The approach slab will be designed for both earth load and NA loading over a span of 2m in longitudinal direction of the structure.
- Waterproof underlay or 40mm thick blinding will be provided under the approach.

Reinforced concrete solid type piers that are 0.6m thick founded on spread foundations are proposed for the bridge. The bridge deck is a four-span continuous cast in situ reinforced concrete slab. The bridge deck is continuous over the pier and bridge expansion joints are provided at the abutments. The bridge parapet will be of F type shaped reinforced concrete parapet and designed in accordance with Technical Methods for Highways (TMH) 7: Part 2 clause 3.51.2 – Type 1 balustrades: 100kN impact force.

Although no temporary works in form of falsework and formwork is required for this type of bridge deck construction, with this option the span of the deck is limited to 11.4m to allow for the transportation of the beams without special clearance. This limitation requires an additional span and pier to be added to the structure. In addition, the precast beams are less adaptive to deck which are curved in plan.

Due to the position of the new bridge over the Mozana River and the change of the alignment, a realignment of the road has been proposed in terms of Road Safety and KZN DOT standards requirement. This will result in the construction of a new road of approximately 8.5m wide and 860m in length which will start from KM 6+800 at approximate GPS coordinates: 27°17' 11.00" S and 31°14' 01.60" E and ends at KM 7+660 at the approximate GPS coordinates: 27°17' 26.60" S and 31°13' 51.06" E.

The design of road caters for a one-way operation on each side. However, from Km 6+000 passing the bridge from Km 7+340 to Km 8+800 due to the steep area on the design and the grade sitting at 12 or more, the design of the road is proposed to cater for a climbing lane to be done on one direction of that section for approximately 2Km. The one direction climbing lane will consist of two lanes on the left side to allow for trucks to go through and one lane on the right side.

At Km 15.520 the road crosses an unchanneled valley bottom wetland (Wetland Unit UCVB1) from the approximate GPS coordinates: 27°19' 38.15" S and 31°12' 41.64" E to the approximate GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E. This wetland area will require rockfill under the road for about 50m long, 15 m wide and 0.750m thick to allow the water to run freely under the road where six (6) stormwater culverts of size 900PC will be installed to prevent the water from being cut off from the wetland. The existing structures and stormwater pipes at Km 15.520 will be removed and decommissioned. The total physical footprint of the causeway is approximately 750 m². More than 10 cubic metres of soil, and other material will be excavated, removed, or moved during construction of the causeway.

In addition to the Basic Assessment process, a Water Use Authorisation (WUA) Application will be submitted in accordance with the requirements of the National Water Act of 1998 (Act No. 36 of 1998) regulated by the Department of Water and Sanitation (DWS) for the upgrade of the road, construction of Mozana bridge and abstraction of water from the Mozana River during the construction activities.

Two existing Borrow Pits (BP1 and BP3) are found along the D1867 alignment, which will be utilised along the road section for the purpose of procurement of raw materials. However, prior to use of these sites, copies of permits from the Department of Mineral Resources (DMR) and Department of Water and Sanitation must be lodged with the KZN DOT. Only materials supplied by permitted sources must be used and compliance with the Minerals and Petroleum Resources Development Act (MPRDA), (Act No.28 of 2002) as applicable to the establishment of borrow pits must be ensured.

The preliminary pavement design adopted for this road is:

- Double Seal 19: 9.5 proposed
- 125mm Base of G2 Compacted to 85% BRD
- 150mm Sub-base of C4 Compacted to 97% Moisture Density Relationship (MOD) American Association of State Highway and Transportation Officials (AASHTO) density
- 150mm Upper Selected Layer of G7 material compacted to 93% Mod AASHTO density
- 150mm Lower Selected Layer of G9 material compacted to 93% Mod AASHTO density
- Fill constructed in layers of 300mm of selected G10 material and compacted to 90% MOD AASHTO density.
- Shoulders constructed as per fill but top 150mm layer constructed of selected material compacted to 93% MOD AASHTO density.

Normal 1m concrete V drains will be used throughout the road. The following cross drainage is provided as shown in **Table** below.

Table: Cross drainage schedule.

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Chainages	Number and Size	Inlet (Headwall)						Outlet (Headwall)					
		Latitude (S)			Longitude (E)			Latitude (S)			Longitude (E)		
		dd	mm	ss.ssss	dd	mm	ss.ssss	dd	mm	ss.ssss	dd	mm	ss.ssss
6300.00	5/600PC	27	16	58.7948	31	14	14.0958	27	16	58.5658	31	14	13.7896
6760.00	1/600PC	27	17	10.2814	31	14	3.3954	27	17	10.027	31	14	3.0552
7359.87	4/600PC	27	17	17.7246	31	13	45.3179	27	17	17.6705	31	13	44.6552
7560.00	1/600PC	27	17	22.9865	31	13	48.5025	27	17	23.3491	31	13	48.0938
7799.87	2/600PC	27	17	30.0951	31	13	51.0927	27	17	30.0468	31	13	50.5185
7920.00	1/600PC	27	17	33.2899	31	13	52.6043	27	17	33.6287	31	13	52.1699
8020.00	1/600PC	27	17	36.4131	31	13	54.0846	27	17	36.5171	31	13	53.5197
8180.01	3/900PC	27	17	41.1508	31	13	55.719	27	17	41.4464	31	13	55.3603
8379.90	1/600PC	27	17	45.0294	31	14	1.3724	27	17	45.1603	31	14	0.9069
9360.00	2/600PC	27	18	6.016	31	13	35.4921	27	18	5.671	31	13	35.1936
9500.00	1/600PC	27	18	8.8021	31	13	31.4676	27	18	8.4571	31	13	31.1692
9900.00	1/600PC	27	18	16.6858	31	13	19.9026	27	18	16.4035	31	13	19.6585
10360.02	3/600PC	27	18	25.8779	31	13	6.7278	27	18	25.6382	31	13	6.4954
10800.00	3/600PC	27	18	36.4224	31	12	55.9932	27	18	36.1903	31	12	55.6899
11080.00	3/600PC	27	18	43.3303	31	12	49.3672	27	18	43.0982	31	12	49.0639
11639.89	2/900PC	27	18	59.0945	31	12	40.1203	27	18	58.9257	31	12	39.2101
12060.00	1/600PC	27	19	11.8762	31	12	43.739	27	19	12.0745	31	12	43.4061
12439.94	3/600PC	27	19	22.1891	31	12	51.3643	27	19	22.3653	31	12	51.017
12600.12	2/600PC	27	19	27.3382	31	12	52.3431	27	19	27.2818	31	12	51.9937
12960.00	1/600PC	27	19	36.2781	31	12	44.0923	27	19	36.0166	31	12	43.8207
13040.00	8/600PC	27	19	38.0436	31	12	41.9568	27	19	37.7822	31	12	41.6851
13520.09	1/600PC	27	19	51.8593	31	12	34.9225	27	19	51.7397	31	12	34.5462
13779.98	1/600PC	27	19	59.3817	31	12	30.6436	27	19	59.1035	31	12	30.3936
14800.00	4/600PC	27	19	57.5088	31	12	0.0181	27	19	57.2182	31	11	59.7864
15520.00	6/900PC	27	20	7.7034	31	11	36.987	27	20	7.2934	31	11	36.7171
16100.00	1/600PC	27	20	18.2303	31	11	19.8621	27	20	18.0532	31	11	19.5676
16320.00	1/600PC	27	20	24.1591	31	11	15.3921	27	20	23.9599	31	11	15.0608
16500.00	1/600PC	27	20	29.0002	31	11	11.7185	27	20	28.8231	31	11	11.424
16720.00	1/600PC	27	20	34.9285	31	11	7.2476	27	20	34.7514	31	11	6.9531

NEED FOR THE PROJECT

The need for the construction of the Road D1867 in this area arises from the KZN Department of Transport's initiative to upgrade the existing gravel road to surfaced road with improved geometrics considerations and therefore improved safety standards. The need for a new bridge at this location arises from the KZN Department of Transport's initiative construct a new bridge which can accommodate two lane traffic and a 1.5m foot walkway.

Road D1867 provides the link between Belgrade area, which is 50km west of Pongola under the Zululand District Municipality, to Oranjedal area. The road provides access to uPhongolo Local Municipality and the eDumbe Local Municipality. It provides access to the community of Belgrade, Oranjedal and Tobolsk as well as local schools.

The proposed project does have a high importance at a local level as it is in a rural area with moderately populated community with homesteads on either side along the proposed road upgrade within the Ntumbane and khiphunyawo Village in KwaZulu-Natal and Ezibawini Village in Mpumalanga. The route falls under Ward 3 and 5 under three Traditional Councils (Ndlangamandla, Sibiya and Msibi Traditional Council). The construction of D1867 will enable the Ntumbane, Khiphunyawo and Ezibawini residents to access local schools, Tobolosk provincial clinic and local pension points as all these community service facilities are along this route.

The project will provide better access to local communities, a variety of local community facilities as well as quick access to uPhongola and eDumbe. The various community services facilities along the route corridor are Langa Secondary School, Bambanani High School, Siyeza Primary School, Lalela Junior Primary School, Tobolosk Clinic, Qambushilo Lower Primary School, Sibumbene High School, Khiphunyawo Higher Primary School, Vimbamshini Combined Primary School, Somile High School, Kwamziwentsha High School, Velobala Junior Primary School and Kwafundeni Senior Primary School. This route provides access to the community of Ntumbane, Khiphunyawo and Ezibawini as well as local schools.

The proposed road upgrade project will reduce inconvenience and delays and improve mobility and accessibility within the local community. Temporary employment opportunities for local community members will be generated during the construction phase and they will benefit from the training of unskilled labour. Therefore, one of their key objectives of the Zululand District Municipality IDP 2022/2023 will be achieved by providing employment to local communities. The core mandate for the Zululand District Municipality (IDP 2022/2023) is to provide improvement and maintenance of local infrastructure.

This road upgrade project will enhance service delivery capacity thereby impacting positively on the local community. In addition, there is a need to balance the convenience by providing bus stops at shorter intervals to reduce walking distances and increase safety by minimising the instances of vehicles pulling off the road at bus-stops locations where population density is unusually high, at all schools and preferably at distances not closer than 1Km apart.

The proposed upgrading of road D1867 will assist towards meeting the objectives outlined in the IDP of the local and district municipalities including meeting the objectives outlined in the national, regional, or local development frameworks.

ANALYSIS OF ALTERNATIVES

Please note that only reasonable and feasible alternatives have been considered during this assessment process.

The site alternative and type of activity to be undertaken

The Project Core Team has considered several Road D1867 upgrade alternatives scenarios, which range from retaining the status quo to making minor improvements to the drainage to the upgrading from gravel to blacktop of the entire road alignment including construction of the new bridge. Each alternative has been assessed based on a variety of aspects, such as the impact on the sensitive environment, geographical, physical, biological, social, economic, heritage and cultural aspects, road safety and spatial configuration.

- (i) **Alternative 1A:** The No-Go Alternative or the option of not implementing the activity.
- (ii) **Alternative 1B:** Closure of the section of Road D1867 from KM 6+000 to KM 16+900.
- (iii) **Alternative 2:** Re-gravel, minor drainage improvements, maintenance and retain existing one-lane bridge.
- (iv) **Alternative 3:** Improve geometrics, upgrade drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900.
- (v) **Alternative 4:** Improve geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900.
- (vi) **Alternative 5:** Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900

Alternative 1A: The No-Go Alternative or the option of not implementing the activity

The no-go alternative assumes that the proposed project will not go ahead i.e., KZN Department of Transport's initiative to upgrade the existing gravel Road D1867 including river crossing to a surfaced road with improved geometrics considerations and therefore improved safety standards; is not occurring and developed into an operational activity.

This alternative entails that the upgrading of Road D1867 and river crossing would not drive any environmental change and result in no environmental impacts on the site or surrounding areas (River, wetlands, vegetation, surrounding landowners, residents, and services) during construction and operation phase. It provides the status quo or baseline against which other alternatives are compared and has been considered throughout the report.

The No-Go Alternative 1A retains the current status quo where the Road D1867 is retained as a gravel road, with some maintenance and no upgraded stormwater, erosion control mechanism and with the existing one-lane bridge No improvements will be made to the drainage system, nor will the safety issues be addressed. It has been noted that this alternative is not feasible in terms of addressing the current environmental and safety issues on the Road D1867. Without effectively upgrading the Road D1867, the road is likely to continue degrading to a state where the environmental degradation and safety risks becomes a fatal flow and will have to be closed leading to Alternative 1B. This alternative will not meet any of the objectives of the proposed project. Therefore, the option of not implementing the activity will not be pursued at this stage.

Alternative 1B: Closure of the section of Road D1867 from KM 6+000 to KM 16+900

The current poor condition of the gravel road and of the old existing single lane bridge is deteriorating to such a degree that, if measures are not taken to rectify the problems, the road and river crossing will be unsafe for public use and will continue to cause significant environmental damage. If no action is taken the road may have to be closed, and decommissioned. Vehicle or pedestrian traffic will no longer be able to move between Belgrade, Oranjedal and Tobolsk through this route. This alternative will not meet any of the objectives of the proposed project. Therefore, the option of closing the section of the Road D1867 from KM 6+000 to KM 16+900 will not be pursued at this stage.

Alternative 2: Re-gravel, minor drainage improvements, maintenance and retain existing one-lane bridge

This second option is to make minor improvements to the drainage system. Although this will not effectively address the stormwater problem per se, it may slow down the flow of water runoff at some point. The road will remain a gravel surface and will be maintained regularly, however, the current deteriorating condition of the old existing single lane bridge will continue to be a problem and unsafe for public use. Degradation of the road will continue as the cause of the erosion has not been improved. This alternative will not meet the objectives of the proposed project. Therefore, this second option of to re-gravel, minor drainage improvements and maintenance of the Road D1867 from KM 6+000 to KM 16+900 will not be pursued at this stage.

Alternative 3: Improve geometrics, upgrade drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900

The third alternative is to improve the geometrics of the road to control the drainage and erosion. The construction will allow the road to retain its original state but the factors which are causing the degradation will be addressed. A hard blacktop surface will be constructed from KM 6+000 to KM 16+900 with no road realignment as the existing one-lane bridge is retained. However, this would leave the existing river crossing in its current degraded and dangerous condition by posing a safety risk to motorists and pedestrians. This alternative will partially meet all the objectives of the proposed project.

Alternative 4: Improve geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900

Alternative 4 is to improve the geometrics of the road to control the drainage and erosion. A hard blacktop surface will be constructed from KM 6+000 to KM 16+900 with a realignment of the road to connect to the new bridge constructed upstream of the existing one-lane bridge. However, the realignment of the road could impact some houses and could damage some graves and burial site. This alternative will meet most of the objectives of the proposed project, although damage to graves could potentially delay the project due to its highly significant value to people and there are many traditional, cultural, and personal sensitivities and norms concerning the removal of graves.

Alternative 5: Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900

Alternative 5 has been expressed as the preferred alternative for the project by the Proponent, KZN DOT. This option involves improving and re-constructing all the geometrics of the road but includes hard surfacing the entire road from KM 6+000 to KM 16+900. The hard surface will be a blacktop surface, asphalt or chip and spray, or a combination of the three depending on the section of Road. The new bridge will be constructed further upstream of the existing one-lane bridge together with the realignment of the road to connect to the bridge. This alternative will avoid potential damage to some graves and burial site, however, could impact some houses. This alternative will meet all the objectives of the proposed project.

The design or layout of the activity:

The preferred design of the activity consists of replacing the existing one-lane bridge with a two-lane bridge constructed south of the existing bridge. Three (3) potential layout options have been proposed by KZN DOT:

- (i) **Option 1:** This alternative (preferred design scheme) comprises a continuous 4 span solid reinforced concrete slab deck.
- (ii) **Option 2:** This alternative comprises a simply supported 5 span precast beam and slab deck construction.
- (iii) **Option 3:** This alternative comprises a continuous 5 span solid slab deck, constructed from precast inverted T-shaped beams placed side by side and in-situ concrete infill and topping.

The preliminary pavement design adopted for this Road D1867 is:

- Double Seal 19: 9.5 proposed
- 125mm Base of G2 Compacted to 85% BRD
- 150mm Sub-base of C4 Compacted to 97% Mod AASHTO density
- 150mm Upper Selected Layer of G7 material compacted to 93% Mod AASHTO density
- 150mm Lower Selected Layer of G9 material compacted to 93% Mod AASHTO density
- Fill constructed in layers of 300mm of selected G10 material and compacted to 90% MOD AASHTO density.
- Shoulders constructed as per fill but top 150mm layer constructed of selected material compacted to 93% MOD AASHTO density.

The operational aspects of the activity:

The preferred and only operational aspects of the activity involve the rehabilitation of degraded areas associated with the road upgrade and river crossing and post-construction road activities. This must be undertaken as part of the operational phase of the proposed project, including erosion control measures as appropriate, ongoing vegetation rehabilitation using indigenous plants and implementation of an ongoing alien and invasive plant control programme.

ENVIRONMENTAL LEGAL REQUIREMENTS

National Environmental Management Act (NEMA) (Act No. 107 of 1998) as amended

The proposed upgrading of Road D1867 project triggers Listed Activities as stipulated in the EIA Regulations (2014) promulgated in terms of the NEMA, 1998 (Act 107 of 1998) as amended under Government Notice Regulation (GNR) No. 982, 983, 964 and 985 of 04 December 2014 read in conjunction with Regulations (GNR) 324, 326 and 327 of 07 April 2017 (DEA, 2014). The following table below provides a summary of the Listed Activities in terms of the EIA Regulations 2014 that are triggered by the project:

Table: Summary of the Listed Activities.

Government Notice Number	Activity number	Description of each listed activity	Component of project
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse	The recommended preferred build alternative consists of replacing the existing one-lane bridge with a two-lane bridge constructed southeast of the existing bridge at about Km 7.2 at GPS coordinates: 27°17' 14.1" S, 31°13' 47.5" E. The proposed Mozana bridge deck will be 56m long continuous slab with 4 spans of 14m length. The bridge deck will be 11.12m to accommodate 2 x 3.5m wide lanes with shoulders of 0.75m wide on both side of the bridge and a 1.5m foot sidewalk on the south edge of the bridge. The total physical footprint of the bridge is approximately a 622,72m ² . At Km 15.520 the road crosses an unchanneled valley bottom wetland (Wetland Unit UCVB1) from approximately GPS

Government Notice Number	Activity number	Description of each listed activity	Component of project
			coordinates: 27°19' 38.15" S and 31°12' 41.64" E to approximately GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E. It is proposed the construction of the new causeway with a physical footprint of approximately 750 m ²
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;	More than 10 cubic metres of soil, and other material will be excavated, removed, or moved during construction of the bridge at Km 7.2 GPS coordinates: 27°17' 14.1" S, 31°13' 47.5" and during construction of the causeway at Km 15.520 GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	24	The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	As the project includes the construction of a new bridge over the Mozana River, small section of the road before and after the bridge requires re-alignment by constructing a new road alignment approach to the new bridge over the Mozana-river on both sides. This will result on the construction of a new road of approximately 8.5m wide and 860m in length which will start from KM 6+800 at the approximate GPS coordinates: 27°17' 11.00" S and 31°14' 01.60" E to KM 7+660 at the approximate GPS coordinates: 27°17' 26.60" S and 31°13' 51.06" E.
GNR 325 of 07 April 2017 (Listing Notice 3) read in conjunction with GNR 985 of 04 December 2014	14	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse d. KwaZulu-Natal vii. Critical biodiversity areas or ecological support areas as identified in systematic biodiversity plans adopted by the Competent Authority or in bioregional plans; f. Mpumalanga (ff) Critical biodiversity areas or ecosystem service areas as identified	At Km 15.520 the road crosses an unchanneled valley bottom wetland (Wetland Unit UCVB1) from the approximate GPS coordinates: 27°19' 38.15" S and 31°12' 41.64" E to the approximate GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E. It is proposed the construction of the new causeway with a physical footprint of approximately 750 m ² and this will occur within a Critical Biodiversity Areas.

Government Notice Number	Activity number	Description of each listed activity	Component of project
		in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	

The abovementioned activities contained in Listing Notice 1 and 3 of the EIA Regulations (2014) promulgated in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) in GNR No 327 and 325 of 07 April 2017 read in conjunction with GN R. 983 and 985 of 04 December 2014; are subject to a Basic Assessment within the jurisdiction of the Department of Forestry, Fisheries, and the Environment (DFFE) – National Office.

Mineral and Petroleum Resources Development Act, (Act No.28 of 2002)

An application for a Mining Permit and Environmental Authorisation has been submitted to DMR for the establishment of two borrow pits in line with the requirements of MPRDA, 2002 (as amended) and NEMA EIA Regulations Act No 107 of 1998), as amended, and the EIA Regulations (2014). The following table below provides a summary of the Listed Activity in terms of the EIA Regulations 2014 that are triggered by the establishment of two borrow pits:

Table: Summary of listed activity for borrow pit

Government Notice Number	Activity number	Description of each listed activity	Component of project
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	21	Any activity including the operation of that activity which requires a mining permit of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002, including - (a) associated infrastructure, structures, and earthworks, directly related to the extractions of a mineral resource, or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening, or washing.	Two existing Borrow Pits (BP1 and BP3) are found along the D1867 alignment, which will be utilised along the road section for the purpose of procurement of raw materials to be used as fill material for the intended road works upgrade project.
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	22	The decommissioning of any activity requiring – (l) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);	The two existing Borrow Pits (BP1 and BP3) will be decommissioned and rehabilitated following the completion of the road upgrade project.

The abovementioned activities contained in Listing Notice 1 of the EIA Regulations (2014) promulgated in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) in GNR No 326 and 327 of 07 April 2017 read in conjunction with GN R. 982 and 983 of 04 December 2014; are subject to a Basic Assessment within the jurisdiction of the DMR.

National Water Act (NWA) (Act No. 36 of 1998)

Due to the project occurring within 500m radius of wetlands and 1:100-year floodline, a Water Use Authorisation (WUA) Application must be submitted to the Department of Water and Sanitation (DWS) in terms of Section 21 (a), (c) or (i) in accordance with the National Water Act (NWA)1998 (Act No. 36 of 1998).

The following table below provides a summary of water uses that apply to this upgrade:

Table: Summary of water uses that require a water use licence

Activity Number	Water Use	Explanation / Definitions
Section 21 (a) of NWA, 1998	Taking water from a water resource	❖ Water is to be abstracted from the Mozana River during construction activities.
Section 21 (c) of NWA, 1998	Impeding or diverting the flow of water in a watercourse.	❖ Impeding flow means the temporary or permanent obstruction or hindrance to the flow of water into watercourse by structures built either fully or partially in or across a watercourse. ❖ Diverting flow means a temporary or permanent structure causing the flow of water to be rerouted in a watercourse for any purpose.
Section 21 (i) of NWA, 1998	Altering the bed and banks of a watercourse or characteristics of a watercourse.	❖ Altering the bed and banks means any change affecting the resource quality of the watercourse (the area within the riparian habitat or 1:100-year floodline, whichever is the greatest).

PUBLIC PARTICIPATION PROCESS

Public participation Process (PPP) is currently being carried out in accordance with Section 24 (J), (O) of the NEMA as amended in the EIA regulations, 2014. Steps undertaken during this phase are summarised below and, in this draft, BAR.

Authority Consultation

The Competent Authority which is the Department of Forestry Fisheries and Environment (DFFE) - Environmental Impact Assessment (National Office), is required to provide a decision for the proposed Road D1867 upgrade project. Consultation with the DFFE for guidance for this project was conducted through a pre-application meeting which was held via Microsoft Teams on the 02nd of September 2020.

A pre-application meeting with DWS was held at their Regional Office in Durban on the 16th of October 2019 for guidance for the application of the Water Use Authorisation (WUA) process. The WUA application will be submitted for decision making and the proof of submission of application will be attached during the submission of the FBAR.

The proposed Road D1867 upgrade project falls within the UPhongolo Local Municipality under Zululand District Municipality, KwaZulu-Natal Province and within Mkhondo Local Municipality under Gert Sibande District Municipality, Mpumalanga Province. Notification and request for comments were sent to both Local and District Municipalities and other Stakeholders. A copy of this draft BAR has been circulated to give them an opportunity to provide comment. They have also been given an appropriate legislated period to comment on this DBAR.

The Phase 1 Heritage Impact Assessment (HIA) Study and Desktop Paleontological Impact Assessment (PIA), Background Information Document (BID), Environmental Screening report and Draft BAR were uploaded into the South African Heritage Resources Information System (SAHRIS) website for the purpose of this application for comment in terms of section 38(8) of the National Heritage Legislation and NEMA.

Identification of Interested and Affected Parties (I&APs)

Upon receiving the description, a site visit was undertaken, this process was used to identify:

- Key areas of concern.
- Sites for the placing of the site notices.
- A visual understanding of the project.
- Areas most impacted by the proposed development.

The next step and measures in the identification of key I&APs and Stakeholders, including the following:

- Landowners (Tribal Authorities).
- Local and Provincial Government.

- Ward Councillor.
- Local businesses.
- Residents within a 150m distance of the project site and other parties.
- Affected and neighbouring landowners.
- Schools, Clinics and Hospitals.
- Organs of State.
- Municipalities.
- Environmental Non-Governmental Organisations; and
- Community Based Organisations.

The properties on which Road D1867 is located are owned by Ingonyama Trust Board Trustees and Vulindlela Communal Property Association. The landowners or lawful occupier of the land in question have all been notified. Msibi, Ndlangamandla and Sibiyi Traditional Authority under Ingonyama Trust Board are the landowners. The landowners have no objection to the proposed Road D1867 upgrade.

Key Stakeholders

In accordance with the requirements of the NEMA EIA Regulations 2014 under Section (24)5 of NEMA (Regulation 42 of GNR 982), a Register of I&APs must be kept by the Public Participation Facilitator. In fulfilment of this requirement Afzelia Environmental Consultants has compiled a comprehensive I&AP database (I&AP Register) comprising of key stakeholders, I&AP's and Organ of States at the onset of the project. Such a register has and is constantly being updated with the details of involved I&APs throughout the duration of the PPP including their comments. Table below lists all the key stakeholders, I&AP's and Organ of States identified.

Table: List of all stakeholders identified.

NAME	ORGANISATION / ENTITIES
Ms Thulisile Nyalunga	DFFE
Ms Fiona Grimett	DFFE
Mr Sbusiso Ndwandwe	EDTEA - Zululand District
Ms Sindisiwe Mbuyane	Department of Agriculture, Rural Development and Land (DARDL) - Mpumalanga Province
Mr B.P. Mnguni	Zululand District Municipality
Mr.Mthandeni Mkhonza	Gert Sibande District Municipality
Ms Nonhlanhla Sibiyi	uPhongolo Local Municipality
Mr Absalom Mahlangu	Mkhondo Local Municipality
Mr Y. Gaunter	Zululand Tourism
Casamia	uPhongolo Tourism: Pongola Arts & Crafts Centre
Ms Zamashenge Hadebe	Department of Water and Sanitation
Dominic Wieners	Ezemvelo KZN Wildlife
Johan Eksteen	Mpumalanga Tourism & Parks Agency (MTPA)
Ms N. Sontangane	DFFE: Forestry Regulations and Support
P. Mans	Department of Agriculture and Rural Development
Ms Bernadet Pawandiwa	AMAFA AKwaZulu-Natali
Mr Benjamin Moduka	Mpumalanga Provincial Heritage Resource Authority (MPHRA)
Andrew Salomon	South African Heritage Resources Agency (SAHRA)
Michelle Smidt	KZN Department of Transport
Michelle Nicol	Eskom
Ms Lynn Boucher	Department of Rural Development and Land Reform (DRDLR)
Suewellan Ellis	Ingonyama Trust Board
Inkosi Ndlangamandla	Ndlangamandla Traditional Authority
Inkosi T.K. Sibiyi	Sibiyi Traditional Authority
Inkosi Msibi	Msibi Traditional Authority
Ntshangase	Ward 3 - Councillor

NAME	ORGANISATION / ENTITIES
S.T. Mavimbela	Ward 5 - Councillor

Circulation of Background Information Document (BID) and flyers to I&APs

The BID for the proposed upgrading of Road D1867; was circulated to stakeholders, Local residents and I&APs for comment as part of the initial PPP on the 19th and 20th of September 2019. These notifications informed the public of the project as well as affording them an opportunity to register as I&APs and to comment or raise any issue that they might have. The I&APs were given a 30-day calendar period to respond.

A copy of the English and isiZulu written notice and flyers were distributed along the proposed road route to I&APs, property owners of land adjacent to the proposed site and local residents for notification and participation purposes,

Local traditional councils were met with on the 21st of August 2019, notifying them of the proposed project, which includes the use of the Borrow Pits and the upgrading of 10.5km of D1867 road. There were no objections during these meetings and the traditional councils all signed the Traditional Council Consent Forms (ITB 2).

Erection of Site Notice

I&AP's were notified of the project through fixing a notice board at a place conspicuous to and accessible by the public. Site Notices were placed in several locations from the start to the end of the road alignment D1867 site on the 21st of August 2019 to notify potential I&APs travelling in both directions along D1867 road alignment.

Placement of advertisement on newspapers

Advert was placed in the Zululand Observer on the 3rd of September 2021 in both English and isiZulu during the circulation of the DBAR. The advertisement is aimed to further inform I&APs of the proposed activity and to invite them to participate in the process.

Circulation of the DBAR

This draft BAR and supporting documentation have been made available for Authority and public review for a total of 30 legislated days from **Monday 16/05/2022 until Monday 20/06/2022** and upon request from the EAP. In order to distribute the information regarding the proposed project to the broader public and to ensure that all potential I&AP's were given the opportunity to comment.

Hard copies of the draft BAR report and supporting documentation has been placed at public venue, that is, **Belgrade Thusong Service Centre**.

Comments received during the 30-day public participation period have been incorporated in the final report which will be submitted to the Competent Authority, DFFE, for their decision.

Public Meeting

A public meeting was conducted at the Msibi, Ndlangamandla and Sibiya Traditional Council on. 21st of August 2019. No further public meeting will be held as there has been minimal response to the documentation issued so far. However, should there be a call for such an additional meeting the necessary arrangements will be made.

Summary of issues raised by I&APs

All comments and issues raised during the initial PPP have been captured, presented, and responded to in this section.

NATURE OF RECEIVING ENVIRONMENT

In terms of the natural receiving environment within the vicinity of the proposed Road D1867 upgrade site, a desktop analysis and field survey of the environment and local population yielded the following results regarding the site and surrounds:

- The study area is characterised by two terrestrial vegetation types namely KaNgwane Montane Grassland (Gm 16) and Ithala Quartzite Sourveld (Gs 2). The former has a threat status of **Vulnerable** and the latter is **Least Threatened**.
- The vegetation of the study site forms three vegetation communities, grassland, bushveld and riparian vegetation.
- 15 Species of Conservation Concern (SCC) have been recorded from the area and surrounds. 2 are listed as endemic. 1 is listed as Vulnerable on the National Threatened and Protected Species List (TOPS). 1 is listed on the National Forests Act list of Protected Trees. 14 species are listed as Protected on the Provincial List for KZN, and 2 species are listed as **Near Threatened**.
- Whilst no azonal vegetation type was flagged by the provincial or national dataset, the specialist recorded the Subtropical Freshwater Wetlands.
- There are also a number of alien invasive and non-indigenous species expected for the site.
- According to the KwaZulu-Natal Biodiversity Spatial Planning (KZN BSP), a small patch of land identified as Critical Biodiversity Areas (CBA): Optimal occurs within the within 5kms of the study area. This means the study area is not critical for the support of conservation important biota, however, a small patch of land serves as an alternate habitat for conservation important biota should their preferred habitat be compromised.
- There are no Protected Areas within 10km of the site. The site occurs within a National Protected Areas Expansion Strategy (NPAES) focus area. The Important Bird Areas (IBA) closest to the site (Ithala Game Reserve) is further than 10kms from the site
- Upon interrogation of the Mpumalanga Biodiversity Sector Plan (MBSP), it was determined that a short section of the road upgrade and the proposed bridge are located within an area identified as “*Other Natural Areas*”.
- As the site is located within an anthropogenically impacted environment, and involves the upgrading of an existing road, faunal impacts are unlikely to occur. Species that are present in the area will move away from the proposed road upgrade project.
- According to the National Freshwater Ecosystem Priority Areas (NFEPA) GIS dataset the study area falls within a sub catchment identified as an “upstream management area.”
- The road upgrade falls within quaternary catchment W42L which forms part of the greater Pongola - Mtamvuna Water Management Area (WMA). The road alignment is located within the Sub-Quaternary Reach (SQR) W42L – 02270.SQR. W42L – 02270 comprises an upland section of the Mozana River which terminates at the confluence of the Mozana and the Phongolo River, approximately 30km downstream of the site.
- A total of five distinct riparian units, including three riverine, *inter alias*, R02 (The Mozana River) is classified as an upper foothills river, R03 and R04 are classified as transitional rivers and S02 and S03 are classified as mountain headwater streams units. These were delineated and assessed in the field using topographical, soil and vegetation indicators.
- Delineated wetland habitats were then sub-divided and classified into hydrogeomorphic (HGM) units and 3 of 6 wetland units were flagged as being at risk of being impacted by the proposed upgrade of the D1867 Road. Infield delineated wetland units at risk of being impacted include two unchanneled valley bottom wetlands (Unit UCVB1 and UCVB2) and a seep wetland (Unit S1).
- A homestead with several structures is situated west of and very close to the proposed diversion as well as a burial site consisting of at least 16 graves. The graves are situated east of the homestead and could be impacted by the proposed road diversion.

- The proposed road diversion also crosses a rocky outcrop which is in pristine condition. It should be avoided by the proposed road upgrade as such areas are often archaeologically sensitive.
- A temporary wooden structure was found close to the road. The house is used by Shembe followers when they come to the area to worship. It is situated within 6m of the road and could be impacted by the upgrade of the D1867. The structure is significant because of its association with the Shembe religion and its potential importance or use to the local Shembe community. Another structure made of stone was found not far from the wooden structure which is also used by Shembe followers. The structure is significant again for its association with the Shembe religion. It is situated close to the road and could be impacted by the road upgrade.
- The geological map shows the general area to be underlain by Sedimentary and Volcanics rocks of the Mozaan Group of the Randian Era, viz. Shales, Sandstones and Quartzites, as well as Basalts from the Nsuze Group, a siliclastic succession consisting of alternating quartzite, shale, conglomerate and iron-formation, unconformably overlies the Nsuze Group. Two units of contemporaneous flood basalt, namely the Tobolsk and Gabela Formation are interbedded with the siliclastic deposit in the upper part of the stratigraphy. The Nsuze Group was uplifted and peneplaned before the deposition of the Mozaan Group
- The proposed road upgrade starts in the Dwyka Group (C-Pd) and continues into basement (Rk and Rd). Dolerite (Red: Jd) dykes and sills may be encountered on the route. According to the geology, there is little likelihood of any vertebrate fossils being found within this area.

SPECIALIST STUDIES

The following specialist studies were conducted for the proposed project and are included within the Appendices of this Draft Basic Assessment Report (DBAR):

- Wetland assessment,
- Aquatic assessment,
- Ecological Impact assessment,
- Heritage Survey,
- Desktop Paleontological, and
- Geotechnical Investigation.

IMPACT IDENTIFICATION AND ASSESSMENT

The summary of impact significance is summarised in table below:

Table: summary of impact significance

IMPACTS	WITHOUT MITIGATION	WITH MITIGATION
Potential Negative Environmental Impacts during the Construction Phase		
Biophysical Environmental Impacts		
Impact on Topography and Geology	60 High	32 Medium
Soil Erosion and Sedimentation	30 Medium	8 Negligible
Hydrological and drainage impact	56 High	48 Medium
Biological Environmental Impacts		
Loss of freshwater habitat and biota	24 Medium	18 Low
Degradation of freshwater habitat	44 Medium	18 Low

IMPACTS	WITHOUT MITIGATION	WITH MITIGATION
Loss of Grassland	60 High	40 Medium
Loss of Bushveld	60 High	40 Medium
Loss of Wetland Vegetation	60 High	40 Medium
Loss of flora SCC	48 Medium	6 Negligible
Fragmentation and edge effects	15 Low	2 Negligible
Soil and Surface Water Pollution Impact	30 Medium	8 Negligible
Loss of fauna SCC	14 Low	2 Negligible
Proliferation of alien invasive vegetation	65 High	15 Low
Social Environmental Impacts		
Noise Pollution	50 Medium	40 Medium
Elevated dust level	45 Medium	21 Low
Impact on graves and burial site	85 Very High	48 Medium
Impact on structures of potential importance to members of the Shembe community	36 Medium	16 Low
Road safety & Traffic issues	40 Medium	15 Low
Potential Positive Environmental Impacts during the Construction Phase		
Creation of temporary employment of local labour	50 Medium	60 High
Community Empowerment and Contribution to Local and Regional Businesses	50 Medium	56 High
Skills Training and Development	50 Medium	65 High
Removal of alien vegetation	55 High	65 High
Potential Negative Environmental Impacts During the Operation Phase		
Increased impervious area (Hardened surfaces)	56 Medium	36 Medium
Degradation of freshwater habitat	36 Medium	8 Negligible
Pollution of soil and water resources	18 Low	2 Negligible
Spread of Alien invasive species	65 High	15 Low
Potential Positive Environmental Impacts during the Operation Phase		
Improved road infrastructure	55 High	80 Very High

IMPACTS	WITHOUT MITIGATION	WITH MITIGATION
Improved road safety	55 High	70 Very High
Improved travel conditions with reduced traveling time	55 High	75 Very High
Reduced dust pollution	56 High	75 Very High
Improved stormwater management control	65 High	85 Very High
Potential Negative Environmental Impacts During the decommissioning Phase		
Disposal management criteria	55 High	44 Medium

ENVIRONMENTAL IMPACT STATEMENT

The overall significance of positive socioeconomic and environmental impacts is beneficial as it should improve access for road users (motorists and pedestrians); improved road safety, increase mobility, reduce travel times, reduce dust pollution, address erosion risks, sedimentation, and pollution of the lower reaches of the river and curbing consequential environmental degradation, if the Road D1867 goes into its operational implementation phase.

Taking into consideration the specialist assessments done during the BA process and the recommendations thereof, the assessment of environmental impacts in this Draft BAR and provided mitigation measures contained in the EMP, the positive impacts of the proposed Road D1867 upgrade project is enhanced, and the negative ones will be avoided or minimised through the implementation of the EMP attached as **Appendix F**. The mitigation measures stated in the EMP must be rigorously implemented, this will further reduce the impacts of construction activities.

COMPARISON OF ALTERNATIVES

The No-Go Alternative 1A retains the current status quo where the Road D1867 is retained as a gravel road, with the existing one-lane bridge. It has been noted that this alternative is not feasible in terms of addressing the current environmental degradation and safety issues on the Road D1867. Without effectively upgrading the Road D1867, the road is likely to continue degrading to a state where the environmental degradation and safety risks becomes a fatal flow and will have to be closed leading to **Alternative 1B**.

The complete closure (**Alternative 1B**) from KM 6+000 to KM 16+900 would have significant economic, trade and social impact for the local communities as they rely on the Road D1867 for trade and travel between home and work. Therefore, retaining the status quo condition of the Road D1867 (**Alternative 1A** and **Alternative 1B**) is unfeasible for biophysical, economic, and social reasons.

Alternative 2, which involves re-graveling, improvements of minor drainage, maintenance and retaining existing the one-lane bridge. along the remaining length of the Road D1867 from KM 6+000 to KM 16+900 is not favoured by the Proponent, KZN DOT. The road will remain a gravel surface and will be maintained regularly, however, the current deteriorating condition of the old existing single lane bridge will continue to be a problem and unsafe for public use. Degradation of the road will continue as the cause of a formalised stormwater drainage control and the erosion has not been effectively addressed. Furthermore, maintenance costs associated with a gravel road are higher than that of a hard surfaced road and are not sustainable in the long term. Further assessment of **Alternative 2** reflects that many of the other potential opportunities, such as economic and social upliftment, and environmental cannot be achieved as the road surface will still limit accessibility.

Alternative 3: involves Improving geometrics, upgrading drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900. this alternative is feasible in terms of addressing the current environmental degradation as a result of poor gravel road surface and lack of effective stormwater drainage on the Road D1867. Retaining the existing

one-lane bridge will prolong the safety issues as the bridge structure has deteriorated to such a degree that significant maintenance is required just to keep the bridge in service,

Alternative 4: involves improving geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900. This alternative will meet any of the objectives of the proposed project. However, it will have a very significant impact to some graves and burial site as result of the new alignment.

Alternative 5 is the Proponent's preferred proposed site activities to meet the project's objectives, and involves improving geometrics, upgrading the drainage, constructing the new bridge further upstream, realignment and hard surface blacktop from KM 6+000 to KM 16+900. as in **Alternatives 3 and 4**. The major purpose for laying a hard surface and improving the stormwater drainage is to address the current poor condition of the gravel surface and the deteriorating condition of the existing single lane bridge.

Alternative 5 offers the highest levels of biophysical, cultural, and environmental benefits of all the alternatives, as the hard surface, in conjunction with the upgraded stormwater infrastructure and new bridge, will manage water movement most effectively, minimise erosion from the road and the surrounding environment, and minimise the subsequent discharge of the eroded materials into the Mozana River. This is one of the major objectives of the project – to minimise and prevent, where possible, the continued erosion and degradation of the Road D1867 and surrounding environment. In addition, the potential impact or damage to some graves and burial site is avoided as a result of road realignment and construction of the new bridge.

The preferred design of the activity consists of replacing the existing one-lane bridge with a two-lane bridge constructed south of the existing bridge. Three (3) potential layout options have been proposed by KZN DOT:

Although **Option 1** (preferred alternative design scheme) comprising a continuous 4 span solid reinforced concrete slab deck, may present a greater cost of materials, however, the support structure, are made to resist hogging bending moments. It has relatively large loading carrying capacity as compared to other alternative **Option 1** and **Option 2**. It reduces the height of fill and consequently the cost of the approaches and the cost of substructure due to lesser height of piers and abutments which again reduces the cost of the foundation. Due to the reduction in the width of pier, less obstruction to flow and as such possibility of less scour.

Option 2: which comprises a simply supported 5 span precast beam and slab deck construction may present some advantages such as it is cost-effective, saves construction time, provides a safe construction working platform and where an improved quality assurance construction can be performed. However, they present some limitations. It does have less loading carrying capacity as compared to **Option 1:** Continuous 4 span solid reinforced concrete slab deck. Beam and slab bridge construction have a relatively poor load distribution property. This can be improved by providing one or more transverse beams or diaphragms within the span. And in bridges built with precast beams, forming these intermediate diaphragms is extremely inconvenient and therefore expensive. Further, it presents transportation cost and issue including handling difficulties.

Option 3: which comprises a continuous 5 span solid slab deck, constructed from precast inverted T-shaped beams placed side by side and in-situ concrete infill and topping are useful in almost any location. The bridge deck system utilises high-quality, factory-made beams that can be quickly erected on site and with minimum interruptions to traffic. However, they present some limitations with the width of the deck span and there are limited placement options available. They do not offer a lot of flexibility. The maintenance costs are very high and are not sustainable in the long term.

CONCLUSION AND EAP'S RECOMMENDATION

It is in the opinion of the EAP that **Alternative 5 (Preferred alternative): Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900 and Option 1: (preferred design scheme) comprising a continuous 4 span solid reinforced concrete slab deck** be authorised by DFFE for the following reasons:

- The Basic Assessment identified that excessive erosion and scouring and evidence of washaways, undercutting and gravel loss on the Road D1867 due to poor storm water runoff control and surface condition has been taking

place for many years and has caused significant damage to not only the Road D1867 but to the terrestrial and aquatic (rivers and wetlands) environments adjacent to, and linked with, the Road D1867. With reduced erosion, sedimentation of the rivers will decrease significantly, and the health of the river system will improve. Undertaking the proposed upgrade would specifically address and remedy key environmental problem areas through engineered solutions.

- A hard surface blacktop road on steep gradient will reduce the amount of sediment run-off and erosion, thereby protecting rivers from siltation to some degree. In addition, reduced dust pollution.
- Implementing **Preferred Alternative 5** and **preferred design scheme Option 1** as proposed would not only ensure protection of the environment into the long term but would also remedy such existing environmental impacts on the Road D1867 through the implementation of engineered measures to control erosion and scour along the Road D1867 and reduce the sedimentation of the downstream watercourse. Wetland Unit UCVB2 is an unchanneled valley bottom wetland unit at Km 15.520 that has been eroded due to concentration of flows by the existing culvert which is very narrow. The implementation of engineered measures by installing a much wider six (6) stormwater culverts 50m long and 15 m wide with rockfill under the road will rectify this problem, by preventing the water being cut off from the wetland so that flows are not concentrated but ideally spread-out over the width of the wetland unit.
- The potential impact or damage to some graves and burial site is avoided because of the road realignment and construction of the new bridge being moved further upstream of the existing bridge.
- The continuous deck (**Option 1: preferred scheme**) is statically indeterminate structure, and the sections at intermediate supports resist hogging bending moments, resulting in the reduction of the sagging bending moment near midspan sections. The continuous span bridge deck has relatively large loading carrying capacity as compared to simple supported decks of similar span length. Due to the reduction in the width of pier, it presents a higher environmental benefit as it provides less obstruction to water flow and as such possibility of less scour.

In addition to the environmental benefits, it is anticipated that the provision of an all-weather road through the Road D1867 will have several anticipated socio-economic benefits, namely:

- The improved condition of the road and bridge will be safer for motorists.
- Improved access to the area between the community of Belgrade, Oranjedal and Tobolsk
- Reduced cost of travel.
- Travel times and distances will be considerably reduced,
- The road upgrade will reduce inconvenience and delays while providing increased vehicular traffic efficiency and pedestrian safety.
- The benefit to the community will increase with a hard surfaced road.

