





Prepared for:
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ENVIRONMENTAL SERVICES FOR THE IMPROVEMENT OF NATIONAL ROAD N11 SECTION 11 FROM GROBLERSDAL (KM 0.00) TO MARBLE HALL (KM 29.50)

BASIC ASSESSMENT REPORT (2022-04-0029)

DRAFT REPORT
REVISION 00

JULY 2023

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RECORD OF REVISIONS

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EXECUTIVE SUMMARY

CinfraTec Consulting Engineers (Pty) Ltd has appointed Delta Built Environment Consultants (Delta BEC) on behalf of the South African National Roads Agency SOC Limited to acquire the Environmental Authorisation (via the Basic Assessment process), and General Authorisation for the proposed new bridge downstream of Bridge B1050, and improvements to Major Culvert C010, and Major Culvert C011. Environmental Authorisation (via the Basic Assessment process) will also be acquired for a Mining Permit for two proposed Borrow Pits less than 5 ha for the proposed project. This improvement project is situated on the National Road N11 Section 11 from Groblersdal (km 0.00) to Marble Hall (km 29.50).

The objective of this project is to relieve congestion to acceptable levels of service, improve road safety, and provide adequate pavement capacity for the design period.

The scope of work for the proposed project is as follows:

- Bridge B1050
  - New bridge downstream of the existing bridge (Width: 14.4 m, Length: 69 m).
  - No demolishing.
- Major Culvert C010
  - Extension of headwall with minor additional fill.
  - No demolishing.
- Major Culvert C011
  - Widening on both sides with new slab over existing culvert.
  - Additional fill to be 4 m deep.
  - Only the wing walls to be demolished.

Using the Department of Forestry, Fisheries, and the Environment (DFFE) Screening Tool, a Screening Assessment was conducted to identify the environmental sensitivities and subsequent specialist studies that may be required for this project. These specialists were confirmed by the DFFE during the pre-application meeting. The screening assessment was only conducted for the areas surrounding Bridge B1050, Major Culvert C010, and Major Culvert C011. All works within the road reserve do not require any environmental authorisation as per the EIA Regulation, 2014 (as amended), and therefore were omitted.

The proposed project entails the improvement of an existing portion of National Road N11 Section 11 from Groblersdal to Marble Hall, and associated infrastructure, along its current alignment. No location/site alternatives could thus be considered as it will be within the road reserve. In effect, this will have less of an impact on the environment when compared to the construction of a new road outside of the current footprint.

The preferred alternative, GD OPTION 2B, is to improve the existing road to be safe for a design speed and a posted speed of at least 100 km/h for both the horizontal- and vertical alignments. However, with the future upgrade to 120 km/h in mind, the design parameters for 120 km/h have been applied to the alignments where it could be done without encroaching on the existing road reserve. The cross-section will also be improved to the SANRAL Standard Cross-section for >3 000 vpd with 3.0 m wide surfaced shoulders. This alternative will also include climbing/passing lanes and an undivided 4-lane road between

Groblersdal and Masakaneng Township and also between the D2535 intersection to Bronkhorstspruit and Marble Hall to improve the level of service. The cross-section of the road through Groblersdal town from km 1.600 to km 4.100 will be retained.

It is also proposed to provide walkways between Groblersdal and Masakaneng Township and to restrict the posted speed to 80 km/h for this specific road section. The existing intersections on the road will be improved and access issues along the road will also be resolved. Approximately 20 ha of additional land will be required to accommodate the improved intersections and accesses. The Level of Service (LOS) of this option will improve and be adequate for the year 2054.

The bridge (B1050) needs widening and is significantly undersized from a hydraulic point of view. Under geometric Option 1, where no adjustment to the vertical and horizontal alignment is made, the bridge needs to be widened on both sides. This would leave the bridge under capacity from a hydraulic point of view and is therefore not recommended. For geometric Option 2 (preferred) and 3, a new 4-span bridge is proposed due to the new alignment and hydraulic capacity.

Culvert C010 is long enough that for geometric Options 1, 2 (preferred) and 3, no lengthening will be required. Only minor raising of the headwall would need to be done on both sides for Option 1, 2 (preferred) and 3. However, the structure needs to be widened in terms of hydraulic capacity; three additional 1.2 m x 0.9 m cells need to be added on the side of the culvert. The structure will need to be lengthened under geometric Option 4.

Culvert C011 is long enough that for geometric Option 1, no lengthening of the structure is required. It might need lateral support in the top portion of the headwall to accommodate the additional load for Option 1. However, it will need to be lengthened for geometric Options 2 (preferred), 3 and 4 on the up/downstream side of the culvert. Retaining walls will also be required to prevent encroachment over the cadastral boundary. A concrete slab supported on piles spanning over the existing structure is proposed to accommodate the additional loads on the existing structure. The new culvert will be constructed alongside the existing structure and joined by drilling and doweling into the existing foundation slab.

The quantitative impact assessment of the activities and perceived impacts assumed to occur within the construction phase of the proposed development are outlined in this report. Recommended mitigation and/or rehabilitation measures that must be implemented to ensure that the post-mitigation impact significance scores are also presented herein. These measures will be included in the project specific EMPr document.

The heritage study identified that no surveys have occurred near the study area, except for two at the southern culvert (Major Culvert C010). Other reports that were conducted previously have recorded several Middle Stone Age artefacts at the Groblersdal Airfield and also noted several historical buildings at southern Groblersdal. The field survey that was undertaken on 7 September 2022 by the specialist revealed that the bridge (B1050) and two Major Culverts (C010 and C011) are undated and appear to be less than 60 years of age. The proposed study area is in an area of low or no palaeontological sensitivity.

Based on the terrestrial biodiversity study, a total of 247 individual species were recorded, with the following plant families being most prominent: (Asteraceae (Daisy Family) – 21 species (no endemic species); Fabaceae (Pea Family) – 41 species (1 endemic species which is Near Threatened (NT)); and Poaceae (Grass Family) – 38 species (1 endemic species). No plant Species of Conservation Concern (SCC) or protected plant species were observed within the study area.

The terrestrial biodiversity impact assessment found that the proposed development is likely to have a "medium" impact on the surrounding terrestrial environment prior to the application of mitigation measures. It is envisioned that through the careful application of mitigation measures, the proposed development is likely to have a far more reduced average impact significance of "low", with the highest post-mitigation impact being the proliferation of alien invasive plant species. It was determined that the present vegetation communities are, however, likely to respond well to rehabilitation, which will encourage any displaced fauna to return to the study area once the upgrades have been completed by the Contractor. Although vegetation clearance, and loss of natural habitat will be unavoidable, the application of rehabilitation within the study area will enable the project to achieve a "no net-loss in biodiversity" status without any need for offsetting residual impacts. Possible impacts to Critical Biodiversity Areas (CBAs) were noted, and according to the Limpopo Conservation Plan: Technical Report, this land should remain in its current state or improved. However, as this is an "upgrade project" over an existing national roadway, the specialist is of the opinion that these upgrades should be permissible and are required to improve drainage in the three (3) affected watercourses, thus improving connectivity and natural flow.

The aquatic study identified that there were three watercourses at high risk of being impacted by the proposed project and these watercourses are: hillslope seepage wetland at Major Culvert C010, B channel stream at Major Culvert C011, and B channel stream at Bridge B1050. The activities within the upstream catchment area such as extensive agricultural and linear activities have altered the natural condition of the area feeding flow to the at-risk watercourses. The Ecological Importance and Sensitivity (EIS) of the at-risk watercourses varied depending on the type and condition of the system, its location within important conservation areas (i.e., Critical Biodiversity Areas (CBAs), threatened vegetation types, Freshwater Ecosystem Priority Area (FEPA) Catchments) and the potential of the watercourses to provide Ecosystem Services (ESS). The wetlands were perceived to provide very limited ESS given their small size, isolated location and low demand for ESS.

The aquatic study determined that the majority of the perceived risks present a 'Low' risk of impact to the receiving watercourses. Two (2) aspects were determined to present a 'Moderate' risk of impact to water resources pre-mitigation. These are inclusive of 'bulk earthworks, clearing and disturbance of vegetation and human activities in the vicinity of watercourse habitats (e.g.: infilling activities, widening of headwalls and slabs) and bulk earthworks, clearing and disturbance of vegetation and human activities in the vicinity of watercourse habitats (e.g.: construction of new bridge)'. Although the impacts were perceived to present a 'Moderate' risk of impact, the 'Moderate risk' could be mitigated to 'Low' if the mitigation measures highlighted by the specialist are strictly followed.

Based on the studies conducted by the relevant specialists and the assessment conducted by the EAP for the proposed project, it was noted that this project will not have any long-term negative impacts on the environmental features but may have some short-term impacts which can be easily mitigated using the conditions set out in the EMPr. It is noted that the development of this project is needed for the safety of road users and future demand.

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GLOSSARY OF TERMS AND ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
DWS	Department of Water and Sanitation
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Environmental Importance and Sensitivity
EMPr	Environmental Management Programme report
ESA	Ecological Support Area
GA	General Authorisation
GNR	Government Notice Regulations
HDPE	High-density Polyethylene
I&AP	Interested & Affected Parties
IDP	Integrated Development Programme
NEMA	National Environmental Management Act,1998 (Act No.107 of 1998)
NWA	National Water Act ,1998 (Act No.36 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
PES	Present Ecological Sensitivity
PPP	Public Participation Process
RE	Resident Engineer
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SANRAL	South African National Roads Agency SOC Limited
SANS	South African National Standards
SABS	South African Bureau of Standards
SCC	Special Conservation Concern
TOPS	Threatened or Protected Species
WULA	Water Use License Application

1 INTRODUCTION

1.1 PROJECT TITLE

The Improvement of National Road N11 Section 11 from Groblersdal (km 0.00) to Marble Hall (km 29.5).

1.2 INTRODUCTION

Delta Built Environment Consultants (Delta BEC) has been appointed by CinfraTec Consulting Engineers on behalf of the South African National Roads Agency SOC Limited (SANRAL) for the subservice of managing the environmental process and monitoring environmental compliance during construction for the improvement of National Road N11 Section 11 from Groblersdal (km 0.00) to Marble Hall (km 29.5).

As per GNR 326 of the Environmental Impact Assessment (EIA) Regulations (2014, as amended on April 2017), a Basic Assessment (BA) Process must be undertaken in such a manner that the environmental outcomes, impacts, and residual risks of the proposed Listed Activities being applied for are noted in the BA Report and assessed accordingly by the Environmental Assessment Practitioner (EAP). In this regard, the requirements of the BA Process are noted in the EIA Regulations (2014, as amended on April 2017), Listing Notice 1 & 3, Appendix 1 of GNR 326 and are consequently adhered to in this report.

1.3 PURPOSE OF REPORT

The Basic Assessment Report (BAR) has been prepared in compliance with Government Notice Regulations (GNR 326) promulgated in terms of Section 24(5) of NEMA (Act No. 107 of 1998). The Basic Assessment Process is to provide the Competent Authority, the Department of Forestry, Fisheries and the Environment (DFFE), with adequate information to make an informed decision on the Application. The BAR has been prepared according to the structure set out in Appendix 1 of the EIA Regulations, 2014 as amended in 2017. This Draft BAR will be circulated to all relevant state departments and registered Interested & Affected Parties (I&APs) for the legislated 30-day commenting period. Thereafter, all comments received by the EAP will be addressed and incorporated into the Final BAR.

1.4 SUMMARY OF AUTHORISATION REQUIREMENTS

The Environmental Impact Assessment (EIA) Regulations, 2014 (as amended), promulgated in terms of Chapter 5 of NEMA, provide for the control of certain listed activities. Such activities are prohibited from commencing until written authorisation is obtained from the competent authority, which, in this case, is the

DFFE. The proposed project triggers the need for a BA process to be undertaken for the DFFE to consider granting or refusing Environmental Authorisation (EA).

Registration of water uses in terms of the National Water Act, 1998 (No. 36 of 1998; NWA) is also required where the proposed works cross drainage lines and if water supply is required from a water resource other than municipal supply. The supply of water for construction is unconfirmed at this stage. If boreholes or surface water sources with lawful rights or municipal water supply cannot be obtained, then an application in terms of Section 21(a) of the NWA must be submitted to the Department of Water and Sanitation (DWS) by the appointed construction contractor. Applications for Section 21(c) and Section 21(i) water uses have been submitted to the DWS on behalf of SANRAL for "impeding or diverting the flow of water in a watercourse" and "altering the bed, banks, course or characteristics of a watercourse".

Section 38 of the National Heritage Resources Act, 1999 (NHRA) requires a Notice of Intent to Develop (NID) to be submitted to the Limpopo Heritage Resources Authority. This legislation provides for the establishment of a provincial heritage resources authority to manage provincial and local heritage resources.

1.5 LOCALITY OF THE PROPOSED PROJECT

The project is located on National Road N11 Section 11 from Groblersdal (km 0.00) Elias Motsoaledi Local Municipality to Marble Hall (km 29.50) Ephraim Mogale Local Municipality in Limpopo Province.

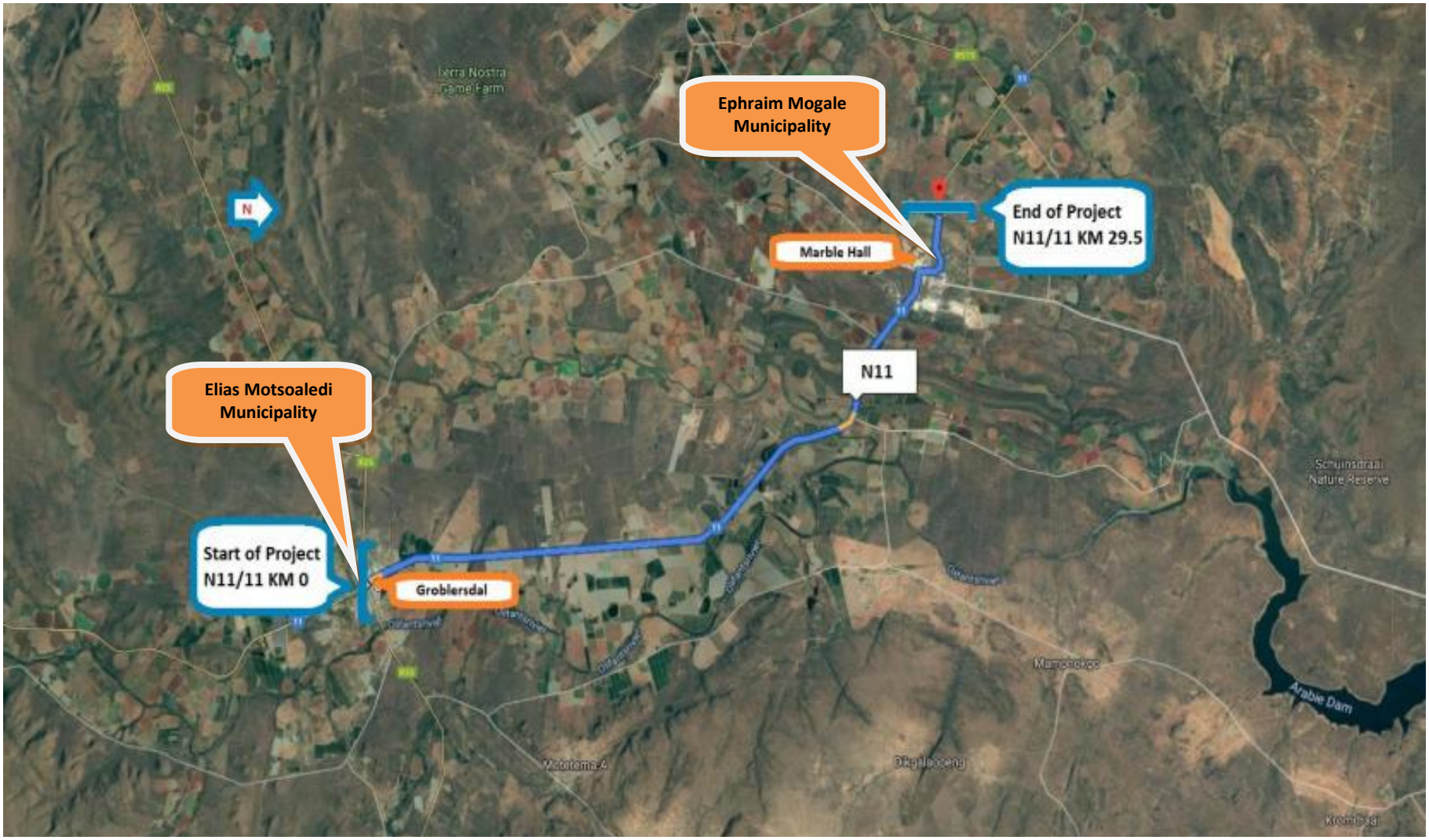

Figure 1-1: Locality Map with all affected Local Municipality

1.6 STRUCTURE OF REPORT

This Report has been drafted in accordance with the EIA Regulations (2014, as amended) and adheres to the requirements contained in Appendix 1 of GNR 326, as noted in Table 1.

Table 1-1 Contents of the BAR (2014 EIA Regulations, as amended)

2014 EIA REGULATIONS	DESCRIPTION OF EIA REGULATIONS REQUIREMENTS FOR BA REPORTS	LOCATION IN THE BAR
Appendix 1, Section 3 (a)	Details of –	
	The EAP who prepared the report; and the expertise of the EAP; and The expertise of the EAP, including a curriculum vitae.	Section 2.3 Appendix I3
Appendix 1, Section 3 (b)	The location of the activity, including – The 21-digit Surveyor General code of each cadastral land parcel; Where available, the physical address and farm name; Where the required information in items (i) and (ii) is not available, coordinates of the boundary of the property or properties	Section 3.3 and 3.4
Appendix 1, Section 3 (c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is – A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Section 3.3 Appendix A
Appendix 1, Section 3 (d)	A description of the scope of the proposed activity, including – All listed and specified activities triggered; A description of the activities to be undertaken, including associated structures and infrastructure.	Section 2.4.5 and 3.5 Appendix B
Appendix 1, Section 3 (e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Section 2.1
Appendix 1, Section 3 (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.	Section 4.5 Appendix K
Appendix 1, Section 3 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including-	Section 3.5.1
	Details of all alternatives considered;	Section 3.5
	Details of the Public Participation Process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 5 Appendix F
	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Appendix F2 and F4
	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural	Section 4 (4.1, 4.2, 4.3, 4.4

2014 EIA REGULATIONS	DESCRIPTION OF EIA REGULATIONS REQUIREMENTS FOR BA REPORTS	LOCATION IN THE BAR
	aspects;	4.6)
	The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which the impacts- (aa) Can be reversed; (bb) May cause irreplaceable loss of resources; and (cc) Can be avoided, managed, or mitigated.	Section 6.2
	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 6.1
	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographic, physical, biological, social, economic, heritage and cultural aspects;	Section 6.2
	The possible mitigation measures that could be applied and level of residual risk;	Section 6.2.4
	The outcome of the site selection matrix;	
	If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and;	N/A
	A concluding statement indicating the preferred alternatives, including preferred location of the activity.	Section 3.5.1
Appendix 1, Section 3 (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including- A description of all environmental issues and risks that were identified during the environmental impact assessment process; and 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.	Section 6.1
Appendix 1, Section 3 (j)	An assessment of each identified potentially significant impact and risk, including- Cumulative impacts; The nature, significance and consequences of the impact and risk; The extent and duration of the impact and risk; The probability of the impact and risk occurring; The degree to which the impact and risk can be reversed; The degree to which the impact and risk may cause irreplaceable loss of resources; and The degree to which the impact and risk can be avoided, managed or mitigated.	Section 6.2
Appendix 1, Section 3 (k)	Where applicable, a summary of the findings and impact management measures identified in 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 report.	Section 4.6

2014 EIA REGULATIONS	DESCRIPTION OF EIA REGULATIONS REQUIREMENTS FOR BA REPORTS	LOCATION IN THE BAR
Appendix 1, Section 3 (l)	An environmental impact statement which contains- A summary of the key findings of the environmental impact assessment; A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 4.6
Appendix 1, Section 3 (m)	Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr.	Section 6.2.4
Appendix 1, Section 3 (n)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	Section 7.1.2.1
Appendix 1, Section 3 (o)	A description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	-
Appendix 1, Section 3 (p)	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 7.2
Appendix 1, Section 3 (q)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised.	Section 7.2
Appendix 1, Section 3 (r)	An undertaking under oath or affirmation by the EAP in relation to- The correctness of the information provided in the report; The inclusion of the comments and inputs from stakeholders and interested and affected parties; the inclusion of inputs and recommendations from the specialist reports where relevant; and Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	Appendix I4 and F2, Section 7.1
Appendix 1, Section 3 (s)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	-
Appendix 1, Section 3 (t)	Where applicable, any specific information required by the Competent Authority.	-
Appendix 1, Section 3 (u)	Any other matter required in terms of section 24(4) (a) and (b) of the Act.	-

2 APPROACH AND METHODOLOGY

This chapter outlines the key legislative requirements applicable to the BA process, describes the objectives of the study, presents details of the BA process undertaken and describes the way forward.

2.1 APPLICABLE LEGISLATION, POLICIES, AND/OR GUIDELINES

To ensure that the proposed improvement of the National Road N11 Section 11 from Groblersdal (km 0.00) to Marble Hall (km 29.50) is developed in an environmentally responsible manner, there are a number of environmental legislation and guidelines that need to be taken into account that are applicable to this project. These include:

2.1.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT NO. 108, 1996)

The project falls within the boundaries of South Africa. The Constitution of the Republic of South Africa has major implications for environmental management.