Based on the balance of social, economic, and environmental considerations, the impacts that will be caused by the proposed upgrading of Road D1867 are within acceptable limits of change, as long as the appropriate mitigation measures outlined in this report and the site specific EMPr attached in **Appendix F** are effectively implemented.

PROPOSED MONITORING AND AUDITING

Monitoring and auditing schedules have been proposed in this report for each phase of the development to address how identified impacts and mitigation will be monitored and/or audited by an independent Environmental Control Officer (ECO) with relevant experience and knowledge for vegetation and rehabilitation.

TABLE OF CONTENTS

REPORT DETAILS & REVISION TRACKING TABLE	ii
REVIEW OF THE DRAFT BASIC ASSESSMENT REPORT	iii
LIST OF ABBREVIATIONS.....	iv
EXECUTIVE SUMMARY	vi
LIST OF FIGURES.....	xxviii
LIST OF TABLES.....	xxix
LIST OF APPENDICES	xxx
SECTION A: THE CORE PROJECT TEAM.....	1
1. DETAILS OF THE PROJECT CORE TEAM.....	1
1.1. Contact Details of Applicant and Project Manager	1
1.2. Name and Contact Details of Environmental Assessment Practitioner' s Organisation	1
1.2.1 Names and details of Expertise of the EAP	1
1.3. Names and details of expertise of each specialist that has contributed to the report	2
SECTION B: ACTIVITY INFORMATION	3
2. INTRODUCTION AND PROJECT OVERVIEW.....	3
2.1 Activity Background	3
2.2 Purpose of the BA Report.....	5
2.3 Report Structure	5
2.4 Scope of assessment and content of the Basic Assessment Report.....	6
2.5 Assumptions and Limitations	9
2.6 Regional Setting and Location of the Activity	10
2.7 Property Description	10
3. CONCEPTUALISATION OF THE PROPOSED ACTIVITY	13
3.1 Description of the activities to be undertaken	13
3.2 Activity Life Description and Cost	18
4. NEED AND DESIRABILITY OF PROPOSED ACTIVITIES	18
5. ANALYSIS OF ALTERNATIVES	23
5.1 The site alternative and type of activity to be undertaken.....	23
5.1.1 Alternative 1A: The No-Go Alternative or the option of not implementing the activity	24
5.1.2 Alternative 1B: Closure of the section of Road D1867 from KM 6+000 to KM 16+900	24
5.1.3 Alternative 2: Re-gravel, minor drainage improvements, maintenance and retain existing one-lane bridge	24
5.1.4 Alternative 3: Improve geometrics, upgrade drainage, retain existing one-lane bridge and hard surface from	24
KM 6+000 to KM 16+900	24
5.1.5 Alternative 4: Improve geometrics, upgrade drainage, construct new bridge upstream, realignment and hard	25
surface from KM 6+000 to KM 16+900.....	25
5.1.6 Alternative 5: Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment	25
and hard surface from KM 6+000 to KM 16+900	25
5.2 The design or layout of the activity:	25

5.3	The operational aspects of the activity:	25
5.4	The advantages and disadvantages of the proposed activity and alternatives.....	26
6.	ENVIRONMENTAL LEGAL REQUIREMENTS FOR THE PROPOSED PROJECT	34
6.1	National Environmental Management Act (NEMA) (Act No. 107 of 1998) as amended.....	34
6.2	Mineral and Petroleum Resources Development Act, (Act No.28 of 2002)	35
6.3	National Water Act (NWA) (Act No. 36 of 1998).....	36
6.4	Other Applicable Legislation and Guidelines Considered.....	37
6.5	Environmental Legislative Context	39
SECTION C: PUBLIC PARTICIPATION PROCESS.....		45
7.	PUBLIC PARTICIPATION PROCESS.....	45
7.1	Overview and Purpose	45
7.2	Authority Consultation	45
7.3	Identification of I&APs	46
7.4	Key Stakeholders	46
7.5	Circulation of Background Information Document (BID) and flyers to I&APs.....	47
7.6	Erection of Site Notice	47
7.7	Placement of advertisement on newspapers.....	48
7.8	Circulation of the DBAR.....	48
7.9	Public Meeting.....	48
7.10	Summary of issues raised by I&APs.....	48
SECTION D: INFORMATION ON ASSESSMENT FACTORS.....		52
8.	DESCRIPTION OF BASELINE ENVIRONMENT	52
8.1	Climate and Rainfall	52
8.2	Topography, Geology and Soil.....	52
8.3	Terrestrial Vegetation	52
8.3.1	Ithala Quartzite Sourveld (Gs 2).....	52
8.3.2	KaNgwane Montane Grassland (Gm 16)	52
8.4	Water Resources and Catchment Characteristics.....	54
8.4.1	Catchment characteristic.....	54
8.4.2	National Freshwater Ecosystem Priority Areas	54
8.5	Provincial Conservation Guidelines	55
8.5.1	KwaZulu-Natal Biodiversity Spatial Planning.....	55
8.5.2	Threatened Ecosystems.....	55
8.5.3	National Protected Areas Expansion Strategy	58
8.5.4	Important Bird Areas	58
8.6	Socio-Economic Profile	58
8.6.1	Population	61
8.6.2	Employment	61
8.6.3	Education	62

8.7	Description of the Surrounding Land Uses	62
9.	FINDINGS OF THE SPECIALIST ASSESSMENT	64
9.1	Ecological Habitat Assessment	64
9.1.1	Overview	64
9.1.2	Potential Impacts and Recommendations	65
9.2	Wetland Habitat Assessment	66
9.3	Aquatic Ecological Assessment	68
9.4	Phase 1 Heritage Impact Assessment	71
9.4.1	Findings of the Heritage assessment	71
9.4.2	Conclusion and recommendations	72
9.5	Desktop Palaeontological Assessment	73
9.5.1	Findings of the Desktop Palaeontological survey	73
9.5.2	Conclusion	73
9.6	Geotechnical Investigation	73
9.6.1	Layers works below existing gravel road	73
9.6.2	Groundwater	74
9.6.3	Slope Stability	74
9.6.4	Problem Soils	74
9.6.5	Excavatability	74
9.6.6	Geotechnical Recommendation	74
9.7	Stormwater Management Plan	75
SECTION E: IMPACT ASSESSMENT AND MITIGATION		77
10.	IMPACT ASSESSMENT AND MITIGATION	77
10.1	Overview	77
10.2	Methodology used in determining and ranking the significance of potential impacts	77
10.3	Precautionary Principle	80
10.4	Waste, Effluent, Dust and Noise Management	80
10.4.1	Dust Emissions	80
10.4.2	Noise Consideration	81
10.4.3	Waste Management	81
10.5	Impacts and Risks identified and the significance of these impacts	82
10.5.1	Potential Environmental Impacts and Mitigation Measures during the Construction Phase	83
10.5.2	Potential Environmental Impacts and Mitigation Measures During the Operation Phase	97
10.5.3	Potential environmental impacts and Mitigation Measures during the decommissioning phase	100
10.5.4	Potential Positive Environmental Impacts and Mitigation Measures during Construction Phase	101
10.5.5	Potential Positive Environmental Impacts and Mitigation Measures during Operational Phase	103
SECTION F: ENVIRONMENTAL IMPACT STATEMENT		106
11.	ENVIRONMENTAL IMPACT STATEMENT	106
11.1	Summary of impact	106

11.2	Environmental Impact Statement.....	107
11.3	Comparison of Alternatives	110
SECTION G: PROPOSED MONITORING, CONTROL AND AUDITING.....		112
12.	PROPOSED MONITORING, CONTROL AND AUDITING	112
SECTION H: CONCLUSION AND EAP'S RECOMMENDATION		113
13.	CONCLUSION AND EAP'S RECOMMENDATION	113
14.	REFERENCES	116
15.	LIST OF APPENDICES	117

LIST OF FIGURES

Figure 1: Locality map showing boundary of KZN and Mpumalanga province.	11
Figure 2: Topographical map.	12
Figure 3: Road Layout.....	14
Figure 4: Bridge Layout.....	15
Figure 5: Vegetation map of the Project site	53
Figure 6: Quaternary Catchment and drainage setting map	54
Figure 7: NFEPA Wetland map.....	55
Figure 8: KZN Biodiversity Spatial Planning map.....	56
Figure 9: Threatened Ecosystems map	57
Figure 10: Vegetation type map	58
Figure 11: Protected Areas and NPAES Focus Area map.....	59
Figure 12: Important Bird Areas map	60
Figure 13: Population data for PLM - population groups and sex and age.	61
Figure 14: Population data for the PLM - languages and marital status.....	61
Figure 15: Employment data for the PLM showing the status of employment between 15-64, and average annual household income.	61
Figure 16: Highest education level achieved by population of PLM.....	62
Figure 17: Environmental and Current Land cover map.	62
Figure 18: Legend Land Cover	63
Figure 19: Wetland and river delineation and classification	67
Figure 20: Watercourse overview map.	70

LIST OF TABLES

Table 1: Contact details of Proponent and Project Manager.....	1
Table 2: Contact details of EAP's Organisation.	1
Table 3: Qualification of the EAP and their expertise.....	1
Table 4: Summary of EAP Experience and Reviewer.....	2
Table 5: Contact details of Specialists and their expertise.....	2
Table 6: Overall structure of the Draft BAR.....	5
Table 7: Contents of the BAR.	6
Table 8: Coordinates of the proposed sites.	10
Table 9: Property associated with the proposed Road D1867.	10
Table 10: New Bridge coordinates.	13
Table 11: Cross drainage schedule.	17
Table 12: Approximate Duration of Activities – Preferred construction programme.....	18
Table 13: Construction cost estimate breakdown.	18
Table 14: Advantages and disadvantages of proposed site alternatives and type of activities to be undertaken.....	26
Table 15: Advantages and disadvantages of proposed alternatives Design layout.....	32
Table 16: Summary of the Listed Activities.....	34
Table 17: Summary of listed activity for borrow pit.....	36
Table 18: Summary of water uses that require a water use licence.....	36
Table 19: Other Environmental Legislation related to the project.....	37
Table 20: Environmental legislation considered during the preparation of the Draft BAR.....	39
Table 21: List of all stakeholders identified.	46
Table 22: Summary of issues raised by I&APs.....	49
Table 23: Summary of ecological impact associated with the project.....	65
Table 24: Summary of ecological impact associated with the project.....	66
Table 25: Summary of river/stream units assessed during fieldwork.....	68
Table 26: Summary of impacts associated with the proposed road upgrade.....	71
Table 27: Table of Evaluation criteria ranking.....	78
Table 28: Significance weighting.....	79
Table 29: Possible significance scores based on Effect x Likelihood.....	79
Table 30: Scoring System.....	79
Table 31: Ranking of overall impact score.....	80
Table 32: Rural noise level limits as per SANS 10103: 2008.....	81
Table 33: Summary of impact ratings of the preferred alternative.....	106

LIST OF APPENDICES

Appendix A: MAPS

Appendix A.1: Locality map showing boundary of KZN and Mpumalanga Province

Appendix A.2: Topographical Map

Appendix A.3: Vegetation Map

Appendix A.4: Quaternary catchment and drainage setting map

Appendix A5: NFEPA Wetland Map

Appendix A.6: KZN Biodiversity Spatial Planning Map

Appendix A.7: Threatened Ecosystem Map

Appendix A.8: Vegetation Type Map

Appendix A.9: Protected Areas and NPAES Focus Areas Map

Appendix A.10: Important Bird Areas Map

Appendix A.11: Wetland and river delineation and classification map

Appendix A.12: Watercourse Overview Map

Appendix B: SITE PHOTOGRAPHS

Appendix C1: FACILITY ILLUSTRATIONS

Appendix C1: Road Layouts

Appendix C2: Bridge Layout

Appendix D: SPECIALIST REPORTS

Appendix D1: Ecological Habitat Assessment

Appendix D2: Wetland Habitat Assessment

Appendix D3: Aquatic Ecological Assessment

Appendix D4: Phase 1 Heritage Impact Assessment

Appendix D5: Desktop Palaeontological Impact Assessment

Appendix D6: Geotechnical Investigation

Appendix D7: Stormwater Management Plan

Appendix D8: Inception Report

Appendix D9: Construction Method Statement for the road

Appendix D10: Bridge Design Report

Appendix D11: Method Statement for Mozana River Bridge

Appendix D12: National Environmental Screening Tool Report

Appendix E: PUBLIC PARTICIPATION

Appendix E1: I&AP Register

Appendix E2: Authority Consultations - Minutes of the pre-application meeting with DFFE / DWS

Appendix E3: Proof of consultation with landowners – Consent Letters / Attendance Register

Appendix E4: Copy BID for the upgrade of Road D1867

Appendix E5: Proof of circulation of BID and DBAR

Appendix E6: Comment received during the circulation of BID and DBAR

Appendix E7: Copy of the English and isiZulu flyers and site notice

Appendix E8: Pictures showing the erection of site notices

Appendix E9: Pictures showing the distribution of flyers

Appendix E10: Copy of attendance register of consultation with local residents

Appendix E11: Proof of advert

Appendix E12: Comments and responses report

Appendix F: DRAFT Environmental Management Programme (EMPR)

Appendix G: Other Information

Appendix G1: CV of EAPs / Specialists and Qualifications

SECTION A: THE CORE PROJECT TEAM

1. DETAILS OF THE PROJECT CORE TEAM

1.1. Contact Details of Applicant and Project Manager

Table 1: Contact details of Proponent and Project Manager.

Applicant	KwaZulu-Natal Department of Transport				
Contact person	Nkululeko Mncwabe				
Physical address	KwaZulu-Natal Department of Transport, 172 Burger Street, Pietermaritzburg, 3201				
Postal address	KwaZulu-Natal Department of Transport, Private Bag X9043, Pietermaritzburg, 3200				
Email	nkululeko.mcwabe@kzntransport.gov.za	Fax	033342 3962	Tel	0333550559
Project Manager	Ibhongo Consulting (Pty) Ltd				
Contact person	Mr Simphiwe Sumo				
Physical address	71 Fifth Avenue, Morningside, 4000				
Postal address	Postnet 2, Private Bag X10, Musgrave, 4062				
Email	simphiwe@ibhongo.co.za	Fax	031324 2222	Tel	031 324 2200

1.2. Name and Contact Details of Environmental Assessment Practitioner's Organisation

The details of the Environmental Assessment Practitioner (EAP)'s Organisation are shown in **Table 2** below.

Table 2: Contact details of EAP's Organisation.

Contact details of the EAP's organisation	
Business Name	Afzelia Environmental Consultants (Pty) Ltd
Physical Address	Office 101A Windermere Centre, 163-177 Lilian Ngoyi Road, Morningside, Durban, 4001
Postal Address	P.O. Box 37069, Overport, 4067
Telephone	031 303 2835
Fax	086 692 2547
Email	solomon@afzelia.co.za

1.2.1 Names and details of Expertise of the EAP

1.2.1.1 Qualification of the EAP

The qualification of the EAP and their expertise is shown in **Table 3** below:

Table 3: Qualification of the EAP and their expertise.

Name of the EAP	Education Qualifications	Professional Affiliations	Experience at Environmental Assessments (yrs)
Mr Solomon Fataki	BSc. Environmental Management: Botany stream / BSc. Honours Environmental Management:	IAIAsa (Reg No: 3653), IAP2SA, EAPASA (pending)	9
Mr Andrew Batho	Master of Social Science – Geography and Environmental Management	EAPASA (Registration No. 2019/1179)	12

The copies of the education qualifications, Curriculum Vitae (CV) and professional registrations / affiliations are attached as **Appendix G1**

1.2.1.2 Summary of EAP's Past Experience

The copies of the CV are attached as **Appendix G1** of this report. A summary of the project teams experience has been described below in **Table 4**:

Table 4: Summary of EAP Experience and Reviewer

NAME OF EAP	DESCRIPTION OF EXPERIENCE
Mr Solomon Fataki	<p>Solomon has 8 years of experience in the environmental field. His specific interest includes water, soil science, terrestrial ecology, environment and occupational health and safety. Solomon is a member of the KwaZulu-Natal branch of IAIAasa and a regional affiliate member of the IAP2SA.</p> <p>His experience inter alia:</p> <ul style="list-style-type: none"> • Undertaking of Environmental Impact Assessments (EIAs) covering the Basic Assessment (BA) and Scoping & EIR processes as required by environmental legislation in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998), • Undertaking of Water Use License (WUL) Application in terms of the National Water Act (NWA) (Act No. 36 of 1998), • Compilation of Environmental Management Programmes (EMPr) for a range of developments, • Undertaking Public Participation Process (PPP) to facilitate EIAs and WUL Applications
Mr Andrew Batho	<p>Andrew graduated with a BsocSc (Masters) in Geography and Environmental Management from the School of Environmental Sciences, University of KwaZulu-Natal, Durban. His Master's dissertation investigated the use of Wetland Bird Species as Indicators of Land Cover Change within the uMgeni Estuary and Beachwood Mangrove Swamps. His interest lies primarily in wildlife and ecosystem monitoring and management and he has been involved in a variety of research assignments including identification of sites for the purpose of bio fuel production in Western Africa. Andrew has approximately 12 years conservation and environmental consulting experience, and is a member of the KwaZulu-Natal Branch of International Association for Impact Assessments (IAIAasa) and International Association for Public Participation (IAP2). Andrew is currently completing his application for registration as Professional Environmental Consultant with Environmental Assessment Practitioners Association of South Africa (EAPASA).</p>
Nikita Van Schoor	<p>Nikita graduated from the School of Life Sciences, University of KwaZulu-Natal with a Master's Degree in Biological Sciences. Her thesis assessed the long term changes in land cover, water quality and fish assemblages in two KZN estuaries. Nikita is proficient in various data analyses programmes, research gathering and has been exposed to the compilation of EMPr's, Section 27 motivations, screening reports and environmental auditing.</p>

1.3. Names and details of expertise of each specialist that has contributed to the report

Table 5: Contact details of Specialists and their expertise

Name of Specialist	Educations Qualifications	Field of Expertise	Title of Specialist Report/s as attached in the Appendices D
Andrew Briggs	MSc Conservation Ecology	Aquatic Specialist	Aquatic Ecological Assessment Report
Brian Mafela	BSc. (Hons) Forest Resources and Wildlife Management	Wetland Specialist	Wetland Habitat Impact Assessment

Name of Specialist	Educations Qualifications	Field of Expertise	Title of Specialist Report/s as attached in the Appendices D
Leigh-Ann	MSc (Botany)	Vegetation Specialist	Ecological Impact Assessment
Jean Beater	MA (Heritage Studies) MSc (Environmental Management)	Heritage Specialist	Proposed upgrade of Road D1867 situated within the Phongola Municipality, KwaZuluNatal and Mpumalanga province - Phase 1 Heritage Impact Assessment
Alan Smith	BSc, BSc (Hons), MSc and PhD (Geology)	Paleontological Specialist	D-1867 Upgrade, KwaZulu-Natal Desk-Top Palaeontology Report
Zane Pienaar	Pr. Sci. Nat.	Geotechnical Specialist	Geotechnical Investigation

SECTION B: ACTIVITY INFORMATION

2. INTRODUCTION AND PROJECT OVERVIEW

2.1 Activity Background

Afzelia Environmental Consultants has been appointed by Ibhongo Consulting (Pty) Ltd on behalf of the (Applicant) KwaZulu-Natal (KZN) Department of Transport (DOT) to undertake an Environmental Impact Assessment (EIA) in the form of a Basic Assessment (BA) Process as well as a Water Use Authorisation Application (WUAA). The proposed project involves the upgrading of the existing gravel Road D1867 to a formalised blacktop surfaced road in terms of the Environmental Impact Assessment (EIA) Regulations (2014), as amended under the National Environmental Management Act (NEMA) (Act 107 of 1998).

KZN DOT proposes to continue with Phase two (2) of the upgrading of the existing Road D1867 from km 6+000 to km 16+900. An EIA was undertaken for Phase 1 from km 0+000 at the T-junction with National Road N2 to km 6+000 and construction of this phase has been completed. This section of the Road D1867 has a formal blacktop surfaced which was upgraded during Phase 1 of the project.

The current application of Road D1867 from Km 6+000 to Km 16+900 for approximately 10+900 Km in length forms part of Phase two (2). This route section traverses through a mountainous terrain from Km 7+000 to Km 8+000 with no guardrail. The road along this portion is characterised by shallow cuts, sharp bends, steep gradients, and is in a poor condition. The road is also adversely affected by inclement weather conditions creating potholes and slippery conditions. In addition, at sharp bends and steep gradients; some deformation to the shape of the road has occurred on the gravel surface rendering the route unsafe for use especially for vehicular traffic. The existing road drainage system is unable to cope with the high intensity storm water runoff of water on steep gradients, which results in areas adjacent to the road being eroded, excessive scour and evidence of washaways, undercutting and gravel loss.

A portion of the road from km 6+800 to km 7+600 falls within Mpumalanga Province and the rest from Km 6+000 to Km 6+800 and from Km 7+600 to Km 16+900 under KwaZulu-Natal Province. The existing single lane bridge under the Mpumalanga Province section is very old, and the bridge structure has deteriorated to such a degree that significant maintenance is required to keep the bridge in service. In addition, the existing one lane bridge is functionally deficient as it's widths do not satisfy the current KZN DOT standards considering the amount of traffic that utilises the bridge. The project lies within privately-owned properties and Ingonyama Trust land. A 30m road reserve has been allowed for this project as per KZN DoT standards. The design was able to fit within the existing road reserve.

The proposed road upgrade D1867 and Mozana bridge links the community of Oranjedal, Tobolsk and Belgrade which is 50km west of Pongola as well as local schools to the N2 main road and provides a daily access route for

commuters into the CBD of uPhongolo Local Municipality and the eDumbe Local Municipality. In view of the importance of the route, KZN DOT realised the need to construct a new bridge and upgrade the road to provide for a new, high-level, two-lane bridge with sidewalks and improved surfaced road and stormwater runoff control. It is possible that the upgrade of the road and construction of the new bridge over the Mozana River may present the opportunity to now mitigate some of the abovementioned existing impacts. Refer to **Photos No. 1 to 6** below on page 4. Additional photographs of relevant features on the site are included in **Appendix B** of this report.



Photo 1: View of the Start point of Road D1867 from Km 6+000 where the Phase 1 of the project ends.



Photo 2: View of the end point of Road D1867 at Km 16+900 at the T-junction with Road D1869.



Photo 3: View of the existing single lane bridge over the Mozana River crossing point.



Photo 4: View of the existing single lane bridge over the Mozana River crossing point.



Photo 5: View of the unchanneled valley bottom wetland crossing point at Km 15.520.



Photo 6: View of the unchanneled valley bottom wetland crossing point at Km 15.520.

2.2 Purpose of the BA Report

The main purpose of this report is to:

- Determine the policy and legislative context within which the activity is located and how the activity complies with and responds to said policy and legislative context,
- Identify the alternatives or motivations considered, including the activity, site location, and layout alternatives,
- State the need and desirability of the proposed activity,
- Provide a description of the receiving environment that would be affected by the proposed activity,
- Identify the preferred site through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of the identified preferred alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment,
- Provide a summary of the specialist studies conducted as part of the BA process,
- Determine the significance, duration and probability of the impacts occurring to inform the technology and micro-siting of the activity on the site,
- Identify the most compatible micro-siting for the activity,
- Identify, assess, and rank the significant impacts and risks the activity will impose on the preferred site through the lifetime of the activity,
- The report will retrospectively assess the impacts that will occur especially where sensitive areas such as wetlands are to be impacted upon and provide mitigation measures to counter or reduce these probable impacts and will provide rectification recommendations,
- Identify suitable measures to avoid, reverse, mitigate or manage identified impacts,
- Identify residual risks that need to be managed and monitored,
- Compile an Environmental Management Programme (EMPr) with this report; and the management measures stipulated in the EMPr should, if stringently applied, reduce the impacts of construction activity,
- Compile a site rehabilitation plan that must be implemented to address the negative impacts that will occur and return the receiving environment to an acceptable level of integrity,
- Describe the public participation process that was undertaken,
- Provide the relevant Interested and Affected Parties (I&APs) with sufficient information to comment on the process and document the public participation process that is being undertaken; and
- Make recommendations for decision-making (DEA, 2014).

2.3 Report Structure

The structure of the report, including short descriptions of each heading, is shown in **Table 6**, below.

Table 6: Overall structure of the Draft BAR.

Chapter	Heading	Description
Chapter 1	Details of the Core Project Team	This chapter provides relevant details of all the key project team members including the EAPs, specialist consultants, applicant, landowner, and project manager.
Chapter 2	Introduction and Project Overview	This chapter provides a general overview of the project which includes background information of the project, the required checklist for BAR, assumptions and limitations, regional setting and location of activity, and property description.
Chapter 3	Conceptualisation of the proposed activity	This chapter includes a comprehensive description of the proposed road upgrade project, including the type of activities to take place onsite.
Chapter 4	Need and Desirability	This chapter explores the motivation for the proposed road upgrade project with reference to national, provincial, and municipal policy, local socio-economic conditions and receiving environment.
Chapter 5	Investigation of Feasible and	This chapter includes a description and assessment of potential alternatives including the no-go alternative considered during all phases of the proposed road upgrade project.

Chapter	Heading	Description
	Reasonable Alternatives	
Chapter 6	Environmental Legal Requirements	This chapter includes a broad assessment on how the project aligns with relevant legislation and policies as well as which Listed Activities are triggered by the proposed road upgrade project.
Chapter 7	Public Participation Process	This chapter outlines the processes that will be implemented to allow for comprehensive public input to the project.
Chapter 8	Environmental and Social Baseline	This chapter provides an overview of the receiving environment as well as the socio-economic characteristics of the study area. This information is largely obtained through desktop datasets supplemented with acquired, site-level, input.
Chapter 9	Specialist Studies	This chapter includes a tabulated summary of all specialist studies undertaken during the BAR phase of the project including the impact objectives and outcomes for inclusion in the EMPr.
Chapter 10	Impact Assessment and Mitigation Measures	This chapter includes an overview of the impact assessment methodology that will be impacted as well as potential impacts based on available data and initial specialist assessments. This includes an assessment of potential mitigation measures as well for each impact identified during the BAR phase.
Chapter 11	Environmental Impact Statement	A summary of the Finding of the Impact Assessment, Specialist Studies, and the Impact Statement.
Chapter 12	Proposed Monitoring	This chapter provides recommendations on monitoring and auditing during the pre-construction, construction, post-construction, rehabilitation, and operational phase.
Chapter 13	Conclusion and EAP's recommendations	This chapter concludes the report and provides recommendations on the way forward.
Chapter 14	References	This chapter includes a full reference list of all sources consulted during the compilation of the project.
Chapter 15	Appendices	This chapter includes all supporting information for the BAR Report.

2.4 Scope of assessment and content of the Basic Assessment Report

This BAR has been compiled in accordance with the requirements set out in Regulation 23 as well as Section 3 of Appendix 1 of the EIA Regulations 2014 in terms of Government Notice Regulations (GNR) 982 of 04 December 2014, as amended read in conjunction with GNR 326 of 07 April 2017, as amended, which clearly specifies the content requirements for a Basic Assessment Report. The **Table 7** below indicates how this document complies with these requirements.

Table 7: Contents of the BAR.

Content of the Basic Assessment Report	
Clause	Section in this report
(a) details of— (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Section A: Chapter 1, Table 2, 3 and 4, Appendix G1
(b) the location of the activity, including— (i) the 21-digit Surveyor General code of each cadastral land parcel, (ii) where available, the physical address and farm name, (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties on which the activity is to be undertaken, (iv) coordinates of the activity on the property or properties,	Section B: Chapter 2 Table 8 and 9

Content of the Basic Assessment Report	
Clause	Section in this report
(v) a map at an appropriate scale of the property on which the activity is to be undertaken clearly indicating the location of the activity on the property or properties.	
<p>or, if it is—</p> <p>(aa) a linear activity, a description and coordinates of the route of the activity and a map at an appropriate scale clearly indicating the route of the activity;</p> <p>(bb) an ocean-based activity, the coordinates within which the activity is to be undertaken and a map at an appropriate scale clearly indicating the area within which the activity is to be undertaken; or</p> <p>(cc) on land where the property has not been defined, the coordinates within which the activity is to be undertaken and a map at an appropriate scale clearly indicating the area within which the activity is to be undertaken.</p> <p>on condition that, where coordinates are provided, it is provided in degrees, minutes and seconds using the Hartebeesthoek 94; WGS84 co-ordinate system.</p>	Section B: Chapter 2 Table 8 and 9, Figure 1 and 2
(c) a description of the proposed activity, including—	
<p>(i) all listed and specified activities triggered and being applied for,</p> <p>(ii) the project type,</p> <p>(iii) a description of the activities to be undertaken and for a linear activity, a description of the route of the activity, and</p> <p>(iv) the sector classification of the activity as identified in the national electronic register.</p>	<p>Section B. Chapter 3 and 6 Table 16</p> <p>Section B: Chapter 3</p>
(d) the need and desirability for the proposed activity-	Section B Chapter 4
(e) the activity context and environmental factors, including:	
<p>(i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and have been considered in the preparation of the report; and</p> <p>(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks and instruments;</p>	Section C Chapter 6 Table 19 to 20
(f) the period for which the environmental authorisation is required and the date on which the activity is concluded, and the post construction monitoring requirements finalised,	Section B Chapter 3 Table 12
(g) a full description of the process followed to reach the proposed preferred activity, site, and location of the development footprint within the site, including—	Section B Chapter 5
<p>(i) details of all the alternatives considered,</p> <p>(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs,</p> <p>(iii) a summary of the issues raised by Interested and Affected Parties (I&APs), and an indication of the manner in which the issues were incorporated, or the reasons for not including them,</p> <p>(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects,</p> <p>(v) the impacts identified and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent,</p>	<p>Section B Chapter 5</p> <p>Section D Chapter 7</p> <p>Section C Chapter 7 Table 22</p> <p>Section B Chapter 5</p> <p>Section D Chapter 8</p> <p>Section D Chapter 9</p> <p>Section E Chapter 10</p>

Content of the Basic Assessment Report	
Clause	Section in this report
<p>duration, and probability of such identified impacts, including the degree to which these impacts—</p> <ul style="list-style-type: none"> (aa) can be reversed, (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed, or mitigated, <p>(vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives,</p> <p>(vii) the advantages and disadvantages that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects,</p> <p>(viii) the possible mitigation measures that could be applied and level of residual risk,</p> <p>(ix) the outcome of the site selection matrix,</p> <p>(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and</p> <p>(xi) a concluding statement motivating the preferred alternative, including preferred location of the activity;</p>	<p>Section E Chapter 10 Tables 27 to 31</p> <p>Section B Chapter 5 Table 14 and 15</p> <p>Section E Chapter 10</p> <p>Section F Chapter 11 N/A</p> <p>Section B Chapter 5 Table 14 and 15, Section F Chapter 11 Section G Chapter 13</p>
<p>(h) a full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site through the life of the activity, including—</p> <ul style="list-style-type: none"> (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures, 	<p>Section F Chapter 10</p>
<p>(i) an assessment of each identified potentially significant impact and risk, including—</p> <ul style="list-style-type: none"> (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated, 	<p>Section E Chapter 10</p>
<p>(j) an environmental impact statement which contains—</p> <ul style="list-style-type: none"> (i) a summary of the key findings of the environmental impact assessment; and (ii) a summary of the positive and negative implications and risks of the proposed activity and identified alternatives; 	<p>Section F Chapter 11</p>
<p>(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;</p>	<p>Section D Chapter 9 & Section F Chapter 11</p>
<p>(l) based on the assessment and, where applicable, recommendations from specialist reports, the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;</p>	<p>Section D Chapter 9</p>

Content of the Basic Assessment Report	
Clause	Section in this report
(m) the final micro-siting layout which implements and responds to the impact avoidance, mitigation and management measures identified through the assessment;	Section B Chapter 3 & Section G Chapter 13 Appendix C
(n) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section B Chapter 2
(o) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section G Chapter 13
(p) an undertaking under oath or affirmation by the EAP in relation to— (i) the correctness of the information provided in the report, (ii) the inclusion of comments and inputs from stakeholders and I&APs; and any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs, (iii) the inclusion of inputs and recommendations from the specialist reports where relevant, and (iv) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.	Section C Chapter 7 Table 22 Section D Chapter 9 Section E Chapter 10
(q) an assessment of the activity against sustainability indicators identified by the Competent Authority,	Section D Chapter 8
(r) details of any financial provisions for the management of negative environmental impacts, rehabilitation, and closure of the proposed activity;	Appendix F
(s) any specific information that may be required by the competent authority; and,	N/A at this stage
(t) any other matters required in terms of sections 24(4)(a) and (b) of the Act.	N/A at this stage

2.5 Assumptions and Limitations

Assumptions and limitations as addressed in this report for the upgrading of the Road D1867 are as follows:

- All information provided by the Project Manager, Ibhongo Consulting (Pty) Ltd, to the EAP was taken to be correct and valid at the time it was provided,
- The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process from the Project Manager or Applicant; and
- The scope of work is limited to assessing the existing and potential environmental impacts associated with the upgrading of the Road D1867, as indicated in the Inception Report, construction method statement, Stats Quo Report, Stormwater Management Plan (SWMP) Report and Geotechnical Investigation submitted by Ibhongo Consulting (Pty) Ltd.
- Descriptions of the natural and social environments are largely based on limited fieldwork, various desktop studies, complimented by available literature.
- With regards to the time frames of construction: these are very rough estimates at this time, subject to several external factors beyond our control that may have an impact on time frame changes.
- The location of the construction camp site is unknown at this stage. The site-specific associated impacts relating to the location of a contractor's camp site have been addressed through suitable mitigation measures in the EMPr as well as in this report. The EMPr is attached in **Appendix F**. Of primary importance is that this location must be approved by the Engineer in consultation with the ECO prior to its establishment. The contractor's camp site area must be located outside the 1:100-year flood line or riparian habitat of a river, spring, lake, dam, and wetland or outside any drainage feeding any wetland or pan and at least 100m away from any watercourse in a disturbed area.

In addition to the above, assumptions and limitations were noted by the specialist team, who have clearly stated their own concerns, which are considered as assumptions and limitations in their report attached in **Appendix D**.

2.6 Regional Setting and Location of the Activity

The proposed Road D1867 is situated in Pongola passing through Ntumbane and Khiphunyawo Village in Ward 3 & 5 within the uPhongolo Local Municipality under Zululand District Municipality, KwaZulu-Natal, and Ezibawini Village within the UMkhondo Local Municipality under Gert Sibande District Municipality, Mpumalanga. The D1867 road links with N2-32 at Km 68, runs along the border and, for a short section, diverts into Mpumalanga, and intersects with Road.D1869.

The geographical coordinates of the Road D1867's sites are shown below in **Table 8**:

Table 8: Coordinates of the proposed sites.

Start	South	27°	16'	51,34"
	East	31°	14'	20,94"
Middle	South	27°	18'	42,75"
	East	31°	12'	49,68"
End	South	27°	20'	38,26"
	East	31°	11'	3,69"

A Locality map on page 11 below showing where Road D1867 crosses the boundary of KZN and Mpumalanga as **Figure 1** (attached as **Appendix A1**), and Topographical map below on page 12 as **Figure 2** (attached as **Appendix A2**), are provided below, respectively on page 11, and 12.

2.7 Property Description

The property that includes the extent of the proposed Road D1867 upgrade is reflected in **Table 9** below:

Table 9: Property associated with the proposed Road D1867.

Property Name	Surveyor-General Cadastral Code No.	Title Deed Reference No.	Owner
Portion 1 of Belgrade Farm No. 27	N0HU0000000002700001	T17260/1961PN	South African Dev. Trust-Trustees
Portion 3 of Belgrade Farm No. 27	N0HU0000000002700003	T17260/1961PN	South African Dev. Trust-Trustees
Portion 0 of Simdlangetsha Farm No. 16956	N0HU0000000169560000	T30537/2003	Ingonyama Trust Board-Trustees
Portion 1 of Simdlangetsha Farm No. 16956	N0HU0000000169560001	T30537/2003	Ingonyama Trust Board-Trustees
Portion 10 of Simdlangentsha Farm No. 16956	N0HU00000001695600010		Ingonyama Trust Board-Trustees
Portion 1 of Welkom Farm No. 26	T0HU0000000002600001	T81504/2000	Vulindlela Communal Property Association
Portion 1 of Oranjedal Farm No. 18354	N0HU00000001835400001	A3562/1911	Ingonyama Trust Board-Trustees

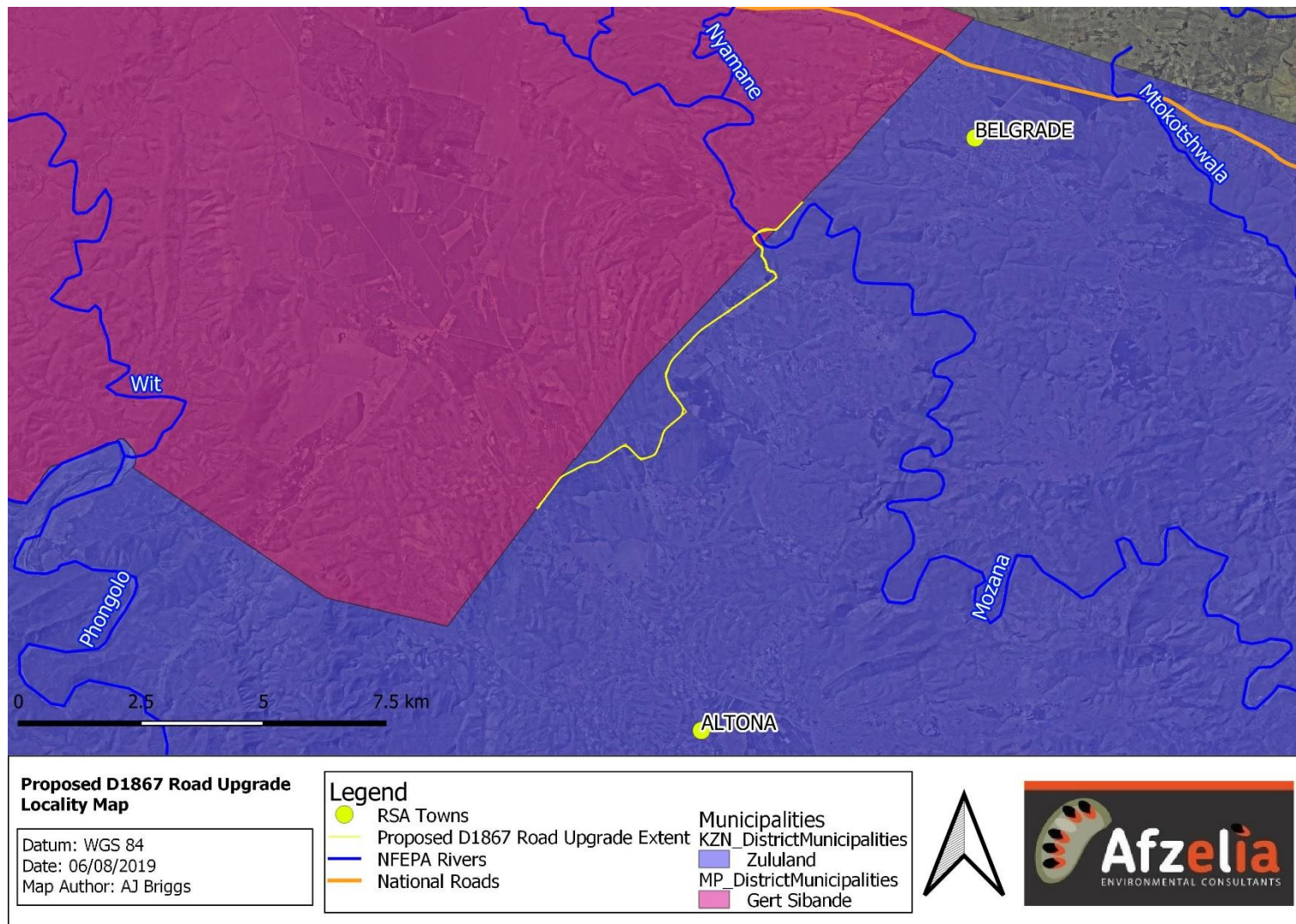


Figure 1: Locality map showing boundary of KZN and Mpumalanga province.

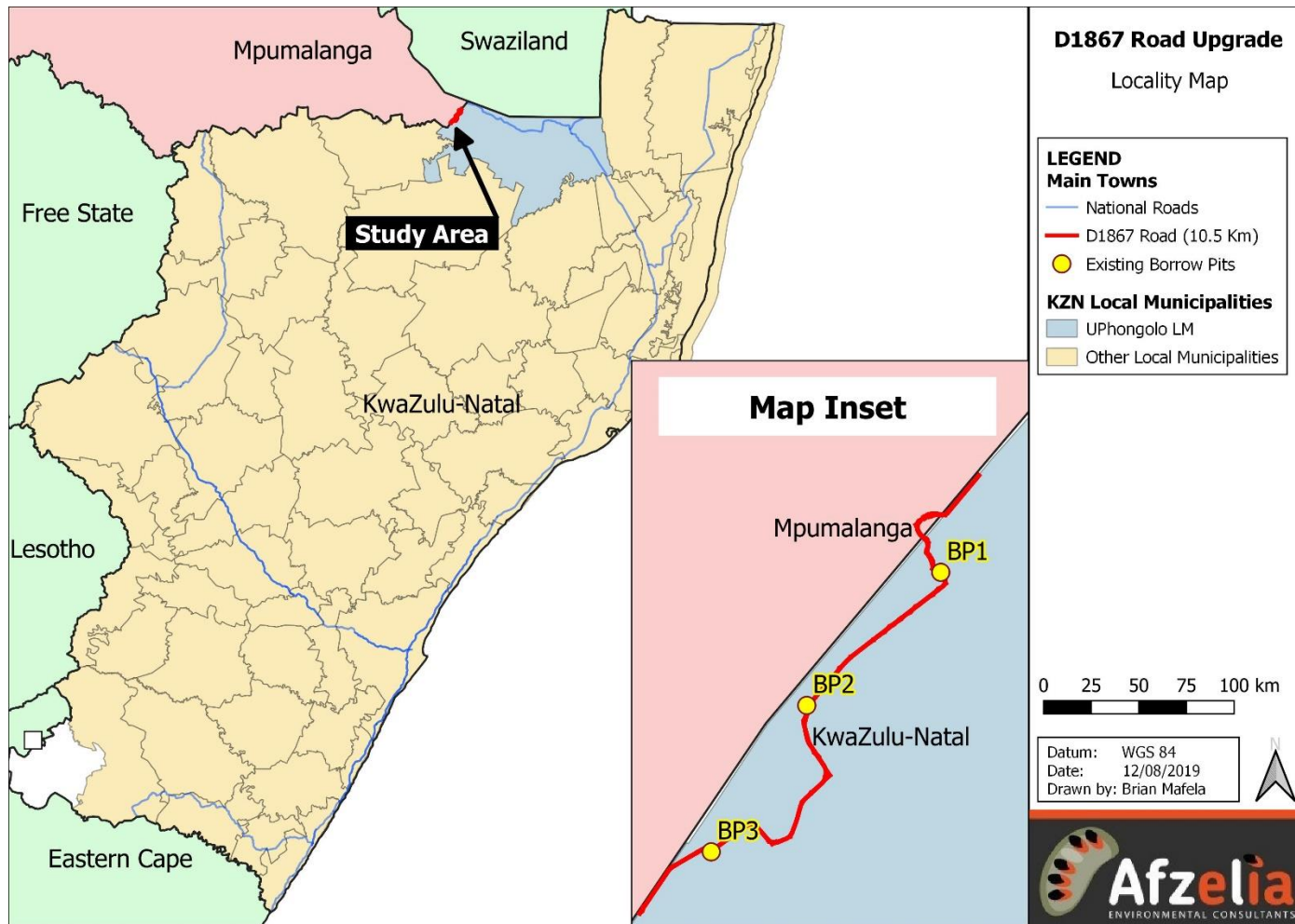


Figure 2: Topographical map.

3. CONCEPTUALISATION OF THE PROPOSED ACTIVITY

3.1 Description of the activities to be undertaken

According to the Inception Report attached as **Appendix D8** and Method statement for the road attached as **Appendix D9**, both compiled by Ibhongo Consulting (Pty) Ltd, the proposed upgrade of D1867 project comprises of the construction of earthworks, layer works, ancillary works and surfacing from gravel to blacktop including road widening, re-alignment of sections, storm water drainage, and major drainage structures as well as the construction of Mozana Bridge.

The existing Road D1867 is approximately 7.5m wide and 10.9 km long with a road reserve of 30m. The project entails the upgrading and widening from 7.5m to 8.5m wide surfaced Type 4 Low Standard Secondary Road with a carriageway width consisting of 2 x 3.5m lanes and a 1.5m concrete paved footway. The design speed on the road is 60km/h (Refer to **Figure 3: Road Layout** on page 14 below and attached as **Appendix C1** of this report).

The proposed upgrade will start from KM 6+000 of the existing Road D1867 at the approximate GPS coordinates: 27°16'51.34" S and 31°14'20.94" E and ends at the T-junction with Road D1869 at KM 16+900 of the existing Road D1867 at the approximate GPS coordinates: 27°20'38.26" and 31°11'3.99" E. The total length of the road upgrade is 10,9 Km. A portion of the road from km 6+800 to km 7+600 falls within Mpumalanga Province and the rest from Km 6+000 to Km 6+800 and from Km 7+600 to Km 16+900 under KwaZulu-Natal Province.

And according to the Bridge Design Report attached as **Appendix D10** and Mozana Bridge Method statement attached as **Appendix D11**, both compiled by Ibhongo Consulting (Pty) Ltd, the existing one-lane bridge structure at chainage Km 7+220 has deteriorated to the degree that significant maintenance is required to keep the bridge in service. The recommended preferred build alternative consists of replacing the existing one-lane bridge with a two-lane bridge constructed southeast of the existing bridge at about Km 7.2 at GPS coordinates: 27°17' 14.1" S, 31°13' 47.5" E. The proposed Mozana bridge deck will be 56m long continuous slab with 4 spans of 14m length. The bridge deck will be 11.12m to accommodate 2 x 3.5m wide lanes with shoulders of 0.75m wide on both sides of the bridge and a 1.5m foot sidewalk on the south edge of the bridge. The total physical footprint of the bridge is approximately 622,72m². More than 10 cubic metres of soil, and other material will be excavated, removed, or moved during construction of the bridge.

The proposed bridge will be constructed while traffic is maintained on the existing bridge for use as a bypass during the construction of the new route. The existing bridge will not be removed following construction of the new bridge as farmers in the surrounding area will utilise the bridge as a means of crossing for their livestock. Bollards will be constructed in the existing bridge approaches to prevent vehicular traffic to gain access to the old bridge. The new bridge will be in the Province of Mpumalanga because surrounding terrain does not allow a road realignment to place the structure within the boundaries of KwaZulu-Natal Province. As the entire road is considered KwaZulu-Natal responsibility, the new bridge will also be considered as an asset of KwaZulu-Natal infrastructure.

The new bridge is designed for a 1:10 return flood to pass under the deck soffit. The abutments and three piers are founded directly on the rock within the riverbed and anchored with dowels (Refer to **Figure 4: Bridge Layout** on page 15 and attached as **Appendix C2** of this report). The GPS coordinates of the abutments and two piers are provided below in **Table 10** from the direction of the start point of the road:

Table 10: New Bridge coordinates.

Structure	Latitude	Longitude
Abutment (E)	27° 17' 13.12" S	31° 13' 49.44" E
Pier (D)	27° 17' 13.35" S	31° 13' 48.98" E
Pier (C)	27° 17' 13.58" S	31° 13' 48.54" E
Pier (B)	27° 17' 13.83" S	31° 13' 48.11" E
Abutment (A)	27° 17' 14.09" S	31° 13' 47.70" E

CULVERT SCHEDULE											
DISTANCE (km)	SIZE (mm)	CLASS	TYPE	BEDDING CLASS	LENGTH (m)	INVERT INLET	INVERT OUTLET	GRADE (%)	DRIVE ANGLE	HEADWALL	REMARKS
15.100	1 x 800mm PPE CULVERT	1000	CONC.	C	9.780	919.800	918.700	2%	92°	HEADWALL	
16.300	1 x 800mm PPE CULVERT	1000	CONC.	C	15.982	925.300	924.000	2%	92°	HEADWALL	
16.800	1 x 800mm PPE CULVERT	1000	CONC.	C	9.780	932.800	931.500	2%	92°	HEADWALL	
16.700	1 x 800mm PPE CULVERT	1000	CONC.	C	9.780	941.400	940.100	2%	92°	HEADWALL	

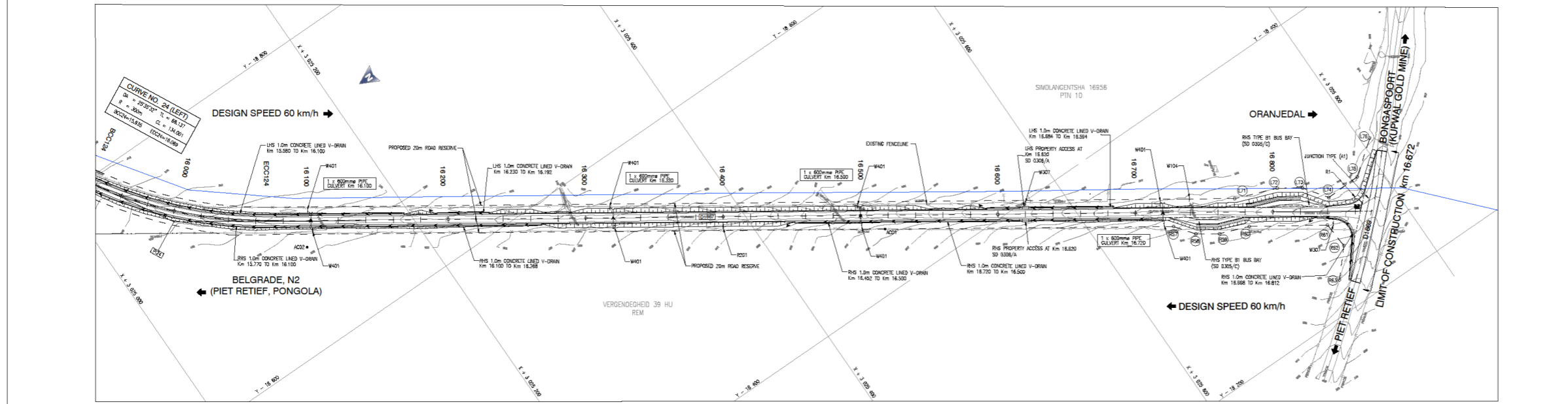
SIDE DRAINS SCHEDULE											
LEFT HAND SIDE						RIGHT HAND SIDE					
FROM (km)	TO (km)	LENGTH (km)	FLOW DEPTH (mm)	VELOCITY (m/s)	COMMENTS	FROM (km)	TO (km)	LENGTH (km)	FLOW DEPTH (mm)	VELOCITY (m/s)	COMMENTS
16.770	16.840	0.110	0.266	1.227	1.0m CONCRETE LINED V-DRAIN (SD 0607/8)	16.800	16.840	0.060	0.284	0.500	1.0m CONCRETE LINED V-DRAIN (SD 0607/8)
16.700	16.860	0.220	0.123	1.150	0.540	0.230	1.0m CONCRETE LINED V-DRAIN (SD 0607/8)				

BENCHMARKS			
POINT	Y	X	ELEV
BS1	-18 641.380	3 025 176.266	935.635
BS2	-18 668.759	3 027 174.462	932.794

KERB & CHANNEL			
LHS OF ROAD		RHS OF ROAD	
FROM (km)	TO (km)	FROM (km)	TO (km)
1.750	1.750	1.750	1.710

EXPROPRIATION OFFSET POINTS (LEFT)			
LHS	CO-ORDINATE	CO-ORDINATE	X
L71	-18 315.028	3 025 350.353	
L72	-18 303.897	3 025 720.710	
L73	-18 292.766	3 025 745.518	
L74	-18 278.267	3 025 757.520	
L75	-18 277.684	3 025 762.873	
L76	-18 286.460	3 025 808.298	

EXPROPRIATION OFFSET POINTS (RIGHT)			
RHS	CO-ORDINATE	CO-ORDINATE	X
R57	-18 321.438	3 025 653.503	
R58	-18 309.877	3 025 862.484	
R59	-18 300.180	3 025 878.210	
R60	-18 292.260	3 025 897.899	
R61	-18 280.789	3 025 745.545	
R62	-18 241.130	3 025 728.421	
R63	-18 222.999	3 025 729.584	



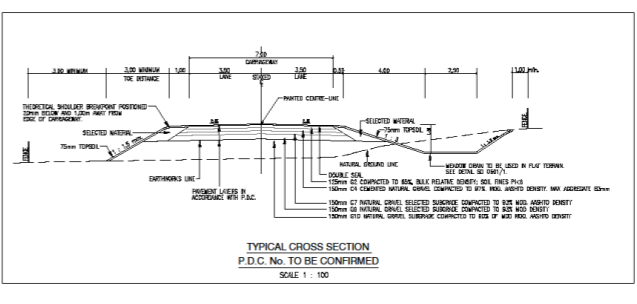
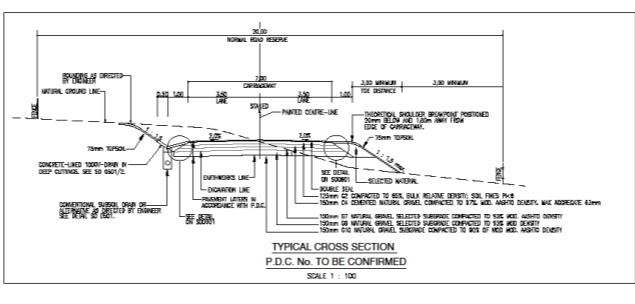
- GENERAL NOTES-**
- ALL LEVELS, DIMENSIONS AND SETTING OUT DETAILS TO BE VERIFIED BY CONSULTANT AND CONTRACTORS ON SITE PRIOR TO CONSTRUCTION.
 - ALL EXISTING DRAINAGE CULVERTS TO BE INSPECTED AND ANY FOUND IN UNACCEPTABLE CONDITION TO BE REPLACED UNLESS OTHERWISE SPECIFIED.
 - CULVERT INVERTS TO BE DECIDED BY ENGINEER ON SITE UNLESS OTHERWISE SPECIFIED WITH CROSS-SLOPE. ALL 800mm PPE CULVERTS TO BE Laid IN ACCORDANCE WITH SANS 3004/1 WITH HEADWALLS AS PER DRAWING. ROAD RESERVE WILL DRAIN TO SIDE FOR MINOR ACCESS ROADS AND BELL-BOUNDS, AND AW, SW, AND SLOTTED FOR MAJOR ROAD CROSS DRAINAGE.
 - 800mm PPE CULVERTS $1.8m$ HIGH TO BE RESTRICTED IN ACCORDANCE WITH SANS 3004/1. ROAD CULVERTS >math>1.8m</math> HIGH TO BE APPROVED BY ENGINEER IN ACCORDANCE WITH SANS 3004/1 STANDARDS.
 - FOR EXCESSIVE WATER WEATHERS ARE RECOMMENDED AT CULVERT INLETS AND OUTLETS.
 - FAITH BEING TO BE CONSTRUCTED AT CULVERT INLETS TO DIRECT STORMWATER INTO CULVERTS WHERE NECESSARY.
 - ROAD WEATHERS TO BE PLACED ACROSS MAJORITY OF DRAINS SUSCEPTIBLE TO EROSION FOR EVERY 2m VERTICAL DROP.
 - CONCRETE LINED V-DRAINS AS PER SANS 3007/3 AND 4 ARE RECOMMENDED FOR SHALLOW CUTTINGS OF DEPTH LESS THAN 500mm. CONCRETE LINED V-DRAINS AS PER SANS 3007/3 ARE RECOMMENDED FOR DEEP CUTTINGS OF DEPTH GREATER THAN 500mm AT A POINT 6m FROM EDGE OF ASPHALTWAY.
 - SUBSOIL DRAINS AS PER SANS 3007/3 TO BE INSTALLED WITH 1000 V-DRAINS OR MORE. HIGH WATER TABLES ARE ENCOURAGED.
 - KERB AND CHANNEL DRAINS AS PER SANS 3007/1 TO BE PROVIDED WHERE FULL ENHANCEMENT EXCEEDS 3m IN HEIGHT, ALSO INSTALLED IN CUTS HERE.
 - WHERE SURFACE RUNOFF IS TOWARD THE ROAD-CATCH-WATER BANKS TO BE PROVIDED TO DIRECT STORMWATER TO MAJOR CROSS DRAINAGE STRUCTURES.
 - NEW FILLS AND EXPOSED CUTTINGS ARE TO BE TOP SOILED AND VEGETATED IMMEDIATELY AFTER CONSTRUCTION TO PREVENT EROSION. THE POSITIONS OF ACCESSIBLE TO BE DETERMINED IN CONSULTATION WITH THE LOCAL COMMUNITY. SIGNAGE REQUIREMENTS ARE TO BE DECIDED BY THE ENGINEER ON SITE. CONCRETE WEIRS AS PER SANS 3003/3 OF ACCESS WEIRS AS PER SANS 3003/3 OF ACCESS WEIRS MAY BE USED IN PLACE OF SURFACE WEIR/WEIR FOR ACCESSIBLE SIGNAGE. RESISTAL PROPERTIES UNLESS OTHERWISE SPECIFIED.
 - ACCESS CLOSURES ARE TO BE PROVISIONALLY MARKED WITH CONE BARRIERS WHERE ACCESS IS STILL POSSIBLE AFTER COMPLETION OF THE WORKS. MARKERS TO BE REMOVED/REPLACED WHERE NECESSARY.
 - EXISTING ROAD SIGNS, SERVICES AND FURNISHING ARE TO BE IN ACCORDANCE WITH SANS 3001/3.
 - UNDERGROUND SERVICES CROSSINGS AND MARKERS TO BE IN ACCORDANCE WITH SANS 3001/3.
 - ALL NEW ROAD SIGNS AND ROAD MARKING REQUIREMENTS TO CONFORM TO THE SOUTH AFRICAN ROAD MARKING CODE (SANS 3001/3).
 - ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH 'DOT' SPECIFICATIONS FOR ROAD AND BRIDGE WORKS FOR STATE ROAD AUTHORITIES.
 - ALL SURVEY AND SETTING OUT DATA PROVIDED IS BASED ON WGS84.

EXISTING SERVICES	LEGEND
EXISTING 800mm CABLES	---
EXISTING TELECOM CABLES	---
EXISTING WATERMAIN	---

SIGN	SERIES	ORIENTATION	SIZE	SYMBOL
DELIMITER PLATE	W401	LEFT	150 X 900	[Symbol]
PEDESTRIAN	W307	RIGHT	900	[Symbol]
SPEED LIMIT	W201 (SD 0204/A)	RIGHT	900	[Symbol]
T-JUNCTION	W104	LEFT	900	[Symbol]
STOP SIGN	BY LOCAL PD 1124	RIGHT	900	[Symbol]
DEVIATE CURVE	W202	RIGHT	900	[Symbol]
T-JUNCTION CHEVRON	W409	AT INTERSECTIONS	2700 X 400	[Symbol]

NOTATION	
BOC	BEGINNING OF CIRCULAR CURVE
ECC	END OF CIRCULAR CURVE
PI	POINT OF INTERSECTION
R	RADIUS OF CIRCULAR CURVE
DA	DEFLECTION ANGLE OF CIRCULAR CURVE
CL	LENGTH OF CIRCULAR CURVE
TL	TANGENT LENGTH

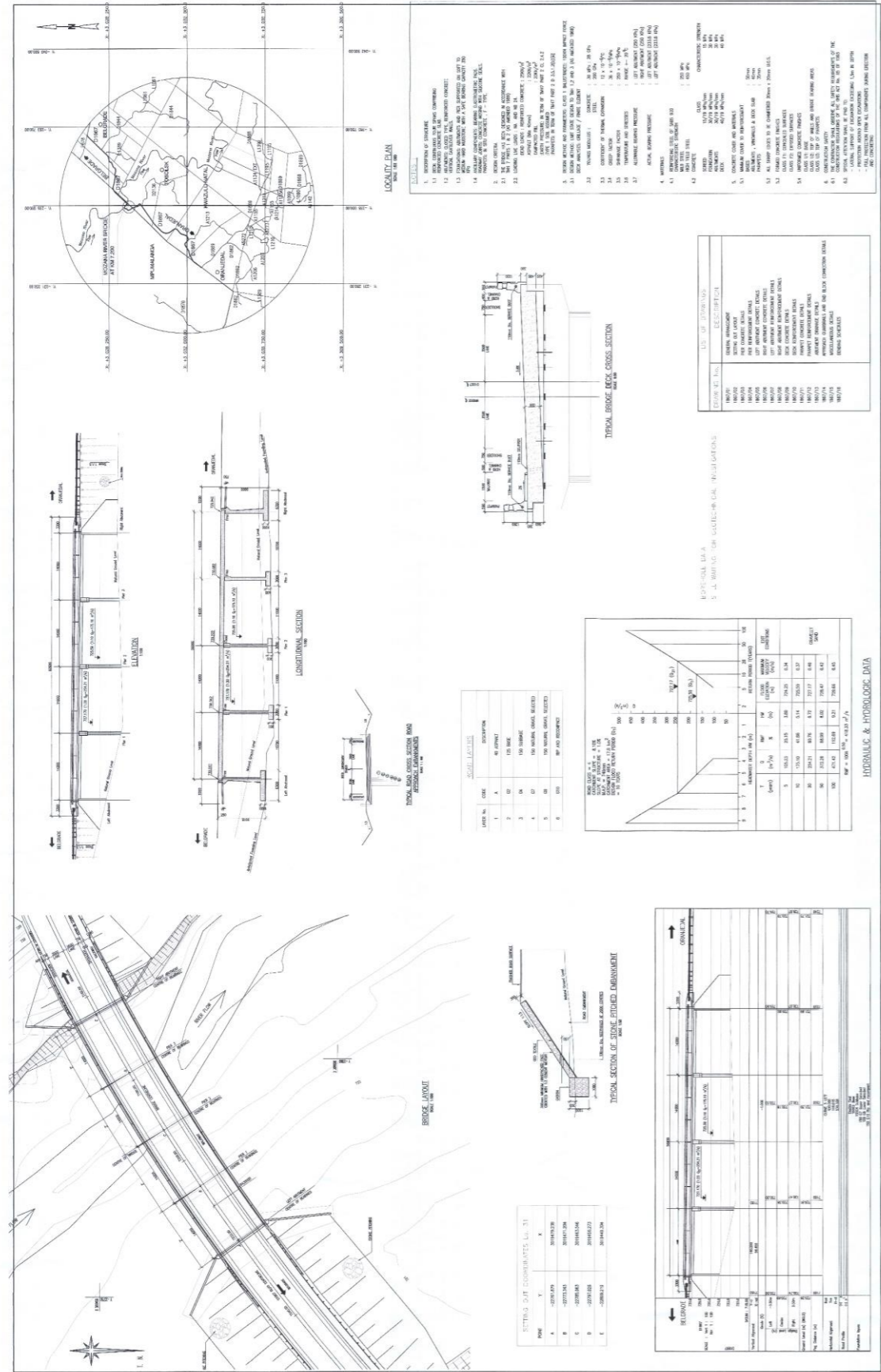
SYMBOL	DESCRIPTION
[Symbol]	CULVERT (SD 0401/A, SD 0402 & SD 0407)
[Symbol]	BRIDGE
[Symbol]	DRAINS
[Symbol]	SIDE INLETS TO FILL (SD 0704/A)
[Symbol]	CHUTE (SD 0604/A)
[Symbol]	CONCRETE LINED V-DRAIN (SD 0607/C)
[Symbol]	KERB AND CHANNEL (SD 0701/A, SD 0702/A)
[Symbol]	QUADRANT (SD 1101/7)
[Symbol]	SEWER/WATERMAIN
[Symbol]	CATCHMENT BARR (SD 0605/A)
[Symbol]	OPEN CHUTE INLET (SD 0605/2 & SD 0704/B)



AS BUILT Supervising Engineer: [Signature] Supervising Authority: [Signature]		Continued from: 2146-RLP010 Continued on: 2146-RLP011 Draw Section No: 2146-RD232, 2146-RD234 Longitudinal Section No: 2146-RLS008 Survey Plan No:	Designed by: M.J. Potgieter Checked by: M.J. Potgieter Drawn by: S. Mathews Checked by: M.J. Potgieter Date of approval:	 Department of Transport Province of KwaZulu-Natal	Designed by: 77 77th Avenue, Durban 4001 Tel: (031) 254 2220 Fax: (031) 254 2222 email: info@dongas.co.za	Road Design & Control Chief Engineer Head Transport	DISTRICT ROAD D1867 : BELGRADE TO ORANJEDAL PORTION UPGRADE OF DISTRICT ROAD 1867 (D1867) BELGRADE TO ORANJEDAL DESIGN / EXPROPRIATION / SERVICE PLAN	Staked km distance: km 16.000 - km 16.868 Scale: 1:1000 Sheet: 11 of 11 Plan No: 2146-RLP011
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Figure 3: Road Layout.

2146-RLP011



1867-01

AS BUILT

DISTRICT ROAD 1867

OPANALAN TO BELGRADE

PROPOSED MOZANA RIVER BRIDGE ON DISTRICT ROAD D1867

As shown

1867-01

transport

Province of Kuchino-Natal

AS BUILT

DISTRICT ROAD 1867

OPANALAN TO BELGRADE

PROPOSED MOZANA RIVER BRIDGE ON DISTRICT ROAD D1867

As shown

1867-01

transport

Province of Kuchino-Natal

Figure 4: Bridge Layout.

A 250mm thick approach slabs will be constructed under the roadway of the bridge. The approach slabs will be supported on the abutments at one end and rest on the fill towards the other end. The following are the specifications of the approach slab to be utilised in the construction of the bridge:

- The slab will extend 4.5m from the curtain wall of the road centreline, with a fall of 100mm.
- The slab will be kept 100mm clear of the wingwall faces to prevent fouling of the wall, should settlement take place.
- The top of supporting rib will be 800mm below the finished road at the carriageway centreline.
- The approach slab will be designed for both earth load and NA loading over a span of 2m in longitudinal direction of the structure.
- Waterproof underlay or 40mm thick blinding will be provided under the approach.

Reinforced concrete solid type piers that are 0.6m thick founded on spread foundations are proposed for the bridge. The bridge deck is a four-span continuous cast in situ reinforced concrete slab. The bridge deck is continuous over the pier, and bridge expansion joints are provided at the abutments. The bridge parapet will be of F type shaped reinforced concrete parapet and designed in accordance with TMH7: Part 2 clause 3.51.2 – Type 1 balustrades: 100kN impact force.

Although no temporary works in form of falsework and formwork is required for this type of bridge deck construction, with this option, the span of the deck is limited to 11.4m to allow for the transportation of the beams without special clearance. This limitation requires an additional span and pier to be added to the structure. In addition, the precast beams are less adaptive to deck which are curved in plan.

Due the position of the new bridge over the Mozana River and the change of the alignment, a realignment of the road has been proposed as the approach on both sides of the new bridge in terms of Road Safety and KZN DOT standards requirement. This will result in the construction of a new road of approximately 8.5m wide and 860m in length which will start from KM 6+800 at the approximate GPS coordinates: 27°17' 11.00" S and 31°14' 01.60" E to KM 7+660 at the approximate GPS coordinates: 27°17' 26.60" S and 31°13' 51.06" E.

The design of road caters for a one-way operation on each side. However, from Km 6+000 passing the bridge from Km 7+340 to Km 8+800 due to the steep area on the design and the grade sitting at 12 or more, the design of road is proposed to cater for a climbing lane to be done on one direction of that section for approximately 2Km. The one direction climbing lane will consist of two lanes on the left side to allow for trucks to go through and one lane on the right side.

At Km 15.520 the road crosses an unchanneled valley bottom wetland (Wetland Unit UCVB1) from the approximate GPS coordinates: 27°19' 38.15" S and 31°12' 41.64" E to the approximate GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E. This wetland area will require rockfill under the road for about 50m long and 15 m wide and 0.750m thick to allow the water to run freely under the road where six (6) stormwater culverts of size 900PC will be installed to prevent the water being cut off from the wetland. The existing structures and stormwater pipes at Km 15.520 will be removed and decommissioned. The total physical footprint of the causeway is approximately 750 m² and more than 10 cubic metres of soil, and other material will be excavated, removed, or moved during construction of the causeway.

In addition to the Basic Assessment process, a Water Use Authorisation Application (WUAA) will be submitted in accordance to the requirements of the National Water Act of 1998 (Act No. 36 of 1998) regulated by the Department of Water and Sanitation (DWS) for the upgrade of the road, construction of Mozana bridge and abstraction of water from the Mozana River during the construction activities.

Two existing Borrow Pits (BP1 and BP3) are found along the D1867 alignment, which will be utilised along the road section for the purpose of procurement of aggregate raw materials to be used as fill material for the intended road works project. However, prior to use of these sites, copies of permits from the Department of Mineral Resources and Department of Water and Sanitation must be lodged with the KZN DOT. Only materials supplied

by permitted sources must be used and compliance with the Minerals and Petroleum Resources Development Act, (Act No.28 of 2002) as applicable to the establishment of borrow pits must be ensured.

Normal 1m concrete V drains will be used throughout the road. The following cross drainage is provided as shown in **Table 11** below.

Table 11: Cross drainage schedule.

Chainages	Number and Size	Inlet (Headwall)						Outlet (Headwall)					
		Latitude (S)			Longitude (E)			Latitude (S)			Longitude (E)		
		dd	mm	ss.ssss	dd	mm	ss.ssss	dd	mm	ss.ssss	dd	mm	ss.ssss
6300.00	5/600PC	27	16	58.7948	31	14	14.0958	27	16	58.5658	31	14	13.7896
6760.00	1/600PC	27	17	10.2814	31	14	3.3954	27	17	10.027	31	14	3.0552
7359.87	4/600PC	27	17	17.7246	31	13	45.3179	27	17	17.6705	31	13	44.6552
7560.00	1/600PC	27	17	22.9865	31	13	48.5025	27	17	23.3491	31	13	48.0938
7799.87	2/600PC	27	17	30.0951	31	13	51.0927	27	17	30.0468	31	13	50.5185
7920.00	1/600PC	27	17	33.2899	31	13	52.6043	27	17	33.6287	31	13	52.1699
8020.00	1/600PC	27	17	36.4131	31	13	54.0846	27	17	36.5171	31	13	53.5197
8180.01	3/900PC	27	17	41.1508	31	13	55.719	27	17	41.4464	31	13	55.3603
8379.90	1/600PC	27	17	45.0294	31	14	1.3724	27	17	45.1603	31	14	0.9069
9360.00	2/600PC	27	18	6.016	31	13	35.4921	27	18	5.671	31	13	35.1936
9500.00	1/600PC	27	18	8.8021	31	13	31.4676	27	18	8.4571	31	13	31.1692
9900.00	1/600PC	27	18	16.6858	31	13	19.9026	27	18	16.4035	31	13	19.6585
10360.02	3/600PC	27	18	25.8779	31	13	6.7278	27	18	25.6382	31	13	6.4954
10800.00	3/600PC	27	18	36.4224	31	12	55.9932	27	18	36.1903	31	12	55.6899
11080.00	3/600PC	27	18	43.3303	31	12	49.3672	27	18	43.0982	31	12	49.0639
11639.89	2/900PC	27	18	59.0945	31	12	40.1203	27	18	58.9257	31	12	39.2101
12060.00	1/600PC	27	19	11.8762	31	12	43.739	27	19	12.0745	31	12	43.4061
12439.94	3/600PC	27	19	22.1891	31	12	51.3643	27	19	22.3653	31	12	51.017
12600.12	2/600PC	27	19	27.3382	31	12	52.3431	27	19	27.2818	31	12	51.9937
12960.00	1/600PC	27	19	36.2781	31	12	44.0923	27	19	36.0166	31	12	43.8207
13040.00	8/600PC	27	19	38.0436	31	12	41.9568	27	19	37.7822	31	12	41.6851
13520.09	1/600PC	27	19	51.8593	31	12	34.9225	27	19	51.7397	31	12	34.5462
13779.98	1/600PC	27	19	59.3817	31	12	30.6436	27	19	59.1035	31	12	30.3936
14800.00	4/600PC	27	19	57.5088	31	12	0.0181	27	19	57.2182	31	11	59.7864
15520.00	6/900PC	27	20	7.7034	31	11	36.987	27	20	7.2934	31	11	36.7171
16100.00	1/600PC	27	20	18.2303	31	11	19.8621	27	20	18.0532	31	11	19.5676
16320.00	1/600PC	27	20	24.1591	31	11	15.3921	27	20	23.9599	31	11	15.0608
16500.00	1/600PC	27	20	29.0002	31	11	11.7185	27	20	28.8231	31	11	11.424
16720.00	1/600PC	27	20	34.9285	31	11	7.2476	27	20	34.7514	31	11	6.9531

:

According to the Standard Industrial Classification (2012), the proposed activities fall under the following sector classification as identified in the national electronic register:

- Construction (Section F Division: 41-43) (Statistics South Africa, 2012).

3.2 Activity Life Description and Cost

The construction phase activities may commence within a period of five (05) years from the date of issuing of the Environmental Authorisation and may be completed within a period of ten (10) years of the commencement of the construction activities on site. Post construction and Rehabilitation Phase may be completed within a period of three (3) years. The proposed undertaking of the Operation Phase has an expected lifespan in excess of 40 years or in perpetuity. The Final BAR will be submitted by 24 of June 2022 and construction can commence during the end of September 2022. Please see **Table 12**, below, outlining the phase specific timeframes for the project:

Table 12: Approximate Duration of Activities – Preferred construction programme.

PHASES	DURATION OF ACTIVITIES
Planning and Design Phase	12 months
Site Establishment Phase	1 month
Construction Phase	24 months
Post construction and Rehabilitation Phase	36 months
Handover Phase	2 months
Operation Phase	In excess of 40 years

The project cost value was estimated at R 51, 476 740.43 (Ibhongo Consulting, Inception report, 2019). See **Table 13** below:

Table 13: Construction cost estimate breakdown.

DESCRIPTION	AMOUNT
Schedule A: Road Works	R 137 481 694.84
Schedule D: Dayworks (Roadworks)	R 12 000 000.00
Schedule D: Dayworks (Concrete Structures)	R 1 374 816.95
Schedule F: Expanded Public Works Programm (EPWP)	R 3 437 042.37
Schedule: Contract Participation Goals (CPG) (Culvert and ancillary works)	R 2 500 000.00
TOTAL A	R 156 793 554.16
Add: Contingencies (10%)	R 15 522 561.86
TOTAL B	R 172 472 909.57
Add: Contract Price Adjustment (10%)	R 15 522 561.86
TOTAL C	R 187 995 471.44
VAT at 15%	R 28 199 320.72
GRAND TOTAL	R 216 194 792.15

4. NEED AND DESIRABILITY OF PROPOSED ACTIVITIES

In considering the Need and Desirability for this project, the Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010 – Government Notice Regulation (GNR) 891 issued in October 2014 in Government Gazette 38108 has been used to inform and provide structure for the Need and Desirability section of this report (DEA, 2017).

The concept of “need and desirability” relates to, amongst others, the nature, scale and location of the development being proposed, as well as the wise use of land. Need and desirability are inter-related and the two should be considered in an integrated and holistic manner.

The following policy, statues and documents were interrogated:

- The Constitution of South Africa (Act 108 of 1996),
- National Spatial Development Perspective (NSDP) (2003 and updated in 2006),

- The New Growth Path (NGP) (2010),
- National Development Plan for 2030,
- The 18 Strategic Infrastructure Projects (SIPs)
- The Integrated Development Plans (IDP) for the uPhongolo Local Municipality Zululand District Municipality, Mkhondo Local Municipality and Gert Sibande District Municipality,
- The Spatial Development Plan (SDP) for the uPhongolo Local Municipality Zululand District Municipality, Mkhondo Local Municipality and Gert Sibande District Municipality,
- The Environmental Management Framework (EMF), and
- The National Environmental Management Act (NEMA) Principals.

National Development Plan (NDP) 2030

The National Development Plan 2030, finalised in 2011, represents an innovative approach by Government to promote sustainable and inclusive development in South Africa. This approach focuses on an array of areas which require improvement on infrastructure and improving the connectivity of townships to economic centres (NDP, 2011).

Improving infrastructure, according to the NDP 2030, is not just essential for faster economic growth and higher employment. It also promotes inclusive growth, providing local communities with the means to improve their own lives and boost their incomes. Upgrade of road infrastructure is essential for development (NDP, 2011).

National Spatial Development Perspective (NSDP)

According to the National Spatial Development Perspective (NSDP), roads are an essential component of the South African transport system and one of the biggest investments by the Country in transport infrastructure. Roads play a crucial part as enabling infrastructure, supporting the interaction (flow of materials and goods) between producers, manufacturers, and consumers nationally (The Presidency RSA: NSDP, 2007). The land in the north-western part of the municipality falls under Ingonyama Trust and is densely populated by traditional communities that are practicing subsistence farming. Infrastructure improvements are likely to impact on the market access and transport logistics for agricultural products. And improve business trade links between the Belgrade area, Oranjedal area and Tobolsk area.

Zululand District Municipality Growth and Development Plan Vision 2030

The road network in Zululand consists largely of local and community access roads (Class 4 to Class 7). Local and community access roads provide the primary access to most settlements and are in far worse condition than the other classes of roads. Rural access roads have the most important impact for future development of the district. The availability of access roads that are passable in 2-wheel drive vehicles is a necessary starting point in providing accessibility for rural residents to the places to which they need to travel (KZN COGTA, 2013).

In order to plan for the long-term growth of the economy of the area, it is important for the district to ensure that it provides input into the Department of Transport's planning for the District, and that its specific road infrastructure needs are included in the Department of Transport's and relevant local municipalities project priority lists (KZN COGTA, 2013).

Zululand District Municipality (ZDM) Draft Integrated Development Plan 2022-2026 (2022/2023 cycle)

Infrastructure development has been identified as an important catalyst for future development and economic upliftment for the municipality. uPhongolo has the third largest paved network dominated by class 1 and 2 roads. With regards to the unpaved network, it can be observed that uPhongolo has the second largest unpaved network dominated by class 3, 4 and 6 (ZDM, IDP, 2022).

Overall, the Zululand District is dominated by classes 3, 5 and 6 unpaved road network. And most of the unpaved network is in a dire state in all the local municipalities. It can be concluded that uPhongolo and Ulundi need the

largest capital injection considering the state of their paved and unpaved road network. The biggest priority in both municipalities is to rehabilitate their road network condition to a 'very good' status (ZDM, IDP, 2022). The core mandate for the Zululand District Municipality (IDP 2022/2023) is to provide improvement and maintenance of local infrastructure.

Gert Sibande District Municipality IDP (2021 – 2022) / SDF (2014)

Infrastructure development is one of the key drivers for economic growth and job creation. All the main economic sectors that have been identified as critical in stimulating economic growth and employment creation as per the Mpumalanga Growth and Development Path consist of agriculture, forestry, mining, energy industry, tourism, cultural industries, Green Economy, ICT, manufacturing, and beneficiation. All these sectors rely, in the main, on infrastructure development for their own growth and development (GSDM: IDP, 2021).

Investment in road infrastructure development by KZN DOT will go a long way in terms of unlocking opportunities for economic growth and development, including jobs opportunities during construction phase. In essence, infrastructure development is critical to the success of the Economic Growth and Development Path (GSDM: IDP, 2021).

Mpumalanga Economic Growth and Development Path (MEGDP)

The primary objective of the Mpumalanga Economic Growth and Development Path (MEGDP) is to foster economic growth that creates jobs, reduces poverty and inequality in the province. Infrastructure development is one of the key drivers for economic growth and job creation. All the sectors such as Agriculture, Forestry, Mining, Energy industry, Tourism and cultural industries rely, in the main, on infrastructure development for their own growth and development. Infrastructure development is critical for the Economic Growth and Development Path to succeed as per the IDP/SDF (GSDM: IDP, 2021).

The MEGDP also states that the proximity of Mozambique, Swaziland, and the other SADC countries, including the memoranda of understanding signed with few overseas countries, provide Mpumalanga with regional and international trade, investment, and tourism opportunities. Road, rail, and air infrastructure is key in terms of facilitating trade and other economic opportunities (GSDM: IDP, 2021).

The District Roads in Gert Sibande District Municipality are in a bad state due to high volumes of coal haulage trucks that transport coal to the four power stations within and beyond its jurisdictional area: thus, inflating the maintenance expenditure of all three spheres of government on roads across the district (GSDM: IDP, 2021). The key Issues to be addressed in terms of Road Conditions are as follow:

- Introduction of ring roads to link the National Roads without affecting the Municipal roads.
- SANRAL to take over the National roads passing through towns since the Municipal has minimal funds on maintenance.
- Reconstruction of roads instead of pothole patching to increase the life span of road and to do road overlays to protect the existing surfacing.
- Upgrading of gravel roads to paved roads.
- Construction of foot bridging to connect functional areas and prevent accidents.
- Provision of drop off points for public transport to prevent traffic jam and accidents.
- To get assistance from local corporates for maintenance and reconstruction of road infrastructure (GSDM: IDP, 2021).

uPhongolo Local Municipality IDP/SDF 2022 / 2023

uPhongolo Municipality Vision Statement is to ensure an inclusive socio-economy by providing quality services that yield a better life for all by 2035. This can be achieved by the following Mission Statement by providing infrastructure and other services to all, with emphasis on rural communities, in a sustainable manner. And providing access to comprehensive basic services and infrastructure development is part of issues and goals that uPhongolo

Municipality is planning to unlock and address over the next 5- years. The paving of Road D1867 in Belgrade is listed under infrastructure assets in the IDP 2022 / 2023 amongst outstanding projects to be undertaken over the medium-term (uPhongolo Local Municipality, IDP, 2022).

Mkhondo Local Municipality (MLM) Integrated Development Plan (IDP) 2020-2021

Mkhondo Local Municipality's mission is its commitment to deliver quality and sustainable services that will enhance economically viable and better life for its community. The improvement and maintenance of the road connectivity on the MLM on the local, provincial, national, and international level is listed amongst the SDF projects. As the state of our roads is partially in an unacceptable condition, projects to upgrade the roads in town has begun as the mark street has been paved, tarred roads are deteriorating and not in a ride able state. Gravel roads (Potholes, crocodile skin) need continuous blading and watering. The Municipality, District municipality and provincial department have engaged to address the state of roads (Mkhondo Local Municipality: IDP, 2020).

Environmental Management Framework (EMF)

The EMFs were developed in accordance with the EMF Regulations, 2010 (GNR547 of 2 August 2010) promulgated in terms of Section 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998). Air, Land, Socio- Economics, Cultural heritage, Water, Aquatic, Wetlands Ecology, Terrestrial Ecology, agriculture / Mineral Resources, Resource Economics, Zoning Schemes, SDFs, Mining Activities, transport, Roads, Linear Developments, Servitudes, Social Environment, Tourism, Integrated waste Management Plans were the focus areas of the EMF.

The districts as well as the local municipalities adopted the EMF between 2011 to 2012. The land management objectives adopted are as follow:

- To allow for development that serves the people of the GSDM in a sustainable manner.
- To ensure that development does not negatively impact on the provisioning function provided by environmental goods and services.
- To ensure the alignment of policies aimed at sustainable development.
- To promote environmental awareness.
- To ensure that environmental impacts of new development are assessed, and the EIA process informs decision making.
- To mainstream environmental considerations in the development and spatial planning processes.
- To ensure compliance to environmental requirements by all developments.

The Water, Aquatic & Wetlands Ecology management objectives adopted are as follow:

- Ensure that the recommended DWS objectives are adhered to by protecting wetlands and watercourses.
- Avoiding development activities in riparian areas and wetland areas and encourage conservation of these areas to avoid impacts on upland areas.
- Minimising development in and around wetlands and pans.
- Avoiding impacts on upstream areas with catchments.
- Restricting mining to areas not considered sensitive.
- Utilise existing programmes such as Working for Water, etc. to rehabilitate the riparian and wetland areas.
- Maintaining ecological corridors within a network of formally protected conservation areas.
- Improve service delivery to communities.
- Promote sustainable economic activities that will strengthen local livelihoods, SMME development and reduce poverty.
- Improve monitoring and enforcement of environmental legislation and implement the Polluter Pays Principle of NEMA.

The Terrestrial Ecology management objectives adopted are as follow:

- Conserve a representative sample of each threatened habitat type (i.e., wetlands vegetation, grasslands, natural forests, etc).
- Encourage farmers to increase earnings from Agrotourism.
- Discourage urban sprawl and informal settlement.
Protect sensitive landscape features and functions.
- Optimise the use of existing services and transport infrastructure through effective maintenance.
- Promote resource efficiency and limited emissions / disposal of waste.
- Identify and formally protect cultural heritage sites and the landscape within which they occur.
- Regulate and monitor the tourism industry.
- Promote dialogue between the various stakeholders.

The need for the construction of the Road D1867 in this area arises from the KZN Department of Transport's initiative to upgrade the existing gravel road to surfaced road with improved geometrics considerations and therefore improved safety standards. The need for a new bridge at this location arises from the KZN Department of Transport's initiative construct a new bridge which can accommodate two lane traffic and a 1.5m foot walkway.

Road D1867 provides the link between Belgrade area, which is 50km west of Pongola under the Zululand District Municipality, to Oranjedal area. The road provides access to uPhongolo Local Municipality and the eDumbe Local Municipality. It provides access to the community of Belgrade, Oranjedal and Tobolsk as well as local schools.

The proposed project does have a high importance at a local level as it is in a rural area with moderately populated community with homesteads on either side along the proposed road upgrade within the Ntumbane and khiphunyawo Village in KwaZulu-Natal and Ezibawini Village in Mpumalanga. The route falls under Ward 3 and 5 under three Traditional Councils (Ndlangamandla, Sibiya and Msibi Traditional Council). The construction of D1867 will enable the Ntumbane, Khiphunyawo and Ezibawini residents to access local schools, Tobolosk provincial clinic and local pension points as all these community service facilities are along this route.

The project will provide better access to local communities, a variety of local community facilities as well as quick access to uPhongola and eDumbe. The various community services facilities along the route corridor are Langa Secondary School, Bambanani High School, Siyeza Primary School, Lalela Junior Primary School, Tobolosk Clinic, Qambushilo Lower Primary School, Sibumbene High School, Khiphunyawo Higher Primary School, Vimbamshini Combined Primary School, Somile High School, Kwamziwentsha High School, Velobala Junior Primary School and Kwafundeni Senior Primary School. This route provides access to the community of Ntumbane, Khiphunyawo and Ezibawini as well as local schools.

The proposed road upgrade project will reduce inconvenience and delays and improve mobility and accessibility within the local community. Temporary employment opportunities for local community members will be generated during the construction phase and they will benefit from the training of unskilled labour. Therefore, one of their key objectives of the Zululand District Municipality IDP 2022/2023 will be achieved by providing employment to local residents.

This road upgrade project will enhance service delivery capacity thereby impacting positively on the local community. In addition, there is a need to balance the convenience by providing bus stops at shorter intervals to reduce walking distances and increase safety by minimising the instances of vehicles pulling off the road at bus-stops locations where population density is unusually high, at all schools and preferably at distances not closer than 1Km apart.

KZN DOT makes provision for the National Youth Service (NYS) programme to be awarded on the project. Under these programmes, formal training is provided by properly qualified service providers. Mentorship and guidance are provided for the construction and the business side of the programmes. The goal of the NYS programme with respect to the upgrading of the Road D1867 is (hopefully) to produce students who will be granted a NQF level 3 (Construction Roadwork's) certificate after completion of the project.

The proposed upgrading of road D1867 will assist towards meeting the objectives outlined in the IDP of the local and district municipalities including meeting the objectives outlined in the national, regional, or local development frameworks.

5. ANALYSIS OF ALTERNATIVES

Alternatives are defined in the Regulations as “*different means of meeting the general purpose and requirements of the activity*” which may include alternatives to:

- the property on which or location where the activity is proposed to be undertaken,
- the type of activity to be undertaken,
- the design or layout of the activity,
- the technology to be used in the activity; or
- the operational aspects of the activity, and
- the option of not implementing the activity” (DEA, 2014).

In terms of the NEMA EIA Regulations (2014) as amended alternatives must be assessed and evaluated by the EAP at a scale and level that enables adequate comparison with the proposed project. The EAP must provide opportunities for stakeholder input in terms of the identification and evaluation of alternatives. When considering alternatives, the criterion to be considered is “*any feasible and reasonable alternatives to the activity and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment*”.

Alternatives must include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished in the specific instance taking account of the interest of the Applicant, KZN DOT, in the activity. The ‘no-go’ alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of whether site or activity (including different processes, etc.) or both is appropriate, needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the Competent Authority may also request the Applicant, KZN DOT, to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if realistic alternatives have not been considered to a reasonable extent.

The assessment of alternatives should, where possible, be done in a way that feeds back into the planning or design of the activity, thereby optimising the positive aspects and minimising the negative aspects that are highlighted during the Basic Assessment (BA) process. The BA process should also be interactive where necessary to reflect the optimal formulation of alternatives. In instances where such an interactive and iterative aspect process has been followed in the development of a preferred alternative, it may be appropriate to terminate the assessment of other alternatives, excluding the ‘no-go’ alternative. In order to justify the termination of the assessment, or limit the number of possible alternatives, or further assessment of any alternative, it is, however, important to document the interactions and iterations aspect effectively.

Please note that only reasonable and feasible alternatives have been considered during this assessment process.

5.1 The site alternative and type of activity to be undertaken

The Project Core Team has considered several Road D1867 upgrade alternatives scenarios, which range from retaining the status quo to making minor improvements to the drainage to the upgrading from gravel to blacktop of the entire road alignment including construction of the new bridge. Each alternative has been assessed based on a variety of aspects, such as the impact on the sensitive environment, geographical, physical, biological, social, economic, heritage and cultural aspects, road safety and spatial configuration.

- (i) **Alternative 1A:** The No-Go Alternative or the option of not implementing the activity.
- (ii) **Alternative 1B:** Closure of the section of Road D1867 from KM 6+000 to KM 16+900.
- (iii) **Alternative 2:** Re-gravel, minor drainage improvements, maintenance and retain existing one-lane bridge.

- (iv) **Alternative 3:** Improve geometrics, upgrade drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900.
- (v) **Alternative 4:** Improve geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900.
- (vi) **Alternative 5:** Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900

5.1.1 Alternative 1A: The No-Go Alternative or the option of not implementing the activity

The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The no-go alternative assumes that the proposed project will not go ahead i.e., KZN Department of Transport's initiative to upgrade the existing gravel Road D1867 including river crossing to a surfaced road with improved geometrics considerations and therefore improved safety standards; is not occurring and developed into an operational activity.

This alternative entails that the upgrading of Road D1867 and river crossing would not drive any environmental change and result in no environmental impacts on the site or surrounding areas (River, wetlands, vegetation, surrounding landowners, residents, and services) during construction and operation phase. It provides the status quo or baseline against which other alternatives are compared and has been considered throughout the report.