The main effects are the protection of environmental and property rights, and the change brought about by the sections dealing with administrative law, such as access to information, just administrative action and broadening of the locus standing of litigants. These aspects provide general and overarching support and are of major assistance in the effective implementation of the environmental management principles and structures of the NEMA. Section 24 in the Bill of Rights of the Constitution specifically states that:

Everyone has the right -

- To an environment that is not harmful to their health or well-being
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -
    - Prevents pollution and ecological degradation.
    - Promotes conservation; and
    - Secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

2.1.2 NEMA AND THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS (2014)

The EIA Regulations, 2014, promulgated under NEMA (1998), focuses primarily on creating a framework for co-operative environmental governance. NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by State Departments and to provide for matters connected therewith. The proposed project triggers Listed Activities as stipulated in the EIA Regulations

(2014, as amended), promulgated in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA), as amended on 07 April 2017. Therefore, the applicant is required to obtain an Environmental Authorisation (EA) by way of a BA process.

2.1.3 NATIONAL HERITAGE RESOURCES ACT (ACT NO. 25, 1999)

This Act legislates the necessity for a cultural and heritage impact assessment in areas earmarked for development that exceed 0.5 hectares (ha) and where linear developments (including roads) exceed 300 m in length. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the Limpopo Heritage Resources Authority (LIHRA) and the Provincial Heritage Resources Authority.

2.1.4 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT NO. 10, 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed. This Act is applicable to this application for environmental authorisation as it requires the project applicant to consider the protection and management of local biodiversity.

2.1.5 NATIONAL WATER ACT (ACT NO. 36, 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected, as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed, and controlled in responsible ways. Of specific importance to this application is Section 19 of the NWA, which states that an owner of land, a person in control of land or a person who occupies or uses the land which thereby causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing, or recurring and must, therefore, comply with any prescribed waste standard or management practices.

2.2 WASTE, EFFLUENT, EMISSIONS, AND NOISE MANAGEMENT

2.2.1 SOLID WASTE MANAGEMENT

Will the activity produce solid construction waste during the construction/initiation phase?	**YES** **X**	**NO**

If YES, what estimated quantity will be produced per month?	**TBD**	
How will the construction solid waste be disposed of?		
All solid waste accumulated during construction will be kept in designated areas/construction campsite and disposed of by the contractor at the registered local landfill site. The contractor must provide the competent authority with disposal certificates from a registered landfill site during construction.		
Where will the construction solid waste be disposed of?		
Marble Hall or Groblersdal Landfill site		
Will the activity produce solid waste during its operational phase?	**YES**	**NO** **X**
If YES, what estimated quantity will be produced per month?	**N/A**	
Can any part of the solid waste be classified as hazardous in terms of the NEM: WA?	**YES**	**NO** **X**
Is the activity that is being applied for a solid waste handling or treatment facility?	**YES**	**NO** **X**

2.2.2 LIQUID EFFLUENT

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	**YES**	**NO** X
Will the activity produce effluent that will be treated and/or disposed of at another facility?	**YES**	**NO** X

2.2.3 EMISSIONS INTO THE ATMOSPHERE

Will the activity release emissions into the atmosphere other than exhaust emissions and dust associated with construction phase activities?	**YES**	**NO** **X**
If YES, is it controlled by any legislation of any sphere of government?	**YES**	**NO** **X**

2.2.4 GENERATION OF NOISE

Will the activity generate noise?	**YES** **X**	**NO**
If YES, is it controlled by any legislation of any sphere of government?	**YES** **X**	**NO**
Describe the noise in terms of type and level:		
• Noise will be generated during the construction phase only (from operating machinery, generators, etc.). The level of the noise generated will be minimal and below the 75 decibels threshold limit. • Noise levels are to be kept within the legislated limits for the area, in accordance with the requirements of the relevant national and local noise control statutes.		

- No noise will be generated during the operational phase other than by the existing traffic; therefore, the impact is temporary in nature and can be minimised with effective monitoring to establish any irregular spikes which will then have to be managed. These spikes may include faulty machinery or vehicles which will require servicing or silencers.

2.2.5 WATER USE

Municipal X	Water board	Groundwater	**River, stream, dam or lake** **X**	**Other** **X** **Wetlands within 500 m and construction within the 1:100-year floodline**	The activity will not use water
A water use Authorisation application is currently being lodged with the Department of Water & Sanitation for water uses 21 (c), & (i). Both applications will run concurrently.					

2.3 DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

2.3.1 DETAILS OF THE PROJECT TEAM

Table 2-1: Details of EAP

DETAILS OF EAP ORGANISATION			
Organisation	Delta Built Environment Consultant		
Postal Address	Delta Built Environment Consultants (Pty) Ltd P.O. Box 35703 Menlo Park 0102		
Tel No.	012 368 1850		
Fax No.	012 348 4738		
NAME	**QUALIFICATIONS**	**PROFESSIONAL REGISTRATIONS**	**TASKS AND ROLES**
Neelan Maduray	BSc Hons Environmental Monitoring & Modelling	EAPASA (2022/4882) SACNASP (131274)	Project Manager
Deborah Weldon	MSc Environmental Biology	EAPASA (2019/639) SACNASP (121210)	Project Reviewer

2.3.2 QUALIFICATIONS AND EXPERIENCE OF THE EAPS

2.3.2.1 Neelan Maduray

Neelan completed a BSc (Honours) Environmental Monitoring & Modelling degree at the University of South Africa in 2019 and is currently registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (131274). Neelan has completed courses and training for ISO14001:2015 EMS Internal Auditor, Integrated Environmental Management (IEM), Water Use Licence Applications (WULAs), Environmental Management, Environmental Legislation and Regulations, and Environmental Assessment.

Neelan has a great understanding of the environmental assessment processes in South Africa and all the relevant legislations and regulations. He has experience in environmental auditing, and compiling basic assessments, scoping and environmental impact assessments, ESIAs, mining permits, environmental management programmes and undertaking water use licence applications and conducting comprehensive screening for proposed developments. He has project managed a multitude of environmental projects throughout their life cycles

2.3.2.2 Deborah Weldon

Deborah is a registered Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (Ref. 2019/639) and a registered Professional Natural Scientist with the South African Council for Natural Scientific Professions (Ref. 121210). She has been in the environmental management field for over 22 years, working on small-scale developments through to large infrastructure (transport, water, and power) and manufacturing projects.

She has participated in the full project life-cycle, from conceptual, pre-feasibility and feasibility stages through to conducting Environmental & Social Impact Assessments (ESIAs) and, finally, to environmental compliance monitoring and auditing during construction. During the conceptual to feasibility stages, her involvement included the development of environmental and social design criteria, identification of environmental risks (“red flags”) and initial stakeholder identification and engagement. Deborah has managed basic environmental assessments through to full ESIAs involving numerous specialist studies and iterative interaction with project design teams. She has worked as both an environmental control officer (ECO) and an Environmental Manager overseeing ECOs for large-scale construction projects, monitoring multiple contractors’ compliance to environmental permits and approved Environmental & Social Management Plans (ESMPs).

Deborah has also acted as lender’s technical advisor, conducting the environmental and social due diligence for projects seeking international finance. She has worked on projects in Cameroon, Ghana, Indonesia, Kenya, Lesotho,

Liberia, Namibia, Nigeria, Malawi, Mozambique, South Africa, Swaziland and Tanzania.

2.4 BASIC ASSESSMENT PROCESS

2.4.1 OBJECTIVES

In accordance with Appendix 1 of the EIA Regulations, 2014 (as amended), the objectives of the BA process are to:

- Identify the relevant policies and legislation relevant to the activity and determine how the activity complies with and responds to the policy and legislative context.
- Present the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location.
- Identify and confirm the preferred activity, technology, and sites related to the project proposal.
- Undertake an impact assessment, inclusive of cumulative impacts, to determine the biophysical and socio-economic sensitivity of the project sites and assess the nature, significance, consequence, extent, duration and probability of impacts occurring.
- Assess the degree to which impacts can be reversed, may cause irreplaceable loss of resources, and can be avoided, managed or mitigated.
- Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of residual risks that need to be managed and monitored.

The BA process consists of a series of steps to ensure compliance with these objectives and the EIA Regulations, 2014, as set out in GN No. R 982 (as amended by GN No. 326). The process involves an open, participatory approach to ensure that all potential impacts are identified, and that decision-making takes place in an informed, transparent and accountable manner.

2.4.2 SCREENING ASSESSMENT

Using the Department of Forestry, Fisheries, and the Environment (DFFE) Screening Tool, a Screening Assessment had to be conducted to identify the environmental sensitivities and subsequent specialist studies that may be required for this project. These specialist studies have been confirmed with the DFFE during the pre-application meeting. The screening assessment was only conducted for the areas surrounding Bridge B1050, Major Culvert C010, and Major Culvert C011 locations, as highlighted in the table below. All works within the road reserve do not require any environmental authorisation as per the EIA Regulation, 2014, and therefore it was omitted.

The summary of identified environmental sensitivities are provided in the respective tables below:

Bridge B1050

Table 2-2: Summary of Sensitivities – Bridge B1050

THEME	VERY HIGH	HIGH	MEDIUM	LOW
Agricultural	X			
Animal Species			X	
Aquatic Biodiversity				X
Archaeological & Cultural Heritage				X
Civil Aviation		X		
Defence				X
Palaeontological			X	
Plant Species				X
Terrestrial Biodiversity	X			

Major Culvert C010

Table 2-3: Summary of Sensitivities – Major Culvert C010

THEME	VERY HIGH	HIGH	MEDIUM	LOW
Agricultural			X	
Animal Species			X	
Aquatic Biodiversity				X
Archaeological & Cultural Heritage				X
Civil Aviation		X		
Defence				X
Palaeontological			X	
Plant Species				X
Terrestrial Biodiversity				X

Major Culvert C011

Table 2-4: Summary of Sensitivities – Major Culvert C011

THEME	VERY HIGH	HIGH	MEDIUM	LOW
Agricultural			X	
Animal Species			X	
Aquatic Biodiversity				X
Archaeological & Cultural Heritage				X
Civil Aviation		X		

THEME	VERY HIGH	HIGH	MEDIUM	LOW
Defence				**X**
Palaeontological			**X**	
Plant Species				**X**
Terrestrial Biodiversity	**X**			

2.4.3 IDENTIFIED SPECIALIST STUDIES

After the screening assessment was conducted, the following list of specialists were identified as per the generated reports. The relevant specialists have been highlighted in Table 2-5 as per the opinion of the EAP.

Table 2-5: Potential Specialist Studies

SPECIALIST STUDY	RELEVANT TO APPLICATION
Agricultural Impact Assessment	×
Landscape/Visual Impact Assessment	×
Archaeological and Cultural Heritage Impact Assessment	✓
Palaeontological Impact Assessment	×
Terrestrial Biodiversity Impact Assessment	✓
Aquatic Biodiversity Impact Assessment, including: - Wetland delineation & Functionality Assessment (500m buffer) - Riparian Delineation and Assessment	✓
Noise Impact Assessment	×
Traffic Impact Assessment - A Traffic Management Plan will need to be prepared by the contractor prior to commencement of the construction phase.	✓
Geotechnical Assessment, including: - Geohydrological Assessment - Hydrological Assessment - Floodline Determination.	✓

2.4.4 WATER USE TRIGGERS

According to Section 21 of the National Water Act (Act 36 of 1998), an applicant must lodge an application to the responsible competent authority for water uses identified in the said Act. Section 21 identifies the following water uses:

a) taking water from a water resource
b) storing water
c) impeding or diverting the flow of water in a watercourse

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

The proposed development will trigger the need for a water use authorisation via the General Authorisation (GA) process due to the construction of the new bridge (downstream of Bridge B1050) and upgrade works to two major culverts (C010 and C011). The new bridge will cross the Moses River and the culverts are located within close proximity to wetlands. The DWS has confirmed all applicable water uses, as outlined in Table 2-6.

Table 2-6: Activities potentially requiring a GA

ACTIVITY NO (S):	SECTION 21 OF THE NATIONAL WATER ACT, ACT 36 OF 1998	APPLICABILITY TO PROPOSED PROJECT
(c)	Altering the bed, banks, and characteristics of a watercourse.	The construction of the new bridge and upgrades to the culverts will occur over the Moses River and in close proximity to wetlands, respectively.
(i)	Impeding or diverting the flow of water in a watercourse.	The construction of the new bridge and upgrades to the culverts will occur over the Moses River and in close proximity to wetlands, respectively.

2.4.5 DESCRIPTION OF LISTED AND SPECIFIED LISTED ACTIVITIES TRIGGERED

The Environmental Impact Regulations (2014), as amended in 2017, promulgated in terms of the National Environmental Management Act, 1998, identifies activities that would require environmental authorisations prior to the commencement of the proposed activity. The following listed activities in Government Notice (GNR 327 – Listing Notice 1) requiring a Basic Assessment (BA) process are applicable for the proposed project.

Table 2-7: Triggered Activity

ACT. NO.	ACTIVITY DESCRIPTION	RELEVANCE TO PROJECT
LISTING NOTICE 1		
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.	The upgrade works to the bridge and two culverts will involve some infilling and removal of more than 10 cubic metres of material from the respective watercourses.
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— i. where the existing reserve is wider than 13,5 meters; or ii. where no reserve exists, where the existing road is wider than 8 metres;	The road will be widened by 9.79m, where the new bridge will be.
LISTING NOTICE 3		
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 b. If no development has been adopted within 32 metres if a watercourse measured from the edge of a watercourse. **e. Limpopo** i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	The construction of the new bridge, next to the existing bridge, will have a physical footprint of more than 10 square metres (9.79m wide and 69m in length) and will be constructed across the Moses River which has been identified to be in a CBA1.
23	The expansion of (ii) infrastructure or structures with a physical footprint of 10 square metres or more; Where such expansion occurs – a. Within a watercourse a. If no development has been adopted within 32 metres if a watercourse measured from the edge of a watercourse. **e. Limpopo**	Major Culvert C010, which spans an unnamed stream, will be widened by 3.6m. Major Culvert C011, which spans an unnamed stream, will be lengthened by 18.2m.

	ii. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	

2.4.1 PRE-APPLICATION

2.4.1.1 DFFE Pre-Application Meeting

A pre-application meeting was held on 25 May 2022 with the DFFE via MS Teams. The objective of the pre-application meeting was to present the project to the Department and to confirm all listed activities pertaining to the development and specialist studies that will be pertinent to the application. Please refer to Appendix J for the minutes of the meeting.

2.4.1.2 DMRE Pre-Application Meeting

A pre-application meeting will be held with the DMRE to make them aware of the project initiation and receive guidance regarding the required specialists and public participation process for the borrow pits. Delta BEC will present the findings from the screening assessment which will highlight the key sensitivities identified during the desktop analysis. It is imperative that the locations of the proposed borrow pits be identified and finalised prior to any meeting with the DMRE, as they will require exact details of the borrow pits before providing their inputs.

2.4.1.3 DWS Pre-Application Meeting

A profile has been created on the DWS E-WULAAS portal which includes all the relevant information about the project. DWS will review and outline if they require any further information or studies for the application.

3 PROJECT DESCRIPTION

This chapter provides details of the applicant, presents a description of the proposed project and the affected properties, and provides information on the project alternatives considered.

3.1 APPLICANT DETAILS

The applicant details are provided in Table 3-1.

Table 3-1: Applicant Details

APPLICANT	South African National Roads Agency SOC Limited (SANRAL)
CONSULTANT	CinfraTec Engineers and Consultant
ADDRESS	CinfraTec Consulting Engineers (Pty) Ltd 7 Villa Karee Eldoglen Estates East Centurion 0157
CONTACT PERSON	Collin Naidoo
TEL	(082) 443 6509
EMAIL	collinn@cinfratec.co.za

3.2 DESCRIPTION OF THE PROPOSED PROJECT

CinfraTec Consulting Engineers (Pty) Ltd has appointed Delta BEC on behalf of the South African National Roads Agency SOC Limited to acquire the Environmental Authorisation (via the Basic Assessment process), and General Authorisation for the proposed new bridge downstream of Bridge B1050, and improvements to Major Culvert C010, and Major Culvert C011. Environmental Authorisation (via the Basic Assessment process) will also be acquired for a Mining Permit for two proposed Borrow Pits of less than 5 ha for the proposed project. This improvement project is situated on the National Road N11 Section 11 from Groblersdal (km 0.00) to Marble Hall (km 29.50).

The project is defined as an improvement project. The objective of this project is to relieve congestion to acceptable levels of service, improve road safety, and provide adequate pavement capacity for the design period.

Scope of Work

- Bridge B1050
  - New bridge downstream of the existing bridge (Width: 14.4 m, Length: 69 m).

  - Existing structure to be demolished.
- Major Culvert C010
  - Extension of headwall with minor additional fill.
  - No demolishing.
- Major Culvert C011
  - Widening on both sides with new slab over existing culvert.
  - Additional fill to be 4 m deep.
  - Only the wing walls to be demolished.

3.3 LOCATION EXTENT

The existing route is a single carriageway which traverses flat terrain. The total extent of this project's limits is 29.50 km and crosses two local municipalities, i.e., Motsoaledi Local Municipality and Mogale Local Municipality in Limpopo Province.

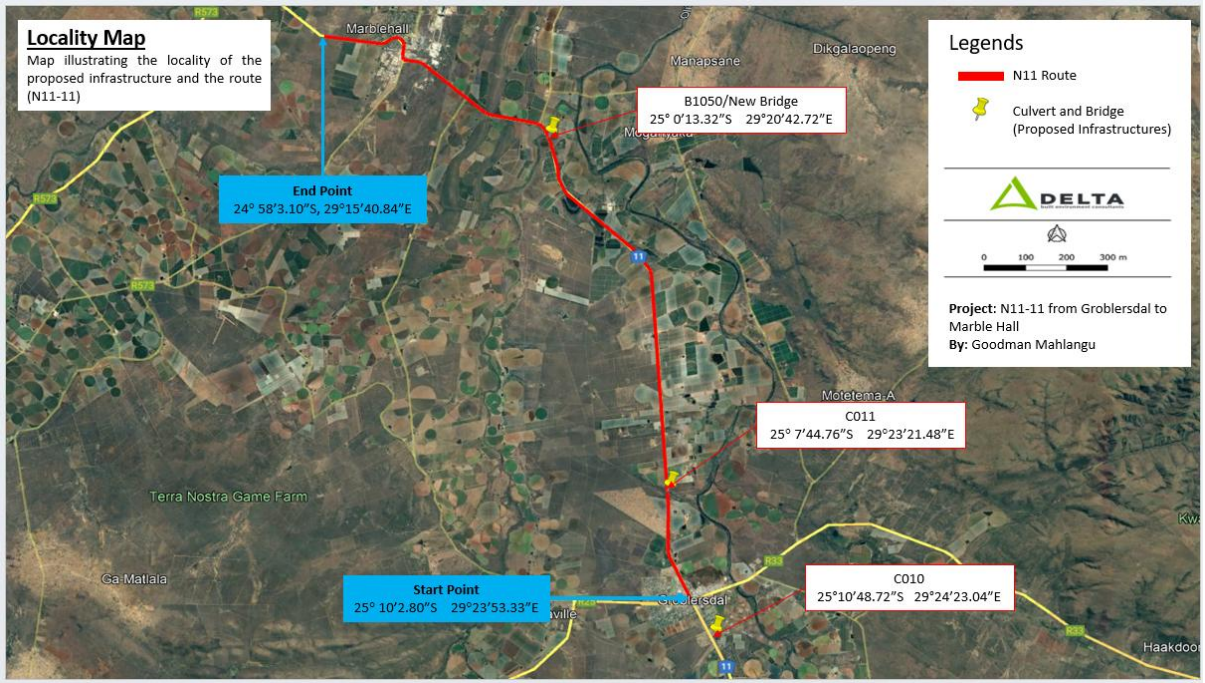

Figure 3-1: Locality Map

The co-ordinates of the start, middle and end points of the route as well as bridge and major culvert locations are presented in Table 3-2.

Table 3-2: Locations of Proposed Infrastructure

PROPOSED INFRASTRUCTURE CO-ORDINATES	LOCATION
Project Start Point	25° 10'2.80"S 29°23'53.33"E
Project End Point	24° 58'3.10"S 29°15'40.84"E
Bridge B1050/New Bridge	25° 0'13.32"S 29°20'42.72"E
Major Culvert C010	25°10'48.72"S 29°24'23.04"E
Major Culvert C011	25° 7'44.76"S 29°23'21.48"E

3.4 AFFECTED PROPOERTIES

The existing road is located in the centre of the existing road reserve that is predominantly 40m but narrows to 32m in certain sections. Additional land will be required for the 100km/h and 120km/h design speed options and some certain intersection improvements.

The additional land that might be required for the preferred design options (GD Option 2B) is 20ha

Table 3-3: Affected Properties

FARM NAME	PORTION/FARM NUMBER	21 digit SGID
Klipbank 26 JS	0	T0JS000000000026000000

3.5 PROJECT ALTERNATIVES

There are six geometric design alternatives for this project: Options 1, 2A, 2B, 3A, 3B, and 4.

3.5.1 LOCATION ALTERNATIVES

The proposed project entails the improvement of an existing road of National Road N11 Section 11 from Groblersdal to Marble Hall, and associated infrastructure, along its current alignment. No location/site alternatives could thus be considered as it will be within the existing road reserves. In effect, this would have less of an impact on the environment when compared to the construction of a new road outside the current footprint.

3.5.2 PREFERRED ALTERNATIVES

3.5.2.1 Road

The preferred alternative, GD OPTION 2B, is to improve the existing road to be safe for a design speed and a posted speed of at least 100 km/h for both the

horizontal- and vertical alignments. However, with the future upgrade to 120 km/h in mind, the design parameters for 120 km/h have been applied on the alignments where it can be done without encroaching on the existing road reserve. The cross-section will also be improved to the SANRAL Standard Cross-section for >3 000vpd with 3.0 m wide surfaced shoulders. This alternative will also include climbing/passing lanes and an undivided 4-lane road between Groblersdal and Masakaneng Township and also between the D2535 intersection to Bronkhorstspruit and Marble Hall to improve the level of service (LOS). The cross-section of the road through Groblersdal town from km 1.600 to km 4.100 will be retained.