The No-Go Alternative 1A retains the current status quo where the Road D1867 is retained as a gravel road, with some maintenance and no upgraded stormwater, erosion control mechanism and with the existing one-lane bridge. No improvements will be made to the drainage system, nor will the safety issues be addressed. It has been noted that this alternative is not feasible in terms of addressing the current environmental and safety issues on the Road D1867. Without effectively upgrading the Road D1867, the road is likely to continue degrading to a state where the environmental degradation and safety risks becomes a fatal flow and will have to be closed leading to Alternative 1B. This alternative will not meet any of the objectives of the proposed project. Therefore, the option of not implementing the activity will not be pursued at this stage.

5.1.2 Alternative 1B: Closure of the section of Road D1867 from KM 6+000 to KM 16+900

The current poor condition of the gravel road and of the old existing single lane bridge is deteriorating to such a degree that, if measures are not taken to rectify the problems, the road and river crossing will be unsafe for public use and will continue to cause significant environmental damage. If no action is taken the road may have to be closed, and decommissioned. Vehicle or pedestrian traffic will no longer be able to move between Belgrade, Oranjedal and Tobolsk through this route. This alternative will not meet any of the objectives of the proposed project. Therefore, the option of closing the section of the Road D1867 from KM 6+000 to KM 16+900 will not be pursued at this stage.

5.1.3 Alternative 2: Re-gravel, minor drainage improvements, maintenance and retain existing one-lane bridge

This second option is to make minor improvements to the drainage system. Although this will not effectively address the stormwater problem per se, it may slow down the flow of water runoff at some point. The road will remain a gravel surface and will be maintained regularly, however, the current deteriorating condition of the old existing single lane bridge will continue to be a problem and unsafe for public use. Degradation of the road will continue as the cause of the erosion has not been improved. This alternative will not meet the objectives of the proposed project. Therefore, this second option of to re-gravel, minor drainage improvements and maintenance of the Road D1867 from KM 6+000 to KM 16+900 will not be pursued at this stage.

5.1.4 Alternative 3: Improve geometrics, upgrade drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900

The third alternative is to improve the geometrics of the road to control the drainage and erosion. The construction will allow the road to retain its original state but the factors which are causing the degradation will be addressed. A hard blacktop surface will be constructed from KM 6+000 to KM 16+900 with no road realignment as the existing one-lane bridge is retained. However, this would leave the existing river crossing in its current degraded and dangerous condition by posing a safety risk to motorists and pedestrians. This alternative will partially meet all the objectives of the proposed project.

5.1.5 Alternative 4: Improve geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900

Alternative 4 is to improve the geometrics of the road to control the drainage and erosion. A hard blacktop surface will be constructed from KM 6+000 to KM 16+900 with a realignment of the road to connect to the new bridge constructed upstream of the existing one-lane bridge. However, the realignment of the road could impact some houses and could damage some graves and burial site. This alternative will meet most of the objectives of the proposed project, although damage to graves could potentially delay the project due to its highly significant value to people and there are many traditional, cultural, and personal sensitivities and norms concerning the removal of graves.

5.1.6 Alternative 5: Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900

Alternative 5 has been expressed as the preferred alternative for the project by the Proponent, KZN DOT. This option involves improving and re-constructing all the geometrics of the road but includes hard surfacing the entire road from KM 6+000 to KM 16+900. The hard surface will be a blacktop surface, asphalt or chip and spray, or a combination of the three depending on the section of Road. The new bridge will be constructed further upstream of the existing one-lane bridge together with the realignment of the road to connect to the bridge. This alternative will avoid potential damage to some graves and burial site, however, could impact some houses. This alternative will meet all the objectives of the proposed project.

5.2 The design or layout of the activity:

The preferred design of the activity consists of replacing the existing one-lane bridge with a two-lane bridge constructed south of the existing bridge. Three (3) potential layout options have been proposed by KZN DOT:

- (i) **Option 1:** This alternative (preferred design scheme) comprises a continuous 4 span solid reinforced concrete slab deck.
- (ii) **Option 2:** This alternative comprises a simply supported 5 span precast beam and slab deck construction.
- (iii) **Option 3:** This alternative comprises a continuous 5 span solid slab deck, constructed from precast inverted T-shaped beams placed side by side and in-situ concrete infill and topping.

The preliminary pavement design adopted for this Road D1867 is:

- Double Seal 19: 9.5 proposed
- 125mm Base of G2 Compacted to 85% BRD
- 150mm Sub-base of C4 Compacted to 97% Mod AASHTO density
- 150mm Upper Selected Layer of G7 material compacted to 93% Mod AASHTO density
- 150mm Lower Selected Layer of G9 material compacted to 93% Mod AASHTO density
- Fill constructed in layers of 300mm of selected G10 material and compacted to 90% MOD AASHTO density.
- Shoulders constructed as per fill but top 150mm layer constructed of selected material compacted to 93% MOD AASHTO density.

5.3 The operational aspects of the activity:

The preferred and only operational aspects of the activity involve the rehabilitation of degraded areas associated with the road upgrade and river crossing and post-construction road activities. This must be undertaken as part of the operational phase of the proposed project, including erosion control measures as appropriate, ongoing vegetation rehabilitation using indigenous plants and implementation of an ongoing alien and invasive plant control programme. Other operational aspects of the activity must include:

- Maintenance of stormwater infrastructure,
- Maintenance of the SUDS,
- Routine maintenance inspections; and
- Repair and maintenance works – with associated environmental impacts which would be like those that would occur in the construction phase.

5.4 The advantages and disadvantages of the proposed activity and alternatives

The advantages and disadvantages that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects, as shown in **Table 14** and **15** below.

Table 14: Advantages and disadvantages of proposed site alternatives and type of activities to be undertaken

Site Alternatives and type of activities to be undertaken	Advantages	Disadvantages
<p>Alternative 1A: The No-Go Alternative or the option of not implementing the activity</p>	<ul style="list-style-type: none"> • The upgrading of Road D1867 and river crossing would not drive any environmental change and result in no environmental impacts on the site or surrounding areas (River, aquatic, wetlands, vegetation, surrounding landowners, residents, and services) during construction and operation phase • There will no longer be any upgrade expenses for KZN DOT or the Municipality. • Upgrading an existing well used road alignment within the existing footprint and within an existing (disturbed) road reserve. Therefore, no unnecessary additional disturbance to the environment or surrounding land uses. 	<ul style="list-style-type: none"> • Maintenance cost of the gravel road and as these costs are likely to be high in the long term as a permanent labour force will be required. • The road along section characterised by shallow cuts, and sharp bends will continue to be in a poor condition. • The section of the road adversely affected by inclement weather conditions will continue to create potholes and slippery and dangerous conditions. • The section of the road with steep gradients; will continue to create some deformation to the shape of the road on the gravel surface rendering the route unsafe for use especially for vehicular traffic. Generally, gravel roads constructed in steep gradients are more difficult to maintain, which could lead to intermittent closure of the road due to significant erosion and environmental damage. • The existing road drainage system will continue to be unable to cope with the high intensity storm water runoff of water on steep gradients, and will continue to result in erosion, excessive scour, rutting, washaways, undercutting and gravel loss. • The eroded gravel eventually will continue to deposit in the Mozana River which flows down the valley, resulting in sedimentation and pollution of the lower reaches of the river and when the velocity of the river slows and it also affects fish breeding and in stream

		<p>habitat negatively, thereby impacting aquatic biodiversity.</p> <ul style="list-style-type: none"> • The existing stormwater infrastructure will remain in the same positions and will continue to be inefficient. • The existing single lane bridge is very old, and the bridge structure has deteriorated to such a degree that significant maintenance is required to keep the bridge in service. This would leave the existing river crossing in its current degraded and dangerous condition by posing a safety risk to motorists and pedestrians. It would also continue to degrade the immediate and downstream environment. • In addition, the existing one lane bridge will continue to be functionally deficient as it's widths do not satisfy the current KZN DOT standards considering the amount of traffic that utilises the bridge. • The existing road surface from KM 6+000 to KM 16+900 which is gravel, dust pollution, will continue. And gravel roads result in dust being deposited on the adjacent vegetation, which in turn leads to a decline in the quality of adjacent vegetation and impacts on biodiversity. • The gravel road surface will continue to be subject to widening by road users, who usually choose to drive on the verges around puddles and potholes, thereby extending the width of the road. • It also assumes that the possibility of this activity to lead to socio-economic gains such as temporary job opportunities or skill development during the construction phase will not be realised or achieved.
<p>Alternative 1B: Closure of the section of Road D1867 from KM 6+000 to KM 16+900</p>	<ul style="list-style-type: none"> • There will no longer be any upgrade expenses for KZN DOT or the Municipality. • The closure and rehabilitation of the road will allow the road servitude to return to its natural state. 	<ul style="list-style-type: none"> • The link between Belgrade area, to Oranjedal area will not be provided so as the access to the community of Belgrade, Oranjedal and Tobolsk.

	<ul style="list-style-type: none"> • Soil erosion will be reduced significantly resulting in less sedimentation of the rivers. • The river and the riverine environment conditions will improve. • All aspects associated with road safety will be irrelevant. 	<ul style="list-style-type: none"> • Closure of the road would detrimentally impact on the local communities as they rely on the Road D1867 for trade and travel between home and work. • It also assumes that the possibility of this activity to lead to socio-economic gains such as temporary job opportunities or skill development during the construction phase will not be realised or achieved. This will mean the status quo of the Department's Road Infrastructure upgrade for Rural Development Programme backlogs will be maintained.
<p>Alternative 2: Re-gravel, minor drainage improvements, maintenance, and retain existing one-lane bridge</p>	<ul style="list-style-type: none"> • The initial construction cost will be low. • improved storm water control. • Slightly reduced Road D1867 closures. 	<ul style="list-style-type: none"> • The maintenance costs will be high in the long term. • Materials will have to be transported to the site on a regular basis and a permanent maintenance team will have to be set up which adds to the costs. • The section of the road, with steep gradients; will continue to create some deformation to the shape of the road on the gravel surface rendering the route unsafe for use especially for vehicular traffic. Generally, gravel roads constructed in steep gradients are more difficult to maintain, which could lead to intermittent closure of the road due to significant erosion and environmental damage. • The existing road drainage system will continue to be unable to cope with the high intensity storm water runoff of water on steep gradients, and will continue to result in erosion, excessive scour, rutting, washaways, undercutting and gravel loss. • The eroded gravel eventually will continue to deposit in the Mozana River which flows down the valley, resulting in sedimentation and pollution of the lower reaches of the river and when the velocity of the river slows and it also affects fish breeding and in stream habitat negatively, thereby impacting aquatic biodiversity.

		<ul style="list-style-type: none"> • The existing stormwater infrastructure will remain in the same positions and will continue to be inefficient. • The existing single lane bridge is very old, and the bridge structure has deteriorated to such a degree that significant maintenance is required to keep the bridge in service. This would leave the existing river crossing in its current degraded and dangerous condition by posing a safety risk to motorists and pedestrians. It would also continue to degrade the immediate and downstream environment. • In addition, the existing one lane bridge will continue to be functionally deficient as it's widths do not satisfy the current KZN DOT standards considering the amount of traffic that utilises the bridge. • Dust pollution from the existing road surface from KM 6+000 to KM 16+900 which is gravel, will continue. And gravel roads result in dust being deposited on the adjacent vegetation, which in turn leads to a decline in the quality of adjacent vegetation and impacts on biodiversity. • Retaining the current status quo (a gravel road), with required maintenance, is not sustainable in the long term. • Indirect environmental impacts
<p>Alternative 3: Improve geometrics, upgrade drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900</p>	<ul style="list-style-type: none"> • This will involve very high construction costs, but the maintenance costs of a hard surface road thereafter are reduced than compared to gravel road. • The improved condition of the road will be safer for motorists and will reduce the impact on the environment. • Controlling the drainage on the road will reduce the environmental impacts caused by run-off and erosion on all sections, particularly the water crossings. 	<ul style="list-style-type: none"> • The existing one lane bridge is functionally deficient as it's widths do not satisfy the current KZN DOT standards in terms of horizontal curve and road gradient considering the amount of traffic that utilises the bridge. • The width of the existing bridge cannot accommodate the road carriageway and the foot walkway. • With the upgrade of the road to blacktop, the existing bridge has the potential to become a black spot due to increase traffic volume.

	<ul style="list-style-type: none"> • A hard surface road on steep gradient will reduce the amount of sediment run-off and erosion, thereby protecting rivers from siltation to some degree. • Reduced dust pollution. • Reduced cost travel. • Travel times and distances will be considerably reduced, 	<ul style="list-style-type: none"> • Road verge vegetation is removed in the lower section to allow for the increased road width of 8.5m.
<p>Alternative 4: Improve geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900</p>	<ul style="list-style-type: none"> • The maintenance costs of a hard surface road are lower than a gravel road. • The improved condition of the road will be safer for motorists and will reduce the impact on the environment. • Controlling the drainage on the road will reduce the environmental impacts caused by run-off and erosion on all sections, particularly the water crossings. • A hard surface road on steep gradient will reduce the amount of sediment run-off and erosion, thereby protecting rivers from siltation to some degree. • Reduced dust pollution. • Reduced cost of travel. • Travel times and distances will be considerably reduced, • The road upgrade will reduce inconvenience and delays while providing increased traffic efficiency and pedestrian safety. • Improved access to the area between the community of Belgrade, Oranjedal and Tobolsk • The benefit to the community will increase with a hard surfaced road, 	<ul style="list-style-type: none"> • Road verge vegetation is removed in the lower section to allow for the increased road width of 8.5m. • Biophysical impacts on the environment, namely river, aquatic, wetlands, terrestrial vegetation., heritage and cultural aspects. • Realignment of the road could potentially impact few houses. • Realigning the road would have a greater net economic impact on the surrounding residential areas • Realignment of the road could potentially damage some graves and burial site.
<p>Alternative 5: Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900</p>	<ul style="list-style-type: none"> • The maintenance costs of a hard surface road are lower than a gravel road. 	<ul style="list-style-type: none"> • Road verge vegetation is removed in the lower section to allow for the increased road width of 8.5m.

	<ul style="list-style-type: none"> • The improved condition of the road will be safer for motorists and will reduce the impact on the environment. • Controlling the drainage on the road will reduce the environmental impacts caused by run-off and erosion on all sections, particularly the water crossings. • Erosion of the road and the adjacent environment will be significantly reduced. • With reduced erosion, sedimentation of the rivers will decrease significantly, and the health of the river system will improve. • A hard surface road on steep gradient will reduce the amount of sediment run-off and erosion, thereby protecting rivers from siltation to some degree. • Reduced dust pollution. • Improved access to the area between the community of Belgrade, Oranjedal and Tobolsk • Reduced cost of travel. • Travel times and distances will be considerably reduced, • The major causes of the environmental impacts will be addressed. • The road upgrade will reduce inconvenience and delays while providing increased traffic efficiency and pedestrian safety. • The benefit to the community will increase with a hard surfaced road. • Avoid potential damage to some graves and burial site. 	<ul style="list-style-type: none"> • Biophysical impacts on the environment, namely river, aquatic, wetlands, terrestrial vegetation., heritage and cultural aspects. • Realignment of the road could potentially impact few houses. • Realigning the road would have a greater net economic impact on the surrounding residential areas.
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Table 15: Advantages and disadvantages of proposed alternatives Design layout

Alternatives Design Layouts	Advantages	Disadvantages
<p>Option 1 (Preferred Design Scheme): Continuous 4 span solid reinforced concrete slab deck</p>	<ul style="list-style-type: none"> • The continuous deck is statically indeterminate structure, and the sections at intermediate supports will resist hogging bending moments, resulting in the reduction of the sagging bending moment near midspan sections. • The continuous span bridge deck has relatively large loading carrying capacity as compared to simple supported decks of similar span length. • Formwork is simpler and less costly. • Smaller thickness of deck thereby reducing the height of fill and consequently the cost of the approaches. • Reduces depth at mid-span due to which vertical clearance or headroom is increased. This may bring down the bridge deck level reducing thereby not only the cost of the approaches but also the cost of substructure due to lesser height of piers and abutments which again reduces the cost of the foundation. • Simpler arrangement of reinforcement. • Placing of concrete in solid slab is much easier than in slab and girder or any other similar type of bridges. • Due to reduction in the width of pier, less obstruction to flow and as such possibility of less scour. • Chances of honeycombing in concrete are less. • Cost of surface finish is less than girder bridges. • Quicker construction. 	<ul style="list-style-type: none"> • Greater cost of materials. • Larger dead loads. • Not suitable on yielding foundations. Differential settlement may cause undesirable stresses.
<p>Option 2: Supported 5 span precast beam and slab deck construction.</p>	<ul style="list-style-type: none"> • Precast Concrete construction saves time, and the risk of project delay is minimised. The construction 	<ul style="list-style-type: none"> • Supported 5 span precast beam and slab deck construction does have less loading carrying

Alternatives Design Layouts	Advantages	Disadvantages
	<p>work can be carried on simultaneously with other works on site such as earthwork, survey, etc. and thus saving time.</p> <ul style="list-style-type: none"> • Improved Quality Assurance construction can be performed. • By using pre-stressed precast, structural materials of high strength and load-bearing capacity can be achieved, which can result in greater clear span, reduced size of the cross-section of structural members, etc. • Cost-effective. • Precast Concrete structure has a longer service period and minimal maintenance. • Provides a safe construction working platform. 	<p>capacity as compared to Continuous 4 span solid reinforced concrete slab deck</p> <ul style="list-style-type: none"> • Beam and slab bridge construction have a relatively poor load distribution property. This can be improved by providing one or more transverse beams or diaphragms within the span. • In bridges built with precast beams, forming these intermediate diaphragms is extremely inconvenient and therefore expensive. • Permanent formwork must be provided at the soffit of the in-situ reinforced concrete slab topping. • Transportation cost and issue. • Handling Difficulties. • Limitation in the modification. • Sensitive connection works.
<p>Option 3: Continuous 5 span solid slab deck, constructed from precast inverted T-shaped beams placed side by side and in-situ concrete infill and topping</p>	<ul style="list-style-type: none"> • This bridge deck system utilises high-quality, factory-made beams that can be quickly erected on site and with minimum interruptions to traffic. • Beam bridges are useful in almost any location. 	<ul style="list-style-type: none"> • There are no built-in supports for beam bridges. • Span limitations exist for beam bridges. • Beam bridges are not sustainable in the long term. • They do not offer a lot of flexibility. • High maintenance costs. • The width of the deck span is limited. • There are limited placement options available.

6. ENVIRONMENTAL LEGAL REQUIREMENTS FOR THE PROPOSED PROJECT

6.1 National Environmental Management Act (NEMA) (Act No. 107 of 1998) as amended

The proposed upgrading of Road D1867 project triggers Listed Activities as stipulated in the EIA Regulations (2014) promulgated in terms of the NEMA, 1998 (Act 107 of 1998) as amended under Government Notice Regulation (GNR) No. 982, 983, 964 and 985 of 04 December 2014 read in conjunction with Regulations (GNR) 324, 326 and 327 of 07 April 2017 (DEA, 2014). The following **Table 16** provides a summary of the Listed Activities in terms of the EIA Regulations 2014 that are triggered by the project:

Table 16: Summary of the Listed Activities.

Government Notice Number	Activity number	Description of each listed activity	Component of project
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse	The recommended preferred build alternative consists of replacing the existing one-lane bridge with a two-lane bridge constructed southeast of the existing bridge at about Km 7.2 at GPS coordinates: 27°17' 14.1" S, 31°13' 47.5" E. The proposed Mozana bridge deck will be 56m long continuous slab with 4 spans of 14m length. The bridge deck will be 11.12m to accommodate 2 x 3.5m wide lanes with shoulders of 0.75m wide on both side of the bridge and a 1.5m foot sidewalk on the south edge of the bridge. The total physical footprint of the bridge is approximately a 622,72m ² . At Km 15.520 the road crosses an unchanneled valley bottom wetland (Wetland Unit UCVB1) from approximately GPS coordinates: 27°19' 38.15" S and 31°12' 41.64" E to approximately GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E. It is proposed the construction of the new causeway with a physical footprint of approximately 750 m ²
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;	More than 10 cubic metres of soil, and other material will be excavated, removed, or moved during construction of the bridge at Km 7.2 GPS coordinates: 27°17' 14.1" S, 31°13' 47.5" and during construction of the causeway at Km 15.520 GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E

Government Notice Number	Activity number	Description of each listed activity	Component of project
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	24	The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	As the project includes the construction of a new bridge over the Mozana River, small section of the road before and after the bridge requires re-alignment by constructing a new road alignment approach to the new bridge over the Mozana-river on both sides. This will result on the construction of a new road of approximately 8.5m wide and 860m in length which will start from KM 6+800 at the approximate GPS coordinates: 27°17' 11.00" S and 31°14' 01.60" E to KM 7+660 at the approximate GPS coordinates: 27°17' 26.60" S and 31°13' 51.06" E.
GNR 325 of 07 April 2017 (Listing Notice 3) read in conjunction with GNR 985 of 04 December 2014	14	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (b) within a watercourse d. KwaZulu-Natal vii. Critical biodiversity areas or ecological support areas as identified in systematic biodiversity plans adopted by the Competent Authority or in bioregional plans; f. Mpumalanga (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	At Km 15.520 the road crosses an unchanneled valley bottom wetland (Wetland Unit UCVB1) from the approximate GPS coordinates: 27°19' 38.15" S and 31°12' 41.64" E to the approximate GPS coordinates: 27°19' 38.45" S and 31°12' 41.29" E. It is proposed the construction of the new causeway with a physical footprint of approximately 750 m ² and this will occur within a Critical Biodiversity Areas.

The abovementioned activities contained in Listing Notice 1 and 3 of the EIA Regulations (2014) promulgated in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) in GNR No 327 and 325 of 07 April 2017 read in conjunction with GN R. 983 and 985 of 04 December 2014; are subject to a Basic Assessment within the jurisdiction of the Department of Forestry, Fisheries, and the Environment (DFFE) – National Office.

6.2 Mineral and Petroleum Resources Development Act, (Act No.28 of 2002)

An application for a Mining Permit and Environmental Authorisation has been submitted to the Department of Mineral and Resources (DMR) for the establishment of two borrow pits in line with the requirements of the Mineral and Petroleum Resources and Development Act, 2002 (as amended) and NEMA EIA Regulations Act No 107 of 1998), as amended, and the EIA Regulations (2014). The following **Table 17** below on page 36 provides a summary of the Listed Activity in terms of the EIA Regulations 2014 that are triggered by the establishment of two borrow pits:

Table 17: Summary of listed activity for borrow pit

Government Notice Number	Activity number	Description of each listed activity	Component of project
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	21	Any activity including the operation of that activity which requires a mining permit of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002, including - (a) associated infrastructure, structures, and earthworks, directly related to the extractions of a mineral resource, or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening, or washing.	Two existing Borrow Pits (BP1 and BP3) are found along the D1867 alignment, which will be utilised along the road section for the purpose of procurement of raw materials to be used as fill material for the intended road works upgrade project.
GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014	22	The decommissioning of any activity requiring – (I) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);	The two existing Borrow Pits (BP1 and BP3) will be decommissioned and rehabilitated following the completion of the road upgrade project.

The abovementioned activities contained in Listing Notice 1 of the EIA Regulations (2014) promulgated in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) in GNR No 326 and 327 of 07 April 2017 read in conjunction with GN R. 982 and 983 of 04 December 2014; are subject to a Basic Assessment within the jurisdiction of the DMR.

6.3 National Water Act (NWA) (Act No. 36 of 1998)

Due to the project occurring within 500m radius of wetlands and 1:100-year floodline, a Water Use Authorisation (WUA) Application must be submitted to the Department of Water and Sanitation (DWS) in terms of Section 21 (a), (c) or (i) in accordance with the National Water Act (NWA)1998 (Act No. 36 of 1998).

The NWA is a legal framework for the effective and sustainable management of water resources in South Africa. A Water Use Licence/Authorisation is a legislative process governed by DWS for the licence/authorisation of all water uses defined in section 21 of the National Water Act, 1998 (Act No 36 of 1998) (NWA). The following **Table 18** below provides a summary of water uses that apply to this upgrade:

Table 18: Summary of water uses that require a water use licence

Activity Number	Water Use	Explanation / Definitions
Section 21 (a) of NWA, 1998	Taking water from a water resource	❖ Water is to be abstracted from the Mozana River during construction activities.
Section 21 (c) of NWA, 1998	Impeding or diverting the flow of water in a watercourse.	❖ Impeding flow means the temporary or permanent obstruction or hindrance to the flow of water into watercourse by structures built either fully or partially in or across a watercourse. ❖ Diverting flow means a temporary or permanent structure causing the flow of water to be rerouted in a watercourse for any purpose.
Section 21 (i) of NWA, 1998	Altering the bed and banks of a watercourse	❖ Altering the bed and banks means any change affecting the resource quality of the watercourse (the area within the riparian habitat or 1:100-year floodline, whichever is the greatest).

Activity Number	Water Use	Explanation / Definitions
	or characteristics of a watercourse.	

6.4 Other Applicable Legislation and Guidelines Considered

Other legislation, policies and guidelines that have possible bearing on the upgrading of Road D1867 project and consider during the preparation of this Basic Assessment Report are captured in the **Table 19** below.

Table 19: Other Environmental Legislation related to the project

Title of Legislation, Policy or Guideline	Administering Authority
Constitution of the Republic of South Africa (108 of 1996); specifically, the Bill of Rights (Chapter 2, Section 24)	The South Africa State
National Environmental Management Act of 1998 (Act 107 of 1998) as amended	DFFE, Department of Economic Development, Tourism and Environmental Affairs (EDTEA) (Provincial and Local Authority) & Department of Agriculture, Rural Development and Land (DARDL) - Mpumalanga Province
Environmental Impact Assessment Regulations 2014, published in Regulation Gazette No. 38282 under GNR 982,983, and 985 (of 4 December 2014), as amended	DFFE, EDTEA, DARDL
National Water Act (Act 36 of 1998)	DWS
Water Service Act of 1997 (Act No. 108 of 1997).	DWS
National Environmental Management: Waste Act (Act 59 of 2008)	DFFE, EDTEA, DARDL
Hazardous Substances Act of 1973 (Act 15 of 1973)	Department of Health (DoH)
The Occupational Health and Safety Act (Act 85 of 1998)	Department of Labour (DoL)
National Environmental Management: Biodiversity Act, (Act 10 of 2004)	Ezemvelo KwaZulu-Natal Wildlife (EKZNW), Mpumalanga Tourism & Parks Agency (MTPA)
Conservation of Agricultural Resources Act (Act 43 of 1983)	DFFE
National Environmental Management: Protected Areas Act of 2003 (Act No. 57 of 2003)	EKZNW, MTPA
National Forests Act (NFA) (Act No. 84 of 1998)	DFFE
Alien and Invasive Species Regulations (2014) in terms of section 97(1) of NEMBA	DFFE, MTPA & EKZNW
Animals Protection Act of 1962 (Act No. 71 of 1962)	DFFE
Mineral and Petroleum Resource Development Act (MPRDA). 2002 (Act No. 28 of 2002)	DMR
National Heritage Resources Act (Act No 25 of 1999)	South Africa Heritage Resource Agency (SAHRA) and Provincial Heritage Authorities: KZN AMAFA & Mpumalanga Provincial Heritage Resource Authority (MPHRA)
National Environmental Management: Air Quality Act (NEMAQA) (Act No. 39 of 2004)	Zululand District Municipality & Gert Sibande District Municipality
Spatial Planning and Land Use Management Act (Act No. 16 of 2013) (SPLUMA)	Department of Rural Development and Land Reform (DRDLR)
KwaZulu-Natal Planning and Development Act (Act 6 of 2008)	The Department of Cooperative Governance and Traditional Affairs (COGTA)
Local Government: Municipal Systems Act, (Act No 32 of 2000)	uPhongolo Local Municipality & Mkhondo Local Municipality

Title of Legislation, Policy or Guideline	Administering Authority
Minimum requirements for handling, classification, and disposal of hazardous waste, second edition, 1998	DWS
Minimum requirements for waste disposal by landfill, 2nd addition, 1998.	DWS
KwaZulu-Natal Provincial Roads Act (Act No. 4 of 2001)	KZN DOT
National Road Traffic Act (No. 93 of 1996)	KZN DOT
Road Traffic Act of 1989 (Act No. 29 of 1989)	KZN DOT
Zululand District Municipality IDP/SDF 2022 / 2023	Zululand District Municipality
uPhongolo Local Municipality IDP/SDF 2022 / 2023	uPhongolo Local Municipality
Gert Sibande District Municipality IDP (2021 – 2022) / SDF (2014)	Gert Sibande District Municipality
Mkhondo Local Municipality IDP/SDF	Mkhondo Local Municipality
Integrated Environmental Management (IEM) Guidelines	DFFE (EDTEA)
South African Water Quality Guidelines. Volume 8	DWS
Guideline: Public Participation guideline (2017) in terms of NEMA EIA Regulations, DFFE, Pretoria, South Africa	DFFE, EDTEA, DARDL
Guideline: Need and Desirability (2017) issued by the Department of Environmental Affairs, Pretoria, South Africa	DFFE, EDTEA, DARDL
The National Development Plan (NDP) 2030	Department: The Presidency of Republic of South Africa (RSA) – National Planning Commission
National Spatial Development Perspective (NSDP)	Department: The Presidency of RSA

The above lists of legislation, policy guidelines, policies and development frameworks should not be regarded as complete or exhaustive, and it is possible that additional legislative requirements will be identified during the Basic Assessment process.

6.5 Environmental Legislative Context

The environmental legislative context is captured in **Table 20** below that describes how the proposed Road D1867 project complies with the relevant legislation, policy, guidelines and development frameworks

Table 20: Environmental legislation considered during the preparation of the Draft BAR

DESCRIPTION OF COMPLIANCE WITH THE RELEVANT LEGISLATION, POLICY, OR GUIDELINE	
Legislation, policy of guideline	Description of compliance or relevance to the development
Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)	<p>Under Section 24 of the Constitution, it clearly states that “<i>Everyone has the right to</i>”</p> <p>(a) <i>an environment that is not harmful to their health or wellbeing;</i>” and</p> <p>(b) <i>to have the environment protected, for the benefit of the present and future generations, through reasonable legislative and other measures. that:</i></p> <p>(i) Prevent pollution and ecological degradation.</p> <p>(ii) Promote conservation; and</p> <p>(iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</p> <p>The Constitution has thus paved the way for environmental legislation in South Africa post 1994.</p> <p>The appointed contractors have an obligation to ensure that the construction and operation of the proposed Road D1867 upgrade will not result in the pollution and/or ecological degradation at the site; and to ensure that the proposed road upgrade is ecologically sustainable as well as improving local economic and social conditions to support the rights enshrined in the Constitution.</p>
The National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended	<p>NEMA as amended, 1998 (Act No 107 of 1998) was enacted in November 19998. It was set in place in accordance with Section 24 of the Constitution. It prescribes principles and guidelines that allow for sustainable development. Ensuring that these principles are adhered to is important for sound environmental practice to inform decision making for issues affecting the environment. The conditions for the Environmental Authorisation (EA) must be adhered to should approval be granted.</p> <p>KZN DOT must be aware of these principles and implications associated with the NEMA and must avoid or mitigate any potential negative impacts of causing damage to the environment associated with the construction or operation of Road D1867.</p>
The Environmental Impact Assessment Regulations 2014 as amended promulgated under the NEMA as amended.	Section 24 (1)(a) and (b) of NEMA state that: “the potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law, and which may significantly affect the environment, must be

DESCRIPTION OF COMPLIANCE WITH THE RELEVANT LEGISLATION, POLICY, OR GUIDELINE	
Legislation, policy of guideline	Description of compliance or relevance to the development
	<p>considered, investigated, and assessed prior to their implementation and reported to the Organ of State charged by law with authorising, permitting, or otherwise allowing the implementation of an activity”.</p> <p>The proposed Road D1867 upgrade triggers the following listed activities: Activities 12, 19 and 24 of GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014 and Activity 14 of GNR 325 of 07 April 2017 (Listing Notice 3) read in conjunction with GNR 985 of 04 December 2014. These activities that have been identified, require EA through a BA process in terms of NEMA regulated by DFFE.</p> <p>Specialist studies have been conducted to inform the BA process with regards to sensitive natural environment. and KZN DOT must comply with the amended EIA Regulations in terms of the Act which specifies the requirements of a Basic Assessment process</p>
Mineral and Petroleum Resource Development Act (MPRDA). 2002 (Act No. 28 of 2002)	<p>The MPRDA sets out the requirements relating to the development of South Africa's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities.</p> <p>The establishment of two existing Borrow Pits (BP1 and BP3) along the Road D1867 alignment, that will be utilised for the purpose of procurement of raw materials to be used as fill material for the intended road works project triggers the following listed activities: Activities 21, and 22 of GNR 327 of 07 April 2017 (Listing Notice 1) read in conjunction with GNR 983 of 04 December 2014. These activities that have been identified, require EA through a BA process in terms of NEMA and MPRDA regulated by DMR.</p>
The National Heritage Resources Act (NHRA), 1999 (Act No. 25 of 1999)	<p>The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa.</p> <p>KwaZulu-Natal AMAFA, MPHRA and SAHRA are the relevant Competent Authority for protection of archaeological and paleontological resources in KZN and Mpumalanga. A request for statutory comment has been submitted to AMAFA, MPHRA and SAHRA by uploading a copy of the DBAR into the South African Heritage Resources Information System (SAHRIS) website in terms of the NHRA as amended.</p> <p>NHRA requires a cultural heritage study for any development of 5000 m² or more. It also provides guidelines for impact assessment studies to be undertaken whenever cultural resources may be affected by onsite project activities.</p> <ul style="list-style-type: none"> • AMAFA, MPHRA and SAHRA have been informed of the proposed project so they can provide their comment. • In the case that heritage resources are identified during the construction and upgrade of the road, AMAFA, MPHRA and SAHRA must be notified to protect these resources.
National Water Act (NWA) (Act No. 36 of 1998)	<p>The NWA provides for the sustainable and equitable use and protection of water resources in South Africa. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management,</p>

DESCRIPTION OF COMPLIANCE WITH THE RELEVANT LEGISLATION, POLICY, OR GUIDELINE	
Legislation, policy of guideline	Description of compliance or relevance to the development
	<p>including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.</p> <p>Due to the proposed Road D1867 upgrade project occurring within 500m radius of wetlands and 1:100-year floodline, a WUA Application has been submitted to DWS in terms of Section 21 (a), (c) or (i) in accordance with the NWA1998 (Act No. 36 of 1998).</p>
The National Environmental Management: Biodiversity Act (NEM:BA), 2004 (Act No. 10 of 2004)	<p>The NEM:BA regulates the management and conservation of the biodiversity in South Africa. NEMBA promotes the sustainable use of biological resources by protecting natural species and threatened ecosystems that may potentially occur within the development footprint, and the surrounding area.</p> <p>NEM:BA also considers the management of alien and invasive species. KZN DOT has the responsibility to conserve endangered ecosystem in the area and apply any appropriate management tools such as the KwaZulu-Natal Biodiversity Plan. KZN DOT will aim to limit any further loss of biodiversity and control the spread of alien and invasive species within the construction footprint. An Ecological habitat Assessment specialist study was undertaken, and the mitigation measures incorporated into the EMPr attached as Appendix F.</p>
Alien and Invasive Species Regulations (published on the 19 July 2013) under NEMBA, 2004 (Act No 10. of 2004)	The control of alien invasive plant species is controlled by the Alien and Invasive Species Regulations under NEMBA. Alien invasive species listed in the Ecological habitat Assessment report were recorded on site for the purposes of a basic management plan. Any declared weed or invasive species listed in NEMBA, found onsite, must be removed, and controlled as per the EMPr attached in Appendix F .
Conservation of Agricultural Resources Act (CARA) (Act No 43 of 1983)	<p>According to CARA (Act No 43 of 1983) all declared aliens must be controlled. KZN DOT is responsible for the alien invasive species present on the development property.</p> <p>It is important that all alien invasive species recorded and mapped and applied species-specific control measures as mentioned in the EMPr attached in Appendix F. KZN DOT is responsible of the management of protected trees which occur within the project footprint.</p>
National Forests Act (NFA) (Act No. 84 of 1998) (NFA)	<p>KZN DOT is responsible of the management of invasive species which occur within the project footprint.</p> <p>KZN DOT must obtain permits for the damaging, cutting or removal of any protected trees and other protected species (TOPs or KZN listed.) from DFFE prior to commencement of construction activities.</p>
The National Environmental Management: Waste Act (NEM:WA), 2008 (Act No. 59 of 2008)	A waste management plan has been included in the EMPr attached in Appendix F for the construction phase activities.

DESCRIPTION OF COMPLIANCE WITH THE RELEVANT LEGISLATION, POLICY, OR GUIDELINE	
Legislation, policy of guideline	Description of compliance or relevance to the development
	The contractor must ensure that all waste related activities associated with the construction of the proposed Road D1867 is compliant with the NEM:WA.
National Environmental Management: Air Quality Act (NEMAQA) (Act No. 39 of 2004)	<p>Provision of national standards regulating air quality monitoring, management and control that will be applicable during the proposed construction of Road D1867</p> <p>The increased dust levels as a result of construction activities are expected to be within acceptable limits and measures to reduce dust is contained in the EMP_r attached in Appendix F and must be adhered to. The appointed contractors must take the necessary measures to ensure compliance with the NEMAQA.</p>
Spatial Planning and Land Use Management Act (Act No. 16 of 2013) (SPLUMA)	SPLUMA is a framework act for all spatial planning and land use management legislation in South Africa. It seeks to promote consistency and uniformity in procedures and decision-making in this field. SPLUMA will also assist municipalities to address historical spatial imbalances and the integration of the principles of sustainable development into land use and planning regulatory tools and legislative instruments.
Occupational Health and Safety Act (Act 85 of 1993)	<p>The Contractor will provide Health & Safety Plan for approval by the Engineer. This project specific Health and Safety Management Plan will be established in accordance with current Health & Safety regulations as a minimum during construction and the content of this document will be implemented during the currency of the Project being reviewed and updated as site conditions change. The document will include detailed procedures for risk assessments and method statements for all aspects associated with the effective management of Health and Safety in relation to the proposed upgrade and construction of Road D1867 and other related works.</p> <p>A permit to work system will operate on this project and before a permit is authorised by the responsible manager, they will have personally inspected the area and location of the works in order to ensure that all necessary safety measures have been completed before the relevant works proceed.</p>
Local Government: Municipal Systems Act, (Act No 32 of 2000)	Section 4 of the Local Government: Municipal Systems Act, No. 32 of 2000 Section 4(2)(i) states that “ <i>The Council of a municipality... has the duty to ... (i) promote a safe and healthy environment in the municipality.</i> ”
The National Development Plan 2030	<p>The National Development Plan, finalised in 2011, represents an innovative approach by government to promote sustainable and inclusive development in South Africa. This approach focuses on an array of areas which require improvement on infrastructure and improving the connectivity of townships to economic centres.</p> <p>Improving infrastructure is not just essential for faster economic growth and higher employment. It also promotes inclusive growth, providing local communities with the means to improve their own lives and boost their incomes. Upgrade of road infrastructure is essential to development.</p>

DESCRIPTION OF COMPLIANCE WITH THE RELEVANT LEGISLATION, POLICY, OR GUIDELINE	
Legislation, policy of guideline	Description of compliance or relevance to the development
National Spatial Development Perspective (NSDP)	<p>Principal 5 of NSDP states that for South Africa to overcome the spatial distortions caused by Apartheid, future settlement and economic development opportunities are to be channelled into activity corridors and nodes that are adjacent to or linked the main growth centres of the Country.</p> <p>Belgrade and a node halfway between Belgrade and Pongola have been identified as secondary development nodes as they are envisaged to serve the surrounding region and making usage of their approximate location along the N2.</p> <p>Road D1867 has been identified as tertiary corridor as it is a local access road that provides location for tertiary and local development.</p>
The Zululand District Municipality IDP/SDF 2022/ 2023	<p>Infrastructure development has been identified as an important catalyst for future development and economic upliftment for the municipality. uPhongolo has the third largest paved network dominated by class 1 and 2 roads. Coming to the unpaved network, it can be observed that uPhongolo has the second largest unpaved network dominated by class 3, 4 and 6. Overall, the Zululand District is dominated by classes 3, 5 and 6 unpaved road network. Most of the unpaved network is in a dire state in all the local municipalities. It can be concluded that uPhongolo and Ulundi need the largest capital injection considering the state of their paved and unpaved road network. The biggest priority in both municipalities is to rehabilitate their road network condition to a 'very good' status.</p>
Gert Sibande District Municipality IDP (2021 – 2022) / SDF (2014)	<p>Infrastructure development is one of the key drivers for economic growth and job creation. All the main economic sectors that have been identified as critical in stimulating economic growth and employment creation as per the Mpumalanga Growth and Development Path consist of agriculture, forestry, mining, energy industry, tourism, cultural industries, Green Economy, ICT, manufacturing, and beneficiation. All these sectors rely, in the main, on infrastructure development for their own growth and development.</p> <p>Investment in road infrastructure development by KZN DOT will go a long way in terms of unlocking opportunities for economic growth and development, including jobs opportunities during construction phase. In essence, infrastructure development is critical to the success of the Economic Growth and Development Path.</p>
uPhongolo Local Municipality IDP/SDF 2022 / 2023	<p>uPhongolo Municipality Vision Statement is to ensure an inclusive socio-economy by providing quality services that yield a better life for all by 2035. This can be achieved by the following Mission Statement by providing infrastructure and other services to all, with emphasis on rural communities, in a sustainable manner. Providing access to comprehensive basic services and infrastructure development is part of issues and goals that uPhongolo Municipality is planning to unlock and address over the next 5- years. The paving of Road D1867 in Belgrade is listed under infrastructure assets in the IDP 2022 / 2023 amongst salient projects to be undertaken over the medium-term.</p>

DESCRIPTION OF COMPLIANCE WITH THE RELEVANT LEGISLATION, POLICY, OR GUIDELINE	
Legislation, policy of guideline	Description of compliance or relevance to the development
Mkhondo Local Municipality (MLM) Integrated Development Plan (IDP) 2020-2021	Mkhondo Local Municipality's mission is its commitment to deliver quality and sustainable services that will enhance economically viable and better life for its community. The improvement and maintenance of the road connectivity on the MLM on the local, provincial, national, and international level is listed amongst the SDF projects. As the state of our roads is partially in an unacceptable condition, projects to upgrade the roads in town has begun as the mark street has been paved, tarred roads are deteriorating and not in a ride able state. Gravel roads (Potholes, crocodile skin) need continuous blading and watering. The Municipality, District municipality and provincial department have engaged to address the state of roads.
Guideline: Public Participation guideline (2017) in terms of NEMA EIA Regulations, DFFE, Pretoria, South Africa	The Public Participation Process (PPP) stipulated in Chapter 6, sub –regulation 41 of the 2014 Regulations (Gazette No 38282) has been conducted. Applicable to the conduction of the public consultation process with key stakeholders, Government Departments, NGOs and directly affected residences and businesses for the duration of the proposed project.
Guideline: Need and Desirability (2017) issued by the Department of Environmental Affairs, Pretoria, South Africa	Utilised in the assembling of the need and desirability of the proposed Road D1867 upgrade project.
South African National Standard (SANS) 10400-B	The following guidelines and specifications have be used as criteria for the design of the roads network and Stormwater infrastructure: <ul style="list-style-type: none"> • TRH Technical Recommendations for Highways) guidelines. • TMH (Technical Methods for Highways) guidelines. • SANS 3001. • Standard Specifications for Road and Bridge Works: COLTO 1998. • SARTSM (South African Road Traffic Signs Manual). • Conditions of Contract Construction: GCC 2015 for road and bridge works for state Authorities, COLTO 1998.

SECTION C: PUBLIC PARTICIPATION PROCESS

7. PUBLIC PARTICIPATION PROCESS

7.1 Overview and Purpose

The Environmental Impact Assessment (EIA) Regulations of 2014 promulgated in accordance with the National Environmental Management Act (NEMA) 107 of 1998 (Act No. 107 of 1998) as amended; requires that during a Basic Assessment (BA) process a Public Participation Process (PPP) must be conducted; the Organs of State together with Interested and Affected Parties (I&APs) and the general public (communities) be informed of the application and be afforded an opportunity to participate and comment on the application. Public participation is currently being carried out in accordance with Section 24 (J), (O) of the NEMA as amended in the EIA regulations, 2014.

The primary objectives of the PPP are to:

- Inform and notify potentially I&APs of the proposed application (explain steps that were taken to achieve this),
- Initiate or promote meaningful and timeous participation of I&APs by providing proof that notice boards, advertisements and notices notifying potentially I&APs of the proposed application have been displayed, placed, or given,
- Maintain a list of all persons, organisation and organs of state that register as interested and affected parties in relation to the application,
- Identify issues and concerns of key stakeholders and I&APs with regards to the application for the proposed project,
- Provide a summary of the issues raised by I&APs, the date of receipt of and the response of the EAP to those issues; and
- Provide responses to I&AP queries.

Steps undertaken during this phase are summarised below and, in this draft, BAR. All public participation material can be referred to in **Appendix E**.

7.2 Authority Consultation

The Competent Authority which is the Department of Forestry Fisheries and Environment (DFFE) - Environmental Impact Assessment (National Office), is required to provide a decision for the proposed Road D1867 upgrade project. Consultation with the DFFE for guidance for this project was conducted through a pre-application meeting which was held via Microsoft Teams on the 02nd of September 2020. A copy of the minutes of the meeting is attached in **Appendix E2**.

A pre-application meeting with DWS was held at their Regional Office in Durban on the 16th of October 2019 for guidance for the application of the Water Use Authorisation (WUA) process. A copy of the minutes of the meeting are attached in **Appendix E2**. The WUA application will be submitted for decision making and the proof of submission of application will be attached during the submission of the FBAR.

The proposed Road D1867 upgrade project falls within the UPhongolo Local Municipality under Zululand District Municipality, KwaZulu-Natal Province and within Mkhondo Local Municipality under Gert Sibande District Municipality, Mpumalanga Province. Notification and request for comments were sent to both Local and District Municipalities and other Stakeholders. A copy of this draft BAR has been circulated to give them an opportunity to provide comment. They have also been given an appropriate legislated period to comment on this DBAR.

The Phase 1 Heritage Impact Assessment (HIA) Study and Desktop Paleontological Impact Assessment (PIA), Background Information Document (BID), Environmental Screening report and Draft BAR were uploaded into the South African Heritage Resources Information System (SAHRIS) website for the purpose of this application for comment in terms of section 38(8) of the National Heritage Legislation and NEMA.

7.3 Identification of I&APs

Upon receiving the description, a site visit was undertaken, this process was used to identify:

- Key areas of concern.
- Sites for the placing of the site notices.
- A visual understanding of the project.
- Areas most impacted by the proposed development.

The next step and measures in the identification of key I&APs and Stakeholders, including the following:

- Landowners (Tribal Authorities).
- Local and Provincial Government.
- Ward Councillor.
- Local businesses.
- Residents within a 150m distance of the project site and other parties.
- Affected and neighbouring landowners.
- Schools, Clinics and Hospitals.
- Organs of State.
- Municipalities.
- Environmental Non-Governmental Organisations; and
- Community Based Organisations.

The properties on which Road D1867 is located are listed under **Table 9** on page 10 and are owned by Ingonyama Trust Board Trustees and Vulindlela Communal Property Association. The landowners or lawful occupier of the land in question have all been notified. Msibi, Ndlangamandla and Sibiya Traditional Authority under Ingonyama Trust Board are the landowners. The landowners have no objection to the proposed Road D1867 upgrade. The consent or proof of consultation with the landowners and Tribal Authorities on which the proposed Road D1867 upgrade activity is to be undertaken is attached in **Appendix E3**.

7.4 Key Stakeholders

In accordance with the requirements of the NEMA EIA Regulations 2014 under Section (24)5 of NEMA (Regulation 42 of GNR 982), a Register of I&APs must be kept by the Public Participation Facilitator. In fulfilment of this requirement Afzelia Environmental Consultants has compiled a comprehensive I&AP database (I&AP Register) comprising of key stakeholders, I&AP's and Organ of States at the onset of the project. Such a register has and is constantly being updated with the details of involved I&APs throughout the duration of the PPP including their comments. The database is shown in **Appendix E1** as an attachment in the DBAR. **Table 21** below lists all the key stakeholders, I&AP's and Organ of States identified.

Table 21: List of all stakeholders identified.

NAME	ORGANISATION / ENTITIES
Ms Thulisile Nyalunga	DFFE
Ms Fiona Grimett	DFFE
Mr Sbusiso Ndwandwe	EDTEA - Zululand District
Ms Sindisiwe Mbuyane	Department of Agriculture, Rural Development and Land (DARDL) - Mpumalanga Province
Mr B.P. Mnguni	Zululand District Municipality
Mr.Mthandeni Mkhonza	Gert Sibande District Municipality
Ms Nonhlanhla Sibiya	uPhongolo Local Municipality
Mr Absalom Mahlangu	Mkhondo Local Municipality
Mr Y. Gaunter	Zululand Tourism
Casamia	uPhongolo Tourism: Pongola Arts & Crafts Centre
Ms Zamashenge Hadebe	Department of Water and Sanitation
Dominic Wieners	Ezemvelo KZN Wildlife

NAME	ORGANISATION / ENTITIES
Johan Eksteen	Mpumalanga Tourism & Parks Agency (MTPA)
Ms N. Sontangane	DFFE: Forestry Regulations
P. Mans	Department of Agriculture and Rural Development
Ms Bernadet Pawandiwa	AMAFSA AKwaZulu-Natali
Mr Benjamin Moduka	Mpumalanga Provincial Heritage Resource Authority (MPHRA)
Andrew Salomon	South African Heritage Resources Agency (SAHRA)
Michelle Smidt	KZN Department of Transport
Michelle Nicol	Eskom
Ms Lynn Boucher	Department of Rural Development and Land Reform (DRDLR)
Suewellan Ellis	Ingonyama Trust Board
Inkosi Ndlangamandla	Ndlangamandla Traditional Authority
Inkosi T.K. Sibiyi	Sibiyi Traditional Authority
Inkosi Msibi	Msibi Traditional Authority
Ntshangase	Ward 3 - Councillor
S.T. Mavimbela	Ward 5 - Councillor

7.5 Circulation of Background Information Document (BID) and flyers to I&APs

The BID for the proposed upgrading of Road D1867; was circulated to stakeholders, Local residents and I&APs for comment as part of the initial PPP on the 19th and 20th of September 2019. These notifications informed the public of the project as well as affording them an opportunity to register as I&APs and to comment or raise any issue that they might have. Please refer to **Appendix E4** to view a copy of the BID attached on this report. The I&APs were given a 30-day calendar period to respond. Proof of the circulation of BID to I&APs is attached as **Appendix E5**. And comment received during the circulation of BID is attached in **Appendix E6**.

A copy of the English and isiZulu written notice and flyers were distributed along the proposed road route to I&APs, property owners of land adjacent to the proposed site and local residents for notification and participation purposes, (Refer to **Appendix E7**). Pictures showing the distribution of flyers along the proposed Road D1867 sites are attached in **Appendix E9**. And proof of consultation with the local residents is shown in the attendance register attached in **Appendix E10**.

Local traditional councils were met with on the 21st of August 2019, notifying them of the proposed project, which includes the use of the Borrow Pits and the upgrading of 10.5km of D1867 road. There were no objections during these meetings and the traditional councils all signed the Traditional Council Consent Forms (ITB 2). The attendance register of the meeting is attached in **Appendix E3**.

7.6 Erection of Site Notice

I&AP's were notified of the project through fixing a notice board at a place conspicuous to and accessible by the public from the start to end of Road D1867 site on the 21st August 2019. Several site notices were placed, at the entrance to the borrow pit sites and on the opposite side of the road across from the borrow pit entrances to notify potential I&APs travelling in both directions along D1867 road alignment.

The notices put up and information given out included the following information:

- Details of the proposed application / project,
- What procedure is being undertaken, i.e., BA, borrow pit application, EA, and WUA,
- The nature and location of the proposed activity,
- Where further information on the application can be obtained; and
- Contact details for the person who represents the Applicant.

Site Notices were placed in several locations from the start to the end of the road alignment. Pictures showing the erection of site notices along the proposed road route are attached in **Appendix E8**.

7.7 Placement of advertisement on newspapers

Advert was placed in the Zululand Observer on the 3rd of September 2021 in both English and isiZulu during the circulation of the DBAR. Proof of the advert is attached as **Appendix E11**. The advertisement is aimed to further inform I&APs of the proposed activity and to invite them to participate in the process.

7.8 Circulation of the DBAR

This draft BAR and supporting documentation have been made available for Authority and public review for a total of 30 legislated days from **Monday 16/05/2022 until Monday 20/06/2022** and upon request from the EAP. In order to distribute the information regarding the proposed project to the broader public and to ensure that all potential I&AP's were given the opportunity to comment.

Hard copies of the draft BAR report and supporting documentation has been placed at public venue, provided below:

- ✓ Belgrade Thusong Service Centre.

Comments received during the 30-day public participation period have been incorporated in the final report which will be submitted to the Competent Authority, DFFE, for their decision. Proof of the circulation of DBAR to I&APs is attached as **Appendix E5**.

7.9 Public Meeting

A public meeting was conducted at the Msibi, Ndlangamandla and Sibiya Traditional Council on. 21st of August 2019 and the attendance register is attached in **Appendix E3**. No further public meeting will be held as there has been minimal response to the documentation issued so far. However, should there be a call for such an additional meeting the necessary arrangements will be made.




7.10 Summary of issues raised by I&APs

The purpose of the comments and responses section of the report is to record comments received from Organs of State and I&APs during the initial PPP undertaken for the proposed Road D1867 upgrade project. All comments and issues raised during the initial PPP have been captured, presented, and responded to in this section. Copies of the original comments by I&APs are attached in **Appendix E12** of this report. Refer to **Table 22** below summarising comments and issues raised, and reaction to those responses by the EAP:

Table 22: Summary of issues raised by I&APs

Method of response

 = Letter/Fax  = E-mail  = Public Consultation

NO.	ISSUE	NAME	METHOD & DATE	COMMENT	RESPONSE
COMMENTS RECEIVED DURING THE CIRCULATION OF THE BACKGROUND INFORMATION DOCUMENT					
1	Registration as an I&AP and general comment	Mr M.R. Dlamini <i>Tribal Council</i>	 21/08/2019	<p>Reasons for interest:</p> <ul style="list-style-type: none"> • Most learners' academic activities are conducted there. • Learners are from Ntambane • The gold mine helps with career shadowing <p>Comments:</p> <ul style="list-style-type: none"> • Career shadowing is done with the mine • Education excursions are also done at Ntumbane • Sports and tournaments • Cultural activities • Workshops, meetings, and sports activities for parents of learners <p>Department activities (KZN DOE) e.g.: AIDS Awareness Days, Crime Awareness Day, and Use of the Road (Interschool Competitions).</p>	<p>The comments appear to address potential benefits of the road upgrade to the local schools and communities (i.e., "interschool competitions" and "cultural activities").</p> <p>No specific queries pertaining to the Road D1867 upgrade have been raised in the comment received and therefore cannot be addressed.</p> <p>It is unknown whether the "gold mine" referred to is one of the borrow pits. The utilisation of the road upgrade project for potential career shadowing opportunities will have to be investigated by the KZN DOT and the contractor.</p>
2	Registration as an I&AP and general comment	Ms Catherine Phakathi/Msibi <i>Tribal Council</i>	 21/08/2019	We are happy about the development. People came and said they will move us and build us a new home. They said the alignment of the road goes through our home and we agreed to that. We plough the field here; we also have livestock. So, we would love to get an area which will cater for all those activities. We also have graves in our yard that might also be.	Noted.
3	Registration as an I&AP and general comment	Mr Bhekinkosi Sibiya <i>Tribal Council</i>	 21/08/2019	We really love the idea of upgrading the road as it is going to create easy access. If you must move our home that is near the road, please build us a new house at a place that we will be happy	See comment above.

NO.	ISSUE	NAME	METHOD & DATE	COMMENT	RESPONSE
COMMENTS RECEIVED DURING THE CIRCULATION OF THE BACKGROUND INFORMATION DOCUMENT					
				with. Please do not come with your own people, we also want jobs otherwise we will stop the construction.	
4	General comments on the application and concern on biodiversity including ecologically sensitive areas	<p style="text-align: center;">Ms Nomonde Ndebele <i>Ezemvelo KZN Wildlife</i></p>	<p>01/10 2021</p>	<p>The Draft Basic Assessment Report and Environmental Management Programme for the abovementioned application have been reviewed by Ezemvelo KZN Wildlife's (Ezemvelo) IEM Planning Committee. Based on the information supplied, and the interrogation of Ezemvelo's biodiversity databases, Ezemvelo does not anticipate that the proposed activity would result in significant negative impacts upon local biodiversity, provided that:</p> <p>1. No access is allowed to ecologically sensitive areas, including inter alia:</p> <p>a. The 1:100-year flood line including a further ecological buffer zone of 20m;</p> <p>b. Wetlands, springs and pans, and their 30m ecological buffer (where the outer edge of the hydromorphic zone has been delineated by a suitably qualified specialist); and</p> <p>c. Wetlands, streams, rivers, springs, dams, or pans and their 32m ecological buffer – as an absolute minimum (where the outer edge of the hydromorphic zone and floodline is unknown).</p> <p>2. The mitigation measures outlined in the Draft Basic Assessment Report and Environmental Management Programme must be strictly adhered to.</p>	<p>Noted.</p> <p>An Ecological, Wetland, and Aquatic Habitat Impact Assessment has been conducted for the project to identify any ecologically sensitive areas related concerns and provide mitigation hierarchy to prevent any impact on the ecological integrity of the developable area. The reports are attached as Appendix D1, D2 and D3 respectively.</p> <p>The buffer requirements and other mitigation measures requirements with regards to ecological sensitive areas, as per the wetland habitat assessment attached as Appendix D2 have been included in the EMP attached as Appendix F and will be stringently adhered to.</p> <p>See comment above.</p> <p>Noted. Provision has been made for the appointment of an experienced and independent Environmental Control Officer (ECO) by KZN DOT prior to commencement of any construction</p>

NO.	ISSUE	NAME	METHOD & DATE	COMMENT	RESPONSE
COMMENTS RECEIVED DURING THE CIRCULATION OF THE BACKGROUND INFORMATION DOCUMENT					
				Should you wish to discuss any of the points raised in this correspondence or should you have any biodiversity related queries, please do not hesitate to contact us.	activities to ensure that the environmental conditions are implemented and that compliance with the provisions of the EMPr attached in Appendix F are implemented by the Engineer and appointed Contractor.
5	Impact on natural forests and protected trees.	<p style="text-align: center;">Mr T. Sibozana</p> <p style="text-align: center;"><i>DFFE Forestry Regulations & Support</i></p>	<p style="text-align: center;">☐</p> <p style="text-align: center;">14/10/2021</p>	<p>DFFE appreciates the opportunity given to review and comment for the above-mentioned project. DEFF through the sub-directorate Forestry Regulations and Support is the authority mandated to implement the National Forests Act No. 84 of 1998 (NFA) by regulating the use of natural forests and protected trees species in terms of the said Act.</p> <p>With reference to the above-mentioned project received on the 02 August 2021, the site does not comprise of tree species that constitute a natural forest in terms of NFA, however the vegetation of the study area forms three vegetation communities, grassland, bushveld, and riparian vegetation. It is also noted that there is one protected tree (<i>Pterocarpus angolensis</i>) identified that might be affected by the proposed project.</p> <p>It is brought to your attention that DFFE's concern pertain to the potential of the project impacting on the bushveld and the riparian vegetation as well as protected tree species in terms of NFA. It is recommended that, should group of trees with interlocking crowns and protected trees be directly impacted by the proposed development, a licence application be submitted to our offices in Pietermaritzburg prior the commencement of the activities for review.</p> <p>This letter does not exempt you from considering other environmental legislations. Should any further information be required, please do not hesitate to contact this office.</p>	<p>Noted.</p> <p>Noted.</p> <p>This has been included as a condition of the Environmental Authorisation that a walk through of the full site must be conducted by an Ecological specialist and ECO prior to the construction activities commencing to determine the presence and identity of any protected plants or trees and the relevant permits applied for.</p>

SECTION D: INFORMATION ON ASSESSMENT FACTORS

8. DESCRIPTION OF BASELINE ENVIRONMENT

8.1 Climate and Rainfall

The Mean annual precipitation is 763.9 mm while annual potential evapotranspiration is approximately 1900.1 mm with a simulated mean annual run-off of approximately 122.9 mm. The rain falls primarily in early to mid-summer with highly infrequent winter rainfall. The maximum temperatures vary between 24-32°C in summer to 18-26°C in winter, whilst minimum temperatures are between 14-19°C in summer and 2-9°C in winter (Mucina & Rutherford, 2011).

8.2 Topography, Geology and Soil

The full extent of the study area is underlain by shale. Available GIS information pertaining to the geological structures along the road alignment indicate no known faults or fractures. The soil erodibility score (k-factor) within the study area is between 0.36-0.54 indicating moderate to highly erodible soils (Mucina & Rutherford, 2011).

According to the Geotechnical Report compiled by Ibhongo Consulting, much of the existing gravel road is underlain by a 150mm to 300mm gravel surface comprising light yellowish brown, medium dense to dense sandy gravel with crushed dolerite or shale (Ibhongo - Geotechnical Report , 2019).

8.3 Terrestrial Vegetation

Vegetation of the study site is described by Mucina and Rutherford (2006) (Refer to **Figure 5** vegetation map below on page 53 and attached as **Appendix A3**) as Ithala Quartzite Sourveld (Gs 2), and KaNgwane Montane Grassland (Gm 16) the description of which by Mucina and Rutherford (2006) is as follows (Mucina & Rutherford, 2011).

8.3.1 Ithala Quartzite Sourveld (Gs 2)

This vegetation type occurs in KwaZulu-Natal, Mpumalanga, and Swaziland on large quartzite patches. It occurs on low mountain ranges and undulating hills with rocky lowlands and comprises a mosaic of woody shrubs and small trees in rocky areas, interspersed with species rich grassland patches. This vegetation type is in the transition zone between Grassland and Savanna where the grassland gives way to woodland as the elevation decreases. Endemic taxa include *Euclea natalensis* subsp. *Magutensis*, *Aloe dewetii*, *Danthoniopsis scopulorum* and *Gladiolus scabridus*. This vegetation type is considered as **Least Threatened**, with a conservation target of 26% and 10% conserved in the Ithala Game Reserve. Not much is transformed as the rockiness makes it difficult to transform for cultivation and other land uses. This vegetation type is both rocky and has nutrient poor soils and thus supports a unique assemblage of plant species (Mucina & Rutherford, 2011).

8.3.2 KaNgwane Montane Grassland (Gm 16)

This vegetation type occurs in Mpumalanga and Swaziland, and into northern KwaZulu-Natal on the gentle slopes of the escarpment. It occurs primarily on undulating plains and hills on the eastern edge of the escarpment and is considered transitional between the Highveld and Escarpment and contains elements of both regions. It comprises a short, closed grassland with numerous forbs and scattered shrubs associated with rocky outcrops. Three endemic herbs occur in this vegetation type: *Lotononis difformis*, *Lotononis spicata* and *Streptocarpus occultis* and one endemic shrub: *Syncolostemon comptonii*. This vegetation type is considered as **Vulnerable**, with a conservation target of 27% and less than 1% statutorily conserved with much of it transformed for afforestation (Mucina & Rutherford, 2011).

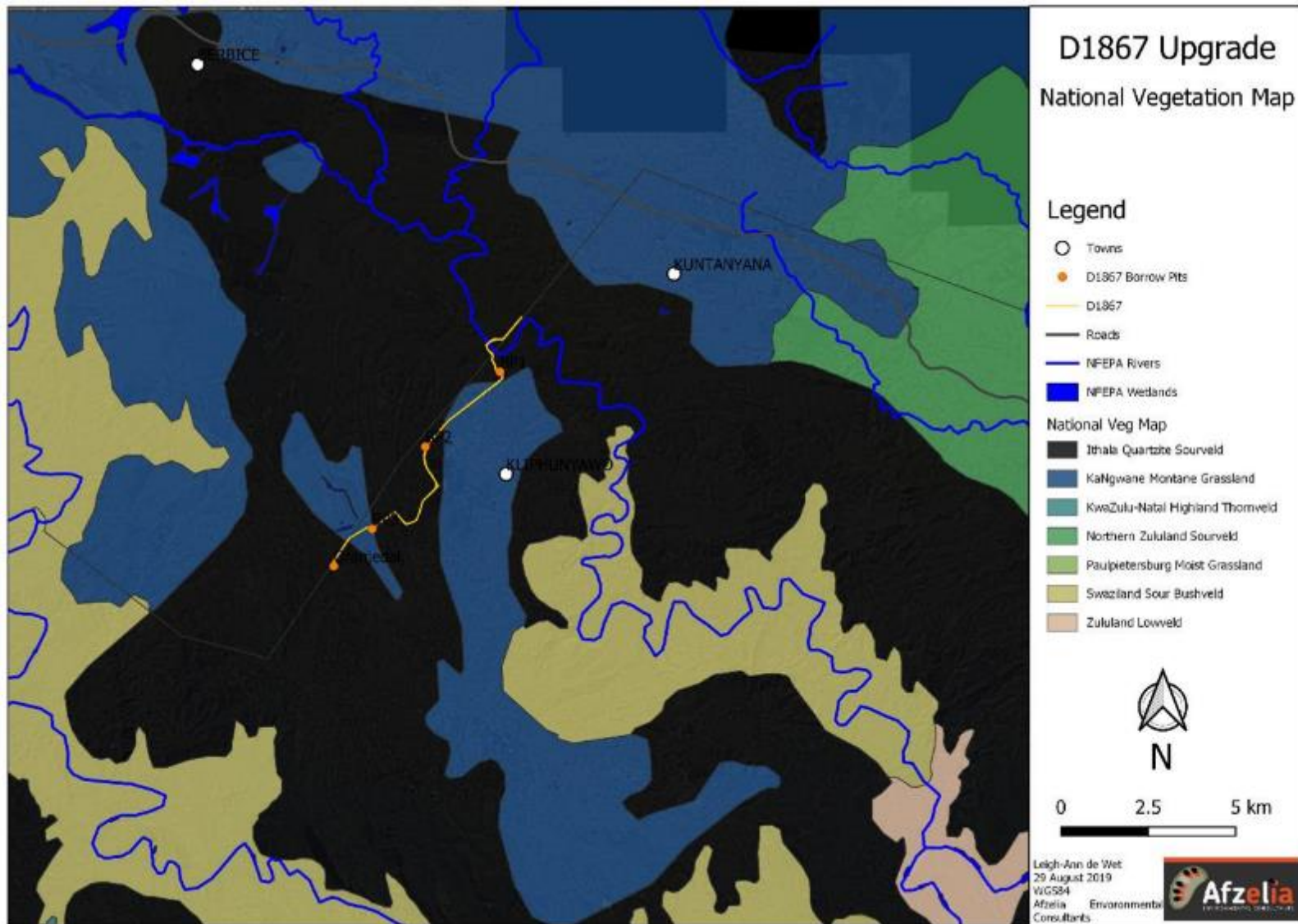


Figure 5: Vegetation map of the Project site

8.4 Water Resources and Catchment Characteristics

8.4.1 Catchment characteristic

The road upgrade falls within quaternary catchment W42L which forms part of the greater Pongola - Mtamvuna Water Management Area (WMA). The road alignment is located within the Sub-Quaternary Reach (SQR) W42L – 02270.SQR. W42L – 02270 comprises an upland section of the Mozana River which terminates at the confluence of the Mozana and the Phongolo River, approximately 30km downstream of the site. The SQR is considered to be in a **largely natural** or **Class B** state, whilst the ecological integrity (EI) and ecological sensitivity (ES) are both rated as **high** (DWS, 2014). Primary impacts to the SQR include the prevalence of rural areas within the catchment, roads, sand mining as well as subsoil mining (DWS, 2014). The drainage network within the quaternary catchment is shown in **Figure 6** Quaternary Catchment and drainage map below and attached as **Appendix A4**.

8.4.2 National Freshwater Ecosystem Priority Areas

Although a field investigation has determined that the study area comprised wetland and stream units, these watercourses have not been identified as a Wetland Freshwater Ecosystem Priority Areas (FEPA)'s on the national coverage. According to the National Freshwater Ecosystem Priority Areas (NFEPA) GIS dataset the study area falls within a subcatchment (Sub-catchment No. 2270) identified as an “upstream management area” (See **Figure 7** FEPA map on page 55 and attached as **Appendix A5**). An upstream management area is an SQR in which human activities need to be efficiently managed to prevent degradation of downstream river FEPAs and Fish Support Areas (Nel *et al.* 2011), (Afzelia Environmental Consultants - Wetland, 2019).

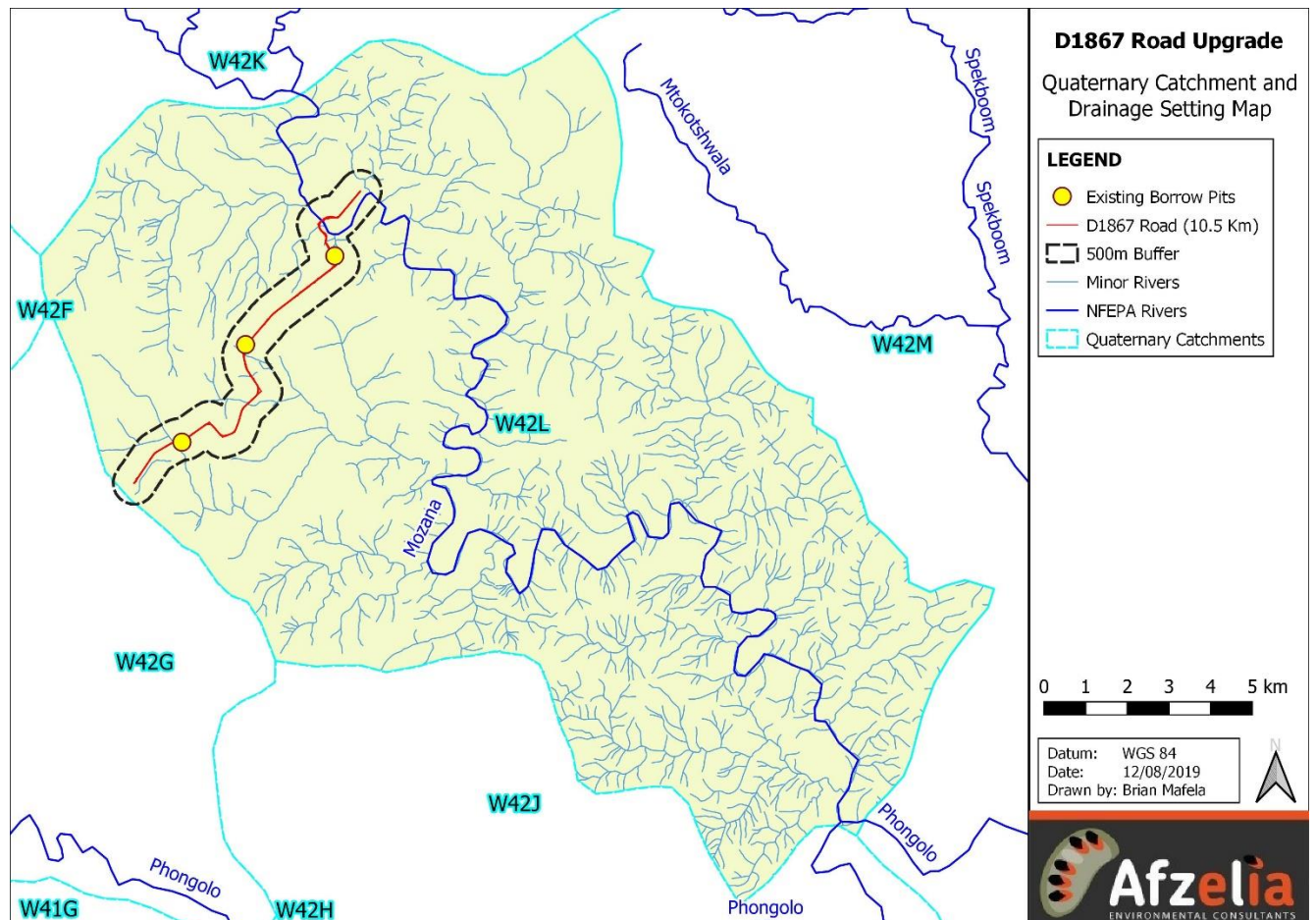


Figure 6: Quaternary Catchment and drainage setting map

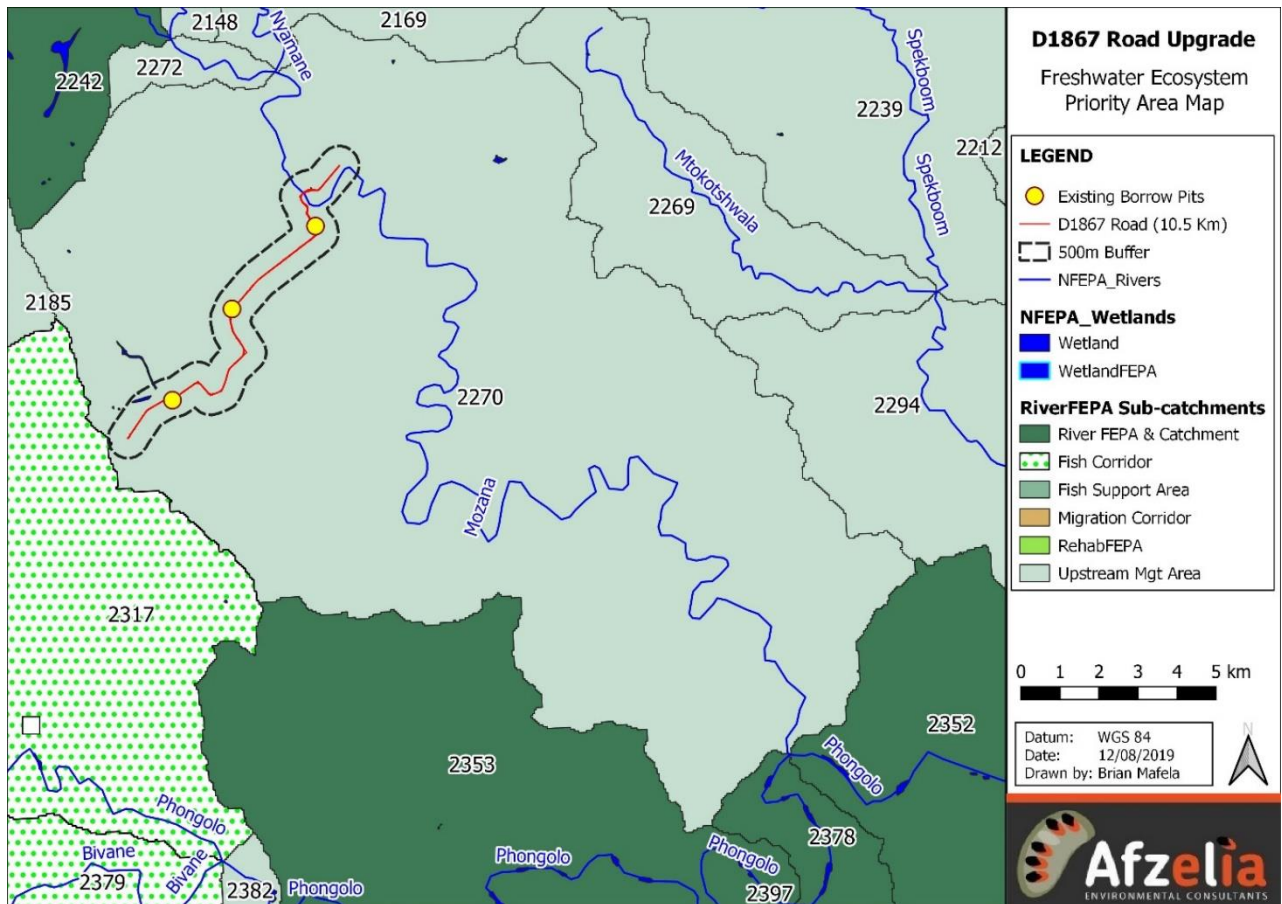


Figure 7: NFEPA Wetland map

8.5 Provincial Conservation Guidelines

8.5.1 KwaZulu-Natal Biodiversity Spatial Planning

The KwaZulu-Natal Biodiversity Spatial Planning (KZN BSP) defines the areas of land in the form of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) required to ensure the persistence and conservation of biodiversity within the province. The spatial plan then provides a tool to guide conservation and protected area expansion as well as informing economic sectors involved in alien plant control, conservation officer priorities and guiding the nature of development. The spatial guidelines provided by the plan outline two main categories of areas that are required to meet conservation targets for the province. These two main categories include CBAs and ESAs, including corridors (Afzelia Environmental Consultants - Wetland, 2019).

According to the KZN BSP, a small patch of land identified as CBA: Optimal occurs within 5kms of the study area (Refer to **Figure 8** KZN Biodiversity Spatial Planning map on page 56 and attached as **Appendix A6**). This means the study area is not critical for the support of conservation important biota, however, a small patch of land serves as an alternate habitat for conservation important biota should their preferred habitat be compromised. Therefore, transformation of the small patch of land identified as CBA: Optimal is not advisable (Afzelia Environmental Consultants - Wetland, 2019).

8.5.2 Threatened Ecosystems

According to the National List of Threatened Ecosystems in Need of Protection, the study includes the **Vulnerable Threatened Ecosystem**, KaNgwane Montane Grassland (Afzelia Environmental Consultants: Ecological Study, 2019). Whilst no azonal vegetation type was flagged by the provincial or national dataset, the specialist recorded the Subtropical Freshwater Wetlands: Short Grass / Sedge Wetland vegetation type within the study area. This azonal vegetation type is considered **Least Threatened** (Afzelia Environmental Consultants - Wetland, 2019). Refer to **Figure 9** Threatened Ecosystem map on page 57 and **Figure 10** Vegetation type map on page 58 both attached as **Appendix A7** and **Appendix A8** respectively.

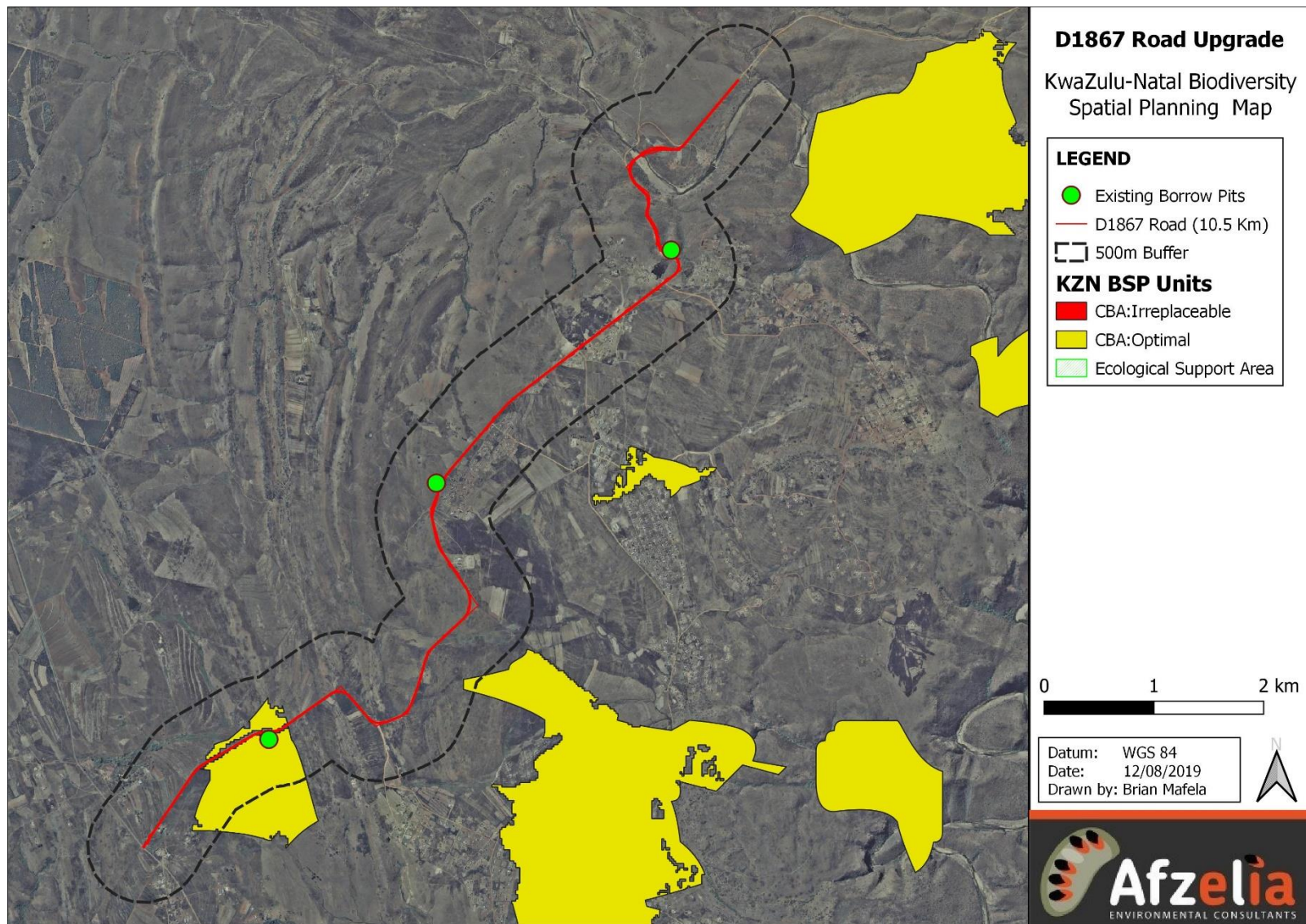


Figure 8: KZN Biodiversity Spatial Planning map

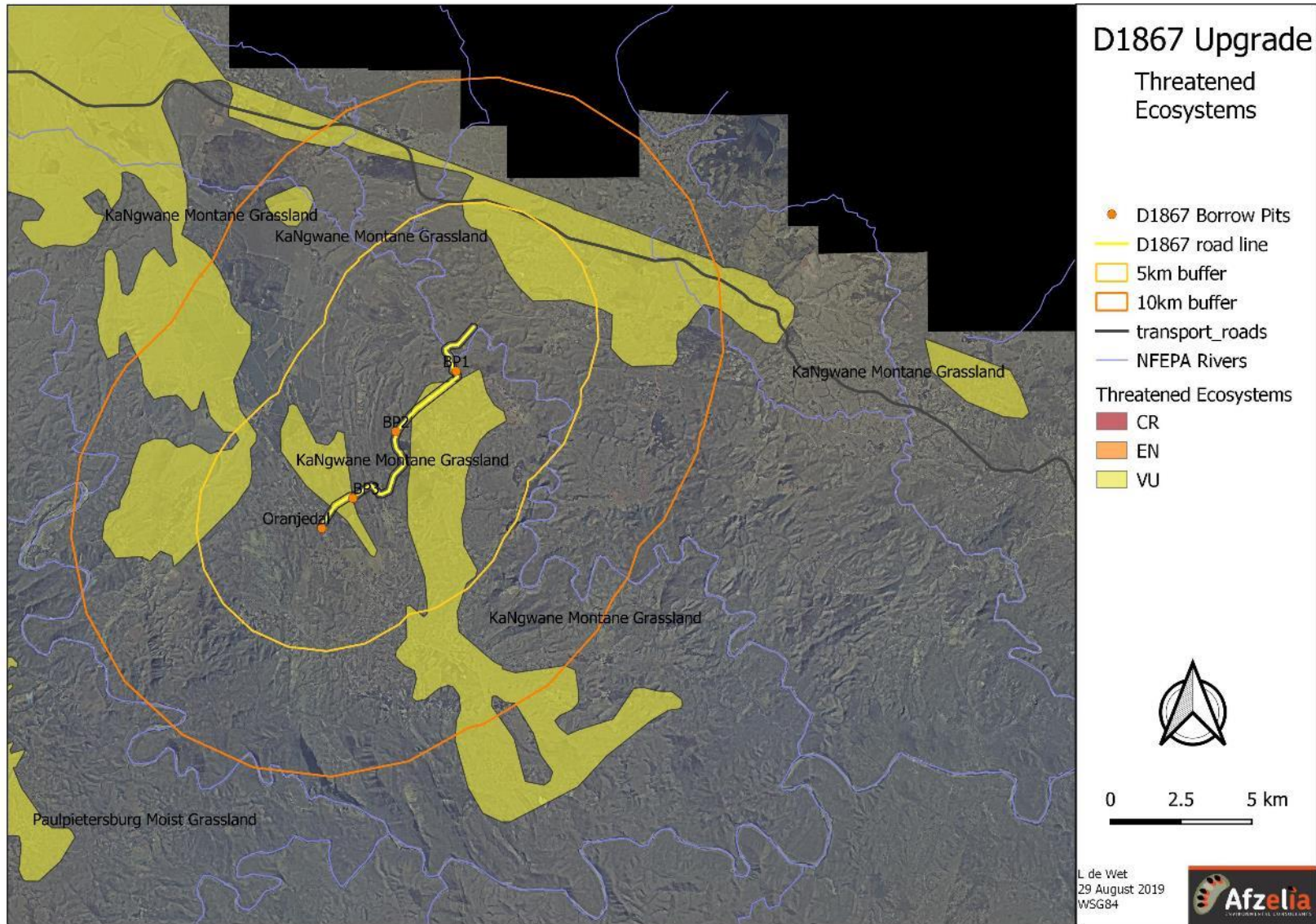


Figure 9: Threatened Ecosystems map

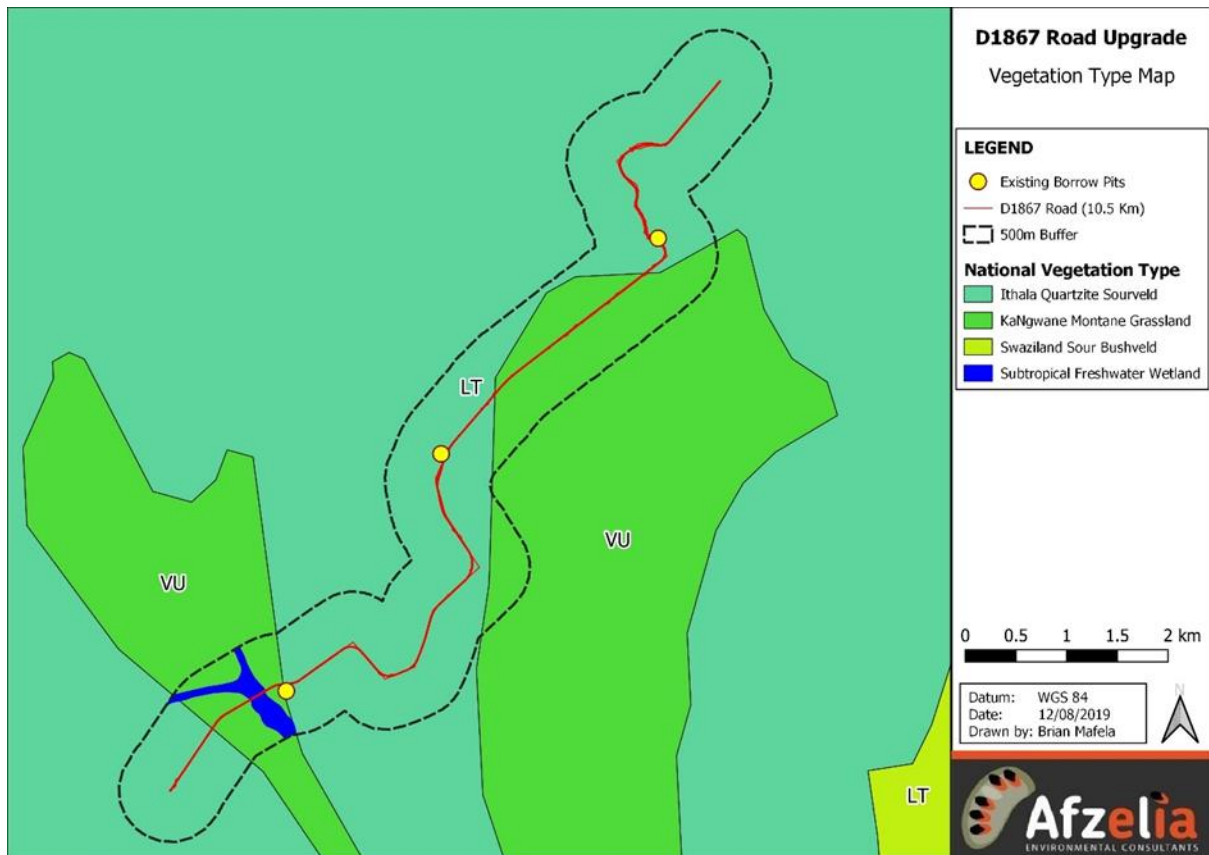


Figure 10: Vegetation type map

8.5.3 National Protected Areas Expansion Strategy

Protected areas are important to look at in relation to the study site. If there are protected areas within 10km of the study site, or National Protected Areas Expansion Strategy (NPAES) focus areas within 10km of the study site, this indicates that the study area may be important from a biodiversity perspective. Proximity to protected areas and expansion areas is thus important for looking at biodiversity value of a site. The site occurs within a focus area (Afzelia Environmental Consultants: Ecological Study, 2019). Refer to **Figure 10** Protected areas and NPAES on page 59 and attached as **Appendix A9**.

8.5.4 Important Bird Areas

Important Bird Areas (IBA) are areas internationally recognised for the bird species that occur there and are internationally important for bird conservation. The IBA closest to the site (Ithala Game Reserve) is further than 10kms from the site (Afzelia Environmental Consultants: Ecological Study, 2019) and can be seen in **Figure 11** Important Bird Areas on page 60 and attached as **Appendix A10**.

8.6 Socio-Economic Profile

The proposed Road D1867 upgrade site is located within the uPhongolo Local Municipality (PLM) which forms part of the greater Zululand District Municipality (ZDM) in KZN and within the Mkhondo Local Municipality which forms part of the Gert Sibande District Municipality in Mpumalanga. The PLM is situated on the northern border of KwaZulu-Natal, immediately south of Swaziland.