It is also proposed to provide walkways between Groblersdal and Masakaneng Township and to restrict the posted speed to 80 km/h for this specific road section. The existing intersections on the road will be improved and access issues along the road will also be resolved. Approximately 20 ha of additional land will be required to accommodate the improved intersections and accesses. The LOS of this option will improve and be adequate to the year 2054.

3.5.2.2 Bridge – B1050 at km 22.8

This bridge comprises a 9.79 m wide 3 span drum deck. Each span is 11 m long and spans over the Moses River just upstream of the Olifants River confluence. The existing bridge consists of a reinforced concreted voided deck, two reinforced concrete piers, reinforced concrete abutments and wing walls, and has concrete parapets. Figure 3-2 illustrates the elevation of the bridge.

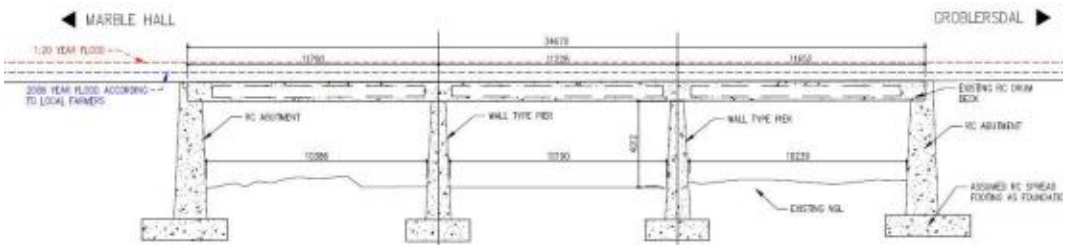

Figure 3-2: Elevation of Bridge B1050 at km 22.80

The bridge (B1050) is in need of widening and is significantly undersized from a hydraulic point of view. For geometric Option 2 (preferred) and 3, a new 4 span bridge is proposed due to the new alignment and hydraulic capacity.

Table 3-4: Details of new proposed bridge at km 22.8

NEW BRIDGE	DECK WIDTH (M)	DIMENSION DETAILS
Geometric Option 2 & 3	9.79	New 4 span bridge 69m in length 14.2m wide

3.5.2.3 Major Culvert – C010 at km 1.38

This major culvert spans over an unnamed stream and comprises a 6 cell 1.2 x 0.9 m precast concrete culvert that is 17.2 m long. The ends of the culvert consist

of reinforced concrete wing walls and apron slabs. The fill over the culvert is 1.25 m. Figure 3-3 represents the long section of the structure as per the structural survey conducted.

Culvert C010 is long enough, that for geometric Options 1, 2 (preferred) and 3 no lengthening will be required. Only minor raising of the headwall would need to be done on both sides for Option 1, 2 (preferred) and 3. However, the structure needs to be widened in terms of hydraulic capacity, three additional 1.2 m x 0.9 m cells need to be added on the side of the culvert. The structure will need to be lengthened under geometric Option 4.

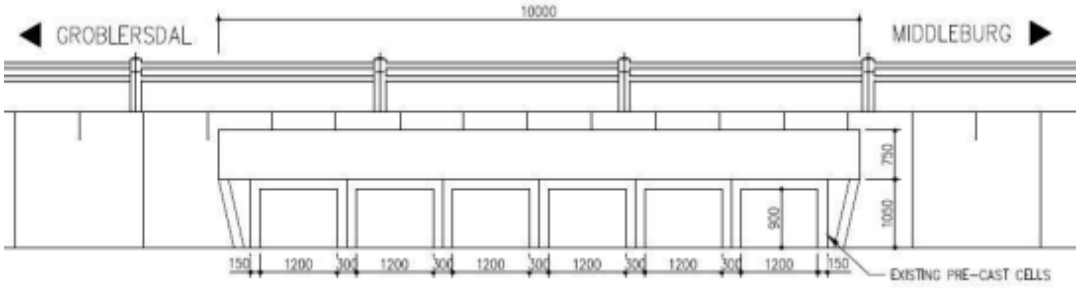

Figure 3-3: Major Culvert at km 1.38 culvert elevation

Table 3-5: Upgrades for Major Culvert C010

MAJOR CULVERT AT KM 1.34	EXISTING LENGTH (M)	PROPOSED EXTENSION (M)	PROPOSED WIDENING (M)	FINAL LENGTH (M)
Geometric Option 1	17.2	-	3.6	17.2

3.5.2.4 Major Culvert – C011 at km 7.84

This Major Culvert spans an unnamed stream and comprises a 2 cell 1.8 x 2.1 m in-situ concrete culvert that is 16.4 m long. The ends of the culvert consist of reinforced concrete wing walls and apron slabs.

Culvert C011 is long enough that for geometric Options 1, no lengthening of the structure is required. It might need lateral support in the top portion of the headwall to accommodate the additional load for Option 1. However, it will need to be lengthened for geometric Option 2 (preferred), 3 and 4 on the up/downstream side of the culvert. Retaining walls will also be required to prevent encroachment over the cadastral boundary. The proposed extension size and the new length is presented in the table below.

Table 3-6: Upgrades for Major Culvert C011

SAND RIVER –RIVER BRIDGE B287	EXISTING LENGTH (M)	PROPOSED EXTENSION NORTHERN SIDE (M)	PROPOSED EXTENSION SOUTHERN SIDE (M)	COMBINED PROPOSED EXTENSION (M)	NEW LENGTH (M)
Geometric Option 2 & 3	16.4	9	9.2	18.2	34.6

3.5.3 OTHER ALTERNATIVES

3.5.3.1 Road

3.5.3.1.1 Level of Service (LOS) for Option 1: "Do Minimum"

With Option 1, it is intended to improve the existing road to be safe for a design speed of at least 80 km/h. The design principle of Option 1 is to do minimal improvements and retain the existing horizontal and vertical alignments, improve the intersections and resolve access issues. Surfaced shoulders of 3.0 m wide and 0.5 m wide edges (roundings) are added to the typical cross section.

3.5.3.1.2 GD OPTION 2A: Improve Horizontal and Vertical Alignments to 100km/h Design Speed, Typical Cross-section to SANRAL Standard Cross-section for >3 000vpd and Upgrade Intersections

This GD OPTION 2A is intended to improve the existing road to be safe for a design speed of at least 100 km/h for both the horizontal- and vertical alignments. However, with the future upgrade to 120 km/h in mind, the design parameters for 120 km/h will be considered on the alignments where it could be done without encroaching the existing road reserve. The cross-section will also be improved to the SANRAL Standard Cross-section for >3 000vpd with 3.0 m wide surfaced shoulders.

The horizontal alignment of the existing road will be improved to adhere to the design parameters for 100 km/h fully. The K-values of the vertical alignment will also be improved to at least 100 km/h design parameters and the cross-section improved to the standard SANRAL typical single carriageway cross-section for >3 000 vehicles per day from km 0.0 up to km 29.5, except for the section through the Groblersdal township.

It is proposed to retain the existing road N11-11 as far as possible as the southbound carriageway of the future upgrade to a dual carriageway freeway.

3.5.3.1.3 GD OPTION 3A: Upgrade Horizontal and Vertical Alignments to 120km/h Design Speed, Typical Cross-section to SANRAL Standard Single Carriageway Cross-section for >3 000vpd and Upgrade Intersections

This GD OPTION 3A is intended to upgrade the existing road to be safe for a design speed of 120 km/h for both the horizontal- and vertical alignments. The cross-section will also be upgraded to the SANRAL typical single carriageway cross-section for >3 000 vehicles per day with 3.0 m wide surfaced shoulders in a minimum 40 m wide road reserve from km 0.0 up to km 29.5, except for the section through the Groblersdal township. The farm accesses will also be consolidated and shifted to safe locations in this option.

It is proposed that this GD OPTION 3A upgraded alignment based on the existing road N11-11 be retained as the southbound carriageway of the future upgrade to a dual carriageway freeway.

3.5.3.1.4 LOS for Option 3B: Improve vertical and horizontal alignment for a design speed of 120km/h Adding Climbing/Passing Lanes and Undivided 4-lane Road for Certain Sections at Groblersdal and Marble Hall and Upgrade Intersections

Exactly the same improvement is to be applied as proposed for the horizontal and vertical alignments and the typical cross-section for Option 3A, but with the addition of climbing/passing lanes and undivided 4-lane road at certain sections at Groblersdal and Marble Hall to improve the level of service.

3.5.3.1.5 LOS for Option 4: Future Upgrade to a Dual Carriageway Road Within an 80m Wide Road Reserve

Being such an important route between Botswana and the South African harbours, it is foreseen that in the long term, most probably shortly after the year 2054, the increase in traffic might demand the road to be upgraded to a divided dual carriageway road with a design speed of 120 km/h throughout. At that stage, it might be required to increase the road reserve to 80 m minimum to accommodate the standard SANRAL typical cross-section in a rural area.

Because this GD OPTION 4 will be a major upgrade that is premature and would not be demanded by traffic soon for the medium to long term, it falls outside the scope of this 20-year window assignment for the improvement of the N11-11. GD OPTION 4 will be very costly to build and also require very valuable and expensive land for the wider road reserve that is not justified at this stage and will therefore not be considered any further as an option for the improvement of the N11-11.

3.5.3.2 Bridge

3.5.3.2.1 Geometric Option 1

Under geometric option 1, where no adjustment to the vertical and horizontal alignment is made, the bridge needs to be widened on both sides. This would leave the bridge under capacity from a hydraulic point of view and is therefore not recommended.

Table 3-7: Required extension for bridge at km 22.8

MOSES RIVER – RIVER BRIDGE B1050	EXISTING DECK WIDTH (M)	PROPOSED EXTENSION NORTHERN SIDE (M)	PROPOSED EXTENSION SOUTHERN SIDE (M)	COMBINED PROPOSED EXTENSION (M)	NEW WIDTH (M)
Geometric Option 1	9.79	3.3	3.5	6.8	14.2

3.5.3.3 Geometric Option 3

Options 3 & 4 are the same for Option 2(preferred) in which a new 4 span bridge 69 m in length 14.2 m wide will be constructed.

3.5.3.4 Geometric Option 4

Option 4 includes the same new 4 span bridge 69 m in length but will be 22.8 m in width.

3.5.3.5 Major Culverts

3.5.3.5.1 Major Culvert C010

Geometric Option 1 and 3

This structure is long enough that for geometric options 1 and 3, no lengthening will be required. Only minor raising of the headwall would need to be done on both sides for options 1 and 2. However, the structure needs to be widened in terms of hydraulic capacity, and three additional 1.2 m x 0.9 m cells need to be added on the side of the culvert. This option is also the same as the preferred option.

Geometric 4

For geometric option 4, the new widened portions of the culvert will be constructed alongside the existing structure and joined by drilling and doweling into the foundation slab of the existing structure. See Table 3-8 for the extension sizes.

Table 3-8: Extension length for Major Culvert at km 1.34

MAJOR CULVERT AT KM 1.34	EXISTING LENGTH (M)	PROPOSED EXTENSION (M)	PROPOSED WIDENING (M)	FINAL LENGTH (M)
Geometric Option 1	17.2	7.4	3.6	17.2

3.5.3.5.2 Major Culvert C011

Geometric Option 1

For Geometric Option 1 the structure is long enough that lengthening of the structure will not be required. It might need lateral support in the top portion of the headwall to accommodate the additional load for option 1. The Major Culvert C011 will remain the same.

Geometric Option 3 and 4

Options 3 and 4 are the same as Option 2 (preferred), where the structure will need to be lengthened on the up/downstream side of the culvert. Retaining walls will also be required to prevent encroachment over the cadastral boundary. A concrete slab supported on piles spanning over the existing structure is proposed to accommodate the additional loads on the existing structure. The new culvert will be constructed alongside the existing structure and joined by drilling and doweling into the foundation slab of the existing.

Table 3-9: Required extension length for Major culvert at km 7.48

SAND RIVER – RIVER BRIDGE B287	EXISTING LEGNTH (M)	PROPOSED EXTENSION NORTHERN SIDE (M)	PROPOSED EXTENSION SOUTHERN SIDE (M)	COMBINED PROPOSED EXTENSION (M)	NEW LENGTH (M)
Geometric Option 3	16.4	9	9.2	18.2	34.6
Geometric Option 4					

3.5.4 NO-GO ALTERNATIVES

SANRAL's main objective with the current project is to provide future traffic capacity by upgrading the existing road. Should the project not be approved, traffic congestion will be a challenge for road users. Thus, should the proposed project not proceed as planned, safety risks associated with road use will increase. The NO-GO option is, therefore, not preferred.

3.5.5 SITE ACCESS

All site accesses will occur from the N11-11 as all works will be done within the existing road reserve; therefore, no access is required from private landowners at this stage.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This chapter describes the existing biophysical and social environment that could potentially be affected by the proposed project.

4.1 LAND USE AND CHARACTER OF THE SURROUNDING AREA

The land use in the region entails farming, domestic households, tourism, and small business centres. Farming activities include the use of heavy vehicles for the distribution of raw materials and farm produce. There are movements of retail goods and workforce from the two towns of Groblersdal and Marble Hall.

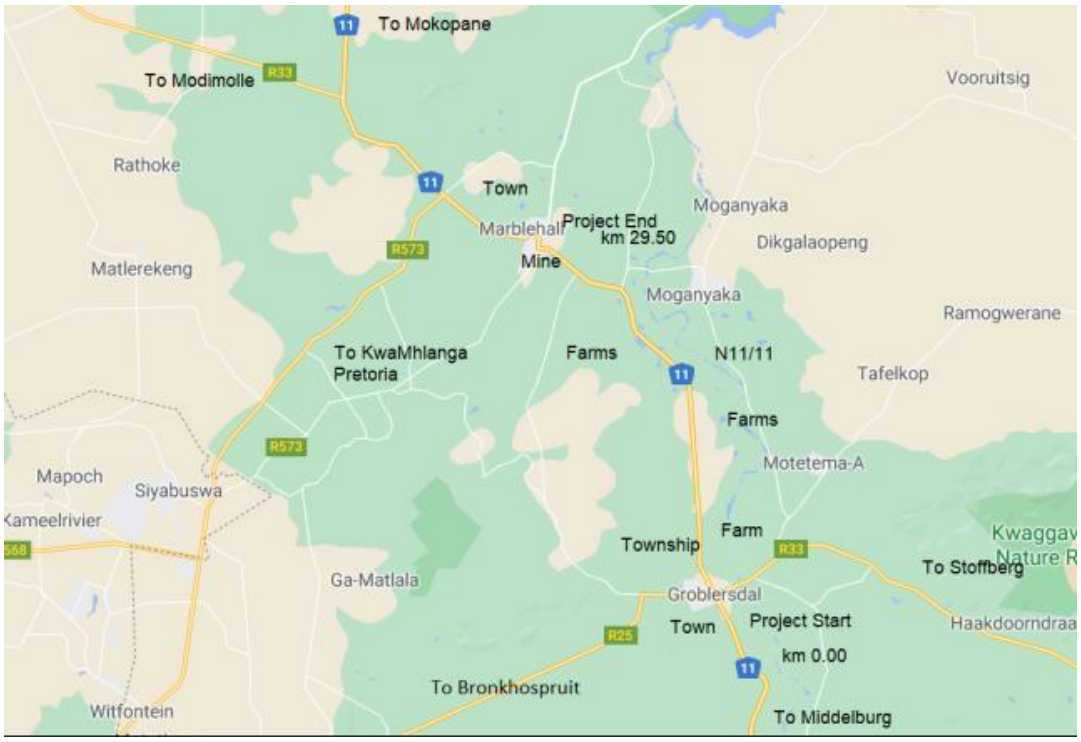

Figure 4-1: Land-use and road network within the project area

Groblersdal is a provincial growth point in Elias Motsoaledi Municipality, and several important arteries connect it with other towns (Middelburg, Marble Hall, Bronkhorstspruit and Stoffberg) through the N11, R33 and R25. These arteries create social and economic viability and diversified development in the area. In addition, as per the provision of the Groblersdal Town Planning Scheme (2006), other economic opportunities could flourish in co-existence with agriculture as the main economic base. There are strategically located parcels of land near the N11/11. Most of the parcels of land are underutilised (informal settlement) or not used at all.

Marble Hall is the growth point of Ephraim Mogale Municipality. The Municipality's economic and land use entails extensive agriculture areas, dominated by growing citrus fruit, game reserves and nature reserves, including

game lodges, and sprawling rural villages. The land use comprises residential, agricultural, game lodge, nature reserves and dolomite mining (near the town) in Marble Hall Town. Several important roads such as the R573, D2535, D1819, and R33 connect it with other towns such as KwaMhlanga, Pretoria, Bronkhorstspruit, Matlala, Swartkop and Modimolle.

4.2 TEMPERATURE AND RAINFALL CONDITIONS

The weather station at Marble Hall is the closest station to the site. The climate is classified as hot summers and mild winters. The average annual temperature is 20.2 °C and the average yearly rainfall is 500/600 mm.

During the months of April, May, July, August, and September, the average temperatures fall between 20 °C and 26 °C. The coldest month in this area is July (18 °C) and the hottest month is January with the average of 27 °C. Winter is the dry season of this area. November tops the wettest month list with 86 mm of rainfall.

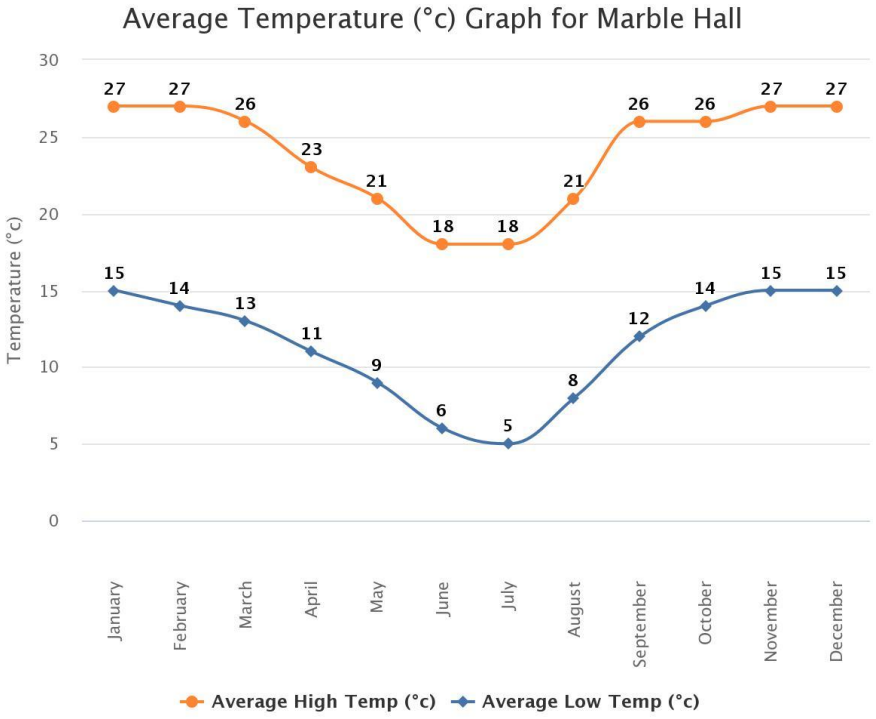

Figure 4-2: Monthly Average Temperature

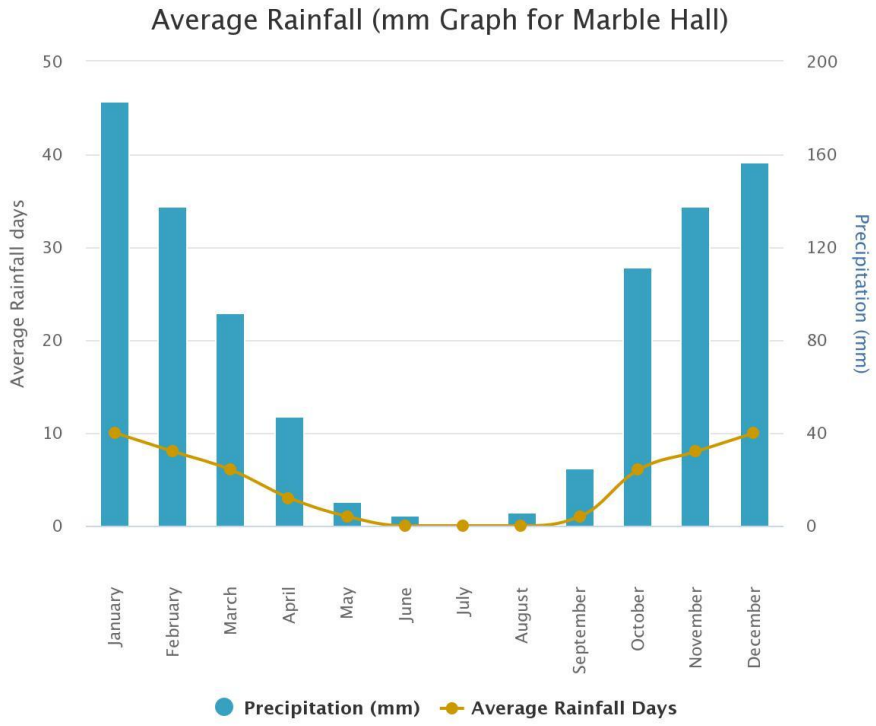

Figure 4-3: Monthly Average Rainfall

4.3 TOPOGRAPHY, GEOLOGY AND SOILS

The N11 section 11 route topography is classified as a flat terrain. The elevation at the start of the project, km 0.00 is 930.895 m and the elevation at the end of the project at km 29.460 is 907.973 m. The highest elevation is 965.108 m at km 12.70 and the lowest point is 858.112 m at km22.960.