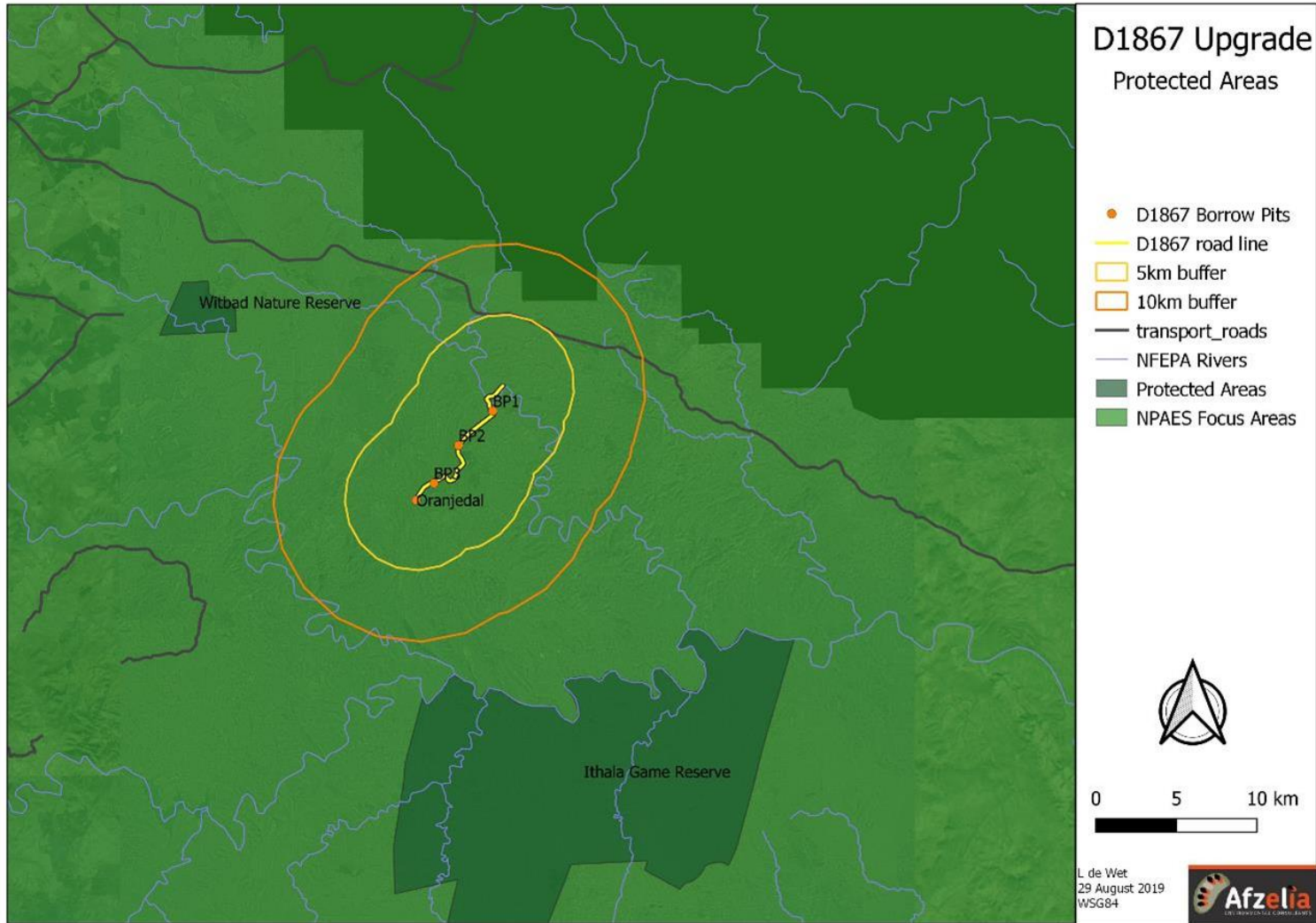


Figure 11: Protected Areas and NPAES Focus Area map

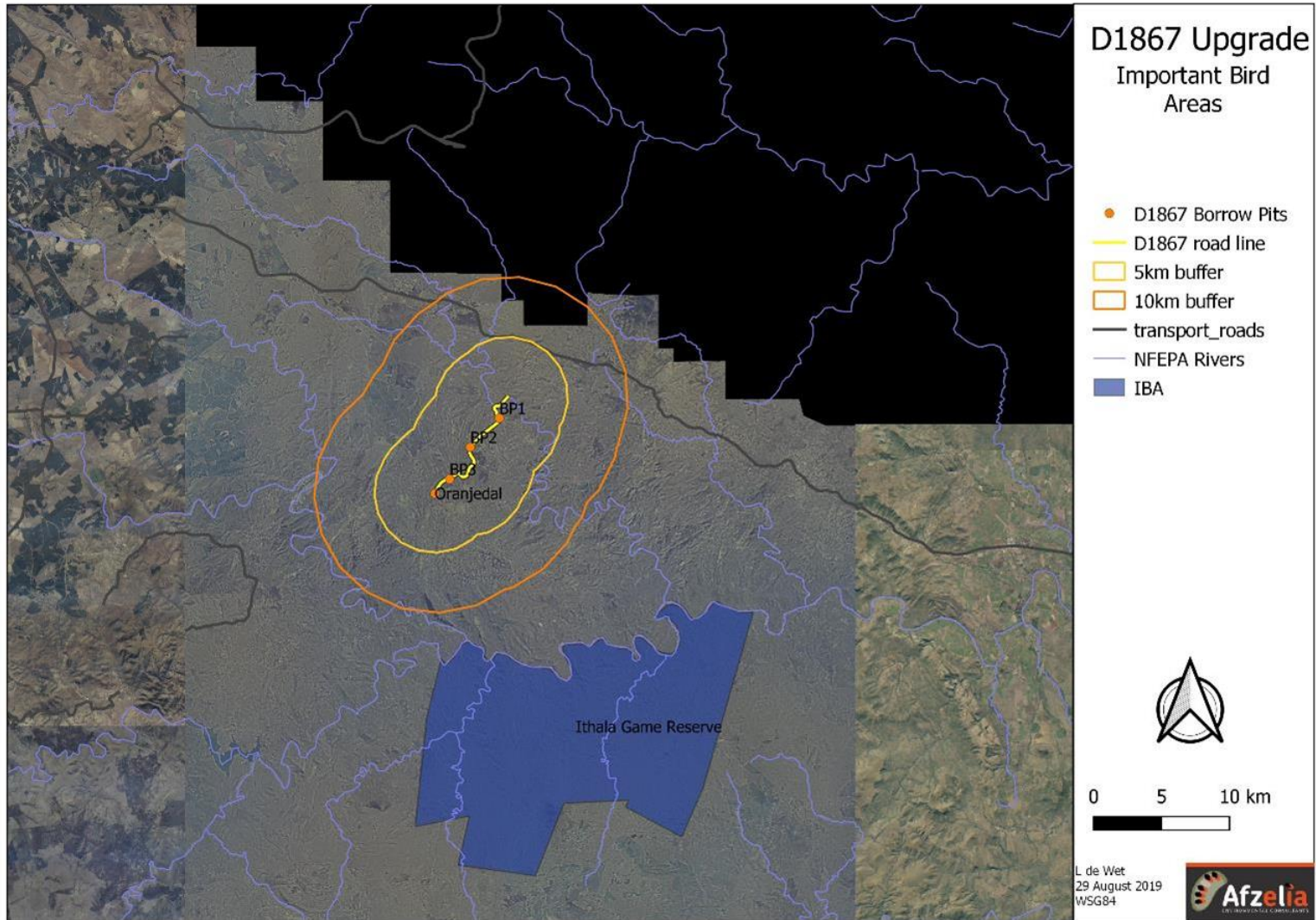


Figure 12: Important Bird Areas map

8.6.1 Population

The 2011 census of the area determined that the total population of the PLM is 127 238. 98.1% of the population are black African, 1.5% are white whilst the other population groups constitute the remaining 0.4%. The vast majority of the population listed isiZulu as their mother tongue, followed by Afrikaans and isiNdebele. (Refer to **Figure 13**) The average household consists of 4.3 members with 83.5% of dwellings listed as formal, however, only 17.4% have piped water into their dwellings. Females head-up 48.6% of households within the PLM. 12.9% of the population was listed as married. (Refer to **Figure 14**)

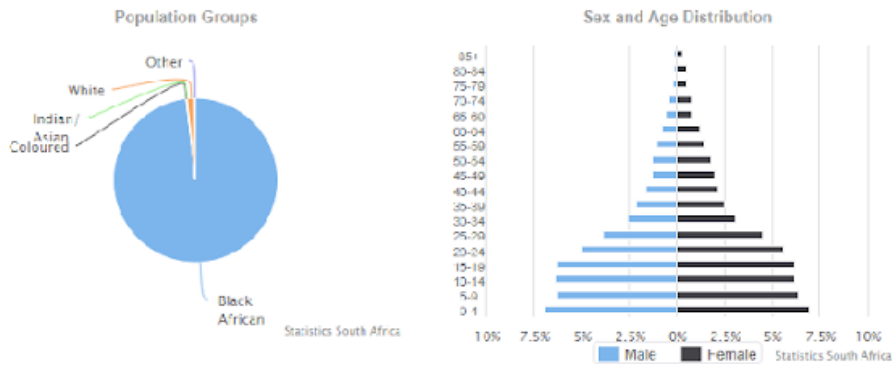


Figure 13: Population data for PLM - population groups and sex and age.

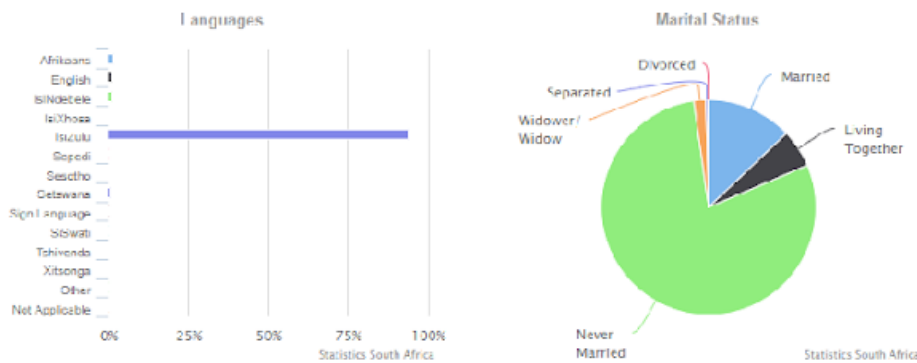


Figure 14: Population data for the PLM - languages and marital status.

8.6.2 Employment

According to Stats SA (2011), 56.4% of the population is within the working Age group (15-64 Years) whilst the overall unemployment rate is 35.5%. The primary average annual income within the PLM is between R 9,601.00 and 19,600.00. Refer to **Figure 15** below:

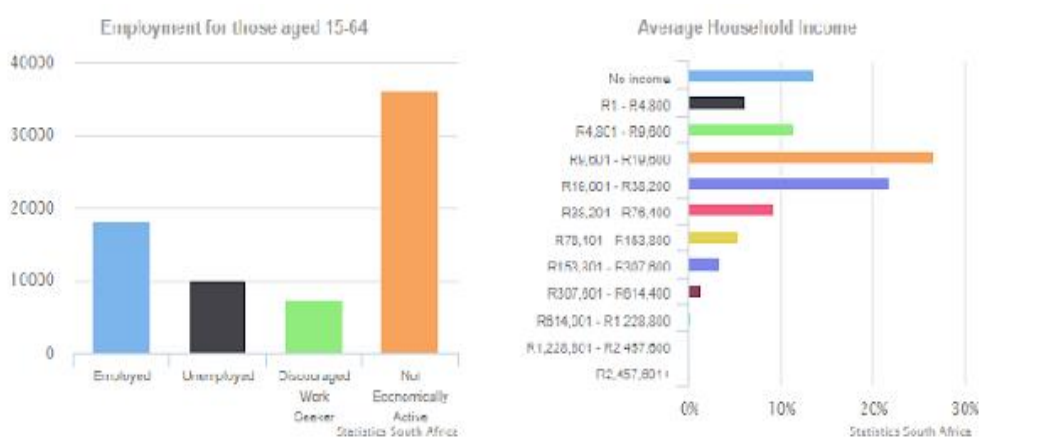


Figure 15: Employment data for the PLM showing the status of employment between 15-64, and average annual household income.

8.6.3 Education

19.9% of the population aged over 20 years have never received any form of schooling, 11.8% have a matric qualification whilst only 4.7% have had some form of higher education. **Figure 16**, below, gives a visual representation of the highest education level achieved by the overall population within the PLM.

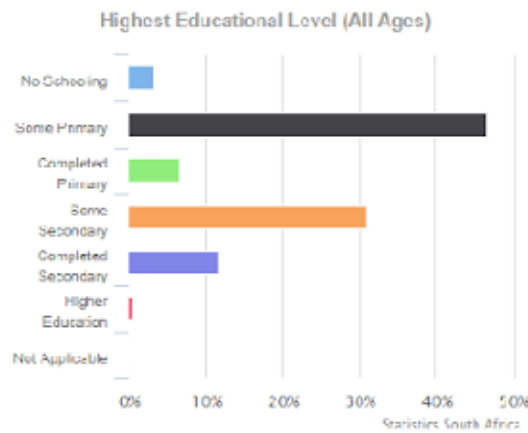


Figure 16: Highest education level achieved by population of PLM.

Please note that the above information provided within this section was obtained from Stats SA (2011) using information collected during the national census.

8.7 Description of the Surrounding Land Uses

General habitat and land use surrounding the proposed Road D1867 upgrade site include medium to low-density rural area with open grassland and bushveld vegetation and subsistence farming. Refer to **Figure 17** Environmental and Current Land Use map below with **Figure 18** Legend Land Cover on page 63.

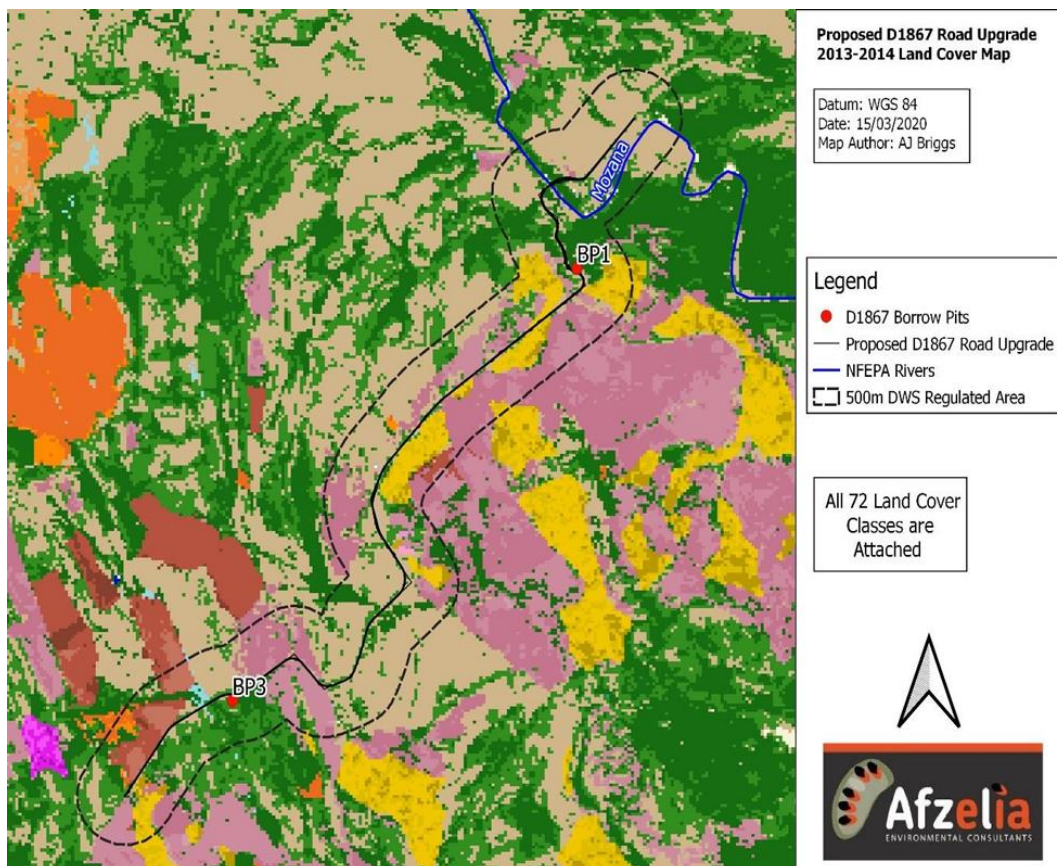


Figure 17: Environmental and Current Land cover map.



Figure 18: Legend Land Cover

9. FINDINGS OF THE SPECIALIST ASSESSMENT

In order to quantify how and where a project may impact on the environment, specialist studies are required to inform the Basic Assessment process as per the EIA 2014 Regulation as well as the WUA Application process and borrow pits application to provide supporting specialist data. Specialists were consulted during the completion of this section.

According to the National Screening Report attached as **Appendix D12** for Environmental Authorisation as required by the 2014 EIA Regulations, the following list of specialist assessments have been identified for inclusion in the assessment report:

- Landscape / Visual Impact Assessment,
- Archaeological and Cultural Heritage Impact Assessment,
- Palaeontological Impact Assessment
- Terrestrial Biodiversity Impact Assessment,
- Aquatic Biodiversity Impact Assessment,
- Hydrological Assessment,
- Socio- Economic Assessment,
- Plant Species Assessment, and
- Animal Species Assessment.

The following specialist studies have been identified so far and have been conducted to inform the BAR and WUA Application process. The full reports are attached in **Appendix D**.

- Wetland Habitat Impact Assessment and Rehabilitation Plan,
- Aquatic Habitat Impact Assessment,
- Ecological Habitat Impact Assessment,
- Level 1 Heritage Impact Assessment,
- Desktop Paleontological Impact Assessment.
- Hydrological Assessment and Stormwater Management Plan, and
- Geotechnical Investigation.

Plant Species Assessment and Animal Species Assessment have been included in the Ecological Habitat Assessment. The Socio-Economic Profile is presented under Chapter 8 section 8.6. In view of the small scale of the project, a detailed Socio- Economic Assessment is not needed for this project.

The Road D1867 consists of upgrading an existing well used road alignment within the existing footprint and within an existing (disturbed) road reserve. The existing Road D1867 has a formal blacktop surfaced from Km 0+000 at the T-junction with National Road N2 to Km 6.00 which was upgraded during Phase 1 of the project. The current phase 2 construction and upgrade on Road D1867 consists of surfacing from gravel to blacktop starting from Km 6+000 to Km 16+900. Therefore, a Landscape / Visual Impact Assessment is not required for this project. The Ecological and Wetland Habitat Assessment attached as **Appendix D1** and **D2** respectively has provided recommendations for rehabilitation and Landscaping. In addition, the EMPr attached as **Appendix F** has provided mitigation measures to reduce any impact with regards to the visual aspect of the proposed Road D1867 project during construction activities.

9.1 Ecological Habitat Assessment

9.1.1 Overview

Afzelia Environmental Consultants (Pty) Ltd undertook the Ecological assessment for this project in September 2019 and the full report has been included in **Appendix D1**. The main findings of this specialist report are based on a single field survey conducted at the end of the dry season and have been summarised below:

A site assessment was conducted on the 21st of August 2019, during winter (which does not constitute a summer survey as per the Ezemvelo KZN Wildlife recommendations). Overall, the site comprises areas of grassland and

bushveld with a riparian habitat component in the vicinity of the Mozana River. The proposed sites for the two borrow pits are existing and comprise disturbed vegetation and bare ground. The ecological specialist has indicated that a wet season survey, between November and April, must be undertaken prior to any decisions being made with regards to this proposed development (Afzelia Environmental Consultants - Ecological Impact Assessment , 2019).

Sensitivity of the overall study site could not be determined based on the dry season field survey, however, riparian and wetland habitat along the route has been assigned a “high” sensitivity due to the important functions that these ecosystems perform in the greater landscape. The specialist has rated the entire site as a high sensitivity for the purpose of the impact assessment although this is not necessarily the case and will be confirmed during a wet season survey (Afzelia Environmental Consultants - Ecological Impact Assessment , 2019).

9.1.2 Potential Impacts and Recommendations

The potential impacts to the terrestrial ecological environment range from high to low without proposed mitigation, however, these impacts can be reduced to medium or negligible provided the mitigation measures are adhered to. A summary of the ecological impacts is shown in **Table 23**, below.

Table 23: Summary of ecological impact associated with the project.

Impact	Without Mitigation	With mitigation
Issue 1: Loss of vegetation communities		
1: Loss of Grassland	High -	Medium -
2: Loss of Bushveld	High -	Medium -
3: Loss of Riparian Vegetation	High -	Medium -
Issue 2: Loss of Species of Conservation Concern (SCC) and biodiversity		
4: Loss of flora SCC	High -	Negligible -
5: Loss of fauna SCC	Low -	Negligible -
Issue 3: Loss of ecosystem function and process		
6: Fragmentation and edge effects	Low -	Negligible
7: Invasion of alien species	High -	Low -

Recommended mitigation measures extracted from Ecological assessment include the following:

- Keep the footprint of the development (particularly during construction) as small as possible. Ensure that excavations are kept to the minimum size and that stockpiles of soil piled adjacent to the excavation takes up as little space for as short an amount of time as possible.
- Laydown areas should be located exclusively in areas of low sensitivity including in areas that have already been disturbed or contain primarily alien vegetation.
- Permits must be obtained for the damaging, cutting or removal of protected trees and other protected species (TOPs or KZN listed.),
- Prior to construction, a final walk through must be conducted in order to confirm no flora SCC are present; should these be found:
 - Removal and replanting/ relocation to a nursery of existing SCC,
 - Planting of additional individuals of specific SCC,
 - It is recommended that where possible, protected species should be selected and planted in any gardens planted as part of the development.
- Development and application of an alien invasive management plan to prevent spread and new invasions by alien invasive plant species,
- Rehabilitation should take place as soon as possible after construction is completed and should comprise the planting of region-specific water wise plants (or wetland species where applicable) (Afzelia Environmental Consultants - Ecological Impact Assessment , 2019).

9.2 Wetland Habitat Assessment

Afzelia Environmental Consultants (Pty) Ltd undertook a wetland habitat impact assessment for this project on 7th August 2019 and it has been included in **Appendix D2**. The main findings of this wetland report have been summarised below:

Through a process of desktop and infield delineation undertaken on the 7th of August 2019, several wetland systems were identified within and around the study area. Delineated wetland habitats were then sub-divided and classified into hydrogeomorphic (HGM) units as per Ollis et. al. (2013) and 3 of 6 wetland units were flagged as being at risk of being impacted by the proposed upgrade of the D1867 Road. Infield delineated wetland units at risk of being impacted include two unchanneled valley bottom wetlands (Unit UCVB1 and UCVB2) and a seep wetland (Unit S1). It is worth noting that the existing D1867 Road crosses Wetland Unit UCVB2 (Afzelia Environmental Consultants - Wetland, 2019).

The results of the Present Ecological State (PES) assessment indicated that Wetland Units UCVB1 and UCVB2 were **moderately modified (C PES Class)** and Wetland Unit S1 **largely natural (B PES Class)**. Key impacts were identified as poor veld management, overgrazing, and trampling of wetland vegetation and erosion of the wetland habitat. In terms of providing ecosystem services, all 3 wetlands were assessed as providing most regulating and supporting benefits at a moderate level and providing all provisioning and cultural benefits at a low level. In terms of their Ecological Importance and Sensitivity (EIS), Wetland Unit UCVB2 was assessed as being of **high EIS** whilst Units UCVB1 and S1 were assessed as being of **moderate EIS** (Afzelia Environmental Consultants - Wetland, 2019).

Wetland Unit UCVB 2 is located approximately 100m downslope of BP3 whilst BP1 is located approximately 60m upslope of an ephemeral stream that will be discussed in the summary of the aquatic ecological report. The use of BP1 and BP3 will have no direct impact on nearby wetlands; however, indirect impacts may arise if suitable mitigation measures are not implemented. A map depicting the position of all wetlands and streams in relation to proposed Road D1867 upgrade are shown in **Figure 18**, Wetland and river delineation and classification below on page 67 and attached in **Appendix A11**. Note that BP2 is no longer under consideration for use (Afzelia Environmental Consultants - Wetland, 2019).

Impacts likely to result from the construction and operation phase of the D1867 Road upgrade were grouped into the following broad categories for ease of assessment in terms of impact significance:

- (a) loss of aquatic habitat and biota,
- (b) degradation of aquatic habitat and
- (c) water & soil pollution (Afzelia Environmental Consultants - Wetland, 2019).

The significance assessment results indicate that without mitigation, both the construction and operational phases of the development will have “**medium** impact significance” on the wetland environment and its biota. If best practice mitigation measures are implemented, both during construction and operational phases of the development, this will have a reduced impact significance of “**low**” and “**negligible**,” respectively. Note that the summarised impact table, below (**Table 24**), is concerned with all impacts associated with the road upgrade including watercourse crossings; borrow pit use and the actual road surface upgrade (Afzelia Environmental Consultants - Wetland, 2019).

Table 24: Summary of ecological impact associated with the project

Impact	Construction Phase		Operational Phase	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Loss of freshwater habitat and biota	Medium	Low	N/A	N/A
Degradation of freshwater habitat	Medium	Low	Medium	Negligible
Soil and water pollution	Medium	Low	Low	Negligible

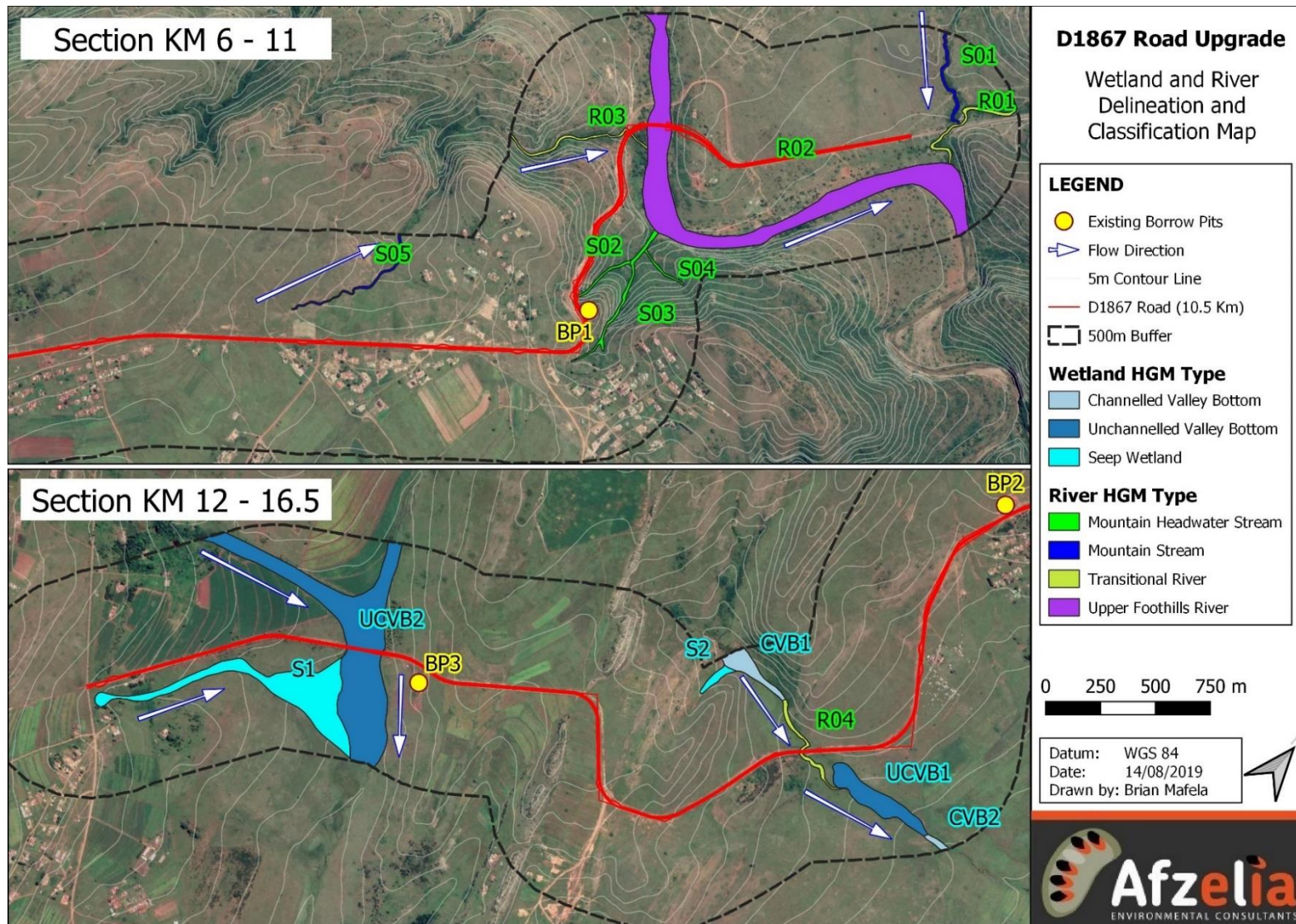


Figure 19: Wetland and river delineation and classification

The results from the DWS risk assessment model indicate that there is **moderate** 'risks' associated with the use of the borrow pits, however, these risks can be reduced to 'low' in the case of effective mitigation measures and project recommendations being adhered to. The 'low' risk of activities indicates that the project will require a General Authorisation (Afzelia Environmental Consultants - Wetland, 2019).

Key best practice mitigation measures that can reduce the risk level include:

- i. The culvert must span a minimum of 50m across the width of the wetland.
- ii. The culvert must be constructed out of pre-cast concrete box culverts. Their larger openings provide adequate hydraulic capacity whilst spreading high flows.
- iii. The culvert should not create any significant discontinuities in the water profile. Its size and placement should not cause ponding upstream.
- iv. Culverts should be designed with adequate capacity to carry maximum design flows without creating surcharge or backwater conditions.
- v. Designing the road stormwater infrastructure to discharge stormwater in the terrestrial environment and away from the wetland habitat.
- vi. All work to be done within the wetland habitat must be carried out at a time of low flow conditions (winter to early spring). It is prudent however to be prepared for increased flows by scheduling work according to the weather forecast and to have a contingency plan for unexpectedly large runoff from a sudden storm.
- vii. The use of heavy equipment in the wetland habitat should be avoided. The operation of heavy equipment should be confined to dry stable areas such the road.
- viii. Prior to commencement of construction, the construction footprint within Wetland Unit UCVB2 must be demarcated using wooden pegs and an orange safety net. The fence must be maintained throughout the construction phase.
- ix. Prior to commencement of construction, a silt fence / curtain must be installed downstream of the construction footprint but within Wetland Unit UCVB2 (Afzelia Environmental Consultants - Wetland, 2019).

9.3 Aquatic Ecological Assessment

An Aquatic Ecological Assessment was undertaken by Afzelia Environmental Consultants (Pty) Ltd in accordance with the requirements for a Basic Assessment process and Water Use Licence application in October 2019 – a summary thereof is listed below. The full report has been included in **Appendix D3**.

Five riverine and stream units were identified as likely receivers of impacts from the proposed road upgrade project, however, the units that will possibly receive impacts from the use of the borrow pits were units S02 and S03, which are located in the vicinity of BP1 (See **Figure 19**, Watercourse overview map below on page 70 and attached in **Appendix A12**). BP3 has the potential to impact on wetland habitat, not riverine or aquatic habitat (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019). A summary of the riverine or stream units that may receive impacts from the proposed Road D1867 upgrade is shown in **Table 25**, below on page

Table 25: Summary of river/stream units assessed during fieldwork.

Unit and Classification	Primary Vegetation Characteristics and Flow Regime	IHIA PES Class	EIS	EcoStatus
R02 – The Mozana River Upper Foothills River	Marginal vegetation comprised rushland whilst the riparian vegetation comprised a grassland community with sporadic trees. Flow within the unit is perennial.	B	High	B/C
R03 Transitional River	Riparian vegetation is medium-tall indigenous thicket upstream of the road and an alien thicket	B/C	Low	n/a

Unit and Classification	Primary Vegetation Characteristics and Flow Regime	IHIA PES Class	EIS	EcoStatus
	below the road. Flow within the unit is ephemeral.			
R04 Transitional River	Riparian vegetation medium-tall open woodland community whilst marginal vegetation comprised a sedgeland community. Flow within the unit was seasonal.	C	Moderately Low	n/a
S02 Mountain Headwater Stream	Vegetation comprised a medium-tall indigenous thicket. Flow within the unit is ephemeral.	A	Low	n/a
S03 Mountain Headwater Stream	Riparian vegetation comprised a mixed indigenous and alien thicket. Flow within the unit is ephemeral.	A/B	Low	n/a

These units were found to be in a **Natural to Largely Natural** state given the low severity of present impacts to the units. Unit S03 was found to have a slightly altered habitat due to the encroachment of alien vegetation from nearby terrestrial areas. The two ephemeral units were rated as being of **low** Ecological Importance and Sensitivity due to the perceived absence of rare, endangered, or unique biota, low species richness as well as low habitat diversity, sensitivity, and conservation importance. The full EcoStatus of these units could not be determined as fish, aquatic macroinvertebrates and water quality could not be ascertained due to the absence of flow within the units (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019).

Additional focused analysis of the perennial Mozana River (unit R02) was undertaken and included the analysis of aquatic macroinvertebrates, instream biotopes, fish and water quality. The analysis of instream biotopes within the river reach assessed indicated a fair to good biotope availability score (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019).

The biotope score is attributed to the overall good diversity of instream habitat except for Gravel, Sand and Mud (GSM), which scored poorly. The aquatic macroinvertebrate assessment yielded an overall moderate diversity of macroinvertebrates, the majority of which preferred average to good water quality conditions. The results of the Macroinvertebrate Response Assessment Index (MIRAI) indicated a **moderately to largely modified** macroinvertebrate invertebrate community (Class C/D). Suitable habitat availability was identified as the key driver of the macroinvertebrate community composition (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019).

The fish assessment yielded four species, namely, *Barbus unitaeniatus* (Longbeard Barb), *Labeo molybdinus* (Leaden Labeo), *Labeobarbus marequensis* (Largescale Yellowfish) and *Tilapia sarrmanii* (Banded Tilapia). The Fish Response Assessment Index (FRAI) indicated that the overall fish community structure is in a **largely modified** state (**Class D**). A number of species are known be present within the reaches assessed were not found during the site assessment, this is likely due to availability of more suitable habitat further upstream or downstream of the monitoring site (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019).

The water quality results indicate that the water onsite is of good quality with only free ammonia exhibiting slightly elevated concentrations, potentially due to fertiliser application associated with upstream farming practices. The overall EcoStatus of the riverine unit R02 was determined to be **Class B/C (Largely Natural to Moderately Modified)** (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019).

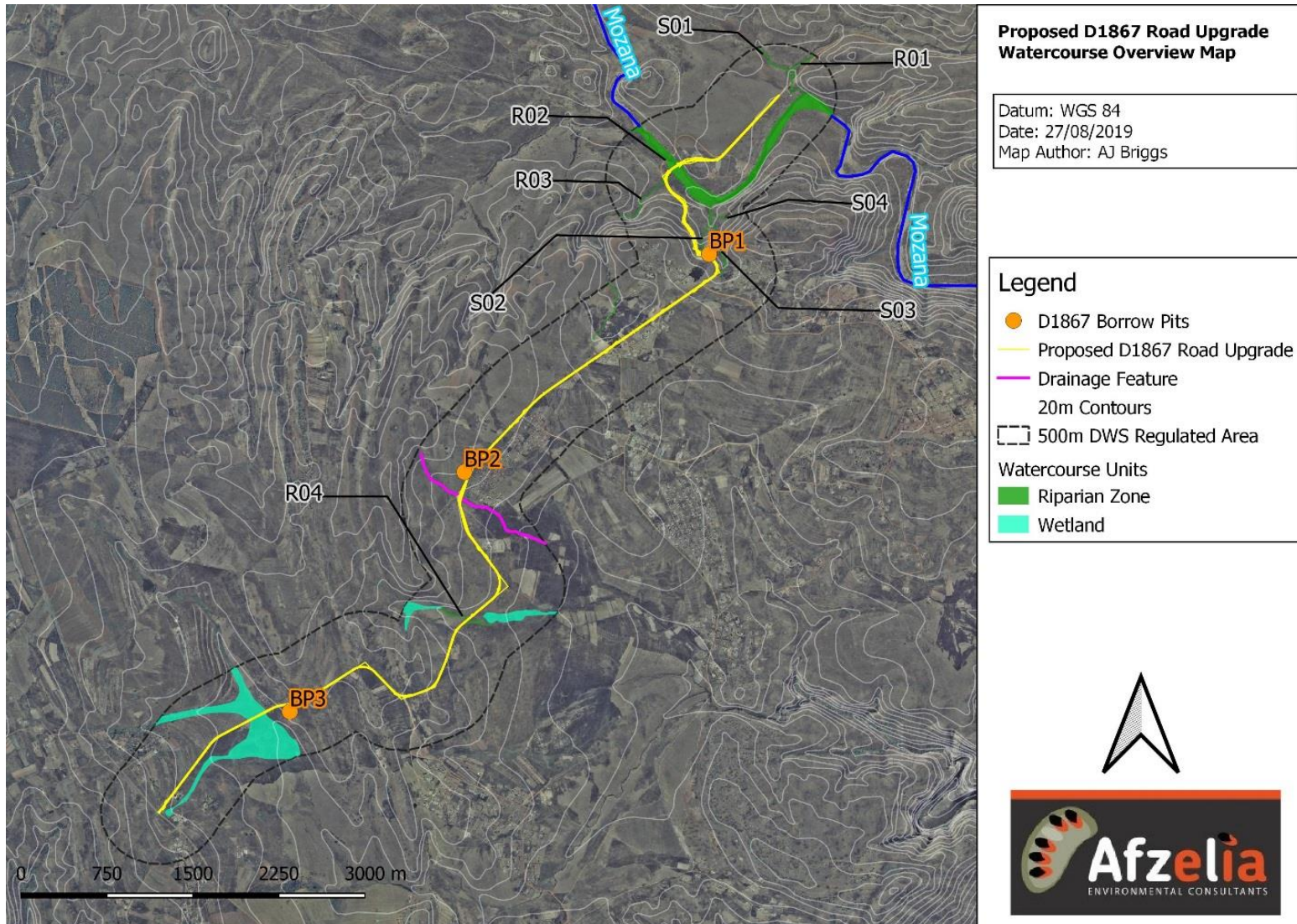


Figure 20: Watercourse overview map.

The potential impacts to the riverine and stream areas were assessed for the construction phase and operational phase of the proposed road upgrade, bridge construction and borrow pit use. Potential impacts to the riverine and stream units arising from the construction and operation phase of the road are linked to.

- Direct habitat disturbance,
- Soil erosion and sedimentation,
- Pollution of water resources and soil; and
- Recruitment of invasive alien plants (IAPs)

Most of the potential impacts to the riverine and stream unit's unit can be reduced to low or negligible provided the mitigation measures prescribed in this report are strictly adhered to. The summary of the impact assessment results is shown in **Table 26**, below.

Table 26: Summary of impacts associated with the proposed road upgrade.

Impact	Phase of Activity	Without Mitigation	With Mitigation
Direct habitat disturbance	Construction	High	Medium
	Operation	Low	Negligible
Soil erosion and sedimentation	Construction	Medium	Low
	Operation	High	Low
Pollution of water resources and soil	Construction	Medium	Negligible
	Operation	Low	Negligible
Recruitment of invasive alien plants (IAPs)	Construction	Medium	Negligible
	Operation	medium	Negligible

The results from the DWS risk assessment model indicate that there is **moderate** 'risks' associated with the construction and operational activities under a best practice mitigation scenario, primarily related to the destruction of riparian and instream habitat for the placement of new bridge and road related infrastructure (i.e., culverts and embankments). The proposed road upgrades will therefore require a Water Use License (WUL) as per Section 21 of the National Water Act No. 36 of 1998 (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019).

In the case that the application of best practice mitigation is implemented to ensure the potential impacts to the watercourses are reduced as far as possible; it is the opinion of the aquatic specialist that no fatal flaws are applicable to the proposed road upgrade in terms of potential impacts to the riverine and aquatic environment (Afzelia Environmental Consultants - Aquatic Ecological Assessment, 2019).

9.4 Phase 1 Heritage Impact Assessment

A Phase 1 Heritage Survey was undertaken by Ms Jean Beater of JLB Consulting on 19 July 2019 and the full report is attached in **Appendix D4**. The main findings of this report and recommendations have been summarised below.

9.4.1 Findings of the Heritage assessment

The length of the road upgrade is 10.5 km in length hence it triggers section 41 (1)(a) of the KwaZulu-Natal Amafa and Research Institute Act (Act No 5 of 2018) and section 38 (1)(a) of the National Heritage Resources Act (Act No 25 of 1999), which refer to the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length. Although the borrow pits maybe less than 5 ha (50 000 m²) in size, they still trigger sections 41 (1)(c) and section 38 (1)(c) of both the above Acts that refer to any development or other activity which will change the character of site- (i) exceeding 5000 m² (JLB Consulting, Heritage Survey, 2019).

There is existing infrastructure along the Road D1867 including power lines as well as a new water pipeline on the western side of the road. This pipeline runs the entire length of the proposed road upgrade.

A diversion of the current alignment of the D1867 is proposed where the road loops into the Mozana River valley before crossing the river. A homestead with several structures is situated west of and very close to the proposed diversion as well as a burial site consisting of at least 16 graves. The graves are situated east of the homestead and could be impacted by the proposed road diversion (JLB Consulting, Heritage Survey, 2019).

In addition, the proposed road diversion also crosses a rocky outcrop which is in pristine condition. It should be avoided by the proposed road upgrade as such areas are often archaeologically sensitive (JLB Consulting, Heritage Survey, 2019).

Homesteads and other structures were found to be situated some distance from the Road D1867 and at no risk of damage by the proposed upgrade. Several graves were noted that are situated within the homestead boundaries hence at no risk by the road upgrade (JLB Consulting, Heritage Survey, 2019).

A temporary wooden structure was found close to the road. The house is used by Shembe followers when they come to the area to worship. It is situated within 6m of the road and could be impacted by the upgrade of the D1867. The structure is significant because of its association with the Shembe religion and its potential importance or use to the local Shembe community. Another structure made of stone was found not far from the wooden structure which is also used by Shembe followers. The structure is significant again for its association with the Shembe religion. It is situated close to the road and could be impacted by the road upgrade (JLB Consulting, Heritage Survey, 2019).

The three proposed borrow pit sites were inspected and all were found to have been previously mined. No heritage resources were found therefore, any of the sites can be used (JLB Consulting, Heritage Survey, 2019).

The proposed deviation will have a **very high** impact on the graves, as assessed. It can be reduced to a **medium** impact if the graves are fenced and well protected from activities related to the road upgrade. Graves and burial sites are protected by section 39 (1) of the KwaZulu- Natal AMAFA and Research Institute Act, which refers to the general protection of informal and private burial grounds and section 36 (3)(a) (b) of the National Heritage Resources Act (NHRA), 1999 (Act No 25 of 1999) (JLB Consulting, Heritage Survey, 2019).

The relocation of the graves is not recommended as graves are highly significant to people and there are many traditional, cultural, and personal sensitivities and norms concerning the removal of graves. It is therefore recommended that the proposed deviation is not considered, and the upgrade take place along the existing road and bridge, an area which is already highly disturbed. If the road deviation proceeds, then the graves must be fenced with a 5 m buffer. If the risk is too high, then relocation of the graves could be considered as a last resort (JLB Consulting, Heritage Survey, 2019).

9.4.2 Conclusion and recommendations

It is recommended that, in discussion with the Shembe leaders in the community the temporary Shembe structure is moved away from the road and that the immovable structure is protected by a buffer to avoid damage to it during the upgrade of the road (JLB Consulting, Heritage Survey, 2019).

If the recommendations and mitigation measures provided in this report are implemented and adhered to as well as those of the desktop palaeontological study, then the upgrade of the D1867 may proceed from a heritage perspective (JLB Consulting, Heritage Survey, 2019).

Mitigation Measures

- Workers must be made aware of the types of heritage resources, such as graves that could be found during the construction of the proposed road upgrade.
- For any chance heritage finds (graves, etc.), all work must cease in the area affected and the Contractor must immediately inform the Project Manager. A registered heritage specialist must be called to site to

inspect the finding/s. The relevant heritage resource agency (the Institute) must be informed about the finding/s.

- The heritage specialist will assess the significance of the heritage resource/s found and provide guidance on the way forward.
- Permits must be obtained from the Institute if heritage resources are to be removed, destroyed or altered.
- Under no circumstances may any heritage material be destroyed or removed from the project site unless under direction of a heritage specialist.
- Should any recent remains be found on site that could potentially be human remains, the South African Police Service as well as the Institute must be contacted. No SAPS official may remove remains (recent or not) until the correct permit/s have been obtained.
- All mitigation measures and recommendations proposed by the desktop palaeontological study must be implemented (JLB Consulting, Heritage Survey, 2019).

9.5 Desktop Palaeontological Assessment

A desktop Palaeontological Impact Assessment was undertaken by Alan Smith Consulting in July 2019 and the full report is attached in **Appendix D5**. The main findings of this report and recommendations have been summarised below:

9.5.1 Findings of the Desktop Palaeontological survey

The proposed road upgrade starts in the Dwyka Group (C-Pd) and continues into basement (Rk and Rd). Dolerite (Red: Jd) dykes and sills may be encountered on the route (Alan Smith Consulting: Desktop Palaeontological Study, 2019).

Randian age rocks (2,500 – 3, 000 Ma) may contain unicellular microfossils. Although multi-cellular life only came into existence ~ 600 Ma, prior to this the world was dominated by single-celled life. These microfossils are the subject of academic study but are very common when they are found (Alan Smith Consulting: Desktop Palaeontological Study, 2019).

In theory vertebrate fossils could be found within the Mbizane Formation of the Dwyka Group but none have been recorded to date. Trace fossils may be encountered but these are common (Alan Smith Consulting: Desktop Palaeontological Study, 2019).

9.5.2 Conclusion

According to the geology, there is little likelihood of any vertebrate fossils being found within this area. The impact is **low** and there are no mitigations required (Alan Smith Consulting: Desktop Palaeontological Study, 2019).

9.6 Geotechnical Investigation

A Geotechnical Investigation to characterise the subsurface conditions in terms of excavation, groundwater and founding conditions and material usage; was carried out by Ibhongo Consultants cc during November 2019 and the full report is attached in **Appendix D6**. The main findings of this report and recommendations have been summarised below:

9.6.1 Layers works below existing gravel road

The existing road is a gravel road which is generally underlain by:

- 150mm to 300mm gravel surface; and
- Up to 250mm of fill (selected layer) which overlies
- *In-situ* soils/bedrock

In some areas the selected layer is absent and in some areas the surfacing is directly overlain by weathered bedrock. The gravel surface is generally a light yellowish brown, medium dense to dense slightly sandy gravel comprising crushed dolerite gravel (Pit1) or Shale. This layer is underlain by a selected fill layer which is variable and comprises reworked ferruginised transported or residual soils from the area (Ibhongo - Geotechnical Report , 2019).

9.6.2 Groundwater

Groundwater seepage was not encountered in any of the test pits however it can be expected in areas which fall within the river floodplain and drainage lines. Water seepage can also be anticipated at the contact between the colluvium / residuum and the underlying bedrock in the form of a perched water table (Ibhongo - Geotechnical Report , 2019).

9.6.3 Slope Stability

Talus is prevalent on the steep portion of the site at km7+600 to km8+400 and this therefore is an indication of slope instability. The necessary precautions to ensure that the slope be secured should be taken during design and construction (Ibhongo - Geotechnical Report , 2019).

No evidence of previous or ongoing slope instability was noted along the level portions of the existing road. Additionally, given the relatively moderate sloping nature of the area along with being a generally stable bedrock type, slope stability is considered to of moderate concern. Notwithstanding the above, localised instability could be induced should any prejudicious cutting and/or filling take place along the road during the upgrade construction (Ibhongo - Geotechnical Report , 2019).

Taking this into consideration, during construction, should thick clay lenses, localised significant seepage or moderate to steeply inclined strata dipping adversely out of the slope be encountered along portions of the road, slope stability should be further assessed by a Geotechnical Engineer (Ibhongo - Geotechnical Report , 2019).

9.6.4 Problem Soils

Active soils can be encountered in the areas underlain by deep clayey residuum and their overlying colluvial soils. More active soils can be expected to be encountered locally upon excavation (Ibhongo - Geotechnical Report , 2019).

Where loose gravelly sandy sediment is encountered along the road alignment, these materials should be considered as potentially moderately collapsible in the sense that when subjected to a critical increase in moisture content under load, the soils may undergo a sudden densification and settlement (Ibhongo - Geotechnical Report , 2019).

9.6.5 Excavatability

Excavatability of the colluvial and residual soils, as well of the ferricrete are expected to classify in general as “soft” excavation according to SABS 1200D throughout the area across all rock types (Ibhongo - Geotechnical Report , 2019).

Where highly to slightly weathered, soft to hard bedrock is encountered, excavation will likely increase to “intermediate” to “hard” according to SABS 1200D and require pneumatic equipment or even blasting to remove in places. However, the depth to highly or moderately weathered bedrock for the different rock types due to their respective proclivity to weather as well the relative position on the slopes may vary greatly and will determine the depth to which easy excavation can be achieved (Ibhongo - Geotechnical Report , 2019).

9.6.6 Geotechnical Recommendation

The following geotechnical recommendations were put forward regarding the use of materials by Ibhongo (2019a).

- It is evident that the *in-situ* materials on the route are highly variable (G6 to G9 plus spoil material) and in some instances, may serve as suitable in-situ subgrade horizon on which to build up the road prism. The material classifies as material to be used as Subbase (G6) through to Selected Fill (G6 and G7) and Sub-grade material (G8 to G9).
- In areas where deep cuts expose suitable subgrade material, these may be stockpiled for use in other areas of the site. In areas where the in-situ material does not meet the requirements of G10 gravel soils, imported material will be needed.
- Permanent cut slope batters in the gravelly sandy materials such as the residual soils should be sloped to a batter of 1:2 (26°) with a batter of 1:1.5 (34°) being implemented for competent highly weathered bedrock at

the discretion of the Engineer, provided it is not adversely dipping out of the slope or, significant seepage is encountered. Slope batters of 1:3 (18°) must be implemented in loose sandy material such as the alluvium.

- In addition, it is recommended that all excavations be frequently assessed by a Geotechnical Engineer or Engineering Geologist during the earthwork's operation. All excavations deeper than 1.20m should be stored at the Engineers discretion
- All excavations deeper than 1.2m must be stored at the discretion of the Engineer.
- It is recommended that in areas of cut, where intersected, unsuitable material will need to be boxed out and spoiled.
- All fills should be constructed using suitable granular material placed in layers of maximum 300mm thickness and compacted to 95% of the materials Mod. AASHTO density prior to placement of the next layer. The maximum particle size of the fill material should not exceed two thirds of the layer thickness. Prior to placement of any fill the natural ground should be stripped of any vegetation. Engineered fills should be laid back to a maximum batter of 1:1.75 (30°). Required fill volumes should consider the expected settlements in the underlying natural materials and the new fill as extra fill will be necessary to achieve design levels. As a rule of thumb consolidation settlement in the order of 1 to 2% of fill thickness is inferred for an engineered fill due to its own mass in the medium term, independent of any imposed load. Hence for fills up to 11.20m thickness, consolidation settlement up to 224mm within the fill can be reasonably expected.
- All cut, and fill slopes must be 'vegetated as soon as possible after construction Furthermore, road platforms should be graded to ensure they are free draining and side drainage is installed as per Engineers specifications.
- Given the presence of the shallow perched water table encountered at the main river crossing and all watercourse crossings, ground water seepage should be anticipated in this area during construction and given the observed amount may cause some difficulty during this process.
- When seepage is encountered, it should be dealt with symptomatically. Should seepage be problematic, it should be dealt with by either raising the level of the road or installing subsoil drains to prevent seepage affecting the layer works. A drainage pioneer layer prior to placing earthworks also aids in this regard.
- A Geotechnical Professional must inspect founding levels and temporary cut slopes.
- Construction must be undertaken during the winter months to minimise the effects of groundwater seepage. Lower gradient cut slopes, shoring and dewatering may be required if extensive seepage is encountered during winter (Ibhongo - Geotechnical Report , 2019).

9.7 Stormwater Management Plan

The Storm Water Management Plan Report (SWMP) was compiled by Ibhongo Consulting for the design and construction management of Upgrade of D1867. The full report is attached in **Appendix D7**. The main findings of this report and recommendations have been summarised below:

Stormwater control is viewed as a critical component of the road upgrade project. The existing lesser culverts and stormwater pipes will be replaced. The design of stormwater drainage is based on the SANRAL Drainage Manual. The following assumptions have been made.

- Rational Method is used for each catchment with its own unique characteristics
- Return period of 20 years is used
- The road lies in Catchment No. 26
- Minimum pipe diameter size: 600mm generally and 900mm at low points
- Minimum cover to main pipes: 600mm
- Minimum grades for pipes 2%
- Maximum grades for pipes 7%
- Minimum grades for "V" drains 1% (Ibhongo Consulting, Inception report, 2019).

The objective of this SWMP report is to outline the management of storm water along the proposed road where three types of drainage systems will be used:

1. **Cross drainage** - where water outside the road is take under the road via culverts to avoid the road from being washed away.

2. **Surface drainage** – water on the road being drained to avoid accidents by road users.
3. **Side drains** – drains next to the road specifically in cut situations to avoid water undermining the road and to prevent failure of the road (Ibhongo Consulting, SWMP, 2019).

The road requires cross drainage, and the existing structures are replaced with new structures as per KZN: DoT standard procedures of replacing old structures due to age related defects which are not always visible and may compromise the road. Therefore, this is done before the road is upgraded to blacktop during the construction phase. The cross drainage is calculated to accommodate 1:20 year floods (Ibhongo Consulting, SWMP, 2019).

The road will be finished with a double seal which allows for free movement of storm water run-off from the road. Where sidewalks are provided concrete kerbs and channels are used and have been designed to catch runoff generated on the road and sidewalks to be accumulated in side-drains. The road has been designed with appropriate falls to encourage catching of water at low points to prevent accidents due to water standing on the road (Ibhongo Consulting, SWMP, 2019).

Storm water drains run alongside the road in cut areas to accumulate water and to avoid damage to the road and are released at designated culverts. All storm water drains are lined with concrete or a rough textured concrete to reduce scouring, to culverts and outlet structures that are used as conduits to transport the storm water generated on the road to natural catchment areas. Prior to releasing the water to natural storm water channels, the water velocity is reduced using natural stone and concrete energy breakers or gabions at outlets. This design principle reduces scour and hence encourages minimal damage to the natural water ways. Head walls have also been provided to retain earth around the outflow system. All outlets are placed at specific points to avoid damage to houses (Ibhongo Consulting, SWMP, 2019).

The pipe and box culverts will be constructed/installed with enough grades to be self-cleaning to avoid sedimentation build up. Under these conditions the culverts won't be prone to blockages thus preventing flooding (Ibhongo Consulting, SWMP, 2019).

A Bridge at km 7.200 over the Mozana river is also being upgraded to replace the old bridge. This bridge will do away with the single carriageway that is there currently and to allow for a 1:50 year flood so that the communities are not cut off during a flood (Ibhongo Consulting, SWMP, 2019).

There is a wetland at km 15.520 which needs to be prevented from being cut off by the road. This is achieved by putting rockfill under the road for 50m long, for the width of the road, 0.75m thick that will allow the water to freely cross under the road for the wetland. In a flood situation there are 6x600mm pipes on top to let water cross under the road to prevent flooding (Ibhongo Consulting, SWMP, 2019).

Mitre drains, pipe crossings and Gabions / Reno mattresses will effectively attenuate the storm water from the roads into the surrounding veld /drainage lines. Erosion controls will be included during construction on instruction of the Road Site Engineer and or the Environmental Control Officer (Ibhongo Consulting, Inception report, 2019).

The entire road has been designed to accommodate effective storm water drainage from the surface and the shoulders into side drains and eventually into the storm water drainage system. This will result in contributing to eliminate storm water / drainage / erosion issues (Ibhongo Consulting, Inception report, 2019).

Normal 1m concrete V drains will be used throughout the road. The capacities of the side drains are still to be checked for each section for possible over topping. Discharge points will be provided as required. Kerb and channeling will only be provided on high fills and next to sidewalk, to avoid scouring, as per the KZN DoT standard details. Chutes will be provided as required (Ibhongo Consulting, Inception report, 2019).

The drainage on access to the road will be in the form of 900mm x 450mm portal culverts. This will be adequate given the size of drains adopted above. The presence of sub-surface water in deep cuts will be investigated on a case-by-case basis during construction and sub-soil drainage systems installed, as and when required. Provision will be made in the construction budget (Ibhongo Consulting, Inception report, 2019).

SECTION E: IMPACT ASSESSMENT AND MITIGATION

10. IMPACT ASSESSMENT AND MITIGATION

10.1 Overview

This section focuses on the environmental impacts that could potentially be caused by the proposed upgrading of Road D1867 during the construction, operational and decommissioning phases of the project. Maintenance of infrastructure is addressed as part of the operational phase impact assessment.

An Impact assessment must take account of the interactions between all aspects and associated activities of the project nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental).

The Impact Assessment of the project's activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental impacts. The significant scoring of this environmental impact assessment is focussed only on the construction, operational phase and the decommissioning of Road D1867 and associated infrastructure.

10.2 Methodology used in determining and ranking the significance of potential impacts

This section of the report focuses on the pertinent environmental impacts that could potentially be caused by the proposed upgrading of Road D1867 project. An "impact" refers to a change in an environment that results from an environmental activity (or aspect), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

The significance (quantification) of potential environmental impacts identified during the BA process has been assessed in terms of the following criteria (Guideline Documentation on EIA Regulation, Department of Environmental Affairs and Tourism, 2014). This is the rating scale developed by Afzelia for use in the reports. To determine the significance of impacts identified for a project, there are several parameters that need to be assessed. These include four factors, which, when plugged into a formula, will give a significance score. The following four parameters were assessed:

1. **Duration**, which is the relationship of the impact to temporal scale. This parameter determines the time span of the impact and can range from very short term (less than a year) to permanent.
2. **Extent**, which is the relationship of the impact to spatial scales. Each impact can be defined as occurring in minor extent (limited to the footprint of very small projects) to International, where an impact has global repercussions (an example could be the destruction of habitat for an IUCN CR listed species).
3. **Magnitude**, which is used to rate the severity of impacts. This is done with and without mitigation, so that the residual impact (with mitigation) can be rated. The Magnitude, although usually rated as negative, can also be positive.
4. **Probability**, which is the likelihood of impacts taking place. These include unlikely impacts (such as the rate of roadkill of frogs, for example) or definite (such as the loss of vegetation within the direct construction footprint of a development).

The impact assessment that is carried out for each environmental impact that may arise from the proposed project, forms the basis to determine which management measures that will be required to prevent or minimise these impacts. It is also a means in which the mitigation measures that are determine in the impact assessment which are then translated to action items. These actions items are required to prevent or to keep those impacts that cannot be prevented within acceptable levels.

In order to establish best management practices and prescribe mitigation measures, the following project-related information needs to be adequately understood:

- **Activities** that are associated with the proposed project;
- **Environmental aspects** that are associated with the project activities;

- **Environmental impacts** resulting from the environmental aspects; and
- The nature of the surrounding **receiving environment**.

Information provided by specialists was used to calculate an overall impact score by multiplying the product of the nature, magnitude and the significance of the impact by the sum of the extent, duration and probability based on the following equation. Impact severity qualified with spatial, temporal and probability:

Each of these aspects is rated according to **Table 27** below. Where Duration, Extent and Magnitude are assessed first, followed by Likelihood.

Table 27: Table of Evaluation criteria ranking

Score	Label	Criteria
Duration		
1	Very short term	0 -1 years
2	Short term	2 – 5 years
3	Medium term	5 – 15 years
4	Long term	>15 years
5	Permanent	Permanent
Extent		
1	Minor	Limited to the immediate site of the development
2	Local	Within the general area of the town, or study area, or a defined Area of Impact
3	Regional	Affecting the region, municipality, or province
4	National	Country level
5	International	International level
Magnitude		
0	Negligible	Very small to no effect on the environment
2	Minor	Slight impact on the environment
4	Low	Small impact on the environment
6	Moderate	A moderate impact on the environment
8	High	The impacts on the environment are large
10	Very high	The impacts are extremely high and could constitute a fatal flaw
Probability		
1	Very improbable	Probably will not happen
2	Improbable	Some possibility, but low likelihood
3	Probable	Distinct possibility
4	Highly probable	Most likely
5	Definite	The impact will occur

Once each of these aspects is rated, the overall significance can be scored (based on the score for Effect). The significance is calculated by combining the criteria in the following formula:

$$S = (D+E+M) P$$

Where:

S = Significance weighting

D = Duration

E = Extent

M = Magnitude

P = Probability

The explanation for each of the overall significance ratings are presented in **Table 28**, with the layout of all possible scores and their overall significance presented in **Table 29**.

Table 28: Significance weighting.

Score	Label	Motivation
<10	Negligible	The impact is very small to absent
10-20	Low	where this impact would not have a direct influence on the decision to develop in the area
20-50	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated
50 -70	- High	where the impact must have an influence on the decision process to develop in the area
>70	Very high	Where the impact may constitute a fatal flaw for the project

Table 29: Possible significance scores based on Effect x Likelihood.

Likelihood	Effect																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Very improbable (1)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Improbable (2)	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
Probable (3)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
Highly probable (4)	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
Definite (5)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

Each impact was assessed based on the methodology above, and a table produced, indicating the scores and the overall significance rating both without and with mitigation. Where relevant, mitigation measures are recommended.

The following definitions apply:

For the methodology for the impact assessment, the analysis is conducted on a qualitative basis with regards to the **nature, extent, magnitude, duration, probability, and mitigation potential** of the impacts. The following scoring system applies:

Table 30: Scoring System.

Nature / Status	<ul style="list-style-type: none"> • Positive impact on the environment. • Negative impact on the environment. • Neutral impact on the environment.
Extent	<ul style="list-style-type: none"> • Local – extends to the site and its immediate surroundings. • Regional – impact on the region but within the province. • National – impact on an interprovincial scale. • International – impact outside of South Africa.
Magnitude¹	<ul style="list-style-type: none"> • Low – natural and social functions and processes are not affected or minimally affected. • Medium – the affected environment is notably altered, the natural and social functions and processes continue albeit in a modified way. • High – the natural or social function or processes could be substantially affected or altered to the extent that could temporarily or permanently cease.

¹ The degree to which an impact may cause irreplaceable loss of resources.

Duration	<ul style="list-style-type: none"> • Short term – 0-2 years. • Medium term – 2 – 5 years. • Long term – 5-10 years • Permanent – mitigation is either by natural process or by human intervention, will not occur in such a way or in such a time span that the impact can be considered transient.
Probability	<ul style="list-style-type: none"> • Almost certain – 90% +. • Likely – 60-90% • Moderate – 40-60% • Unlikely – 20-40% • Rare / Remote – 1-20%
Mitigation Potential	<p>Provides an overall impression of an impact's importance, and the degree to which the impact can be mitigated. The range for significance ratings are as follows:</p> <p>0 – Impact will not affect the environment; therefore, no mitigation is necessary. 1 – No impact after mitigation. 2 – Residual impact after mitigation. 3 – Impact cannot be mitigated.</p>

Impact Scores will be ranked in the following way as listed in the table below:

Table 31: Ranking of overall impact score.

Impact Rating	Negligible	Low / Acceptable Impact	Medium	High	Very High
Significance	1 to 9	10 to 20	21 to 50	51 to 70	71 to 100

10.3 Precautionary Principle

The significance scoring follows the Precautionary Principle. The Precautionary Principle is based on the following statement: *“When the information available to an evaluator is uncertain as to whether or not the impact of a proposed development on the environment will be adverse, the evaluator must accept as a matter of precaution, that the impact will be detrimental. It is a test to determine the acceptability of a proposed development. It enables the evaluator to determine whether enough information is available to ensure that a reliable decision can be made”.*

In addition, the Applicant is obliged to adhere to the requirements of Section 28 of the NEMA (Duty of Care and Remediation of Environmental Damage) which states that: *“Duty of care and remediation of environmental damage: “(1) Every person who causes has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot be reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment”.*

For the purpose of this assessment, the impact significance for each identified impact was evaluated according to the following key criteria outlined in the sub-sections 5. Impacts and Risks Identified and The Significance of These Impacts.

10.4 Waste, Effluent, Dust and Noise Management

10.4.1 Dust Emissions

There will be increased dust levels as a result of construction activities associated with the upgrading of Road D1867, which will cause nuisance to the surroundings. However, this is expected to be within acceptable limits. Measures to reduce dust will be contained in the EMP attached in **Appendix F** and must be adhered to. Dust suppression must be used by dampening with water or spraying from a water tanker to control the amount of dust created and released into the atmosphere and working environment. Potable or treated water must not be used for dust suppression.

10.4.2 Noise Consideration

Noise levels in the area will be increased during the construction phase due to the operation of heavy machinery, using construction equipment and the movement of large trucks transporting concrete, rock, sand and gravel to the site. However, measures to reduce noise will be contained in the EMPr attached in **Appendix F** and relevant legislation guideline levels as per SANS 10103 regarding noise levels must be adhered to. The measurement and assessment of environmental noise with respect to annoyance and speech communication is found in the **table 32** below:

Table 32: Rural noise level limits as per SANS 10103: 2008

RURAL	OUTDOORS		INDOORS	
	DAY	NIGHT	DAY	NIGHT
	45 dB(A)	35 dB(A)	35 dB(A)	25 B(A)

10.4.3 Waste Management

The different types of waste which will be generated during the construction activities may include:

- Solid waste – e.g., Plastics, metal, wood, stone, construction rubble, concrete, discarded pipes and general domestic waste, etc.
- Chemical waste – e.g., Petrochemicals, resins, paints and herbicides, etc.
- Sewage and wastewater:
 - Chemical toilets have the potential to contaminate the environment if not appropriately managed. Portable chemical toilets must be provided along the working place and within the construction camp site. An independent registered chemical waste company, such as Justloo or SANITECH is to be used to service and remove waste from chemical toilets at least weekly on site. Certificates of service must be retained as proof.
 - Wastewater from construction activities may be contaminated and can result in the pollution of the surrounding environment. This would mainly relate to storm water potentially contained within bunded areas where spillages may have occurred or inside drip trails used to contain spills from parked construction equipment, vehicles, trucks and plants. Contaminated water associated with construction activities must be contained in separate bunded areas and must not be allowed to enter into the natural drainage system.

Facilities for solid waste collection are to be provided by the appointed contractor on site. The construction solid waste must be collected in skips which must be placed within the construction camp. Solid waste containers and drums must be made available where and when required along the construction front, and these must be taken to the construction camp at the end of each day. These are to be at least 200 litre drums and clearly identified as the point for waste disposal. These waste receptacles with suitable covers or lids must be provided and conveniently placed to prevent wind-blown rubbish and scavenging by people and animals. All the waste must be removed from the site for nearest disposal at a commercial facility licensed for this purpose. **Under no circumstances is waste to be buried or burnt.**

Solid waste, hazardous waste and wastewater must be disposed of at a nearest licensed and operational municipal landfill site or municipal waste stream collection areas at least once per month. Any hazardous waste must be separated from the non-hazardous waste before being disposed of. Waybills for all such disposal are to be kept by the Contractor on site for record purpose and review.

The Contractor is to implement a daily litter collection programme. The collected waste is to be disposed of regularly and proportionately to its generation at a site designed for waste disposal. Communication and education material on the waste management system must be part of site induction program and weekly toolbox talks. Solid Waste Management has been addressed effectively in the EMPr attached in **Appendix F**.

The following recommendations are made to reduce the amount of waste needing disposal:

1. Existing road surfaces must be re-milled and reused as much as possible.
2. Old materials such as dilapidated or discarded pipes to be returned to the Local KZN DOT prior to completion of construction activities.
3. Excess old material must be offered to the Local Authorities for them to reuse where needed.
4. Materials sourced from the site (topsoil) must be used for the site rehabilitation and landscaping post construction.
5. Recycling must be undertaken where possible to reduce the amount of waste sent to the landfill site.

PLEASE NOTE: NO SPOIL SITES ARE TO BE USED FOR THE DISPOSAL OF WASTE MATERIAL OR EXCESS MATERIAL GENERATED BY THIS PROJECT

10.5 Impacts and Risks identified and the significance of these impacts

The following sections will provide a description of the potential impacts as identified by the specialists, EAP and through the PPP as well as the assessment according to the criteria described from **Table 21** to **Table 25**. All potential impacts associated with the proposed upgrading of Road D1867 through the construction, operation and decommissioning of the project lifecycle have been considered and assessed with the significance, probability, and duration of the impacts in the following sections including mitigation measures.

The impacts that are tabulated are based on construction methods statement derived from the available engineering report and directly from the engineer.

10.5.1 Potential Environmental Impacts and Mitigation Measures during the Construction Phase
 10.5.1.1 Biophysical Environmental Impacts
 10.5.1.1.1 Impact on Topography and Geology

Activity / Issue	Nature of potential impact / risks
<ul style="list-style-type: none"> Stripping of topsoil. Clearing and grubbing Cut and fill operation, Excavation. Earthworks Layer works, Abutments and Piers Construction, Deck Construction, Surfacing. 	<ul style="list-style-type: none"> Localised slope instability. Disturbance of surface geology. Vibrations and fly rocks which may damage existing structures

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Topography and geology	5	2	2	8	60 High	4	2	2	4	32 Medium
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Construction must be performed in the drier winter months to minimise the effects of ground water seepage.
- A Geotechnical Professional must be appointed to inspect founding levels and temporary cut slopes.
- It is recommended that all excavations be frequently assessed by a Geotechnical Engineer or Engineering Geologist during the earthwork's operation.
- The necessary precautions measures to ensure that the slope is secured and stable must be taken during the design and construction phase.
- Slope stability must be further assessed by a Geotechnical Engineer, should thick clay lenses, localised significant seepage or moderate to steeply inclined strata dipping adversely out of the slope, be encountered along portions of the road from Km 7+600 to Km 8+400.
- In areas where deep cuts expose suitable subgrade material, these may be stockpiled and used in other areas of the site.
- Permanent cut slope batters in the gravelly sandy materials such as the residual soils must be sloped to a batter of 1:2 (26°) with a batter of 1:1.5 (34°) being implemented for competent highly weathered bedrock at the discretion of the Engineer, provided it is not adversely dipping out of the slope or, significant seepage is encountered.
- Slope batters of 1:3 (18°) must be implemented in loose sandy material such as the alluvium.

- All fills should be constructed using suitable granular material placed in layers of maximum 300mm thickness and compacted to 95% of the materials Mod. AASHTO density prior to placement of the next layer.
- The maximum particle size of the fill material should not exceed two thirds of the layer thickness.
- Prior to placement of any fill the natural ground should be stripped of any vegetation.
- All excavations deeper than 1.20m should be shored at the Engineers discretion.
- All cut, and fill slopes must be vegetated as soon as possible after construction. Furthermore, road platforms must be graded to ensure they are free draining and side drainage is installed as per Engineers specifications.

10.5.1.1.2 Soil Erosion and Sedimentation

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks • Layer works, • Surfacing. • Paving of external roads, and landscaping. 	<ul style="list-style-type: none"> • Physical disturbance of soil. • Soil loss. • Soil compaction. • Increased sedimentation of surrounding surface water resources • Deposition of sediment into the watercourse, • Increase in on-site and off-site erosion, • Reduced bank stability.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Soil Erosion and Sedimentation	3	2	2	8	30 Medium	2	1	1	2	8 Negligible
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Prior to commencement of construction, a silt fence / curtain must be installed downstream of the construction footprint but within Wetland Unit UCVB2.
- Implement effective topsoil management practices (stripping topsoil, stockpiling, and reuse during rehabilitation of disturbed areas).
- Prior to any excavation or allowing plants onto site, Topsoil² from all construction / working areas must be stripped and stockpiled separately from subsoil³.

² Topsoil is defined as the A horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic fraction. Where topsoil is referred to, it is deemed to be both the soil and grass/ground cover fraction. Subsoil is defined as the B horizon of the soil profile.

³ Subsoil is the soil horizons between the topsoil (A horizon) and the underlying parent rock. Subsoil often has more clay-like material than topsoil. Subsoil is of less value to plants, in terms of nutrients (food) and oxygen supply, than topsoil. When subsoil is exposed, it tends to erode fairly easily.

- Depending on the depth of the topsoil, a recommendation is made to remove between 100 and 200 mm of topsoil and stockpile it in small mounds (less than 1.5m in height) located on an area of level ground that will not be in the path of runoff water during a storm, away from the working area, drainage lines, areas of valuable vegetation or on the bases of banks.
- Topsoil must be handled twice only – once to strip and stockpile, and secondly to replace, level, shape, and scarify/cut.
- Maintain topsoil stockpiles in a weed free condition.
- Soil stockpiles are to be protected from possible erosion, e.g., through covering of the stockpiles with tarpaulin, and limiting the height and angle of the stockpile.
- Soil stockpiling areas must be sufficiently situated away from the drainage areas towards the Mozana River or wetland areas.
- Subsoil must be removed to a depth instructed by the Engineer and stored separately to the topsoil if not used on rehabilitation of the site. This soil must be replaced in the excavation in the original order that it was found.
- Care must be taken not to keep excavations open for longer than necessary.
- The excavated areas must be backfilled with approved materials and compacted to the required density.
- Backfilling must be employed effectively to ensure that no water ponds is near the structure or enters the foundations.
- The road working servitude should be clearly demarcated to ensure that no un-necessary intrusion of vehicles into any other instream areas, or unnecessary clearing activities takes place.
- Similarly, the extent of infilling within any instream habitat must be minimised.
- Soil erosion measures must be implemented during the construction phase of the project in areas sensitive to erosion to prevent increased levels of siltation and sedimentation, *inter alia*, the use of sandbags, Berms, reno mattress and hessian sheets, erosion control blankets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells.
- The use of existing tracks and roads to gain access to the work servitude must be prioritised as far as practically possible, the use of new tracks / haul roads must be approved by the Engineer prior to formation or use by the contractor.
- Storm water management techniques must be designed and placed correctly to ensure that storm water runoff is controlled and channelled effectively to prevent soil erosion and sedimentation.
- Water must not be allowed to flow down cut or fills slopes without adequate soil erosion protection in place.

10.5.1.1.3 Hydrological and drainage impact

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Road upgrade and widening. • Construction of new bridge. • Construction of new road alignment approach on both sides of the new bridge. • Abutments and Piers Construction • Construction of bridge deck, bridge gutters, downspouts, and bridge end collectors., • Placement of waterproofing layer. • Construction of culvert bridge. • Layer works, 	<ul style="list-style-type: none"> • Alteration of the current hydrological patterns of the Mozana River. • Physical alteration of natural water flow reaching water resources downslope/downstream. • Increased storm water runoff volume. • Increased storm water runoff velocity. • Increase in stream velocity. • Altered hydro dynamics.

<ul style="list-style-type: none"> • Surfacing. • Storm water drainages. 	
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Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Hydrological and drainage impact	4	3	3	8	56 High	4	2	2	8	48 Medium
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Construction activities of the upgrading of Road D1867 and Mozana River bridge must ideally be restricted to the dry season when low flows are present within the Mozana River.
- All storm water discharges into the terrestrial environment must be attenuated at discharge points prior.
- Such attenuation infrastructure must ideally be located at least 30m away from any delineated watercourse. The longer the distance the better.
- Vegetated swales/side drains must be used to convey storm water rather than concrete lined channels or V-drains. These features must be well vegetated with appropriate species and stabilized with reno mattresses or rock packs to prevent erosion and vertical incision.
- Road runoff must be discharged into the terrestrial habitat at regular intervals to reduce the risk of soil erosion at discharge points.
- The natural drainage lines, wetlands, river and vegetation must be preserved, and engineering interventions must be prohibited wherever possible that may alter their physical and ecological characteristics.
- Energy dissipaters must be constructed at any surface water outflow points.
- Water spreaders must be used to reduce the velocity of flow.
- During the construction of the culverts within the watercourse, the client / Engineer must be cognisant of the following:
 - The culvert must span a minimum of 50m across the width of the wetland.
 - The culvert must be constructed out of pre-cast concrete box culverts. Their larger openings provide adequate hydraulic capacity whilst spreading high flows.
 - Bed level crossings which are wider than the channel provide the best opportunities for maintaining channel functionality.
 - The total width of the culverts must be wider than the channel width. Undersized culverts constrict the stream flow, thereby leading to impoundment upstream and a reduction of flows downstream.
 - The culverts must be aligned perpendicular to the flow.
 - Culvert inverts must be buried one quarter of the rise below the average natural streambed / wetland surface up to a maximum depth of 1 m.
 - The inlet and outlet of the culverts must be established at the same level as the bed of the watercourse. Poor design or implementation in this regard will result in excessive ponding at the inlet which will cause accumulation of floating debris and culvert clogging and / or scouring at the outlet.
 - The outlet of the box culvert must be designed and constructed to resist undermining and scour using energy dissipaters.
 - The culvert must not create any significant discontinuities in the water profile. Its size and placement should not cause ponding upstream
- In the case that coffer dams are used to temporarily impound flow for construction purposes, these structures must be temporary in nature and removed from the watercourse immediately after the required construction has been completed. The dewatering process from the coffer dams must involve piping the water within the active channel as, or if, required.

- The construction of an artificial channel outside of the active channel for water diversion purposes is not permitted.

10.5.1.2 Biological Environmental Impacts

10.5.1.2.1 Impact on wetlands

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Road upgrade and widening. • Construction of culvert bridge. • Layer works, • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation, • Excavation. • Earthworks • Layer works, • Surfacing. • Stormwater drainages. 	<ul style="list-style-type: none"> • Loss of Freshwater Habitat & Biota Impact • Degradation of Wetland Habitat • Degradation of Freshwater Habitat.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Loss of freshwater habitat and biota	3	2	2	4	24 Medium	3	1	1	4	18 Low
Degradation of freshwater habitat	4	2	3	6	44 Medium	3	1	1	4	18 Low
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Activities directly impacting on wetlands and channel watercourse must occur during the dry winter months (low or zero flow periods) in order to limit the potential impact linked to high runoff rates.
- Prior to commencement of construction, the construction footprint within Wetland Unit UCVB2 must be demarcated using wooden pegs and an orange safety net.
- All construction activities (excavations, access roads etc.) must be limited to the confines of the construction servitude.
- The demarcation fence must be signed off by the Environmental Control Officer (ECO).
- The fence must be maintained throughout the construction phase.
- No stockpiling of soil shall take place in the wetland or within 50m from the wetland boundary.
- There shall be no mining of soil/sand required for construction purposes from any delineated watercourses.

- Preserve the natural drainage lines, wetlands and vegetation, and any engineering interventions wherever possible that may alter their physical and ecological characteristics must be prevented
- Maintain the present ecological condition and functioning of the wetland.
- Minimise construction footprints prior to commencement of construction and control all edge effects of construction activities i.e. proliferation of alien vegetation, disturbances of soils.
- The wetland areas must be monitored weekly for any signs of off-site siltation.
- Control of in-situ concrete works for the culvert must be implemented.
- Appropriate measures must be put in place to minimise erosion and the amount of sediment entering wetlands and channel watercourse.
- Contractor laydown areas and camp site must be outside of wetland areas.

10.5.1.2.2 Impact on flora

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks • Layer works, • Road upgrade and widening. • Construction of culvert bridge. • Surfacing. • Storm water drainages. 	<ul style="list-style-type: none"> • Loss of Vegetation Communities <ul style="list-style-type: none"> ○ Loss of Grassland ○ Loss of Bushveld ○ Loss of Wetland Vegetation • Loss of Species of Conservation Concern and Biodiversity. <ul style="list-style-type: none"> ○ Loss of species of conservation concern (SCC). ○ Loss of flora SCC. • Loss of Ecosystem Function and Process <ul style="list-style-type: none"> ○ Fragmentation and edge effects.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Loss of Grassland	5	3	3	6	60 High	5	2	2	4	40 Medium
Loss of Bushveld	5	3	3	6	60 High	5	2	2	4	40 Medium
Loss of Wetland Vegetation	5	3	3	6	60 High	5	2	2	4	40 Medium
Loss of flora SCC	4	3	3	6	48	2	2	1	0	6

					Medium					Negligible
Fragmentation and edge effects	3	2	1	2	15 Low	1	1	1	0	2 Negligible
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Keep the footprint of the development (particularly during construction) as small as possible. Ensure that excavations are kept to the minimum size and that stockpiles of soil piled adjacent to the excavation takes up as little space for as short an amount of time as possible.
- Laydown areas must be located exclusively in areas of low sensitivity including in areas that have already been disturbed or contain primarily alien vegetation.
- Permits must be obtained for the damaging, cutting or removal of protected trees and other protected species (TOPs or KZN listed.), following a walk-through with the Ecological Specialist of the full site in the wet season prior to construction commencing.
- Prior to construction, a final walk through with the Ecological Specialist must be conducted in order to confirm no flora SCC are present; should these be found and for permits for the removal of listed plant SCC must be undertaken.
- Removal and replanting / relocation to a nursery of existing SCC; and Planting of additional individuals of specific SCC to be undertaken by a suitably experienced horticulturist.
- Planting of additional individuals of specific SCC.

10.5.1.2.3 Soil and Surface Water Pollution Impact

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Road upgrade and widening. • Construction of new bridge. • Construction of new road alignment approach on both sides of the new bridge. • Abutments and Piers Construction • Construction of bridge deck, bridge gutters, downspouts, and bridge end collectors., • Backfilling around the abutment and pier walls. • Parapets. • Construction of culvert bridge. • Layer works, • Surfacing. • Storm water drainages. 	<ul style="list-style-type: none"> • Potential contaminants include hydrocarbons, oils and grease, cement, sewage from chemical toilets and bitumen entering wetlands, river and negatively affecting receiving water resource integrity / quality. • Pollution of the water resource originating from construction vehicles, concrete, or bitumen. • Contamination of soil and surface water resource. • Mismanagement of waste and pollutants like hydrocarbons, construction waste and hazardous substances resulting in these substances entering and polluting sensitive natural environments either directly through surface runoff, or subsurface water movement. • Oil / fuel leaks from vehicles and portable construction equipment such as generators will result in soil, surface / groundwater contamination.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Soil and Surface Water pollution	3	2	2	8	30 Medium	2	1	1	2	8 Negligible
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- *In-situ* Concrete Work - Inspection of shutter work prior to pouring to ensure minimum risk of leakage. Strict supervision of concrete pour to ensure on overtopping of shutter and concrete splashing / spillage from use of plant such as conveyors and vibrating pokers.
- No washing of equipment or any object that is contaminated with cement in any water resource. No concrete mixing trucks must be washed on site; they must return to the supplier for cleaning out.
- Hazardous chemical substances must be stored within a bunded and roofed area to prevent spills from occurring directly on the ground / soil.
- Handling of hazardous chemical substances (i.e., re-fuelling, pouring of oil etc.) must be done on a lipped spill tray.
- Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using permitted hazardous waste landfill sites.
- Any contaminated soil must be uplifted and removed and disposed of at a permitted hazardous waste landfill site.
- Construction activities must be conducted during the dry or low flow season, when the volume of water in the stream is at reduced levels.
- Construction materials and equipment must be stored at least 100m away from the Riverbank and have suitable retention and bunding structures in place to prevent spills or run-off entering the river and riparian zone.
- Proper management and disposal of construction waste must occur during the lifespan of the project.
- No substances (e.g., Cement, oil, fuel, paint, etc.) must be released into the watercourses or wetlands.
- Do not locate the construction camp within 100m of the wetlands or stream.
- The construction site and camp must be cleaned on a daily basis and all litter must be collected and disposed of in waste bins on site.
- Waste must be stored in a clearly demarcated waste area.
- An appropriate collection and disposal strategy must be implemented to ensure that waste is removed at least once per week and taken to a permitted landfill site.
- Hazardous waste must be stored separately and disposed of at a permitted hazardous landfill site at least once per month.
- Waste bins must be secured and have lids to prevent litter from being blown and spread over the area.
- No dumping of any materials in undeveloped open areas and neighbouring properties.
- Provision of adequate toilet facilities must be implemented to prevent the possible contamination of ground (borehole) and surface water in the area. Mobile toilets must be provided in order to minimise unauthorised traffic of construction workers outside of the designated areas.
- Methods for reducing and managing waste e.g., recycling, use of biodegradable material etc. should be considered.
- Instream habitat that is disturbed as a result of road and culvert construction must be rehabilitated as soon as construction in an area is complete or near complete and not left until the end of the project to be rehabilitated (i.e., progressive rehabilitation).

10.5.1.2.4 Loss of fauna

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks • Layer works, • Road upgrade and widening. • Construction of culvert bridge. • Movement of construction vehicles, equipment, and heavy machineries. 	<ul style="list-style-type: none"> • Loss of fauna SCC • Potential to destroy to disturb, harm or injure faunal species (especially species with limited mobility) inhabiting the site directly. • Poaching by construction workers.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Loss of fauna SCC.	2	5	1	1	14 Low	1	1	1	0	2 Negligible
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Selected workers must be given training on the possible fauna that may be encountered along the Road D1867.
- Site workers are to be informed of any sensitive fauna on the site prior to construction activities commencing and be informed that poaching or disturbance is strictly prohibited.
- Under no circumstances shall any fauna be handled, removed, killed, or interfered with by the Proponent, Project Manager, Resident Engineer, contractors, engineers, and their employees, including subcontractors or their subcontractors' employees. However, if construction activities are likely to injure, kill or interfere with any fauna encountered on the site, appropriate action must be taken to ensure their protection.
- Any fauna found within the construction corridor must be moved to the closest point of natural or semi-natural vegetation outside the construction servitude. This includes those species perceived to be vermin (such as snakes and rats). The latter species may require the services of a specialist to catch and relocate dangerous/venomous species.
- Contract employees must be educated about the value of wild animals and the importance of their conservation.

10.5.1.2.5 Proliferation of alien invasive vegetation

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks • Layer works, • Road upgrade and widening. • Construction of culvert bridge. 	<ul style="list-style-type: none"> • Local alien invasive species may rapidly encroach into riparian and instream areas. • Disturbance of indigenous vegetation. • Alteration of habitat structure. • Lower biodiversity. • Increased water usage.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Proliferation of alien invasive vegetation species	5	5	2	6	65 High	3	2	1	2	15 Low
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- An alien invasive management programme has been incorporated into EMPr and must be implemented throughout the construction defects liability period of the project.
- Ongoing alien plant control must be undertaken on the Road D1867 and particularly in the wetland and riverine areas.
- All alien vegetation must be eradicated. Invasive species (Category 1a, 1b and 2) must be given the highest priority. The use of herbicides must only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. Application must be under the direct supervision of a qualified technician. All surplus herbicides must be disposed of in accordance with the supplier's specifications.
- Herbicides must be carefully applied, to prevent any chemicals from entering the river. Spraying of herbicides is strictly forbidden.
- Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas as soon as possible once construction ceases so as to stabilise against erosion and sedimentation. If this means that vegetation requires regular watering to ensure that it establishes, the contractor must undertake this.
- All disturbed soils must be rehabilitated with local plant species to ensure that alien vegetation does not invade the area.
- Keeping the disturbance footprint as small as possible.
- Rehabilitation should take place as soon as possible after construction is completed and should comprise the planting of region-specific water wise plants (or wetland species where applicable).

10.5.1.3 Social Environmental Impacts

10.5.1.3.1 Noise Pollution

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks • Layer works, • Road upgrade and widening. • Construction of culvert bridge. • Movement of construction vehicles, equipment, and heavy machineries. • Construction activities related to sourcing of construction materials. 	<ul style="list-style-type: none"> • Noise levels within the Road 1867 site will increase during the construction activities due to the use of heavy machinery and vehicles.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Increase in noise	5	2	2	6	50 Medium	4	2	2	6	40 Medium
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- All machinery must be serviced at regular intervals to ensure that they do not emit unnecessary noise.
- During construction keep noise levels within acceptable limits in compliance with all relevant guidelines and regulations such as SANS 10103: 2008.
- All vehicles and machinery must be fitted with appropriate silencing technology that must be properly maintained. This includes side flaps on compressors that shall be in a closed position during operation.
- The use of all plant and machinery must be appropriate to the task required to reduce noise levels.
- Increased attention to maintenance of tools and equipment will reduce worksite noise levels.
- Use light equipment or machinery such as the hand-held (“jackhammers”) and machine breakers (“ woodpeckers”).

10.5.1.3.2 Elevated dust level

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Stripping of topsoil. 	<ul style="list-style-type: none"> • General construction activities will result in increased dust pollution.

<ul style="list-style-type: none"> • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks • Layer works, • Road upgrade and widening. • Construction of culvert bridge. • Movement of construction vehicles, equipment, and heavy machineries. • Construction activities related to sourcing of construction materials. 	
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Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Elevated dust level	5	2	2	6	50 Medium	3	2	1	4	21 Low
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Dust suppression must be implemented by dampening with water or spraying from a water tanker during construction to prevent dust from being blown from the project site into neighbouring properties and from causing visibility problems for users on the road. Potable or treated water must not be used for dust suppression.
- Heavy machinery and vehicles must not exceed a speed limit of 30 km/hr along the area under construction.
- It must be ensured that, during transport, loads of loose material (such as sand, gravel etc.) on trucks is covered and/or dampened.
- Do not exceed the freeboard levels and effectively cover construction related materials when transporting.
- Camp construction areas / Access Road / work faces –that have been stripped of vegetation must be effectively dampened to avoid excessive dust. This must apply particularly in instances of high wind speed or when dust is seen to be generated in significant quantities.
- Cover construction materials skips and stockpiled soils if they are a source of dust.

10.5.1.3.3 Impact on Archaeological sites, cultural heritage resources or sites of historical significance

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks 	<ul style="list-style-type: none"> • Protected graves could be damaged or destroyed by proposed road diversion. • Structures of potential importance to members of the Shembe community that could be altered, damaged, or destroyed.

<ul style="list-style-type: none"> • Layer works, • Road upgrade and widening. • Construction of culvert bridge. 	
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Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Impact on protected graves	5	5	2	10	85 Very High	4	4	2	6	48 Medium
Impact on structures of potential importance to members of the Shembe community	3	4	2	6	36 Medium	2	4	2	2	16 Low
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- A buffer of 5m must be placed around the graves so that the graves are not impacted by the road works.
- A buffer of 5m must be placed between the structures and the road works to avoid damage to them during the upgrade,
- The buffer must be fenced, and no construction activities may take place within the buffer.
- If graves are damaged, then the Institute must be informed, work must stop in the immediate area and the damaged graves must be repaired under supervision of a heritage specialist and the Institute
- Work force to respect the significance of graves to the family and community.
- If relocation of the graves is to take place, then application to the MPHRA must be undertaken according to the relevant regulations.
- Workers must be made aware of the types of heritage resources, such as graves that could be found during the construction of the proposed road upgrade.
- For any chance heritage finds (graves, etc.), all work must cease in the area affected and the Contractor must immediately inform the Project Manager. A registered heritage specialist must be called to site to inspect the finding/s. The relevant heritage resource agency (the Institute) must be informed about the finding/s.
- The heritage specialist will assess the significance of the heritage resource/s found and provide guidance on the way forward.
- Permits must be obtained from the Institute if heritage resources are to be removed, destroyed, or altered.
- Under no circumstances may any heritage material be destroyed or removed from the project site unless under direction of a heritage specialist.
- Should any recent remains be found on site that could potentially be human remains, the South African Police Service as well as the Institute must be contacted. No SAPS official may remove remains (recent or not) until the correct permit/s have been obtained.
- Consultation must be undertaken with the leaders of the Shembe community to see if the movable structure can be moved further away from the road.
- A buffer of 5m must be placed between the structures and the road works to avoid damage to them during the upgrade.
- Work force to respect the significance of the structures to members of the Shembe community.