The geology of the site, as indicated on the 1:250 000 geological map 2528 Pretoria, consists of various geological units of the Bushveld Igneous Complex and Transvaal Supergroup. The lithological units along the road sections are listed below:

- Mn = Grey to pink coarse-grained granite of the Nebo Granite, Lebowa Granite Suite, Bushveld Complex,
- Vsi = Shale, carbonaceous in places, hornfels and chert of the Silverton Formation, Pretoria Group, Transvaal Supergroup,
- Vha = Volcanic rocks of the Hekpoort Formation, Pretoria Group, Transvaal Supergroup,
- Vd = Conglomerate of the Duitschland Formation, Chuniespoort Group, Transvaal Supergroup,
- Vt = Shale, siltstone, conglomerate in places and quartzite of the Timeball Hill Formation, Pretoria Group, Transvaal Supergroup,
- Vmd = Dolomite and chert of the Malmani Subgroup, Chuniespoort Group, Transvaal Supergroup.

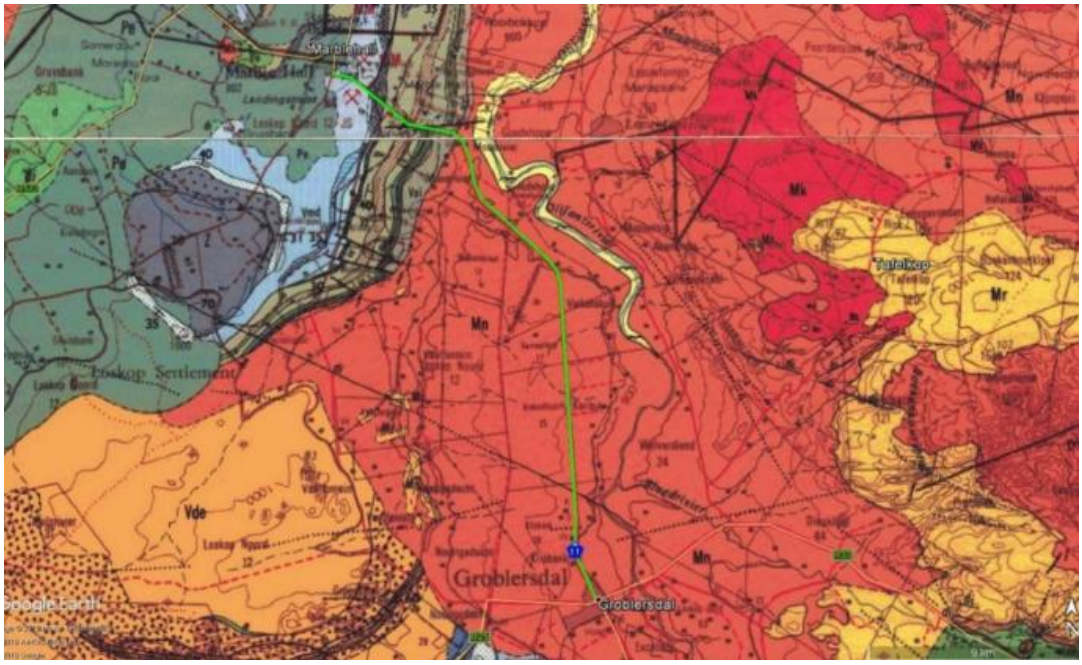

Figure 4-4: Geology overlain map

4.3.1 VEGETATION TYPE

Plant species commonly associate with specific habitats based on their morphological and physiological characteristics. Thus, habitat variability is often expressed in changes to vegetation over time. Based on Mucina and Rutherford (2018), the National Vegetation Map of South Africa (VEGMAP) is a geographical description of plant communities across South Africa that is continuously updated to keep track of changes in vegetation unit boundaries and threat status, which is often determined by land use.

A national vegetation type, the Central Sandy Bushveld, is the only national vegetation type found in the study area, as illustrated in the figures below. Currently, this ecosystem is listed as “Least Concern” and is a dominant vegetation type within these parts, appearing frequently across adjacent landscapes.

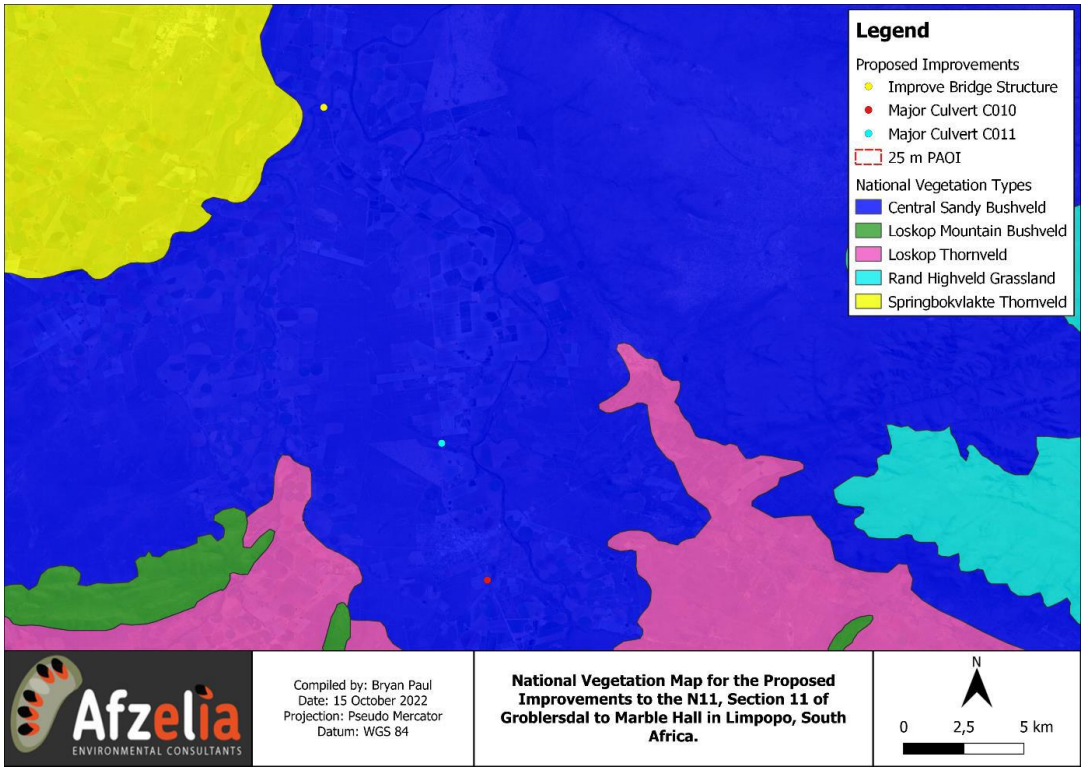

Figure 4-5: Vegetation types associated with the study area

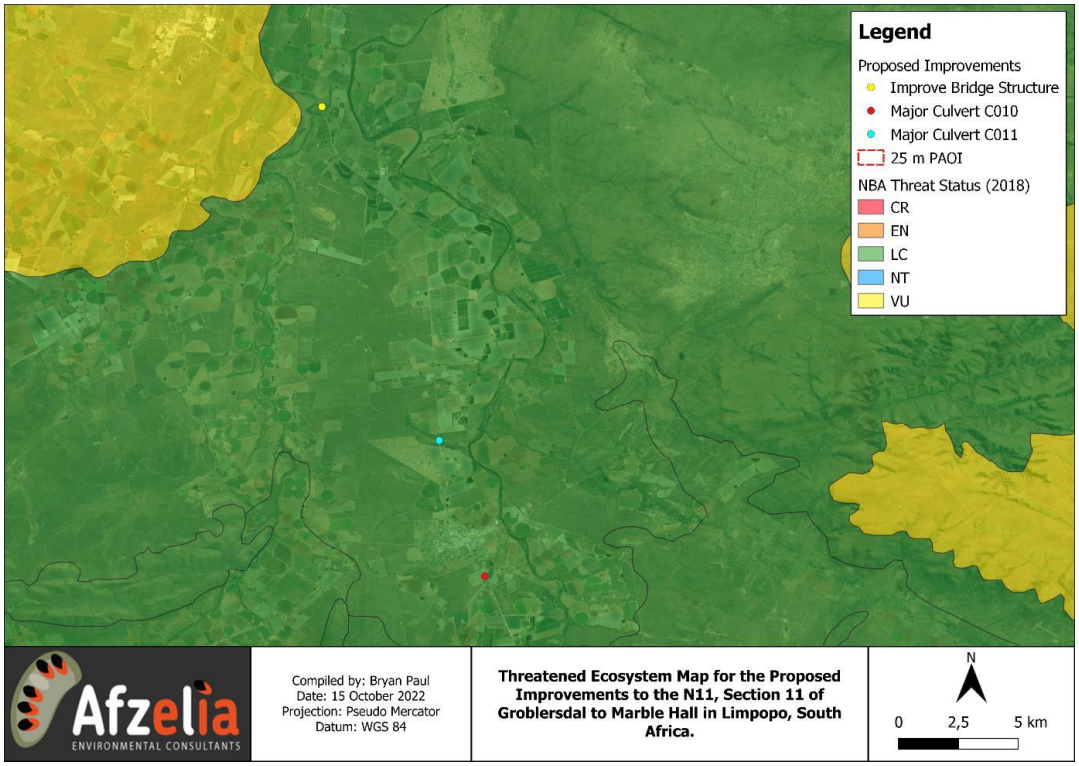

Figure 4-6: Vegetation types threat status according to the National Biodiversity Assessment

4.3.2 HYDROLOGY

A hydrological study was conducted on the two major culverts and bridge over the Moses River. The tables below provide the summary of the information obtained from the hydrological study. According to the *SANRAL drainage manual 6th edition*, the applicable methods for these catchments are the SDF, Empirical and Rational methods. The design floods indicated below for the major culverts were based on the Rational (Alternative 3).

Table 4-1: Catchment size and flow rates for culverts C010 and C011

CULVERT NUMBER	CATCHMENT AREA (km^2)	1:5 (m^3/s)	1:10 (m^3/s)	1:20 (m^3/s)	1:50 (m^3/s)
C010	4.86	9	12	15	21
C011	2.9	7	9	12	16

The bridge over the Moses River is 3 km upstream of the Moses/Olifants River confluence. The Moses River is 123 km long and has a fairly large catchment area of 1 670 km^2. Deterministic methods and extrapolated statistical methods were used to determine the design floods for the river. There are two gauging stations that were used during the study. The one gauging station is in the Olifants River, 5 km downstream of the confluence, and the second gauging station is in the upper catchment of the Moses River. Both these gauging stations are too far away from the bridge to represent the flow data at the bridge fully; therefore, only an extrapolation of the statistical data was used to calibrate the deterministic methods.

The deterministic methods estimated the design floods significantly higher than the extrapolated statistical methods. This could be attributed to the shape of the catchment; it is a long river with a comparatively narrow catchment area. The deterministic method's floods sizes were adjusted accordingly and are listed in Table 4-2.

Table 4-2: Catchment size and flow rates for the bridge

BRIDGE NUMBER	CATCHMENT AREA (km^2)	1:5 (m^3/s)	1:10 (m^3/s)	1:20 (m^3/s)	1:50 (m^3/s)
B1050	1670	542	606	817	1024

4.3.3 CATCHMENT CHARACTERISTICS

The run-off generated within a catchment resulting from precipitation will depend on the:

- Characteristics of the storm event.
- The response characteristic of the catchment.
- The influence of the temporal storage on the run-off.

The temporal distribution of the run-off is reflected in a hydrograph. The flood peak is reached as soon as the entire catchment contributes to the flood, which is also referred to as the time of concentration.

There are different hydrological methods in use in Southern Africa to calculate the maximum flow for a certain recurrence interval. These methods have been developed by various institutions and are either based on measured data (statistical) or on a deterministic variance (Rational, Unit Hydrograph, SDF, and SCS-SA methods), or are empirical relationships. Except for the statistical method, the methods were "calibrated" for certain regions and flood events and are limited in terms of the size of the catchment areas, on which they could be applied.

4.3.3.1 Bridge

The stream under C011 has a catchment area of 2.98 km^2 (Refer to Figure 4-7). The catchment characteristic is shown in Table 4-3 below.

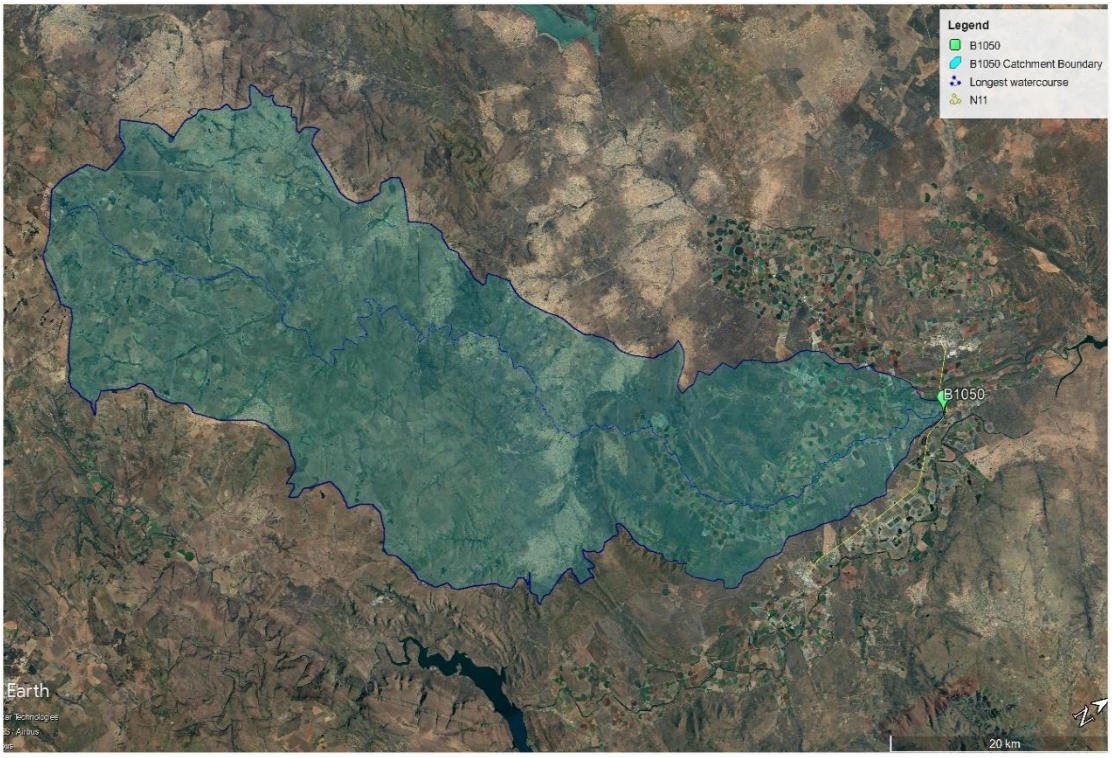

Figure 4-7: Moses River at B1050 catchment area

Table 4-3: Catchment characteristics

CATCHMENT CHARACTERISTICS	
Size of Catchment (km^2)	1671
Longest watercourse (km)	123
Elevation at 10%L (H0.1L)	881
Elevation at 85%L (H0.85L)	1302

CATCHMENT CHARACTERISTICS			
Average slope (Sav)			0.005
Dolomite area (D%)			0.0%
Mean annual Rainfall (MAR)			624.4
Rural %	96%	Urban %	4%
Surface slope	%	Description	%
Vleis and pans (0%-3%)	38.2%	Lawns	100%
Flat areas (3%-10%)	44.1%	Residential areas	0%
Hilly (10%-30%)	16.5%	Industry	0%
Steep areas (>30%)	1.3%	Business	0%
Permeability	%		
Very permeable	0%		
Permeable	0%		
Semi-Permeable	100%		
Impermeable	0%		
Vegetation	%		
Thick bush and plantation	0.0%		
Light bush and farmlands	29.0%		
Grasslands	71.0%		
No vegetation	0.0%		

No large bodies of water such as dams, lakes, etc., that significantly affect the catchment characteristics, were identified within the catchment.

4.3.3.2 Major Culverts

4.3.3.2.1 Culvert - C010

The stream under C010 has a catchment area of 4.86 km^2 (Refer to Figure 4-8). The catchment characteristic is shown in Table 4-4 below.

Figure 4-8: C010 stream catchment area

Table 4-4: Catchment characteristics

CATCHMENT CHARACTERISTICS			
Size of Catchment (km^2)			4.81
Longest watercourse (km)			2.29
Elevation at 10%L (H0.1L)			923
Elevation at 85%L (H0.85L)			959
Average slope (Sav)			0.021
Dolomite area (D%)			0
Mean annual Rainfall (MAR)			535
Rural %	100%	Urban %	0%
Surface slope	%	Description	%
Vleis and pans (0%-3%)	84.6%	Lawns	0%
Flat areas (3%-10%)	15.4%	Residential areas	0%
Hilly (10%-30%)	0.0%	Industry	0%
Steep areas (>30%)	0.0%	Business	0%
Permeability	%		
Very permeable	12.00%		
Permeable	50.00%		
Semi-Permeable	38.00%		
Impermeable	0%		
Vegetation	%		

CATCHMENT CHARACTERISTICS		
Thick bush and plantation	0%	
Light bush and farmlands	86.1%	
Grasslands	13.9%	
No vegetation	0.0%	

No large bodies of water such as dams, lakes, etc., that significantly affect the catchment characteristics, were identified within the catchment.

4.3.3.2.2 Culverts - C011

The stream under C011 has a catchment area of 2.98 km^2 (Refer to Figure 4-9 The catchment characteristic is shown in Table 4-5 below.

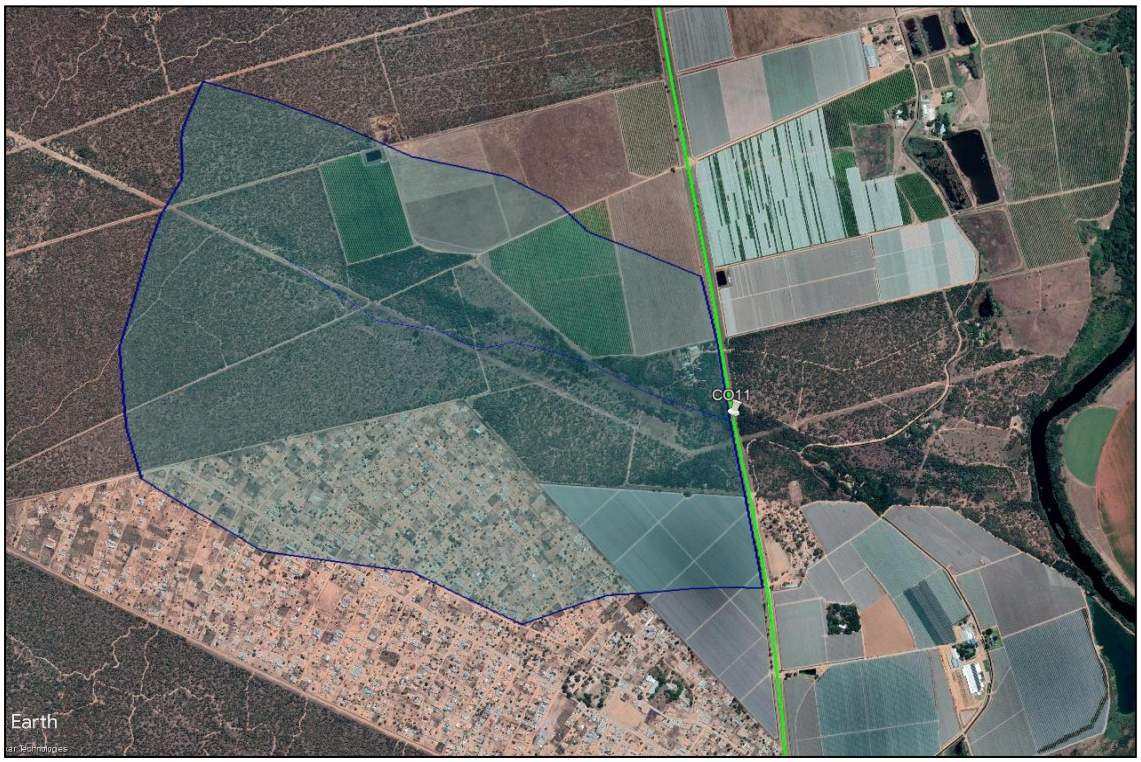

Figure 4-9: C011 stream catchment area

Table 4-5: Catchment characteristics

CATCHMENT CHARACTERISTICS	
Size of Catchment (km^2)	2.98
Longest watercourse (km)	1.74
Elevation at 10%L (H0.1L)	922
Elevation at 85%L (H0.85L)	955
Average slope (Sav)	0.025
Dolomite area (D%)	0
Mean annual Rainfall (MAR)	576

CATCHMENT CHARACTERISTICS			
Rural %	100%	Urban %	0%
Surface slope	%	Description	%
Vleis and pans (0%-3%)	22.6%	Lawns	0%
Flat areas (3%-10%)	77.4%	Residential areas	0%
Hilly (10%-30%)	0.0%	Industry	0%
Steep areas (>30%)	0.0%	Business	0%
Permeability	%		
Very permeable	10%		
Permeable	30%		
Semi-Permeable	60%		
Impermeable	0%		
Vegetation	%		
Thick bush and plantation	0.0%		
Light bush and farmlands	100.0%		
Grasslands	0.0%		
No vegetation	0.0%		

No large bodies of water such as dams, lakes, etc., that significantly affect the catchment characteristics, were identified within the catchment.

4.4 SOCIO-ECONOMIC ASPECTS

4.4.1 SOCIO-ECONOMIC ENVIRONMENT

The Sekhunune District is largely rural in nature and is made up of four Local Municipalities, i.e., Elias Motsoaledi, Ephraim Mogale, Makhuduthamaga and Fetakgomo Tubatse. The District is made up of 117 wards with a total of 764 villages where Groblersdal and Marbel Hall are within the boundaries of this District.

Economic growth is one of the main indicators of a progressing and developing district. The main sectors that contribute to the growth of the economy are agriculture, mining, and community services. Mining is the largest contributor to the economy of the district.

4.4.2 LEVEL OF EMPLOYMENT

One of the challenges Sekhukhune District faces is unemployment. The majority of people within the district are of working age (15-64); however, the available employment opportunities are not adequate to absorb them. The 2011 census data showed that 67.26% of the Sekhukhune District population is employed, 32.74% of these were employed in the formal sector and 48.7% were employed in the informal sector. In the formal economy, mining and agriculture are some of the biggest employers.

4.4.3 EDUCATION

The site is located within the Sekhukhune District Municipality where the number of people without any schooling in the District decreased from 2009 to 2019, while the number of people within the 'matric only' category, increased from 95 252 to 147 666 in the past 10 years.

The above figures show an improvement in the level of education, with an increase in the number of people with 'matric' or higher education.

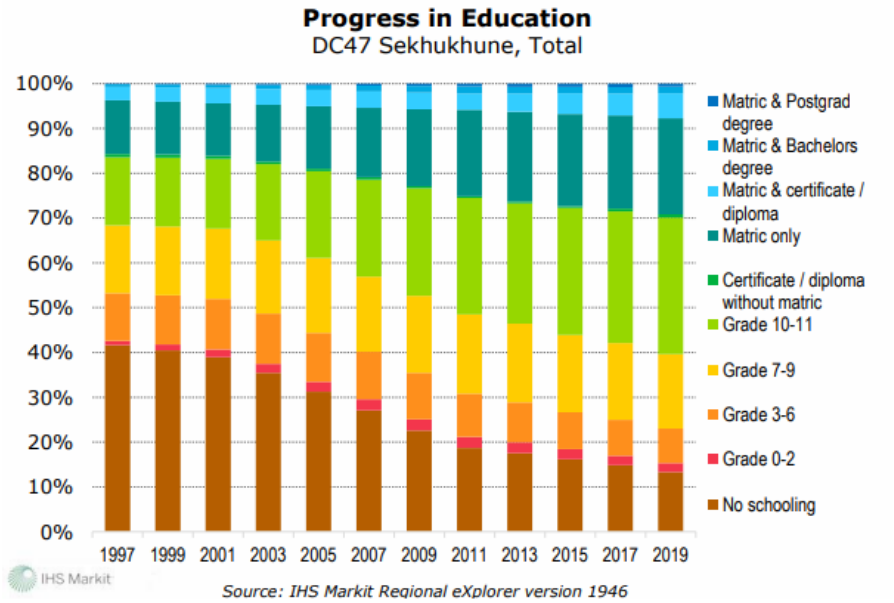

Figure 4-10: District Education levels

4.4.4 ACCESS TO SERVICES

4.4.4.1 Access to Water

Sekhukhune District Municipality is both a Water Services Authority and a Water Services Provider in terms of the Water Services Act, Act 108 of 1997. The 764 villages within the district are supplied with water from 45 water supply schemes. The District is currently providing full water services in the main towns of Burgersfort (12 815 people), Marble Hall (4 025 people), Groblersdal (6 312 people), Steelpoort (3 374 people) and Ohrigstad (1 520 people).

There are about 30 994 (or 10.26%) households in the district with piped water inside the dwelling, about 117 265 (38.82%) households had piped water inside the yard and about 50 259 (16.64%) households had no formal piped water.

Table 4-6: 2011 Access to water

TOWNS	PIPED WATER INSIDE DWELLING	PIPED WATER IN YARD	COMMUNAL PIPED WATER: LESS THAN 200M FROM DWELLING (AT RDP – LEVEL)	COMMUNAL PIPED WATER: MORE THAN 200M FROM DWELLING (BELOW RDP)	NO FORMAL PIPED WATER
Ephram Mogale	3 420	23 100	1 990	2 950	3 570
Eilas Mostoaledi	9 740	35 600	7 110	4 140	11 300
Makhuduthamaga	5 060	22 900	16 800	12 00	13 200
Fetakgomo Tubatse	12 800	35 700	28 100	30 500	22 200
Total Sekhukhune	**30 994**	**117 265**	**54 005**	**49 543**	**50 259**

4.4.4.2 Access to Sanitation

In 2016, about 8.3% of the households had access to a flush or chemical toilet, 85% had access to a pit toilet and 2.8% had no access to any toilet. In 2018, a total number of 37 600 flush toilets (12.43% of total households), 65 900 Ventilation Improved Pit (VIP) (21.82% of total households) and 186 000 pit toilets (61.45% of total households) were recorded.

The district is currently implementing a massive sanitation programme and providing Ventilated Improved Pit latrines (VIPs) to various households. When it comes to sanitation backlog (number of households without hygienic toilets) over time, the number of households without any hygienic toilets in the district was 188 000 in 2008; this increased annually at a rate of 0.57% to 199 000 in 2018.

4.4.5 EMPLOYMENT AND INCOME LEVEL

The total number of unemployed people within Sekhukhune constitutes 28.17% of the total number of unemployed people in Limpopo Province. Between 2018 and 2019, the district experienced an average annual increase of 3.1% in the number of unemployed people, which is worse than that of the Limpopo Province which had an average annual decrease in unemployment of 1.7%. Household incomes in the local municipality are extremely low, with about 39.4% of the households earning no income at all and a majority of population surviving on less than R4 800 per months (Census, 2011).

Table 4-7: 2011 Average income of Sekhukhune

INCOME	PERCENTAGE
No income	39.4%
Under R4000	20.8%
R5k – R10K	22.8%

INCOME	PERCENTAGE
R10k – R20k	10.7%
R20k – R40k	R4.5%
R40k – R75k	1%
R75K – R150k	0.3%
R150k – R300k	0.4%
R300k – R600k	0.1%
R600k – 1.2M	0%
R1.2M – R2.5M	0%
Over R2.5M	0%
No Applicable	0%

4.4.6 SOCIO-ECONOMIC VALUE OF THE ACTIVITY

Anticipated CAPEX (Capital Expenditure) value of the project on completion?	R427.6 million
What is the expected annual turnover to be generated by or as a result of the project?	N/A
Number of new skilled employment opportunities created in the construction phase of the project.	TBD
Number of new skilled employment opportunities created in the operational phase of the project.	TBD
Number of new un-skilled employment opportunities created in the construction phase of the project	TBD
Number of new un-skilled employment opportunities created in the operational phase of the project?	N/A
What is the expected value of the employment opportunities during the operational and construction phase?	TBD

4.4.7 PLANNING CONSIDERATION

Systematic conservation planning is a globally recognized practice which identifies priorities for biodiversity conservation and informs legislation to facilitate the long-term conversion of identified biodiversity (Jewitt, 2018).

4.4.7.1 National Conservation Level

The National Environmental Management: Biodiversity Act (Act 10 of 2004) lists Threatened or Protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected (P). The main purpose of listing Threatened Ecosystems is to reduce the rate of ecosystem and species extinction and includes the prevention of further degradation and loss of structure, function, and composition of Threatened ecosystems.

Threatened terrestrial ecosystems have been delineated based on the following:

- The South African Vegetation Map.
- Priority areas identified in a provincial systematic biodiversity plan.
- High irreplaceability forest patches and clusters.

There are four main types of implications of listed ecosystems on development:

- Planning related implications, linked to the requirement in NEMBA for listed ecosystems to be taken into account in municipal IDPs and SDFs.
- Environmental authorisation implications, especially in terms of NEMA and EIA regulations.
- Proactive management implications, in terms of NEMBA.
- Monitoring and reporting implications, in terms of NEMBA.

4.4.7.2 Provincial Level

Loss of biodiversity results in ecosystem degradation and subsequent loss of important ecological services. Anthropogenic developments are a driving force that exert pressure on the natural habitat and biological diversity.

Sensitivity of the area was assessed through the interrogation of biodiversity databases. The primary aim of this conservation plan is to ensure that representative biodiversity samples are conserved to ensure that subsequent conservation targets are achieved. Areas are categorized based on the site's ecological sensitivity, biological functioning and conservation significance. Classification of sites within this plan refers to the following:

Irreplaceable CBA: Areas that are critical for meeting conservation targets and are required to ensure the persistence of viable populations of species and the functionality of ecosystems. Therefore, the site has an irreplaceable conservation value with no alternative sites available.

Optimal CBA: Areas identified through systematic conservation planning which represent the ideal localities out of a larger selection of available planning units that are optimally located to meet conservation targets.

Ecological Support Areas (ESAs): Areas that sustain and support the ecological functioning of the associated CBAs. These areas are not (in all cases) pristine, but rather functional systems.

The assessment confirmed that the study area intercepted on four (4) of the seven (7) of the provincial conservation features listed under the Limpopo Conservation Plan V2. This included Critical Biodiversity Area (CBA) 1, Critical Biodiversity Area (CBA 2); Ecological Support Area (ESA) 2, and Other Natural Area (ONA). It was determined that the proposed development, whilst imposing on CBA temporarily, will do so within an existing national road servitude and by improving a bridge and two (2) culvert structures, and improve connectivity and faunal movement within the study area.

4.5 NEED AND DESIRABILITY

The Need and Desirability for this project is attached as Appendix K in this report.

4.6 SPECIALIST STUDIES FINDINGS

The specialist studies identified in Table 4-8 have been completed and the findings used to inform the assessment of the proposed project and the development of an Environmental Management Programme (EMPr).

Table 4-8: Specialist Studies Undertaken

REPORT	ORGANISATION/AUTHOR	REPORT DATE
Wetland and Aquatic	Environmental Assurance (ENVASS)	9/11/2022
Terrestrial Biodiversity	Afzelia Environmental Consultants (on behalf of ENVASS)	31/10/2022
Heritage	Umlando: Archaeological Surveys and Heritage Management	15/09/2022
Hydrology	CinfraTec Consultant Engineers	10/2022

4.6.1 HERITAGE AND PALAEONTOLOGY

The desktop study that was undertaken consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. It showed that no surveys have occurred near the study area, except for two at the southern culvert (Major Culvert C010). Other reports that were conducted previously have recorded several Middle Stone Age artefacts at the Groblersdal Airfield and also noted several historical buildings at southern Groblersdal.

The field survey that was undertaken on 7 September 2022 by the specialist revealed that the areas surrounding the Bridge (B1050) and two Major Culverts (C010 and C011) are undated and appear to be less than 60 years in age. The proposed study area is in an area of low or no palaeontological sensitivity.

4.6.2 AQUATIC AND WETLANDS

The proposed study area for the Bridge B1050 and Major Culverts C010 and C011 occurs within a valley and is bounded by gentle to moderate slopes, sporadic hillocks, and mountainous plateaus to the east and west of the study areas. The study area was dominated by river riparian systems, this was the primary indicator, along with riparian vegetation, which was implemented within the study areas.

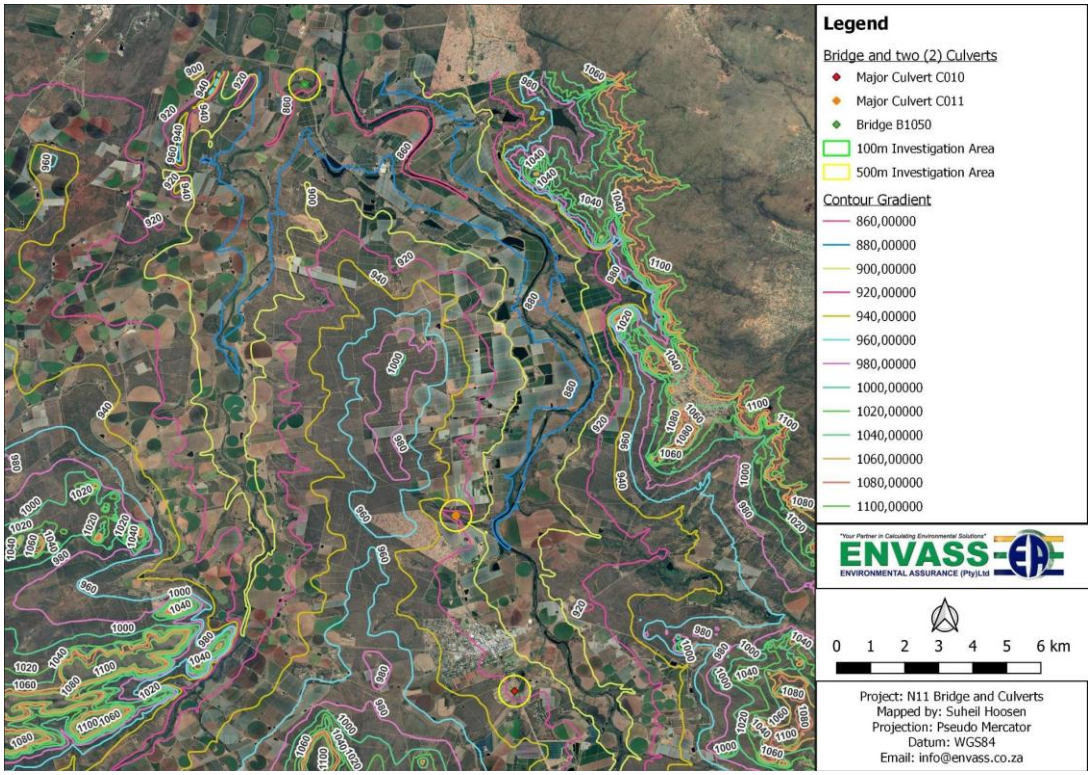

Figure 4-11: Contour gradient illustrating the topographic change within the study areas.

It was determined by the specialist that three (3) watercourses were at high risk of being impacted upon by the proposed development activities. These were classified as one (1) hillslope seepage wetland at Major Culvert C010, one (1) B channel stream at Major Culvert C011, and another B channel stream at Bridge B1050. All other identified remaining water resources are at Low risk of being impacted.

The wetlands were perceived to provide very limited Ecosystem Services (ESS) given their small size, isolated location, and low demand for ESS. Implementing sustainable development practices and the mitigation and rehabilitation measures may result in the improvement of the current integrity of the at-risk watercourses.

Table 4-9 provides the Present Ecological State (PES), Ecological Sensitivity and Importance (EIS) scores and Recommended Management Objectives (RMOs) of the at-risk natural watercourses.

Table 4-9: Summary table presenting the PES, EIS scores and RMOs of the at-risk watercourses

WATERCOURSE	PES SCORE	EIS	RMO
Seep01	Class D (Largely modified)	Low	Maintain Class D
Rip01	Class C (Moderately modified)	Low	Maintain Class C
Rip02	Class C (Moderately modified)	Moderate	Maintain Class C

The figures below illustrate watercourse delineation maps relevant to the study areas for Major Culvert C010, Major Culvert C011 and Bridge B1050. The delineation was developed with the presumed natural flow of water through the site in mind and based on wetness indicators (i.e., terrain unit, soil, vegetation, and hydrology) recorded on-site.

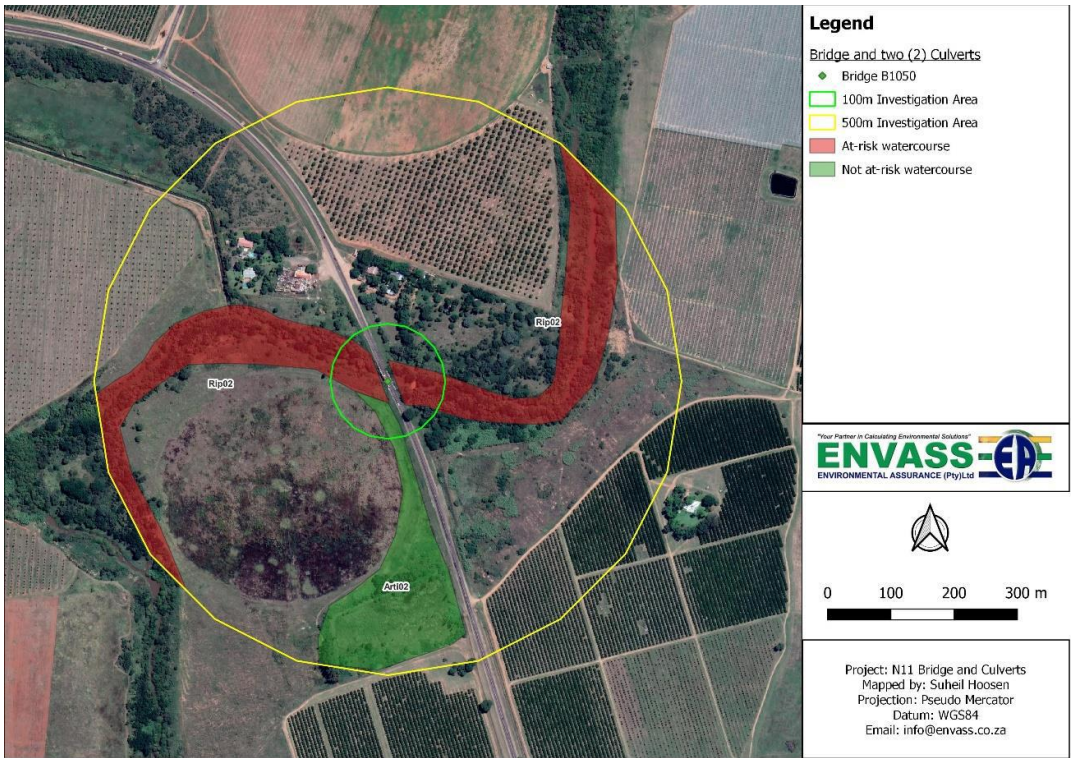

Figure 4-12: Illustration of the overall watercourse delineation with the study area of Bridge B1050

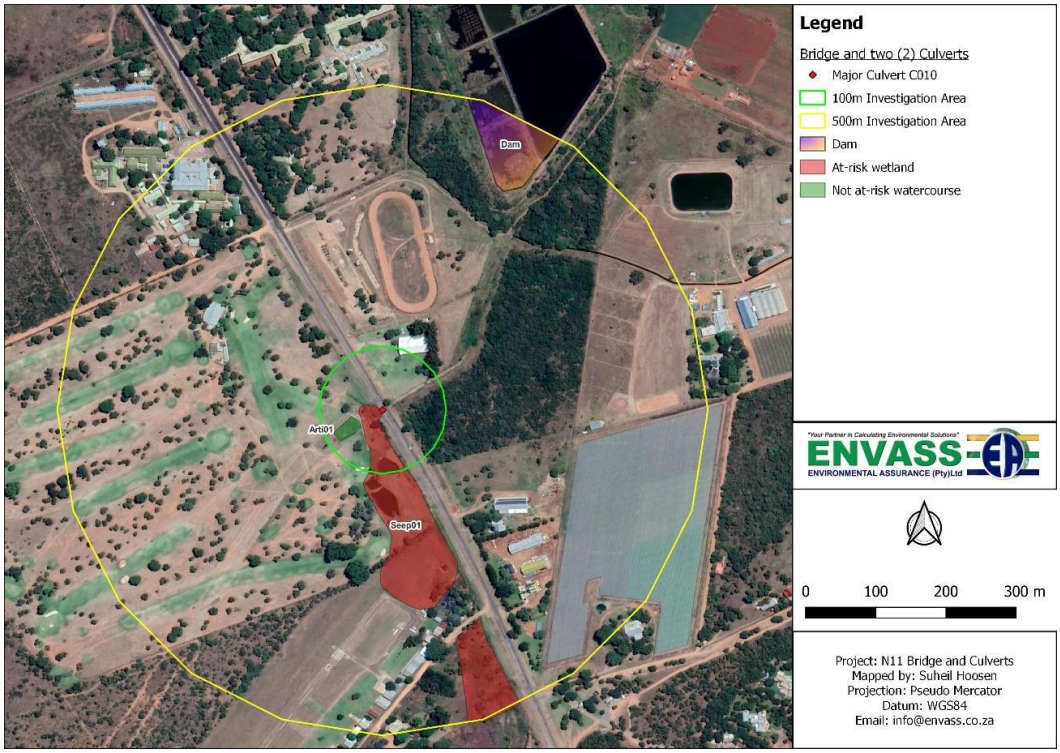

Figure 4-13: Illustration of the overall watercourse delineation with the study area of Major Culvert C010

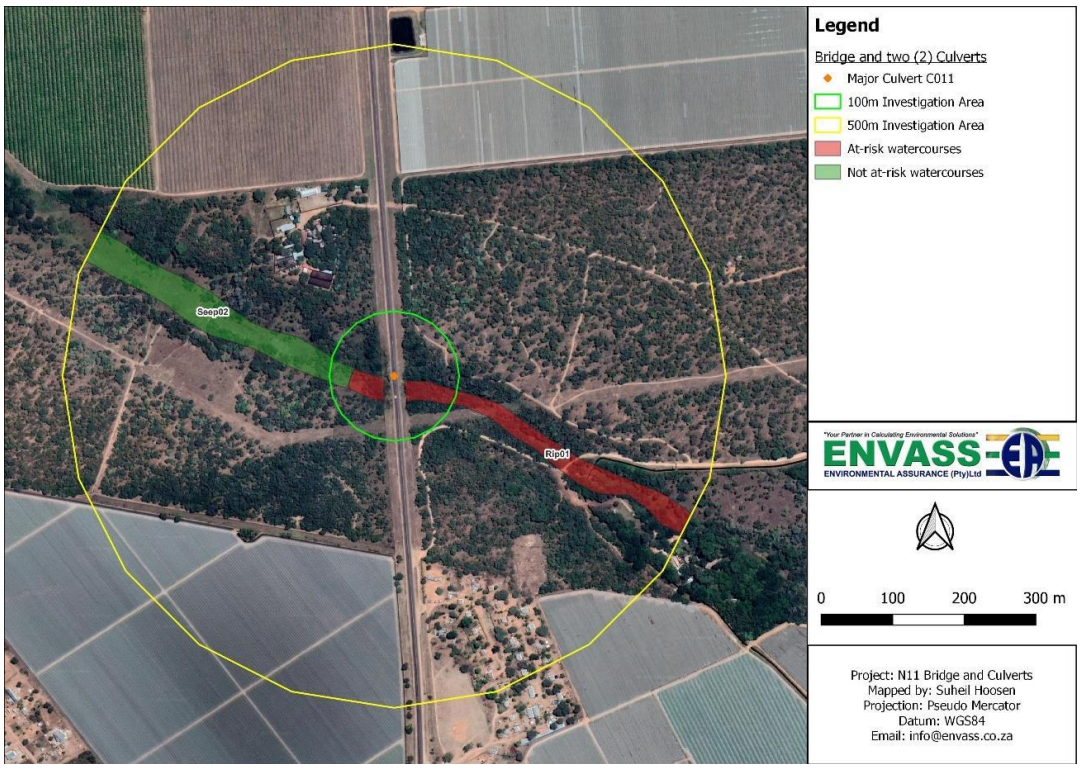

Figure 4-14: Illustration of the overall watercourse delineation with the study area of Major Culvert C011

4.6.3 HYDROLOGY

4.6.3.1 Bridge – B1050

Based on the results in Table 4-10, the available freeboard for the design flood was found to be inadequate. The calculated required freeboard is 1.01 m and currently, there is insufficient freeboard. According to chapter 10 of the drainage manual if the design flood does not meet the required freeboard, the structure must be evaluated for one road class lower (Class 2 to Class 3). According to Figure 4-16, the design recurrence interval for a Class 3 road is the 1:20 year floodline.