10.5.1.3.4 Road safety & Traffic issues

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Construction camp site establishment. • Stripping of topsoil. • Clearing and grubbing • Cut and fill operation to prepare site for construction, • Excavation. • Earthworks • Layer works, • Road upgrade and widening. • Construction of culvert bridge. 	<ul style="list-style-type: none"> • There is the likelihood of disruptions to the movement of pedestrians in the area. • Construction activities and vehicles may pose safety risks to the people in the community. • Site access points and construction areas will result in increased road safety issues to members of the public. • Increased risk of accidents and delays on surrounding roads. • Potential safety risk to members of the public as well as site workers.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Road safety & Traffic issues	5	2	2	4	40 Medium	3	2	1	2	15 Low
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- The traffic must be maintained on the existing single lane bridge for use as a bypass during the construction of the proposed new bridge new route alignment.
- Adequate and safe passage for pedestrians and road users through the construction site must be provided, controlled, and maintained at all times during the construction as this will decrease the risk of accidents.
- Strict safety regulations must be considered during the construction phase to avoid incidents of collisions between road users and construction vehicles, or risks of accidents on areas under construction during poor weather conditions.
- Early closure construction activities must be considered during bad weather.
- The necessary traffic safety warning signage (KZN DOT Standard) must be erected during construction as per the engineers' specifications to warn motorists and pedestrians of the potential dangers of the construction site.
- Traffic in and out of the project area must be monitored. This must be discussed with the affected communities and wards.
- Traffic calming measures must be implemented, and speed limits need to be introduced and managed, especially during the construction period. Traffic must be controlled and regulated, and truck drivers need to be aware of safety regulations through regular briefings and workshops.
- Road safety measures must be effectively delineated with the necessary road warning signage or Stop/Go controls.
- Construction site workers must always remain within the designated construction zone unless otherwise authorised by the engineer in consultation with the ECO.
- Construction workers / construction vehicles to take heed of normal road safety regulations. A courteous and respectful driving manner must be maintained so as not to cause injury to people or livestock.

- Experienced Flagmen or women must be used to control the traffic flow.
- Additional signage must be kept in storage on the construction site for replacement of missing and damaged.
- A speed limit of 30 km/h must be adhered on all access and surrounding roads.
- Potentially hazardous areas such as excavated trenches or pits / storage areas are to be securely demarcated (not with hazard tape only) and made clearly visible at ALL times.

10.5.2 Potential Environmental Impacts and Mitigation Measures During the Operation Phase

10.5.2.1 Increased impervious area (Hardened surfaces)

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Operation of Road D1867, • Operation of stormwater infrastructure (bridge culvert and stormwater pipes). • Operation of Mozana bridge and culvert bridge. 	<ul style="list-style-type: none"> • Alterations in hydrological regimes. • Increased stormwater runoff volume and velocity causing additional run off.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Increased impervious area	4	5	3	6	56 Medium	3	4	2	6	36 Medium
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Attenuation of storm water from the new infrastructure within the road is important to control the velocity of runoff towards the stream. Attenuation structures must be placed between the new infrastructure and the Mozana River i.e., storm water must not be directly deposited into the Mozana River.
- Address increased runoff volumes at source.
- 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 Riverbanks 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 storm water.
- Cutting grass once initial establishment has taken place encourages most grass species to thicken quickly.
- Areas sensitive to erosion must be identified and monitored to ensure that erosion risks are minimised.
- All areas impacted by earth-moving activities must be re-shaped post-construction to ensure natural flow of runoff and to prevent ponding.

10.5.2.2 Impact on wetlands

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Operation of Road D1867, • Operation of storm water infrastructure (bridge culvert and storm water pipes). • Operation of Mozana bridge and culvert bridge. 	<ul style="list-style-type: none"> • Erosion and increase in sediment inputs • Degradation of Wetland Habitat • Degradation of Freshwater Habitat.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Degradation of freshwater habitat	4	2	3	4	36 Medium	2	1	1	2	8 Negligible
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- 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.

10.5.2.3 Pollution of soil and water resources

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Operation of Road D1867, • Operation of storm water infrastructure (bridge culvert and stormwater pipes). • Operation of Mozana bridge and culvert bridge. • Vegetation rehabilitation – on-going during the lifespan of the project. 	<ul style="list-style-type: none"> • First flush effect. • Pollutants from vehicle using the facility and maintenance works would be discharged directly into the Mozana River. • Litter and other contaminants may enter the water system during the operation phase of the Road D1867. • Contamination of wetland resources through toxic organic and/or heavy metals. • Pollution of aquatic resources.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Pollution of water resources and soil	2	3	2	4	18 Low	1	1	1	0	2 Negligible

Nature / Status	Negative impact on the environment	Negative impact on the environment
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Mitigation Measures –

- Soft engineering techniques must be implemented within the Road D1867 site to assist in capturing surface runoff and filtering out contaminants before the water reaches the water resources.
- Storm water outlet structures must be inspected on a monthly basis to ensure that litter is removed and correctly disposed of (at a permitted landfill site).
- All soils compacted as a result of construction activities must be ripped and profiled.
- It's highly recommended that litter traps are installed at all storm water outlets as to minimise litter from entering the stream. These will need to be cleaned out in accordance with a regular maintenance programme.
- Regular maintenance and checking of the infrastructure must however take place over the lifespan of the project.
- Rehabilitation and re-vegetation (using indigenous to the area species) with indigenous hydrophilic plant species must be implemented.

10.5.2.4 Spread of Alien invasive species

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • Routine maintenance inspections. • Vegetation rehabilitation – on-going during the lifespan of the project. 	<ul style="list-style-type: none"> • Infestation of alien vegetation post construction poses an ecological threat as they alter habitat structure, lower biodiversity, change nutrient cycling and productivity, and modify food webs. • Increased water usage. • Destruction of indigenous species; increased flammable biomass with high fire intensity and erosion; clogging of waterways such as small streams and drainage channels causing decreased stream flows and incision of stream beds and banks. • Overall impact on the hydrological functioning of the system.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Proliferation of alien invasive vegetation species	5	5	2	6	65 High	3	2	1	2	15 Low
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- An alien invasive management programme has been incorporated into an Environmental Management Programme attached in **Appendix F**.
- Ongoing alien plant control must be undertaken post construction and particularly in the disturbed areas as these areas could quickly be colonised by invasive alien species.

- Herbicides must be carefully applied, to prevent any chemicals from entering the river. This must be handled with an approved contractor with the expertise.
- Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas as soon as practically possible once construction ceases to stabilise against erosion and sedimentation.
- All disturbed soils must be rehabilitated with local plant species to ensure that alien vegetation does not invade the area.
- All areas disturbed after the completion of the construction activities must be rehabilitated to an acceptable state and must be monitored afterwards to prevent these areas from being colonised by alien invasive species.

10.5.3 Potential environmental impacts and Mitigation Measures during the decommissioning phase

Activity / Issue	Nature of potential impact
<ul style="list-style-type: none"> • De-commissioning of the existing storm water pipes, culvert, and road. 	<ul style="list-style-type: none"> • Physical disturbance of soil. • Disposal criteria.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Disposal management criteria	5	3	2	6	55 High	4	2	3	6	44 Medium
Nature / Status	Negative impact on the environment					Negative impact on the environment				

Mitigation Measures –

- Prior to decommissioning of structures and road material, effective and safe disposal requirements must be identified.
- Any specific requirements to prevent pollution during decommissioning of infrastructure must be identified prior to the commencement of the demolition activities.
- All items removed must be carefully transported and neatly placed in the designated lay down area on the site.
- Pipes, other structures, and construction material that can be reused must be identified prior to disposal so as to minimise the amount of material going to the landfill site.
- All pipes / structures removed that can be reused may be given to the local municipality.
- All mechanical equipment, piping, electrical equipment, cabling must be carefully removed from the structures to avoid undue damage.
- Should there be no identified reuse options then all decommissioned pipes / structures must be disposed of at a nearest suitably licensed facility.
- Methods for reducing and managing waste e.g., recycling, use of biodegradable material etc. should be considered.

10.5.4 Potential Positive Environmental Impacts and Mitigation Measures during Construction Phase

10.5.4.1 Creation of temporary employment of local labour

Through the need of a local workforce for the upgrading of Road D1867, people from around the Belgrade, Oranjedal and Tobolsk area have the opportunity to be employed during the construction phase.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Creation of temporary employment of local labour	5	2	2	6	50 Medium	5	2	2	8	60 High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- To ensure benefit to local community members a preferential procurement policy for employment of local community members (including women) must be established at the start of the project. This must be established in conjunction with the Ward Councillor or a designated Community Liaison Officer (CLO).
- Employment must be managed by selecting employees according to an electronic selection system supported or used by the local municipalities that ensures recruitment from local, impacted communities. This must ensure a fair recruitment process.
- An Employment Equity Plan must be drafted to provide equal job opportunities. Employment preference must be provided to the local residents.
- Attention must be paid to employment opportunities for women and disabled persons.
- In addition to appropriate HR policies and procedures, a labour desk/employment committee must be established to manage and implement labour recruitment policies. This must ensure that recruitment is done in a fair and transparent way, and that job creation opportunities are maximised.
- Provide clear and realistic information regarding employment opportunities and other benefits for local communities in order to prevent unrealistic expectations.

10.5.4.2 Community Empowerment and contribution to Local and Regional Businesses

Empowerment of the local community members living in the area. Local sourcing should be encouraged and recognise the environmental advantages gained, in the form of reduced transportation emissions, by using material and products that are sourced within close proximity.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Community Empowerment and contribution to Local and Regional Businesses	5	2	2	6	50 Medium	4	4	2	8	56 High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- To ensure benefit to local community members a preferential procurement policy for employment of local community members must be established at the start of the project.
- The Proponent must ensure that, as far as reasonably practicable, local suppliers are used. Moreover, local suppliers and SMMEs must be invited to list their businesses on a database managed by the local municipalities.
- Maximising the purchase of materials and equipment from local suppliers.
- The Proponent is encouraged to invest in the surrounding affected communities and wards and specially to stimulate and/or support the development of SMMEs.

10.5.4.3 Skills Training and Development

The short-term employment will lead to long term skills development. The upgrade of Road D1867 project should elevate skills levels and provide needed skills training to a large labour force who is currently unskilled to semi-skilled through the provision of the National Youth Service (NYS) programme to be awarded on this project by KZN DOT.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Skills Training and Development	5	2	2	6	50 Medium	5	3	2	8	65 High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- Provide an opportunity for skills development for local community members.
- There is a strong possibility that the local residents might not have the skills required to perform the work needed. It is, therefore, advised that the Proponent initiates programmes aimed at ensuring that a number of local residents are provided with appropriate education and skills training to allow them to perform the work needed, through a community programme mechanism, are afforded the opportunities and access to further education.
- Skills development and training programmes to assist unskilled workers employed during the construction phase in setting themselves up as SMMEs, or to be in a better position to seek employment in other sectors, once the road construction is completed.
- Sufficient skills and further training opportunities must be created for several reasons. The first is that this must be seen by the Proponent as an investment for future construction- or maintenancerelated work in the area. Training local youth members in becoming familiar with the work required would allow the residents to apply for similar positions elsewhere too. It should also ensure that, for future maintenance work required, the Proponent has a steady local labour supply. Another reason is that more local skilled residents could be absorbed, reducing the need for expats from other areas.

10.5.4.4 Removal of Alien Vegetation

Removal of alien vegetation which is a threat to water security as they consume hundreds of litres of water per day and destroy indigenous vegetation by impacting on the ecological integrity of an area, during the construction period would control future impacts and improve the current conditions.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Removal of Alien Vegetation	5	2	3	6	55 High	5	2	3	8	65 High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- A monitoring programme must be implemented to enforce the continual eradication of alien invasive species during the construction phase. See EMPr attached in Appendix F for the invasive alien plant control plan.

10.5.5 Potential Positive Environmental Impacts and Mitigation Measures during Operational Phase

10.5.5.1 Improved road infrastructure

Through the upgrading of the road the community will continue to have improved access to service delivery in the area.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Improved road infrastructure	5	2	3	6	55 High	5	4	2	10	80 Very High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- All the recommendations and objectives outlined in the in the national, regional, or local development frameworks related to the proposed road upgrade project need to be analysed and implemented.
- Road D1867 must be inspected regularly to ensure that any faults are reported and repaired.
- Road D1867 maintenance must occur to ensure that the service delivery is maintained.

10.5.5.2 Improved road safety

It is anticipated that the proposed upgrade will improve road safety in comparison to the current condition safety levels during operation of the Road D1867.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Improved road safety	5	2	3	6	55 High	5	4	2	8	70 Very High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- The design speed on the Road D1867 is 60km/h.
- Installation of speed reducing measures (rumble strips).
- Barriers along most of the steep area section of the Road D1867.
- Road warning signs.
- Maintenance programme to undertake road repairs and clear debris on stormwater infrastructure.
- As the existing bridge will not be removed following construction of the new bridge as farmers in the surrounding area will be utilising the old bridge as a means of crossing for their livestock. Bollards must be constructed in this old bridge approaches to prevent vehicular traffic to gain access to this old bridge.

10.5.5.3 Reduced dust pollution

Once the road has been hard topped, dust emitted into the area and surrounding residential properties and on the vegetation will be reduced if not eliminated.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Improved road safety	4	4	2	8	56 High	5	4	3	8	75 Very High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- The road design be adjusted where possible to accommodate with particularly sensitive vegetation.
- The Local Municipalities in conjunction with the KZN DOT, will need to implement a carefully designed management plan for the road and road reserve up Road D1867.
- A rehabilitation plan and a monitoring programme have been developed and included in the EMPr attached as Appendix F. This must be implemented during the operational activities.

10.5.5.4 Improved stormwater management control

Improved stormwater management will prevent extreme erosion along the route and potential sedimentation of the downstream river and impact to aquatic habitat.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Improved stormwater management control	5	3	2	8	65 High	5	4	3	10	85 Very High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- The road and associated storm water management must be inspected once every six months for the first 3 years and thereafter once a year to ensure that any faults with the road is reported and repaired.
- Road maintenance must occur in order to ensure that the road is maintained.
- Any reports regarding storm water management damages or deterioration of the road must be addressed as soon as practicably possible to ensure that the positive impact created is maintained.
- An effective stormwater management plan must be designed and implemented during the operation phase, to control significant changes in hydrology to receiving aquatic systems.

10.5.5.5 Improved Travel Conditions with reduced traveling time

The proposed upgrading of the Road D1867 could positively impact on road users, improving the quality of the trip as well as reducing the traveling time while reducing inconvenience and delays.

Significance rating

Impact	Without mitigation					With mitigation				
	Probability	Duration	Extent	Magnitude	Rating	Probability	Duration	Extent	Magnitude	Rating
Improved Travel Conditions with reduced traveling time	5	2	3	6	55 High	5	4	3	8	75 Very High
Nature / Status	Positive impact on the environment					Positive impact on the environment				

On-going Recommendations –

- Continuous investment in road maintenance once the RoadD1867 has been upgraded.

SECTION F: ENVIRONMENTAL IMPACT STATEMENT

11. ENVIRONMENTAL IMPACT STATEMENT

11.1 Summary of impact

Table 33 below provides an assessment of the proposed Road D1867 upgrade activities. The comparative assessment below considers the impact assessment and mitigation provided in Section 10.5.1.1 to Section 10.5.4.3.

Table 33: Summary of impact ratings of the preferred alternative

IMPACTS	WITHOUT MITIGATION	WITH MITIGATION
Potential Negative Environmental Impacts during the Construction Phase		
Biophysical Environmental Impacts		
Impact on Topography and Geology	60 High	32 Medium
Soil Erosion and Sedimentation	30 Medium	8 Negligible
Hydrological and drainage impact	56 High	48 Medium
Biological Environmental Impacts		
Loss of freshwater habitat and biota	24 Medium	18 Low
Degradation of freshwater habitat	44 Medium	18 Low
Loss of Grassland	60 High	40 Medium
Loss of Bushveld	60 High	40 Medium
Loss of Wetland Vegetation	60 High	40 Medium
Loss of flora SCC	48 Medium	6 Negligible
Fragmentation and edge effects	15 Low	2 Negligible
Soil and Surface Water Pollution Impact	30 Medium	8 Negligible
Loss of fauna SCC	14 Low	2 Negligible
Proliferation of alien invasive vegetation	65 High	15 Low
Social Environmental Impacts		
Noise Pollution	50 Medium	40 Medium
Elevated dust level	45 Medium	21 Low
Impact on graves and burial site	85 Very High	48 Medium
Impact on structures of potential importance to members of the Shembe community	36 Medium	16 Low

IMPACTS	WITHOUT MITIGATION	WITH MITIGATION
Road safety & Traffic issues	40 Medium	15 Low
Potential Positive Environmental Impacts during the Construction Phase		
Creation of temporary employment of local labour	50 Medium	60 High
Community Empowerment and Contribution to Local and Regional Businesses	50 Medium	56 High
Skills Training and Development	50 Medium	65 High
Removal of alien vegetation	55 High	65 High
Potential Negative Environmental Impacts During the Operation Phase		
Increased impervious area (Hardened surfaces)	56 Medium	36 Medium
Degradation of freshwater habitat	36 Medium	8 Negligible
Pollution of soil and water resources	18 Low	2 Negligible
Spread of Alien invasive species	65 High	15 Low
Potential Positive Environmental Impacts during the Operation Phase		
Improved road infrastructure	55 High	80 Very High
Improved road safety	55 High	70 Very High
Improved travel conditions with reduced traveling time	55 High	75 Very High
Reduced dust pollution	56 High	75 Very High
Improved stormwater management control	65 High	85 Very High
Potential Negative Environmental Impacts During the decommissioning Phase		
Disposal management criteria	55 High	44 Medium

11.2 Environmental Impact Statement

The overall significance of positive socioeconomic and environmental impacts is beneficial as it should improve access for road users (motorists and pedestrians); improved road safety, increase mobility, reduce travel times, reduce dust pollution, address erosion risks, sedimentation, and pollution of the lower reaches of the river and curbing consequential environmental degradation, if the Road D1867 goes into its operational implementation phase.

Taking into consideration the specialist assessments done during the BA process and the recommendations thereof, the assessment of environmental impacts in this Draft BAR and provided mitigation measures contained in the EMP, the positive impacts of the proposed Road D1867 upgrade project is enhanced, and the negative ones will be avoided or minimised through the implementation of the EMP attached as **Appendix F**. The mitigation measures stated in the EMP must be rigorously implemented, this will further reduce the impacts of construction activities.

The key findings of this Draft BAR and specialist studies conducted are as follows:

- ✓ As per the desktop Paleontological Impact Assessment, according to the geology, there is little likelihood of any vertebrate fossils being found within this area. Impact is **low** and no mitigation required.
- ✓ As per the Phase 1 Heritage Impact Assessment, the proposed road upgrade triggers section 41 (1)(a) of the KwaZulu-Natal AMAFA and Research Institute Act (Act No 5 of 2018) and section 38 (1)(a) of the National Heritage Resources Act (Act No 25 of 1999). The proposed realignment of the road across the Mozana River could impact / damage a burial site. The proposed deviation will have a **very high** impact on the graves, as assessed. This can be reduced to a **medium** impact if the graves are secured, fenced with a 5 m buffer, and well protected from activities related to the road upgrade in such a way that they are not damaged during the construction of the deviation. The relocation of graves must be considered as the last resort if the risk of damage or destruction to the graves is **very high**.

A temporary wooden structure was found close to the road. The house is used by Shembe followers when they come to the area to worship. It is situated within 6m of the road and could be impacted by the upgrade of the D1867. It is recommended that, in discussion with the Shembe leaders in the community, the temporary Shembe structure be moved away from the road and that the immovable structure is protected by a buffer to avoid damage to it during the upgrade of the road.

The proposed borrow pit sites were found to have been previously mined. Due to the highly disturbed nature of the sites, no heritage resources were found therefore, any of the sites can be utilised. The upgrade of the Road D1867 may proceed from a heritage perspective provided the recommendations and mitigation measures provided in this report, and the heritage report attached as **Appendix D4** and included in the EMPr attached as **Appendix F** are implemented and adhered to.

- ✓ For the ecological habitat assessment, vegetation of the study site is described by Mucina and Rutherford as Ithala Quartzite Sourveld, and KaNgwane Montane Grassland. The site falls within a National Protected Areas Expansion Strategy Focus Area and passes through Vulnerable Threatened Ecosystems as well as Optimal Critical Biodiversity Areas (CBA). The vegetation of the study site forms three vegetation communities, grassland, bushveld, and riparian vegetation. Overall, 32 species were recorded from the site, with three Species of Conservation Concern (SCC) recorded.

Overall impacts (Loss of Grassland, Bushveld, Riparian Vegetation, flora SCC, and fauna SCC, and fragmentation and edge effects: including invasion of alien species) are **high to low**, with mitigation measures resulting in the reduction to either **medium** or **negligible**.

- ✓ As per the Wetland Habitat Assessment, the assessment flagged three (3) of six (6) wetland units as being at risk of being impacted by the proposed upgrade of the Road D1867. Infield delineated wetland units at risk of being impacted include two unchanneled valley bottom wetlands (Unit UCVB1 and UCVB2) and a seep wetland (Unit S1). It is worth noting that the existing D1867 Road crosses Wetland Unit UCVB2. The results of the PES assessment indicated that Wetland Units UCVB1 and UCVB2 were **moderately modified (C PES Class)** and Wetland Unit S1 **largely natural (B PES Class)**.

Key impacts were identified as poor veld management, overgrazing, and trampling of wetland vegetation and erosion of the wetland habitat. In terms of providing ecosystem services, all 3 wetlands were assessed as providing most regulating and supporting benefits at a moderate level and providing all provisioning and cultural benefits at a low level. In terms of their Ecological Importance and Sensitivity (EIS), Wetland Unit UCVB2 was assessed as being of **high** EIS whilst Units UCVB1 and S1 were assessed as being of **moderate** EIS.

Impacts likely to result from upgrade of the D1867 Road were grouped into the following broad categories for ease of assessment in terms of impact significance (a) loss of aquatic habitat and biota, (b) degradation of aquatic habitat and (c) water & soil pollution were identified as being likely to occur during construction and operational phase of the project. The significance assessment results indicate that without mitigation,

both the construction and operational phases of the development will have a “**medium** impact significance” on the aquatic environment and its biota. If best practice mitigation measures implemented, both the construction and operational phases of the development will have a reduced impact significance of “**low**” and “**negligible**,” respectively.

The risk level of the proposed upgrade of the D1867 Road under a poor mitigation scenario was assessed as being **Moderate**. The risk level is driven largely by the expected disturbance and degradation of the wetland habitat during both the construction and operational phase of the project. Best practice mitigation measures (as recommended in this report and Wetland report attached as **Appendix D2**) will reduce the risk level of the project to **Low**. The **low** risk level means the proposed upgrade of the D1867 Road qualifies for authorisation under the provisions of the General Authorisation (GA), provided recommended mitigation measures and special conditions provided in this report and Wetland report attached as **Appendix D2** and included in the EMPr attached as **Appendix F** are adhered to.

- ✓ As per the Aquatic Habitat Assessment, five (5) riverine / stream units were identified as likely receivers of impacts from the proposed road upgrade and borrow pit use as the proposed road upgrade will cross these watercourses which will necessitate the likely upgrade of existing culverts as well as the construction of a new bridge across the Mozana River. The Mozana River (unit R02) was classified as an upper foothills river, river units R03 and R04 were classified as transitional rivers whilst units S02 and S03 were classified as mountain headwater streams.

The Intermediate Habitat Integrity Assessment (IHIA) of the units found that the ratings of the units ranged from **natural (PES A)** to **moderately modified (PES C)** whilst the EIS of the units ranged from **High** for unit R02 to **moderately low / low** for the remainder of the units. Existing impacts to these units were limited although erosion was an issue at certain units due to lack of stormwater drainage infrastructure and poorly designed and implemented culvert infrastructure. It is imperative that special consideration is given to ensuring that erosion is adequately mitigated onsite as certain areas downstream of the existing road been severely degraded by erosion due to poor culvert implementation and stormwater drainage controls.

Biotope availability within the units was **fair to good**, MIRAI categories indicated that the macroinvertebrate community in the study area is in a **moderately to largely modified state (Class C/D)** whilst the fish community structure was found to be in a **largely modified state (Class D)**. The water quality within the Mozana River was assessed as being **largely good** with slightly elevated levels of free ammonia.

The impacts (habitat disturbance, soil erosion and sedimentation, pollution of water resources and soil including proliferation of invasive alien plants) associated with the road upgrade and bridge construction will be **high to low** without mitigation, however, the majority of these impacts can be reduced to **low/negligible** in the case that the specialist mitigation measures provided in the Aquatic report attached as **Appendix D3** and included in the EMPr attached as **Appendix F** are adhered to. However, the direct habitat disturbance will be **medium** even with the best practice mitigation as riparian and instream habitat will be lost due to infilling associated with the construction of the bridge. And the DWS risk assessment associated with the construction and operation of the proposed road upgrade (including a new bridge construction and borrow pit use) were assessed as being ‘**low**’ to ‘**moderate**’ for riverine and stream units onsite. The proposed project will therefore require a full Water Use License.

In the case that the application of best practice mitigation is implemented to ensure the potential impacts to the watercourses are reduced as far as possible, it is the opinion of the aquatic specialist that no fatal flaws are applicable to the proposed road upgrade in terms of potential impacts to the riverine and aquatic environment.

11.3 Comparison of Alternatives

KZN DOT proposes to continue with Phase two (2) of the upgrading of the existing Road D1867 from km 6+000 to km 16+900. Road D1867 Phase 1 upgrade from Km 0+000 at the T-junction with National Road N2 to km 6+000 has already been completed to a formal blacktop surfaced with formalised stormwater control.

Road D1867 from Km 6+000 to Km 16+900 for approximately 10+900 Km in length forms part of Phase two (2). This section of the road alignment is characterised by shallow cuts, sharp bends, steep gradients, and is in a poor condition. The road is also adversely affected by inclement weather conditions creating potholes and slippery conditions. The mountainous terrain from Km 7+000 to Km 8+000 of this route section has no guardrail. In addition, at sharp bends and steep gradients; some deformation to the shape of the road has occurred on the gravel surface rendering the route unsafe for use especially for vehicular traffic. The existing road drainage system is unable to cope with the high intensity storm water runoff of water on steep gradients, which results in areas adjacent to the road being eroded, excessive scour and evidence of washaways, undercutting and gravel loss.

The eroded gravel eventually deposits in the Mozana River which flows down the valley, resulting in sedimentation and pollution of the lower reaches of the river and when the velocity of the river slows and it also affects fish breeding and in stream habitat negatively, thereby impacting aquatic biodiversity.

The existing single lane bridge under the Mpumalanga Province section is very old, and the bridge structure has deteriorated to such a degree that significant maintenance is required to keep the bridge in service. In addition, the existing one lane bridge is functionally deficient as it's widths do not satisfy the current KZN DOT standards considering the amount of traffic that utilises the bridge.

In view of the importance of the route, KZN DOT realised the need to construct a new bridge and continue with Phase 2 upgrade of the road to provide for a new, high-level, two-lane bridge with sidewalks and improved surfaced road and stormwater runoff control. It is possible that the upgrade of the road and construction of the new bridge over the Mozana River may present the opportunity to now mitigate some of the abovementioned existing impacts.

The Project Core Team has considered six alternatives Road D1867 upgrade scenarios, which range from retaining the status quo to making minor improvements to the drainage to the upgrading from gravel to blacktop of the entire road alignment including construction of the new bridge. Each alternative was assessed based on a variety of aspects, such as the impact on the sensitive environment, geographical, physical, biological, social, economic, heritage and cultural aspects, road safety and spatial configuration.

1. **Alternative 1A:** The No-Go Alternative or the option of not implementing the activity.
2. **Alternative 1B:** Closure of the section of Road D1867 from KM 6+000 to KM 16+900.
3. **Alternative 2:** Re-gravel, minor drainage improvements, maintenance and retain existing one-lane bridge.
4. **Alternative 3:** Improve geometrics, upgrade drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900.
5. **Alternative 4:** Improve geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900.
6. **Alternative 5 (Preferred alternative):** Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900

The No-Go Alternative 1A retains the current status quo where the Road D1867 is retained as a gravel road, with the existing one-lane bridge. It has been noted that this alternative is not feasible in terms of addressing the current environmental degradation and safety issues on the Road D1867. Without effectively upgrading the Road D1867, the road is likely to continue degrading to a state where the environmental degradation and safety risks becomes a fatal flow and will have to be closed leading to **Alternative 1B**.

The complete closure (**Alternative 1B**) from KM 6+000 to KM 16+900 would have significant economic, trade and social impact for the local communities as they rely on the Road D1867 for trade and travel between home and

work. Therefore, retaining the status quo condition of the Road D1867 (**Alternative 1A** and **Alternative 1B**) is unfeasible for biophysical, economic, and social reasons.

Alternative 2, which involves re-graveling, improvements of minor drainage, maintenance and retaining existing the one-lane bridge. along the remaining length of the Road D1867 from KM 6+000 to KM 16+900 is not favoured by the Proponent, KZN DOT. The road will remain a gravel surface and will be maintained regularly, however, the current deteriorating condition of the old existing single lane bridge will continue to be a problem and unsafe for public use. Degradation of the road will continue as the cause of a formalised stormwater drainage control and the erosion has not been effectively addressed. Furthermore, maintenance costs associated with a gravel road are higher than that of a hard surfaced road and are not sustainable in the long term. Further assessment of **Alternative 2** reflects that many of the other potential opportunities, such as economic and social upliftment, and environmental cannot be achieved as the road surface will still limit accessibility.

Alternative 3: involves Improving geometrics, upgrading drainage, retain existing one-lane bridge and hard surface from KM 6+000 to KM 16+900. this alternative is feasible in terms of addressing the current environmental degradation as a result of poor gravel road surface and lack of effective stormwater drainage on the Road D1867. Retaining the existing one-lane bridge will prolong the safety issues as the bridge structure has deteriorated to such a degree that significant maintenance is required just to keep the bridge in service,

Alternative 4: involves improving geometrics, upgrade drainage, construct new bridge upstream, realignment and hard surface from KM 6+000 to KM 16+900. This alternative will meet any of the objectives of the proposed project. However, it will have a very significant impact to some graves and burial site as result of the new alignment.

Alternative 5 is the Proponent's preferred proposed site activities to meet the project's objectives, and involves improving geometrics, upgrading the drainage, constructing the new bridge further upstream, realignment and hard surface blacktop from KM 6+000 to KM 16+900. as in **Alternatives 3** and **4**. The major purpose for laying a hard surface and improving the stormwater drainage is to address the current poor condition of the gravel surface and the deteriorating condition of the existing single lane bridge.

Alternative 5 offers the highest levels of biophysical, cultural, and environmental benefits of all the alternatives, as the hard surface, in conjunction with the upgraded stormwater infrastructure and new bridge, will manage water movement most effectively, minimise erosion from the road and the surrounding environment, and minimise the subsequent discharge of the eroded materials into the Mozana River. This is one of the major objectives of the project – to minimise and prevent, where possible, the continued erosion and degradation of the Road D1867 and surrounding environment. In addition, the potential impact or damage to some graves and burial site is avoided as a result of road realignment and construction of the new bridge.

The preferred design of the activity consists of replacing the existing one-lane bridge with a two-lane bridge constructed south of the existing bridge. Three (3) potential layout options have been proposed by KZN DOT:

- (i) **Option 1:** This alternative (preferred design scheme) comprises a continuous 4 span solid reinforced concrete slab deck.
- (ii) **Option 2:** This alternative comprises a simply supported 5 span precast beam and slab deck construction.
- (iii) **Option 3:** This alternative comprises a continuous 5 span solid slab deck, constructed from precast inverted T-shaped beams placed side by side and in-situ concrete infill and topping.

Although **Option 1** (preferred alternative design scheme) comprising a continuous 4 span solid reinforced concrete slab deck, may present a greater cost of materials, however, the support structure, are made to resist hogging bending moments. It has relatively large loading carrying capacity as compared to other alternative **Option 1** and **Option 2**. It reduces the height of fill and consequently the cost of the approaches and the cost of substructure due to lesser height of piers and abutments which again reduces the cost of the foundation. Due to the reduction in the width of pier, less obstruction to flow and as such possibility of less scour.

Option 2: which comprises a simply supported 5 span precast beam and slab deck construction may present some advantages such as it is cost-effective, saves construction time, provides a safe construction working platform and where an improved quality assurance construction can be performed. However, they present some limitations. It does have less loading carrying capacity as compared to **Option 1:** Continuous 4 span solid reinforced concrete slab deck. Beam and slab bridge construction have a relatively poor load distribution property. This can be improved by providing one or more transverse beams or diaphragms within the span. And in bridges built with precast beams, forming these intermediate diaphragms is extremely inconvenient and therefore expensive. Further, it presents transportation cost and issue including handling difficulties.

Option 3: which comprises a continuous 5 span solid slab deck, constructed from precast inverted T-shaped beams placed side by side and in-situ concrete infill and topping are useful in almost any location. The bridge deck system utilises high-quality, factory-made beams that can be quickly erected on site and with minimum interruptions to traffic. However, they present some limitations with the width of the deck span and there are limited placement options available. They do not offer a lot of flexibility. The maintenance costs are very high and are not sustainable in the long term.

SECTION G: PROPOSED MONITORING, CONTROL AND AUDITING

12. PROPOSED MONITORING, CONTROL AND AUDITING

The below section details how identified impacts and mitigation will be monitored and/or audited of all phases of the project:

Construction phase:

- The NEMA (Act 107 of 1998) requires that an environmental management programme (EMPr) be submitted where an EIA must be utilised as the basis for a decision on an application for Environmental Authorisation.
- An EMPr has been compiled for this application and has been attached in **Appendix F**. This EMPr is fundamental to the BA process and must ensure that commitments given at a project's planning and assessment stage are effectively implemented through the construction, operation, and decommissioning stage.
- Copies of the EA EMPr, WUL and other environmental approval documents must be kept in the onsite environmental file. The file must be made available for inspection by DFFE, EDTEA, DARDLEA and any other relevant authorities.
- The following monitoring and auditing strategies are recommended for the proposed upgrading of Road D1867:
 - An experienced and independent Environmental Control Officer (ECO) must be appointed by the Applicant/Proponent prior to commencement of any construction activities to ensure that the environmental conditions are implemented and that compliance with the provisions of the EMPr attached in **Appendix F** are implemented by the Engineer and appointed Contractor.
 - The ECO must ensure that all mitigation measures are implemented, and effective rehabilitation undertaken. The site mitigation and rehabilitation measures must be achieved.
 - The ECO is to be on site twice a month – once for site visit or project progress meeting and once for auditing.
 - The ECO must conduct basic environmental awareness training with all personal employed by the appointed contractors to work on the sites before the commencement of construction/site establishment activities.
 - The ECO must be able to make recommendations on the ground as the project unfolds and possible new aspects are noted.
 - One (1) Environmental audit report must be submitted to the relevant DFFE Compliance Control Environmental Officer: Compliance Monitoring and Enforcement (CME) Component every month during construction.

- An invasive alien control programme must be implemented to prevent the further spread of these species as per the legislative requirements specified under the CARA, 1983 amended in 2001 and the NEMBA (Act No, 10 of 2004).

Post-construction and rehabilitation

- Invasive Alien Programme (IAP) must be undertaken at least post-construction after activities completion to ensure that alien plants are actively managed and eradicated from the site.
- Storm water control measures must be implemented and monitored to ensure water running off from the upgraded facilities do not cause erosion to the surrounding environment.
- The first post construction inspection must be conducted upon hand-over, and must be conducted jointly by the Municipality staff, project manager, ECO, and engineers responsible for design. The second inspection must take place 12 months after hand over, to assess:
 - the extent to which natural re-growth is possible; If vegetation coverage is not adequate at completion the site should not be accepted.
 - the erosion resulting from the preceding season, taking into consideration the amount of rainfall.
 - the need for additional erosion protection or re-vegetation; and
 - On completion of construction activities, a post construction phase audit must be conducted to ensure the rehabilitation efforts have been implemented. This audit must be conducted one month after construction and rehabilitation work has been completed.
- An aquatic biomonitring survey which includes an assessment of water quality, habitat, SASS5 and fish must be conducted within one month after the construction of the bridge within the Mozana River to determine the impacts, if any, and implement adaptive management, if required.

Operational phase

- The Applicant/Proponent is required to ensure that follow up assessments for six (6) months post construction are undertaken by an ECO, to determine the success of the re-vegetation process and to check the condition of the banks around the project site during the operation and signing off where no erosion has been observed for one (1) year during operation.
- An annual environmental audit report for the first three (3) years, must be submitted to the DFFE to ascertain the effectiveness of the rehabilitation plans and monitor the operation of the Road D1867
- An annual environmental audit report for the first three (3) years, must be submitted to the DFFE to ascertain the effectiveness of the rehabilitation plans and monitor the operation of the Road D1867.

SECTION H: CONCLUSION AND EAP'S RECOMMENDATION

13. CONCLUSION AND EAP'S RECOMMENDATION

It is in the opinion of the EAP that **Alternative 5 (Preferred alternative): Improve geometrics, upgrade drainage, construct new bridge further upstream, realignment and hard surface from KM 6+000 to KM 16+900 and Option 1: (preferred design scheme) comprising a continuous 4 span solid reinforced concrete slab deck** be authorised by DFFE for the following reasons:

- The Basic Assessment identified that excessive erosion and scouring and evidence of washaways, undercutting and gravel loss on the Road D1867 due to poor storm water runoff control and surface condition has been taking place for many years and has caused significant damage to not only the Road D1867 but to the terrestrial and aquatic (rivers and wetlands) environments adjacent to, and linked with, the Road D1867. With reduced erosion, sedimentation of the rivers will decrease significantly, and the health of the river system will improve. Undertaking the proposed upgrade would specifically address and remedy key environmental problem areas through engineered solutions.

- A hard surface blacktop road on steep gradient will reduce the amount of sediment run-off and erosion, thereby protecting rivers from siltation to some degree. In addition, reduced dust pollution.
- Implementing **Preferred Alternative 5** and **preferred design scheme Option 1** as proposed would not only ensure protection of the environment into the long term but would also remedy such existing environmental impacts on the Road D1867 through the implementation of engineered measures to control erosion and scour along the Road D1867 and reduce the sedimentation of the downstream watercourse. Wetland Unit UCVB2 is an unchanneled valley bottom wetland unit at Km 15.520 that has been eroded due to concentration of flows by the existing culvert which is very narrow. The implementation of engineered measures by installing a much wider six (6) stormwater culverts 50m long and 15 m wide with rockfill under the road will rectify this problem, by preventing the water being cut off from the wetland so that flows are not concentrated but ideally spread-out over the width of the wetland unit.
- The potential impact or damage to some graves and burial site is avoided because of the road realignment and construction of the new bridge being moved further upstream of the existing bridge.
- The continuous deck (**Option 1: preferred scheme**) is statically indeterminate structure, and the sections at intermediate supports resist hogging bending moments, resulting in the reduction of the sagging bending moment near midspan sections. The continuous span bridge deck has relatively large loading carrying capacity as compared to simple supported decks of similar span length. Due to the reduction in the width of pier, it presents a higher environmental benefit as it provides less obstruction to water flow and as such possibility of less scour.

In addition to the environmental benefits, it is anticipated that the provision of an all-weather road through the Road D1867 will have several anticipated socio-economic benefits, namely:

- The improved condition of the road and bridge will be safer for motorists.
- Improved access to the area between the community of Belgrade, Oranjedal and Tobolsk
- Reduced cost of travel.
- Travel times and distances will be considerably reduced,
- The road upgrade will reduce inconvenience and delays while providing increased vehicular traffic efficiency and pedestrian safety.
- The benefit to the community will increase with a hard surfaced road.

Based on the balance of social, economic, and environmental considerations, the impacts that will be caused by the proposed upgrading of Road D1867 are within acceptable limits of change, as long as the appropriate mitigation measures outlined in this report and the site specific EMPr attached in **Appendix F** are effectively implemented.

The following conditions should form part of the Environmental Authorisation should a positive decision be granted by the Competent Authority/ies:

- Financial provision must be set aside prior to construction commencing for the implementation of the EMPr attached in **Appendix F** for the rehabilitation of the disturbed ecosystems after completion of construction activities including monitoring, auditing and maintenance during construction and operational phase of the proposed project.
- The Applicant/Proponent must appoint an independent and suitably experienced ECO for the construction and rehabilitation phases of the development to ensure compliance with the provision of the EMPr and for auditing purpose.
- Cognisance and compliance must be taken of the recommended mitigation and rehabilitation measures in the Specialist Geotechnical report, Wetland Habitat Assessment Report, Aquatic Assessment Report and Ecological Impact Assessment report (See reports attached in **Appendix D**) including all the mitigation measures recommended in this report and the site specific EMPr.
- All parties involved in the construction and ongoing maintenance of the Road D1867, and associated infrastructures (including contractors, engineers, and administrators) are, in terms of NEMA's "Duty of

Care” and “Remediation of Damage” requirements (Section 28), required to prevent any pollution or degradation of the environment, be responsible for preventing impacts occurring, continuing or recurring and for the costs of repair of the environment.

- Municipal water pipeline and Eskom powerlines servitude and clearance requirements must be agreed to in writing prior to construction commencing. Details of any agreed relocations or temporary disruptions in service must be submitted to the competent authority.
- Removal of alien invasive plants must occur with specific follow-up control measures, and reclamation and management of soil erosion along the proposed project site (this is an ongoing requirement in terms of National Legislation).
- Surrounding landowners, business owners and I&APs must be notified of the start of the construction phase as well as the progress of the various phases of the project in order for them to make the necessary arrangements.
- All work to be done within the wetland habitat and river must be carried out at a time of low flow conditions (winter to early spring).
- The road and bridge working servitude must be clearly demarcated to ensure that no excessive intrusion of vehicles into any other riparian or instream areas, or additional unnecessary clearing activities takes place. The working servitude must be no wider than 10m either side of the provided alignment. Areas outside of the demarcated work servitude should be considered no-go areas for the duration of the project
- The culvert at Km 15.520 crossing the unchanneled valley bottom wetland unit (UCVB2) must span a minimum of 50m across the width of the wetland. The culvert must not create any significant discontinuities in the water profile. Its size and placement must not cause ponding upstream.
- All stormwater discharges into the terrestrial environment must be attenuated at discharge points prior. Such attenuation infrastructure must ideally be located at least 30m away from any delineated watercourse.
- Vegetated swales/side drains must be used to convey stormwater rather than concrete lined channels or V-drains.
- Prior to commencement of construction, the construction footprint within Wetland Unit UCVB2 must be demarcated using wooden pegs and an orange safety net. The fence must be maintained throughout the construction phase.
- Prior to commencement of construction, a silt fence / curtain must be installed downstream of the construction footprint but within Wetland Unit UCVB2.
- Prior to commencing with earthworks, the topsoil must be stripped and stockpiled separately from subsoil.
- Fuel must be stored in a bunded structure with a roof. The bund must be able to contain at least 110% of the volumes of fuel.
- All invasive alien plants must be removed from the construction area.
- A walk through of the full site must be conducted by the Ecological specialist and ECO prior to the construction activities commencing to determine the presence and identity of any protected plants or trees and the relevant permits applied for.
- A buffer of 5m must be placed around the graves so that the graves are not impacted by the road works. The buffer must be fenced, and no construction activities may take place within the buffer. If graves are damaged, then the Institute must be informed, work must stop in the immediate area and the damaged graves must be repaired under supervision of a heritage specialist and the Institute.
- If relocation of the graves is to take place, then application to the MPHRA must be undertaken according to the relevant regulations.
- A buffer of 5m must be placed between the structures of potential importance to members of the Shembe community and the road works to avoid damage to them during the upgrade.
- Erosion control measures must be implemented in areas sensitive to erosion such as near water supply points, edges of slopes, etc. These measures include but are not limited to - the use of sand bags, geotextiles such as soil cells which are used in the protection of slopes, hessian sheets, silt fences and retention or replacement of vegetation.

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15. LIST OF APPENDICES

Appendix A: MAPS

Appendix A.1: Locality map showing boundary of KZN and Mpumalanga Province

Appendix A.2: Topographical Map

Appendix A.3: Vegetation Map

Appendix A.4: Quaternary catchment and drainage setting map

Appendix A5: NFEPA Wetland Map

Appendix A.6: KZN Biodiversity Spatial Planning Map

Appendix A.7: Threatened Ecosystem Map

Appendix A.7: Vegetation Type Map

Appendix A.8: Protected Areas and NPAES Focus Areas Map

Appendix A.9: Important Bird Areas Map

Appendix A.10: Wetland and river delineation and classification map

Appendix A.11: Watercourse Overview Map

Appendix B: SITE PHOTOGRAPHS

Appendix C1: FACILITY ILLUSTRATIONS

Appendix C1: Road Layouts

Appendix C2: Bridge Layout

Appendix D: SPECIALIST REPORTS

Appendix D1: Ecological Habitat Assessment

Appendix D2: Wetland Habitat Assessment

Appendix D3: Aquatic Ecological Assessment

Appendix D4: Phase 1 Heritage Impact Assessment

Appendix D5: Desktop Palaeontological Impact Assessment

Appendix D6: Geotechnical Investigation

Appendix D7: Stormwater Management Plan

Appendix D8: Inception Report

Appendix D9: Construction Method Statement for the road

Appendix D10: Bridge Design Report

Appendix D11: Method Statement for Mozana River Bridge

Appendix D12: National Environmental Screening Tool Report

Appendix E: PUBLIC PARTICIPATION

Appendix E1: I&AP Register

Appendix E2: Authority Consultations - Minutes of the pre-application meeting with DFFE / DWS

Appendix E3: Proof of consultation with landowners – Consent Letters / Attendance Register

Appendix E4: Copy BID for the upgrade of Road D1867

Appendix E5: Proof of circulation of BID and DBAR

Appendix E6: Comment received during the circulation of BID and DBAR

Appendix E7: Copy of the English and isiZulu flyers and site notice

Appendix E8: Pictures showing the erection of site notices

Appendix E9: Pictures showing the distribution of flyers

Appendix E10: Copy of attendance register of consultation with local residents

Appendix E11: Proof of advert

Appendix E12: Comments and responses report

Appendix F: DRAFT Environmental Management Programme (EMPR)

Appendix G: Other Information

Appendix G1: CV of EAPs / Specialists and Qualification