The structure was evaluated for the 1:20 year floodline and the results are presented in Table 4-10. Although the structure was evaluated for a lower class, it did not meet the necessary freeboard requirements for a Class 3 road of 0.91 m. The 1:50 year floodline passes underneath the bridge but with insufficient freeboard, indicating that structure is currently significantly under-designed. This also correlates with the reported inundations of the bridge in 1996 and 2008. Therefore, the structure does not meet the necessary hydraulic requirements and a new structure is proposed.

The new structure needs to be constructed on the downstream side to accommodate the new road alignment. The existing structure will need to be demolished to enable the design flood to pass through the new bridge with the required freeboard.

Table 4-10: Summary of Hydraulic Calculation

DESCRIPTION	UNIT	MOSES RIVER BRIDGE	
		CLASS 2	CLASS 3
Catchment Area	km^2	1671	
Hydrological 20-year indicator flood calculation method:			
• Rational Method (Alternative 3)	m^3/s	737	
• Standard Design Flood Method	m^3/s	790	
• Empirical Method	m^3/s	497	
20-year indicator flood used (Alternative 3)	m^3/s	737	
Design flood recurrence interval T for capacity and deck soffit freeboard criteria requirements	yrs.	50	20
Design flood Q_T for capacity and deck soffit freeboard criteria requirements	m^3/s	816	606
Design flood Q_{2T} for shoulder break point overtopping criteria requirements	m^3/s	1024	816
Regional Maximum Flood (RMF)	m^3/s	2635	
Regional Maximum Flood (RMF) level	m.a.s.l.	863.19	

DESCRIPTION	UNIT	MOSES RIVER BRIDGE	
		CLASS 2	CLASS 3
Average slope of stream bed at structure	m/m	0,001	
Design high flood level for Q_T	m.a.s.l.	859.47	855.91
Minimum bridge upstream soffit level	m.a.s.l.	857.2	857.2
Design high flood level for Q_{2T}	m.a.s.l.	859.92	859.47
Design flow velocity through bridge for QT (< 4m/s preferred)	m/s	3.89	3.66
Required freeboard to deck soffit (F = 0.78 log (QT) – 1.26)	m	1.01	0.91
Available (existing) freeboard to deck soffit	m	0	0
Freeboard excess	m	0	0
Shoulder breakpoint (SBP) level	m.a.s.l.	858.70	
Shoulder breakpoint (SBP) excess	m	0	0
Freeboard dictated by road geometry	Y/N	Y	Y
Design flood levels influenced by dams	Y/N	N	N

Figure 4-15: Inundation map for the 1:50 year floodline

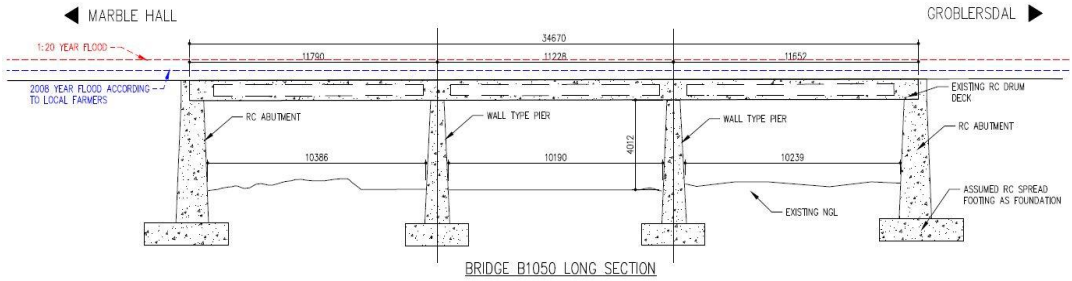

Figure 4-16: Design flood lines of Bridge B1050

4.6.3.2 Major Culvert – C010

The culvert was first tested based on a road class 2 i.e., Q_{C1} and Q_{C2} to be greater than Q_T and Q_{2T}, respectively. The culvert was found to have adequate capacity based on this criterion. The H/D ratio for the Q_T and Q_{2T} was smaller than 1.2D and 2D; therefore, the structure meets the hydraulic requirements.

Table 4-11: Summary of Hydraulic Calculations

DESCRIPTION	UNIT	C010
		CLASS 2
Catchment Area	km^2	4.86
20-year indicator flood used (Rational Alternative 3)	m^3/s	15
Design flood recurrence interval T for current capacity	yrs.	21
Design flood QT for capacity requirements	m^3/s	20
Design flood Q2T for shoulder break point overtopping criteria requirements	m^3/s	35
Slope of river at culvert	m/m	0.021
Culvert Depth	m	0.9
Inlet or Outlet Control	-	Inlet
Headwater Level (QT)	m.a.s.l.	914.54
Invert Level	m.a.s.l.	913.35
QT Headwater Depth (Headwater level – Invert level)	m	1.19
H/D Ratio (QT) (< 1.2 D)	-	1.32
Headwater Level (Q2T)	m.a.s.l.	915.72
Q2T Headwater Depth (Headwater level – Invert level)	m	2.37
H/D Ratio (Q2T) (< 2D)	-	2.63
Shoulder Break Point Level	m.a.s.l.	915.4
Overtopping	Y/N	N
Outlet velocity for QT	m/s	3.38

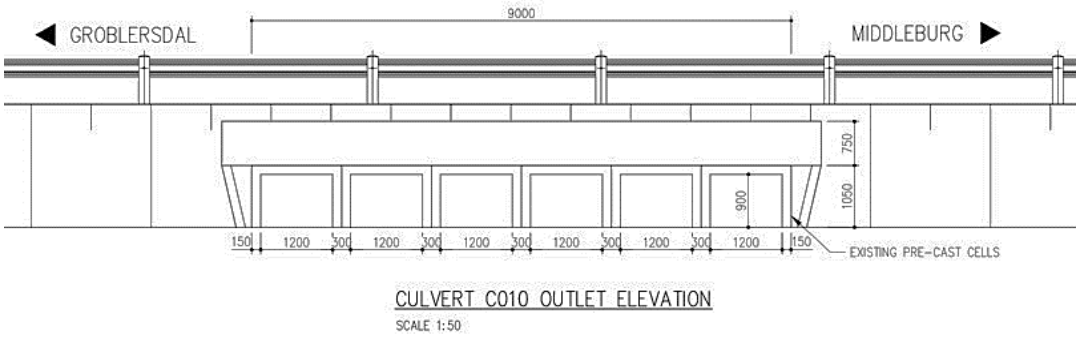

Figure 4-17: Culvert in elevation

4.6.3.3 Major Culvert – C011

The culvert was first tested based on a road class 2, i.e., QC1 and QC2 to be greater than QT and Q2T, respectively. The culvert was found to have adequate capacity based on this criterion. The H/D ratio for the QT and Q2T was smaller than 1.2D and 2D; therefore, the structure meets the hydraulic requirements.

Table 4-12: Summary of Hydraulic Calculations

DESCRIPTION	UNIT	C011
		CLASS 2
Catchment Area	km2	2.9
20-year indicator flood used (Rational Alternative 3)	m3/s	12
Design flood recurrence interval T for current capacity	yrs.	20
Design flood QT for capacity requirements	m3/s	12
Design flood Q2T for shoulder break point overtopping criteria requirements	m3/s	16
Slope of river at culvert	m/m	0.025
Culvert Depth	m	2.1
Inlet or Outlet Control	-	Inlet
Headwater Level (QT)	m.a.s.l.	910.47
Invert Level	m.a.s.l.	907.9
QT Headwater Depth (Headwater level – Invert level)	m	2.57
H/D Ratio (QT) (< 1.2 D)	-	1.22
Headwater Level (Q2T)	m.a.s.l.	910.47
Q2T Headwater Depth (Headwater level – Invert level)	m	3.10
H/D Ratio (Q2T) (< 2D)	-	1.48
Shoulder Break Point Level	m.a.s.l.	912.8
Overtopping	Y/N	N
Outlet velocity for QT	m/s	4.21

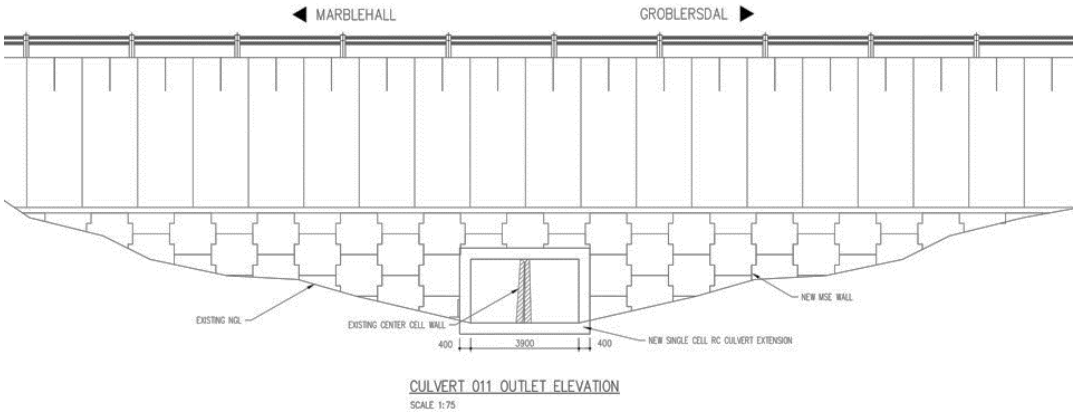

Figure 4-18: Culvert in elevation

4.6.4 BIODIVERSITY AND TERRESTRIAL ECOSYSTEM

Based on the terrestrial ecological study, the most prominent plant families that were found on site are as follows:

- Asteraceae (Daisy Family) – 21 species (no endemic species);
- Fabaceae (Pea Family) – 41 species (1 endemic species which is NT); and
- Poaceae (Grass Family) – 38 species (1 endemic species)

The proposed study area occurs exclusively within the Central Sandy Bushveld vegetation type. No plant Species of Conservation Concern (SCC) or protected plant species in terms of the provincial conservation ordinance were observed in the study area.

According to the records available on Animal Demography Unit (ADU, 2022), the Quarter Degree Square (QDS) in which the site is found contained a moderate species diversity with more than a hundred individual species being recorded. However, only eight (8) species were SCC.

Table 4-13 provides a summary of the animal species identified on site and noteworthy in terms of conservation status.

Table 4-13: Identified Fauna

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	LIKELIHOOD OF OCCURRENCE (LOW, MEDIUM, HIGH)
Mammals			
Hyaena brunnea	Brown Hyaena	NT	Low
Aonyx capensis	African Clawless Otter	NT	Low at culverts and High at bridge
Herpetofauna			
Kinixys lobatsiana	Lobatse hinge-back tortoise	VU	Low
Crocodylus niloticus	Nile Crocodile	VU	Low
Avifauna			
Podica senegalensis	African Finfoot	EN	Low-Medium
Aquila rapax	Tawny Eagle	VU	Medium

A national vegetation type, the Central Sandy Bushveld, is the only national vegetation type found in the study area, as illustrated below. Currently, this ecosystem is listed as “Least Concern” and is a dominant vegetation type within these parts, appearing frequently across adjacent landscapes.

The terrestrial biodiversity impact assessment found that the proposed development is likely to have a “medium” impact on the surrounding terrestrial

environment prior to the application of mitigation techniques. It is envisioned that through the careful application of mitigation measures, the proposed development is likely to have a far more reduced average impact significance of "low", with the highest post-mitigation impact being the proliferation of alien invasive plant species.

It was determined that the present vegetation communities are, however, likely to respond well to rehabilitation, which will encourage any displaced fauna to return back to the study area once the upgrades have been completed by the Contractor. Although vegetation clearance, and loss of natural habitat will be unavoidable, the application of rehabilitation within the study area will enable the project to achieve a "no net-loss in biodiversity" status without any need for offsetting residual impacts. Possible impacts to CBA areas were noted, and according to the Limpopo *Conservation Plan: Technical Report,* this land should remain in its current state or be improved. However, as this is an "upgrade project" over an existing national roadway, the specialist is of the opinion that these upgrades should be permissible and are required to improve drainage in the three (3) affected watercourses, thus improving connectivity and natural flow.

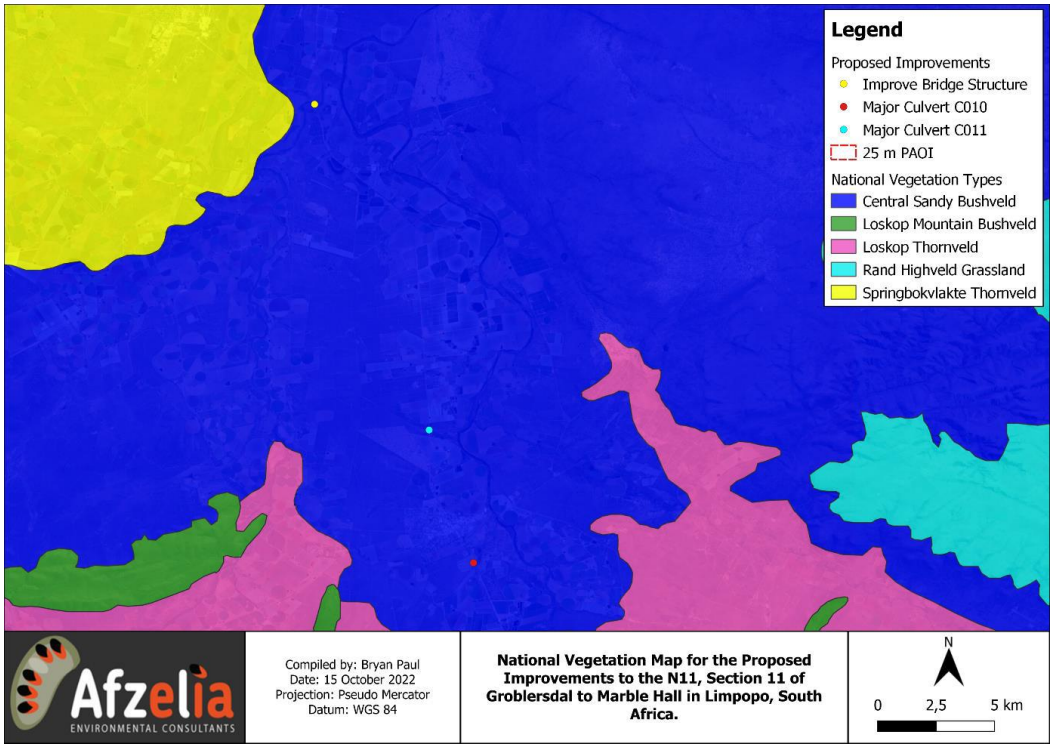

Figure 4-19: Vegetation types associated with the study area (Mucina and Rutherford, 2018)

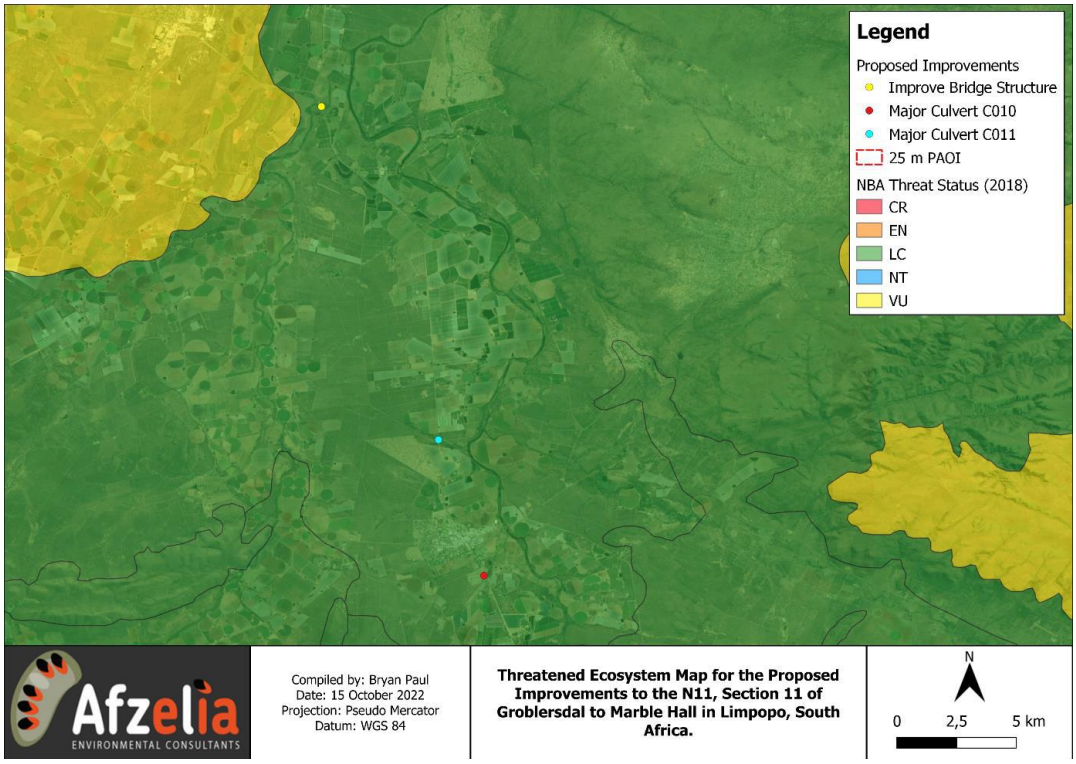

Figure 4-20: Vegetation types threat status according to the National Biodiversity Assessment (Skowno et. al 2019)

5 PUBLIC PARTICIPATION

The following sections will discuss the approach taken with the public participation process for this application. This was conducted in accordance with the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) as well as the DFFE's Public Participation Guideline in terms of NEMA EIA Regulations (2017).

5.1 COMPILATION OF A STAKEHOLDER DATABASE

The stakeholder database consists of all registered interested and affected parties, as well as the competent authorities, relevant municipal departments, and the local and district municipalities.

The stakeholder database has been updated and maintained throughout the public participation process.

5.2 METHODS OF PUBLIC PARTICIPATION

The Public Participation period will commence for the 30-day (EA and Mining Permit) and 40-day (GA – if required) mandatory period after the DBARs and Technical Report were complete. The draft reports were circulated to all I&APs for review and comments. An advert was placed in The Dalla, informing the public of the project and how to register as an I&AP to comment and receive updates on the application. Site notices were also placed at strategic points around the proposed site with the above information. All site notices and adverts were published in both English and Sepedi.

5.2.1 ADVERTISEMENT

The following is the newspaper advert published during the public participation phase.

NOTICE OF A BASIC ASSESSMENT, MINING PERMIT AND GENERAL AUTHORISATION PROCESS FOR THE PROPOSED IMPROVEMENT OF THE NATIONAL ROAD N11 SECTION 11 FROM GROBLERSDAL (KM 0.00) TO MARBLE HALL (KM 29.50).

Notice is hereby given in terms of Regulations published in Government Notice R. 982, Government Gazette No. 38282 of 04 December 2014, as amended by GN R326 under sections 24(5), and 44, of the National Environmental Management Act, 1998 (Act No.107 of 1998), that the South African Road Agency SOC Ltd (SANRAL) proposes the improvement of the National Road N11 Section 11 from Groblersdal (km 0.00) to Marble Hall (km 29.50).

In order to obtain the required Environmental Authorisation, a Basic Assessment process must be undertaken in terms of the EIA Regulations, 2014 (as amended in 2017). A General Authorisation will be submitted as required by the National Water Act (Act 36 of 1998). A Mining Permit application (via the Basic Assessment process) for two borrow pits will be submitted as required by the MPRDA, 2002 (Act No. 28 of 2002). These processes will be conducted to ensure that the environmental impacts that may be associated with the proposed project are taken into consideration. Interested and Affected Parties (I&APs) have an opportunity to comment by providing issues of concern and/or suggestions for enhanced benefits and/or alternatives; and to ensure that the competent authority, the Department of Forestry, Fisheries and the Environment (DFFE), Department of Mineral Resources and Energy (DMRE) and Department of Water and Sanitation (DWS), has sufficient information to make a decision.

Delta Built Environment Consultants (Pty) Ltd has been appointed as the Independent Environmental Assessment Practitioner to conduct the Basic Assessment and General Authorisation process for this project. You are invited to register as an Interested and Affected Party (I&AP) and submit your comments and queries to Delta BEC representative, Attention: Neelan Maduray at Tel: 071 682 1858; E-mail: neelan.maduray@deltabec.com on or before Tuesday, 03 March 2023. All Draft Reports will be available on the SANRAL Website (www.nra.co.za).

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Living Waters' Reading and Writing Week

Ben Viljoen hou prysuitdeling

NOTICE OF A BASIC ASSESSMENT, MINING PERMIT AND WATER USE LICENCE PROCESS FOR THE PROPOSED IMPROVEMENT OF THE NATIONAL ROAD N11 SECTION 11 FROM GROBLERSDAL (KM 0.00) TO MARBLE HALL (KM 29.50).

TSEBIŠO YA KELO YA MOTHEO (BASIC ASSESSMENT), TUMELELO YA MEPHO (MINING PERMIT) LE TOKOPETSO YA LASENSE YA TŠHOMIŠO YA METSI (WATER USE LICENCE) BAKENG BA KAGNAFATŠO YE E ŠEBETŠWAGO YA TSELA YA BOSETŠHABA YA N11 KAROLO 11 GO TŠWA GO GROBLERSDAL (KM 0.00) GO YA GO HALL YA MARBLE (KM 29.50).

Figure 5-1: Proof of publication (outlined on red)

5.2.2 SITE NOTICES

The following is an example of the site notice.

NOTICE OF A BASIC ASSESSMENT, MINING PERMIT AND GENERAL AUTHORISATION PROCESS FOR THE PROPOSED IMPROVEMENT OF THE NATIONAL ROAD N11 SECTION 11 FROM GROBLERSDAL (KM 0.00) TO MARBLE HALL (KM 29.50).

INVITATION TO COMMENT AND REGISTER

Notice is hereby given in terms of Regulations published in Government Notice R. 982, Government Gazette No. 38282 of 04 December 2014, as amended by GN R326 under sections 24(5), and 44, of the National Environmental Management Act, 1998 (Act No.107 of 1998), that the South African Road Agency SOC Ltd (SANRAL) proposes the improvement of the National Road N11 Section 11 from Groblersdal (km 0.00) to Marble Hall (km 29.50).

In order to obtain the required Environmental Authorisation a Basic Assessment process must be undertaken in terms of the EIA Regulations, 2014 (as amended in 2017). A General Authorisation will be submitted as required by the National Water Act (Act 36 of 1998). A Mining Permit application (via the Basic Assessment process) for two borrow pits will be submitted as required by the MPRDA, 2002 (Act No. 28 of 2002). These processes will be conducted to ensure that the environmental impacts that may be associated with the proposed project are taken into consideration. Interested and Affected Parties (I&APs) have an opportunity to comment by providing issues of concern and/or suggestions for enhanced benefits and/or alternatives; and to ensure that the competent authority, the Department of Forestry, Fisheries and Environment (DFFE), Department of Mineral Resources and Energy (DMRE) and Department of Water and Sanitation (DWS), has sufficient information to make a decision.

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5.2.3 SITE PHOTOGRAPHS

Table 5-1 below illustrates the site notices that were strategically placed along the proposed route to inform the public of the proposed project.

Table 5-1: Photos of site notices

		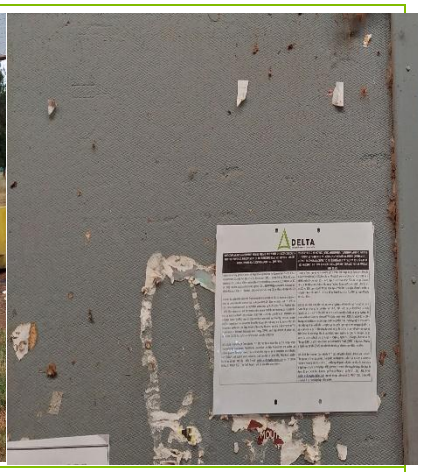
Figure 5-2: Site Notice 1	Figure 5-3: Site Notice 2	Figure 5-4: Site Notice 3
		
Figure 5-5: Site Notice 4	Figure 5-6: Site Notice 5	Figure 5-7: Site Notice 6

Table 5-2: Site notices locations

SITE NOTICE	COORDINATES	LOCATION DESCRIPTION
Site Notice 1	24°58'34.60"S 29°17'35.11"E	Hiking spot/bus & taxi stop - corner R573 and N11
Site Notice 2	24°58'29.12"S 29°17'27.19"E	Corner N11 and 1st street, this route is going to Marble Hall shopping centre
Site Notice 3	24°58'25.23"S 29°17'26.27"E	Notice board at Marble Shopping Centre next to Pick 'n Pay
Site Notice 4	25° 0'7.13"S 29°20'40.64"E	Along the N11 route Moosriver shop and rest@moosriver
Site Notice 5	25° 9'35.73"S 29°23'39.84"E	Next to Sasol filling station where taxis park
Site Notice 6	24°57'4.21"S 29°24'34.80"E	Leeuwfontein – area close proximity to the borrow pit

5.2.4 PUBLIC MEETING

Meetings with all I&APs along the affected route occurred on 2nd February 2023. The notes from these discussions are attached to Appendix F5.

5.3 COMMENTS AND RESPONSES REPORT

All comments received on the Draft BAR have been captured in a Comments and Responses table which is attached to Appendix F2.

6 DESCRIPTION AND ASSESSMENT OF IMPACTS

6.1 RISK ASSESSMENT METHODOLOGY

This section briefly describes the methodology utilised in the rating of the significance of impacts. The impact assessment was conducted as per the conditions set out in the 2014 NEMA Regulations. The scoring assessment was calculated using the following parameters:

6.1.1 NATURE

A description of what causes the effect, what will be affected, and how it will be affected.

6.1.2 PROBABILITY RATING (P)

The occurrence of which describes the likelihood of the impact occurring. Probability is estimated on a scale, and a score is assigned:

- 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 (impact will occur regardless of any prevention measures)

6.1.3 DURATION RATING (D)

Wherein it is indicated whether:

- 1 Immediate – > 1 year
- 2 Short term – 1 to 5 years
- 3 Medium term – 6 to 15 years
- 4 Long Term – the impact will cease when the operation stops
- 5 Permanent – no mitigation measure will reduce the impact after construction.

6.1.4 EXTENT RATING (E)

Wherein it is indicated whether:

- 1 - Immediate area or site of development
- 2 - Local area
- 3 - Regional
- 4 - National
- 5 - International

6.1.5 MAGNITUDE (M)

Quantified on a scale from 0-10, where a score is assigned:

- 0 - small and will have no effect on the environment
- 2 - minor and will not result in an impact on processes
- 4 - low and will cause a slight impact on processes
- 6 - moderate and will result in processes continuing but in a modified way
- 8 - high (processes are altered to the extent that they temporarily cease)
- 10 - very high and results in complete destruction of patterns and permanent cessation of processes.

6.1.6 SIGNIFICANCE (S)

Determined through a synthesis of the characteristics described above (refer to formula below) and can be assessed as low, medium or high.

- The status, which is described as **positive**, **negative** or **neutral**.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The significance is determined by combining the criteria in the following formula:

S= (E+D+M) P

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The significance weightings for each potential impact are described in Table 6-1 below.

Table 6-1: Significance Weightings

POINTS	SIGNIFICANT WEIGHTING	DISCUSSION
< 30 Points	**Low**	This impact would not have a direct influence on the decision to develop in the area.
31 – 60 Points	**Medium**	The impact could influence the decision to develop in the area unless it is effectively mitigated.

POINTS	SIGNIFICANT WEIGHTING	DISCUSSION
> 60 Points	**High**	The impact must have an influence on the decision process to develop in the area.

6.2 IMPACTS IDENTIFIED

6.2.1 CONSTRUCTION PHASE

This section presents the quantitative impact assessment of the activities and perceived impacts assumed to occur within the construction phase of the proposed development.

6.2.1.1 Loss of Aquatic Habitat and Ecological Connectivity

Table 6-2: Impacts on Aquatic Habitat

CRITERIA	DESCRIPTION			
IMPACT	Direct loss of aquatic habitat and ecological structure within the catchment area of the at-risk watercourses associated with the proposed development.			
NATURE	A total of three (3) watercourses were determined to be of high or medium risk of being impacted by the proposed development, and of the three (3), only Rip02 will most likely be directly impacted by the proposed development activities. The direct and indirect excavation within watercourses will disturb the current habitat structure and functionality and may result in Alien Invasive Plant Species (AIPS) encroaching into the disturbed area if not managed appropriately, which presents a risk of reduced biodiversity and ecosystem functionality.			
	BRIDGE B1050		MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Limited to site	2 Local	1 Limited to site
DURATION	5 Permanent	5 Permanent	5 Permanent	5 Permanent
MAGNITUDE	6 Moderate	4 Low	6 Moderate	2 Minor
PROBABILITY	3 Probable	2 Improbable	2 Improbable	1 Very improbable
SIGNIFICANCE	39 MODERATE (-)	20 LOW (-)	26 LOW (-)	8 LOW (-)
REVERSIBILITY	1 Reversible		1 Reversible	

6.2.1.2 Alteration of Water Quality

Table 6-3: Indirect alteration of water quality as a result of the proposed development

CRITERIA	DESCRIPTION
IMPACT	Indirect alteration of the water quality within the at-risk and downstream watercourses.

NATURE	Excess bare soil and sedimentation created from construction activities may enter the adjacent watercourses and deteriorate the water quality. In addition to this, the introduction of hydrocarbon sources and concrete mix poses a risk of contamination occurring if mitigation measures are not implemented. Furthermore, the potential diversion of the Rip02 from the potential construction of a new bridge will impact the downstream water quality of the system.			
	BRIDGE B1050		MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	2 Local area	2 Local area	2 Local area
DURATION	3 Medium term (5- 15 years)	2 Very short (2-5years)	3 Medium term (5-15years)	1 Very short (0-1year)
MAGNITUDE	8 High	4 Low	6 Moderate	2 Minor
PROBABILITY	4 Highly probable	2 Improbable	3 Probable	2 Improbable
SIGNIFICANCE	52 MODERATE (-)	16 LOW (-)	33 MODERATE (-)	10 LOW (-)
REVERSIBILITY	1 Reversible		1 Reversible	

6.2.1.3 Alteration of Catchment Landscape and Hydrological Flows

Table 6-4: Direct alteration of the catchment landscape and hydrological flows

CRITERIA	DESCRIPTION			
IMPACT	Direct alteration of the catchment landscape and hydrological flows.			
NATURE	The hardened surfaces created by the construction of the proposed development (i.e.: access roads) will reduce the area of vegetation and infiltration rates, and slightly alter the current hydrological flow regime within the catchment area. This could lead to erosion features developing downslope of the structures if adequate flow management systems are not integrated into the overall design of the proposed development (e.g.: stormwater management and flow dissipators).			
	BRIDGE B1050		MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Site area	2 Local area	1 Site area
DURATION	2 Short-term (2-5 years)	1 Very short-term (0-1 years)	2 Short-term (2-5 years)	1 Very short-term (0-1 years)
MAGNITUDE	4 Low	2 Minor	4 Low	2 Minor
PROBABILITY	3 Probable	2 Improbable	3 Probable	2 Improbable
SIGNIFICANCE	24 LOW (-)	8 LOW (-)	24 LOW (-)	8 LOW (-)
REVERSIBILITY	1 Reversible		1 Reversible	

6.2.1.4 Alteration to Ecosystem Service Provision

Table 6-5: Indirect alteration of the ecosystem services provided by the freshwater ecosystems

CRITERIA	DESCRIPTION			
IMPACT	Indirect alteration of the ecosystem services provided by freshwater ecosystems within the study area			
NATURE	The disturbance of freshwater ecosystems as a result of construction activities and associated infrastructure may alter the ability of the freshwater ecosystems to provide valuable regulating and supporting, as well as cultural and provisioning, benefits to the surrounding anthropogenic and natural environments			
	BRIDGE B1050		MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Limited to site	2 Local area	1 Limited to site
DURATION	2 Short-term (2-5 years)	1 Very short-term (0-1 years)	2 Short-term (2-5 years)	1 Very short-term (0-1 year)
MAGNITUDE	6 Moderate	4 Low	4 Low	2 Minor
PROBABILITY	3 Probable	2 Improbable	3 Probable	2 Improbable
SIGNIFICANCE	30 MODERATE (-)	14 LOW (-)	24 LOW (-)	8 LOW (-)
REVERSIBILITY	1 Reversible		1 Reversible	

6.2.1.5 Loss of Vegetation

Table 6-6: Loss of Vegetation from construction activities

CRITERIA	DESCRIPTION	
IMPACT	Loss of vegetation from clearing for construction activities.	
NATURE	For the Contractor to upgrade structures and build new ones, vegetation clearing will be required within the immediate vicinity of these structures. Unmanaged clearing activities are likely to impact plant communities significantly and result in more intense rehabilitation being required.	
	BRIDGE B1050, MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Site area
DURATION	3 Medium term (5-15 years)	2 Short term (2-5 years)
MAGNITUDE	6 Moderate	2 Minor
PROBABILITY	5 Improbable	3 Probable
SIGNIFICANCE	40 MODERATE (-)	15 LOW (-)
REVERSIBILITY	1 Reversible	

6.2.1.6 Loss of Plant SCC and/or Threatened or Protected Species (Flora)

Table 6-7: Loss of Plant SCC and/or Threatened or Protected Species (Flora)

CRITERIA	DESCRIPTION	
IMPACT	Loss of Plant SCC and/or Threatened or Protected Species (Flora) from clearing for construction activities.	
NATURE	During the field assessment, no Plant SCC or TOPS were observed within the study area. According to the POSA database, however, there have been Red List Plant Species found within the greater surroundings; therefore, the ECO should ensure that if any SCC or TOPS are found during his/or her inspections, the Competent Authority (CA) is notified, and a permit is received before removing and/or damaging this species.	
	BRIDGE B1050, MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Site area
DURATION	2 Short term (2-5 years)	2 Short term (2-5 years)
MAGNITUDE	4 Low	2 Minor
PROBABILITY	3 Probable	2 Improbable
SIGNIFICANCE	24 MODERATE (-)	10 LOW (-)
REVERSIBILITY	1 Reversible	

6.2.1.7 Loss of Faunal SCC and/or Threatened or Protected Species (Fauna)

Table 6-8: Loss of Faunal SCC and/or Threatened or Protected Species (Fauna)

CRITERIA	DESCRIPTION	
IMPACT	Loss of Faunal SCC and/or Threatened or Protected Species (Fauna) from clearing for construction activities.	
NATURE	According to the observations made during the field assessment and the availability of suitable habitat within the study area, relatively few faunal SCC are likely to be found within the study area. Species like *Aquila rapax* (Tawny Eagle) may be observed flying over the study area and both *Crocodylus niloticus* (Nile Crocodile) and *Aonyx capensis* (African Clawless Otter) may be found within the river over which the bridge improvements will take place. All three (3) species were not found during the field assessment but have occurred within the study area at some point. The application of mitigation techniques, like preventing hunting from taking place on site or ensuring that the natural flow regime is maintained during construction, will ensure the continuation of these species if they occur within the area.	
	BRIDGE B1050, MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Site area
DURATION	2 Short term (2-5 years)	2 Short term (2-5 years)

MAGNITUDE	6 Moderate	2 Minor
PROBABILITY	3 Probable	2 Improbable
SIGNIFICANCE	30 MODERATE (-)	10 LOW (-)
REVERSIBILITY	1 Reversible	

6.2.1.8 Fragmentation, Loss of Ecosystem Function and Edge Effects

Table 6-9: Fragmentation, Loss of Ecosystem Function and Edge Effects

CRITERIA	DESCRIPTION	
IMPACT	Fragmentation, Loss of Ecosystem Function and Edge Effects due to construction activities.	
NATURE	The nearby river and wetland habitat present within the study area would support good ecological connectivity within the study area and be associated with a high number of common faunal species, which would make use of the supply of water and availability of prey and foraging opportunities throughout the year. However, the presence of an existing N11 roadway and extensive fence lines within close proximity to the proposed development would have already had a negative influence on ecosystem function and contributed to the fragmentation of habitat found within the study area. The destruction of watercourses will have an influence on habitat heterogeneity within a greater context than just the site and may influence ecosystem function and the way in which species currently have access to both flowing water and the stagnated water found within wetland habitats. Mitigation, such as rehabilitation and maintenance of a natural flow during construction, should be applied.	
	BRIDGE B1050, MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Site area
DURATION	3 Medium term (5-15 years)	3 Medium term (5-15 years)
MAGNITUDE	6 Moderate	2 Minor
PROBABILITY	3 Probable	2 Improbable
SIGNIFICANCE	33 MODERATE (-)	12 LOW (-)
REVERSIBILITY	1 Reversible	

6.2.1.9 Invasion of Alien Invasive Plant Species (AIPS)

Table 6-10: Invasion of Alien Invasive Plant Species (AIPS)

CRITERIA	DESCRIPTION
IMPACT	Invasion of Alien Invasive Plant Species (AIPS) from construction activities.
NATURE	Existing populations of AIPS were found nearby the site area, and

	executing construction activities within the study area will rapidly encourage the growth of AIPS and noxious weeds. If the appointed Contractor does not implement AIPS control measures at the onset of construction, these species will begin to proliferate and influence areas outside of the footprint and may have significant and somewhat irreversible impacts on more sensitive habitats located nearby.	
	BRIDGE B1050, MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation
EXTENT	3 Regional	1 Site area
DURATION	4 Long term (>15 years)	3 Medium term (5 – 15 years)
MAGNITUDE	6 Moderate	2 Minor
PROBABILITY	4 Highly Probable	3 Probable
SIGNIFICANCE	52 HIGH (-)	18 LOW (-)
REVERSIBILITY	1 Reversible	

6.2.2 POST-CONSTRUCTION PHASE

This section presents the quantitative impact assessment of the activities and perceived impacts assumed to occur within the post-construction phase of the proposed development.

6.2.2.1 Improvement of Aquatic Habitat and Ecological Structure

Table 6-11: Improvement of aquatic habitat and ecological structure

CRITERIA	DESCRIPTION			
IMPACT	**Positive impact**: Improvement of the aquatic habitat and ecosystem structure adjacent to the proposed development site.			
NATURE	Subsequent to the end of the construction phase, the disturbed areas around the proposed development footprint will be rehabilitated to pre-construction (or better) condition. This may result in an improvement of the condition of the downstream watercourses if all mitigation measures presented herein and the site-specific EMPr are strictly implemented and subsequently monitored.			
	BRIDGE B1050		MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation
EXTENT	1 Site area	1 Site area	1 Site area	1 Site area
DURATION	1 Short term (2-5 years)	1 Short term (2-5 years)	1 Short term (2- 5 years)	1 Short term (2- 5 years)
MAGNITUDE	4 Low	4 Low	4 Low	4 Low
PROBABILITY	2 Improbable	5 Definitive	2 Improbable	5 Definitive
SIGNIFICANCE	12 LOW (+)	30 MODERATE (+)	12 LOW (+)	30 MODERATE (+)
REVERSIBILITY	1 Reversible (positive impact,		1 Reversible (positive impact,	

	therefore, recommended not to be reversed)	therefore, recommended not to be reversed)

6.2.3 OPERATIONAL PHASE

This section presents the quantitative impact assessment of the activities and perceived impacts assumed to occur within the operational phase of the proposed development.

6.2.3.1 Alteration of Water Quality

Table 6-12: Indirect alteration of water quality

CRITERIA	DESCRIPTION			
IMPACT	Indirect alteration of the water quality within the at-risk and downstream watercourses.			
NATURE	Maintenance activities will result in hydrocarbons and construction equipment being brought onsite site and potentially utilised in areas where the proposed development crosses watercourses, which will increase the risk of contamination of watercourses.			
	BRIDGE B1050		MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation	Pre-Mitigation	Post-Mitigation
EXTENT	2 Local area	1 Site area	2 Local area	1 Site area
DURATION	2 Short term (2-5 years)	1 Very short (0-1 year)	2 Short term (2-5 years)	1 Very short (0-1 year)
MAGNITUDE	6 Moderate	4 Low	6 Moderate	4 Low
PROBABILITY	3 Probable	2 Improbable	3 Probable	2 Improbable
SIGNIFICANCE	30 MODERATE (-)	12 LOW (-)	30 MODERATE (-)	12 LOW (-)
REVERSIBILITY	1 Completely reversible		1 Completely reversible	

6.2.3.2 Alteration of Catchment Landscape and Hydrological Flows

Table 6-13: Direct alteration of the catchment landscape and hydrological flows

CRITERIA	DESCRIPTION	
IMPACT	Direct alteration of the catchment landscape and hydrological flows	
NATURE	New access roads within terrestrial areas will slightly alter the hydrological flow regime within the catchment area. This could result in alterations of flow to watercourses and the flow patterns within watercourses.	
	BRIDGE B1050, MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation
EXTENT	1 Site area	1 Site area

DURATION	3 Medium term (5-15 years)	2 Short term (2-5 years)
MAGNITUDE	4 Low	2 Minor
PROBABILITY	3 Probable	2 Improbable
SIGNIFICANCE	24 LOW (-)	10 LOW (-)
REVERSIBILITY	1 Completely reversible	

6.2.3.3 Alteration to Ecosystem Service Provision

Table 6-14: Indirect alteration of the ecosystem services provided by the freshwater ecosystems

CRITERIA	DESCRIPTION	
IMPACT	Indirect alteration of the ecosystem services provided by freshwater ecosystems within the study area	
NATURE	Direct and indirect disturbance of watercourses may result in AIPS encroaching into the disturbance footprint during the operational phase of the proposed development. This will reduce the biodiversity within the catchment area and alter the current water balance within the systems. In addition to this, if adequate rehabilitation is not conducted, the niche points created may result in erosion features developing and loss of soils from watercourses. The above will reduce the ability of the watercourses to provide ESS to the natural and anthropogenic environments. However, it must be noted that the upgrade to Bridge B1050 and Major Culverts C010 and C011 will assist with throughflow, reduce the opportunity for back flooding to occur and increase the opportunity for aquatic and semi-aquatic species to move through bridge culverts and culverts more easily	
	BRIDGE B1050, MAJOR CULVERTS C010 & C011	
	Pre-Mitigation	Post-Mitigation
EXTENT	1 Site area	1 Site area
DURATION	3 Medium term (5-15 years)	2 Short term (2-5 years)
MAGNITUDE	4 Low	2 Minor
PROBABILITY	3 Probable	2 Improbable
SIGNIFICANCE	24 LOW (-)	10 LOW (-)
REVERSIBILITY	1 Completely reversible	

6.2.4 MITIGATION AND REHABILITATION MEASURES

The following sections present the recommended mitigation and/or rehabilitation measures that must be implemented to ensure that the post-mitigation impact significance scores presented herein are realised.

6.2.4.1 Pre-construction Phase

6.2.4.1.1 Stormwater Management

- An in-depth Stormwater Management Plan (SWMP), driven by a risk-averse approach, must be drafted for all aspects of the proposed

development and over different hydrological cycles. This is specific to the temporary access roads, site camp, service roads and upgrades to the Bridge and Major Culverts which will remain post-construction.

- All temporary access and service roads must contain mitre drains every 20 m or less, depending on the topography, to control the stormwater wash down the roads. All stormwater infrastructure must contain flow dissipation structures/measures, as the reduced groundcover within the study area is prone to high-velocity surface wash that may encourage preferential flow-paths to form, and thus rill/gully erosion to occur.
- No stormwater infrastructure must be directed into a watercourse, but instead towards a section of vegetated land, or flow dissipators, adjacent to the watercourse.

6.2.4.1.2 Site Layout

- Locate site camps, laydown areas, stockpile areas, construction material, equipment storage areas, vehicle parking areas, bunded vehicle servicing areas and re-fuelling areas in designated areas of already hardened surface or disturbed areas on site. These areas should preferably be located on level ground in a previously disturbed area of vegetation approved by the Environmental Control Officer (ECO). Cut and fill must be avoided where possible during the set-up of the construction site camp.
- No temporary infrastructure must be situated within delineated watercourses and their associated no-go buffer zones.
- Fuel, chemicals and other hazardous substances should preferably be stored offsite, or in suitable, secure weatherproof containers with impermeable and bunded floors onsite to limit pilferage, spillage into the environment, flooding or storm damage. No contaminated run-off or greywater is allowed to be discharged from the construction site camp.
- The SWMP must detail how stormwater run-off from cleared and compacted surfaces will be controlled. Clearly defined clean and how dirty systems must be developed and maintained around the site camp.
- Erosion control measures, including silt fences, low vegetated soil berms and/or shutter boards, should be put in place around the temporary site camp and laydown areas to limit sediment ladened run-off and contaminants travelling into the surrounding environment.
- Restrict the movement of construction vehicles and personnel to designated access roads to avoid soil disturbance. It is recommended that the footprint of the final site camp be fenced or marked to avoid indiscriminate movement of construction personnel.
- Hazardous material storage areas must not be within 50 m of any watercourse or within the 1:100-year flood line. The furthest threshold must be adhered to. Hazardous storage areas are to be hard surfaced and bunded with an impermeable liner to protect groundwater quality and undercover. The bunded catch pit must have at least 110% the storage capacity of the total stored quantity.

- All delineated watercourses and other no-go areas must be demarcated with danger-tape and dropper poles to ensure that site works and external parties do not traverse within the no-go areas.

6.2.4.1.3 Bridge, Culvert and Road Crossing Design Mitigation Measures

- Watercourse road crossings should be minimised as far as practically possible, and crossings of important systems should be avoided to avoid or minimise direct habitat impacts, hydrological impacts, and ecological fragmentation impacts.
- All road crossings should be aligned and designed to minimise the extent of wetland habitat directly impacted by construction activities and permanent structures.
- For all crossing types and designs, flow through road crossings should not be unnecessarily concentrated and flow velocity should not be increased. In this regard, wetland crossings should be either spanned with a bridge or crossed using box/portal culverts established across the entire width of the wetland to avoid flow narrowing and concentration. Pipe culverts should be avoided.
- Erosion protection and energy dissipation measures should be established at all road crossing outlets e.g., stilling basins and reno-mattresses.
- The key impact minimisation measure for watercourse crossings (both existing and new) is the establishment of an adequate number of box culverts to ensure that the culverts span the entire width of the channel being crossed to minimise flow concentration/constriction as far as practically possible.
- Culverts should ideally be sized to transport not only water, but the other materials that might be mobilized (i.e., debris).
- The base (invert) of the new portal/box culvert should be at the exact same elevation as the existing culvert to be replaced so that there are no significant upstream and downstream adjustments in the rates of channel erosion and deposition. In this regard, the levels should be accurately pegged out by an engineer and the engineer should be onsite to guide the settling of the foundation.
- The inlet of the culvert base should match the elevation of the stream bed so that there is no culvert base perching (if culvert inlet is higher than riverbed) or a drop into the culvert (if culvert inlet is lower than bed).
- Erosion protection structures should be established at all culvert outlets to reduce bed erosion/scour. Such structures include Reno-mattresses and/or stilling basins established at the current stream bed surface.

6.2.4.1.4 Loss of Vegetation Communities

- All access to site must be limited to existing access roads and pathways. No ad hoc roadways should be permitted without first being authorised by the ECO (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase).

6.2.4.1.5 Loss of Plant Species of Conservation Concern (SCC)

- No plant species (SCC or common) must be harvested or removed from site without approval from the ECO or Applicant in writing. (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase).

6.2.4.1.6 Loss of Faunal Species of Conservation Concern (SCC)

- Site camps and/or laydown areas should not be established out of the delineated watercourses and their associated buffers, as per the Aquatic Biodiversity Impact Assessment. (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase).
- No fishing within any of the rivers or wetlands must be tolerated. (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase).
- Walking and/or driving vehicles within riverbeds, or wetlands must not be permitted unless critical for construction or for an emergency. (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase).
- The killing of any fauna must not be tolerated. (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase)
- Any lighting must not point outwards toward any natural habitat and should be focused downwards or towards the development. (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase).

6.2.4.1.7 Fragmentation, Loss of Ecosystem Function and Edge Effects

- Construction activities must ensure connectivity within nearby rivers and the on-site watercourses. Construction activities must not restrict movement of fauna both within these ecosystems and the ability for fauna to access these ecosystems from outlying areas, such as grasslands or fields, where water sources may be limited. (Pre-construction Phase, Construction Phase, Operational Phase and Rehabilitation Phase)

6.2.4.2 Construction phase

6.2.4.2.1 Run-off, erosion, and sediment control

- Existing vegetation cover on the development site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes that will not be developed.
- Clearing activities must only be undertaken during agreed upon working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.

- Sediment barriers (e.g.: silt fences/sandbags/hay bales) must be installed immediately downstream of active work areas (including soil stockpiles) as necessary to trap any excessive sediments generated during construction.
- All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g., every 2 m) to break the energy of surface flows.
- Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately.
- If revegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that revegetation can commence.
- All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.
- After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences, or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area.

6.2.4.2.2 Hazardous Substance Management

- The proper storage and handling of hazardous substances (e.g., fuel, oil, cement, etc.) needs to be administered.
- Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater.
- Drip trays should be utilised at all dispensing areas.
- No refuelling, servicing or chemical storage should occur within 30 m of any watercourse.
- No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site.
- Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose.
- Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and disposed of satisfactorily.
- All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately, and contaminated soil/material disposed of appropriately at a registered site.

- Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.
- Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.

6.2.4.2.3 Invasive Alien Plant Management

- All alien invasive plants (AIPS) that colonise the construction site must be removed, preferably by uprooting. The Contractor should consult the ECO regarding the method of removal.
- All bare surfaces across the construction site must be checked for AIPS every two weeks, and AIPS must be removed by hand pulling/uprooting and adequately disposed of.
- Herbicides should be utilised where hand pulling/uprooting is not possible. ONLY herbicides which have been certified safe for use in wetlands by an independent testing authority are to be used. The ECO must be consulted in this regard. The herbicide contractor must be certified to apply/utilise the herbicide in question.

6.2.4.2.4 Wildlife Management

- The handling and/or killing of any animal species present is strictly prohibited and all staff/personnel must be notified of such.
- Wetland fauna (e.g., snakes, frogs, small mammals) that are encountered during the construction phase must be relocated to other parts of the wetland under the guidance of the EO or ECO.
- Poaching/snaring is strictly prohibited.

6.2.4.2.5 General Management

- All construction activities should take place within the dry season for the region (Mid-April to September) where reasonably possible.
- No Threatened and/or Protected Species (TOPS) should be cut or disturbed without a permit being granted from the DFFE.
- Sediment netting or similar should be erected around all open excavations to avoid sediment travelling into the surrounding environment. These should be inspected by the ECO daily to ensure that they are fit for purpose.
- Concurrent rehabilitation of the construction footprint, specifically the pipeline servitudes, should be conducted. All disturbed areas should be tilled and revegetated with a mixture of indigenous grass species subsequent to backfilling.
- All excavation of hydric soil within the outer boundaries of watercourses must be done by hand using spades and picks as far as possible to avoid unnecessary disturbance of a watercourse by heavy machinery. The hydric soil removed must be placed in a designated spoil site in sequence and replaced in inverted sequence directly after each section has been laid.

- All hydrophilic plant species within the direct path of the proposed development must be dug up at the roots and placed within a designated storage area and watered on a daily basis using commercially sourced water (unless an existing abstraction WUL has been obtained) until such time as the species are transplanted back post-construction.

6.2.4.2.6 General

- All site personnel must undergo environmental induction prior to construction commencing. The watercourse delineation and associated buffer zones should be presented therein, and it should be communicated that these areas should be considered no-go, aside from when within the pegged-out footprint.
- A pre-construction walkthrough should be conducted by a suitably qualified botanist to mark any TOPS within the pegged-out construction footprint. These species should be translocated if possible.
- If any TOPS or SCC species are found, the Competent Authority must be notified, and a permit must be acquired before removing or moving the species.
- Excess dust observed in the vicinity of the proposed development must be noted and the appropriate dust suppression techniques implemented to ensure no excess sediment input into the surrounding freshwater resources.
- The digging of pit latrines is not allowed under any circumstances.
- None of the open areas or the surrounding environment may be used as ablution facilities.
- No open fires are permitted on site.
- Adequate waste receptacles, which are both wind and scavenger proof, must be placed throughout the site.

6.2.4.3 Loss of Vegetation Communities

- The construction and operational footprint of the development must not be allowed to extend past the assessment area (PAOI). (Construction Phase –Operation Phase).
- All high-sensitivity habitats (e.g., wetlands or rivers and streams) must be sign-posted and delegated as “no-go” areas”. Having lunch breaks or social (after working hours) activities must be prohibited adjacent to these areas.
- A Rehabilitation Plan, encompassing an alien vegetation control plan, must be compiled prior to construction, and implemented to ensure that all rehabilitation and operational management regimes are well coordinated and budgeted for. (Construction Phase – Operational Phase)

6.2.4.3.1 Loss of Faunal Species of Conservation Concern (SCC)

- The Contractor must conduct a brief faunal sweep of culverts and bridge structures prior to their removal or upgrade.

- Environmental awareness training must be conducted by the ECO before any new staff commence with work on site. The awareness training must include teaching staff to deal with encounters with animals (such as snakes or frogs).
- Excavations should be cordoned off and kept open for the minimum period as practically possible.
- Construction should not take place at night.

6.2.4.3.2 Fragmentation, Loss of Ecosystem Function and Edge Effects

- The construction footprint must be kept as small as possible and ensure that the entire footprint and portions of the 25 m Project Area of Influence (PAOI) that were disturbed are rehabilitated to achieve a suitable natural cover (in accordance with the rehabilitation plan).
- Rehabilitated sections of the route should be cornered off from grazers and/or livestock to prevent overgrazing of new plant shoots and trampling of rehabilitated areas (Construction/Rehabilitation Phase).

6.2.4.3.3 Invasion of Alien Plant Species

- An Alien Invasive Plant Species Control Plan must form part of the rehabilitation plan developed for the project. This plan must be developed to include both construction and operational phase requirements (Construction and Operational Phases).
- No dumping of cleared alien vegetation must be allowed on site. All cleared material must be appropriately disposed of at a registered landfill (Construction and Operational Phases).

6.2.4.3.4 Rehabilitation Phase

- Concurrent rehabilitatin should be implemented. All disturbed areas must be rehabilitated within 30 days of the end of each construction activity.
- All post-construction building material and waste must be cleared in accordance with the EMPr, before revegetation of the disturbed footprints take place.
- Erosion features that have developed as a result of construction related disturbances are required to be stabilised. This may also include the need to deactivate any erosion head cuts/rills/gullies that may have developed by either compacted soil infill, rock plugs, gabions or any other suitable measures.
- Slopes that have been altered due to construction/operation must be reshaped to replicate the original condition and contours.
- If the gradient of the banks is greater than 1:1.75, the banks must be stabilised with a biodegradable cover such as Geojute, which must be secured to the steep slope with wooden (biodegradable) pegs. This will reduce soil erosion potential.

- Any areas, which fall outside the site, that have been compacted are required to be ripped to allow for the establishment of vegetation. This ripping must not result in the mixing of sub- and topsoil.
- No imported soil material may be utilised for rehabilitation unless it can be ensured that it is free of any alien vegetation seeds. In situ earthen material is preferred.
- Additional stabilisation of cleared areas to prevent and control erosion must be actively managed. The method of stabilisation should be determined in consultation with the ECO and the engineer. The following methods (or a combination) may be considered, depending on the specific conditions of the site:
    - Brush packing
    - Mulch or chip cover
    - Terracing
    - Straw stabilising (at the rate of one bale/m² and rotated into the top 100 mm of the completed earthworks)
    - Watering
    - Planting/sodding
    - Hand-seeding/Hydro-seeding
    - Mechanical cover or packing structures (Geofabric, Hessian cover, Armourflex, Log/pole fencing)
- A suitably qualified ECO/botanist/horticulturist must supervise the handling, maintenance and planting of the plants/trees. No AIPS may be utilised during the rehabilitation process.
- Rapidly germinating indigenous species (e.g., fast growing, deep rooting, rhizomatous, stoloniferous) known to bind soils in terrestrial, riparian and/or wetland areas must be utilised where there is a strong motivation for stabilisation over reinstating similar plant communities to that being disturbed. This should be informed by a suitably qualified specialist.
- Exposure of plant root systems to drying winds, high temperatures or water logging must be avoided.
- Where possible, revegetation must take place at the start of the spring rains to maximise water availability and minimise the need for irrigation. This will ensure optimal conditions for germination and rapid vegetation establishment.
- If this is not possible, watering planted areas may be necessary during dry periods (external sources of water must be utilised e.g., Joe-Joe tanks).
- Water utilised for irrigation must be free of any chlorine or contaminants that may negatively affect the plant species.
- All alternative roads, tracks and footpaths created during the construction phase should be appropriately rehabilitated (e.g., tillage and revegetation of the affected areas). This rehabilitation should result in improved surface roughness and increased infiltration, along with reduced stormwater flow and, consequently, reduced rill erosion.
- All construction waste materials must be removed, and temporary structures (e.g., offices, workshops, storage containers, ablution facilities)

dismantled from site and the surrounding environment; this will need to be checked by the ECO and the various contractors.

- All banks where there is exposed soil, with the potential for rill/gully erosion to take place, must be stabilised. Gabion structures or geotextiles must be implemented upslope of the proposed development.

6.2.4.4 Operational Phase

- A Maintenance and Monitoring Programme should be composed for all infrastructure and implemented by a suitably qualified professional to ensure that all defects or leakages are identified timeously.
- Monitoring for erosion and AIPS encroachment within watercourses should be conducted during routine monitoring of the infrastructure components. Any erosion features observed to have been created as a result of the proposed development should be stabilised and revegetated in consultation with a suitably qualified environmental scientist or engineer (if required).
- The control of AIPS must be guided by a AIPS control plan to ensure compliance with the NEM:BA (Act No. 10 of 2004). This act states that all landowners must control listed AIPS on their property according to the NEMBA: Alien and Invasive Regulations (2014, as amended) and associated Alien Species List (2020). A contractor must be appointed by the landowner to control all AIPS within the proposed development site. The clearing should take place in a phased manner, starting with the initial clearing and the follow-up, and, lastly, maintenance clearing. The clearing processes typically take 3 years with annual updates of the site-specific AIPS control plan.

7 CONCLUSION AND RECOMMENDATIONS

7.1 SPECIALIST RECOMMENDATIONS

7.1.1 AQUATIC AND WETLAND

- An engineer/water infrastructure professional with appropriate skills and experience should develop a maintenance and monitoring plan for all infrastructure associated with the proposed development.
- Based on the results obtained during the aquatic study, it is the specialist's substantiated opinion that the proposed development continues, provided that all mitigation and rehabilitation measures proposed in the report and the site-specific EMPr be strictly implemented and subsequently monitored.

7.1.2 TERRESTRIAL

- Careful application of mitigation measures should be implemented to reduce the average impact significance to low.
- Rehabilitation should be done post-construction since the study area vegetation communities are likely to respond well to rehabilitation, which will encourage the displaced fauna to return.
- The specialist recommends that these upgrades should be permissible and are required to improve drainage in the three (3) affected watercourses, thus improving connectivity and natural flow.
- It is the specialist's opinion, therefore, that the proposed development assessed within the report should receive a favourable outcome for the Environmental Application (s) lodged with the Competent Authority (CA), provided that the conditions and mitigation techniques set out in the report are carefully implemented by the Applicant throughout the Project Lifecycle.

7.1.2.1 Specialist recommendations to be included in the Environmental Authorisation

- An ECO must be appointed during both the pre-construction and construction phases to ensure that the conditions of the Environmental Authorisation are sufficiently complied with.
- The appointed Contractor for the project must be legally responsible for complying with the approved EMPr and EA.
- The Contractor must include environmental topics within toolbox talks at least once a month and should be made aware of any protected plant species (if applicable) located nearby, the presence of nearby sensitive habitats (such as wetlands and rivers) and the possibility of faunal species being found within development footprint.

- All natural habitats found outside the development footprint must remain untouched, and listed as a no-go area, unless for management and maintenance purposes (e.g., IAPS control).
- A faunal sweep of the bridge and culvert structures must be conducted by the ECO prior to their removal.
- No construction activities should take place during the evening, and construction should take place between 07h00 and 17h00 to avoid periods where fauna is most active.
- All lighting must be focused inward and not towards sensitive habitats.
- Where possible, areas found within CBA and ESA that have been afforded a SEI score of "medium" and "high" should be avoided. In areas that cannot be avoided, rehabilitation must ensure that there is a "no net-loss" in biodiversity.
- All cleared areas must be adequately rehabilitated immediately after construction has been completed and not only at the end of construction. Rehabilitation activities must be season appropriate and make use of plant species already associated with the vegetation type occurring within the development footprint.
- No laydown areas and/or site camp must be established within the delineated watercourses and associated buffers as per Aquatic Biodiversity Impact Assessment. Appropriate dust suppression activities must be undertaken by the Contractor throughout the construction phase of the development.
- All water used on site must not be allowed to be leeched outside of the site boundary.
- A site-specific stormwater management plan must be compiled for the proposed development. This plan must adequately address both normal rainfall and rainfall associated with flood events to prevent any significant impacts on nearby wetlands or rivers.

7.1.3 HERITAGE AND PALEONTOLOGICAL

All the built structures along the route are less than 60 years in age, and, therefore, it is the heritage specialist's opinion that no further mitigation is required.

7.2 OPINION OF EAP

The implementation of the proposed improvement of National Road N11 from Groblersdal km 0.0 to Marble Hall km 29.50 would ensure that the current and anticipated increase in future traffic along the road section can be accommodated. The planned improvements to existing road, major culverts and the new bridge are intended to improve road user safety. These outcomes, as well as the anticipated socioeconomic benefits during the construction phase, were deemed to be positive impacts associated with the implementation of the proposed project. Most potential negative impacts related to the project (during

both construction and operation) are rated as very low to low significance after mitigation.

Based on all the findings from the specialist studies, it is the EAP's opinion that the proposed improvement of National Road N11 Section 11 from Groblersdal to Marble Hall and its associated upgrades and new infrastructure should be granted Environmental Authorisation. All proposed mitigation measures for this project should be implemented and monitored accordingly by an independent ECO.

It is requested that the Environmental Authorisation, if issued by the DFFE, be valid for a period of ten (10) years from the date of signature to account for other permitting requirements, procurement and any unforeseen delays in the commencement of construction.

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APPENDIX A: MAPS

APPENDIX B: SDP

APPENDIX B1: SITE DEVELOPMENT PLAN

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APPENDIX I: ADDITIONAL INFORMATION

APPENDIX I1: SCREENING REPORT

APPENDIX J: MEETING MINUTES

APPENDIX K: NEED AND DESIRABILITY