

FINAL ENVIRONMENTAL IMPACT REPORT

**FINAL EIA REPORT FOR THE ESTABLISHMENT OF A WATER
RETICULATION NETWORK
FOR THE
GAMAGARA LOCAL MUNICIPALITY, OLIFANTSHOEK,
NORTHERN CAPE**

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Prepared for:

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EXECUTIVE SUMMARY

The Gamagara local municipality is proposing to commence with the project of establishing a water reticulation network that connects six(6) existing boreholes and two existing reservoirs which will feed water to the proposed development of 1179 stands in the town of Olifantshoek, Northern Cape Province. The proposed development will be done on undeveloped land without any services. Currently the land is occupied by people who have not been legally allocated with stands and once construction of services starts these residents are expected to vacate the land.

Eco-Con Environmental (Pty) Ltd. was appointed by Gamagara local municipality as the independent Environmental Assessment Practitioner (EAP) to conduct a full EIA process for the proposed project. Eco-Con Environmental was established in May 2017. Although the formal establishment of the company took place in 2017, it is backed by more than 15 years of collective professional service and experience in the environmental field. The qualifications, expertise and experience of our professional team form the backbone of the company's continued success.

NEMA LISTED ACTIVITIES TRIGGERED BY THE PROPOSED PROJECT

No activities according to the National Environmental Management Act (Act 107 of 1998): Environmental Impact Assessment Regulations, 2017 (Government Notices R327, R325 and R324 in Government Gazette No. 38282 of April 2017) were triggered by the proposed project, however the Gamagara local municipality still demanded that a full informal EIA was to be conducted.

The maximum proposed water pipelines which is 355mm diameter is not a listed item in terms of the latest amended National Environmental Management Act and it will also be constructed on the existing servitude

PROJECT LOCATION

The proposed project area is situated in the town of Olifantshoek in the Northern Cape Province. The proposed area of development is located to the far south-east of Olifantshoek's town, south of Skepdraai and west of Diepsloot. The handheld GPS coordinates are 27°57'36.49"S and 22°44'33.57"E.

NEEDS AND DESIRABILITY OF THE PROJECT

Various key factors must be taken into consideration as motivation/incentive for the potential benefits involved with the proposed project. The town of Olifantshoek is in need of housing and water infrastructures for the local community in order to promote the overall living and socio-economic conditions of the local community.

The outcomes of this project area is in line with the requirements and objectives of the National Development Plan; Northern Cape Provincial Spatial Development Framework; Northern Cape Provincial Growth and Development Strategy as well as the Gamagara Local Municipality and John Taolo District Municipality Integrated Development Plans.

ALTERNATIVES CONSIDERED

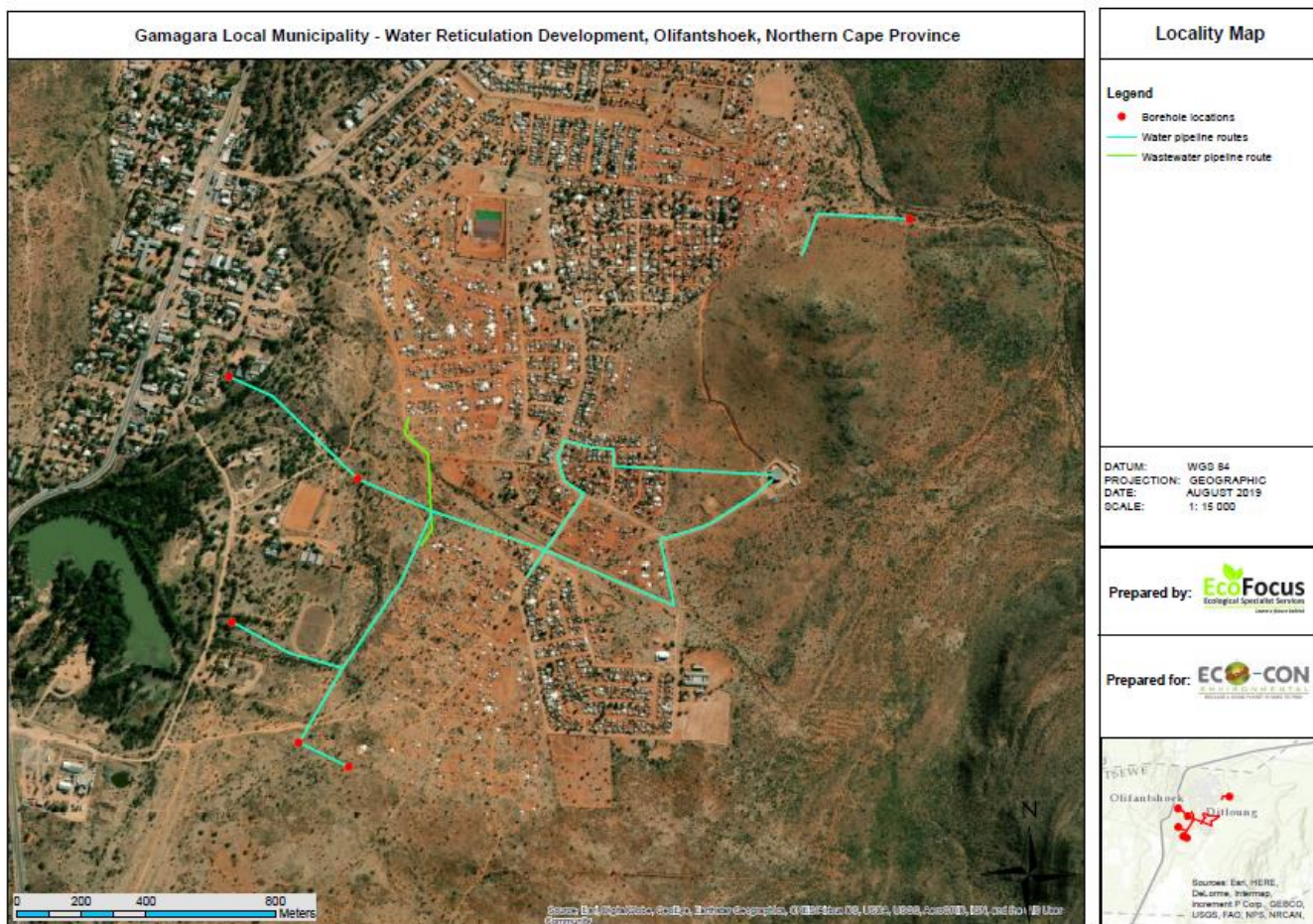
Site / Property Alternatives

No viable site/property alternatives were considered as the project includes the establishment of a water network from existing boreholes.

Layout Alternatives

No viable Layout alternatives were considered as the project includes the establishment of a water network from existing boreholes.

Layout Alternative



PUBLIC PARTICIPATION PROCESS

A continual and comprehensive Public Participation Process (PPP) will be undertaken throughout the entire EIA process with all stakeholders and Interested and Affected Parties (I & AP's), including the relevant organs of state and competent authority (Northern Cape Department of Environment and Nature Conservation). The PPP will be conducted in accordance with the requirements of Regulation 41 of the EIA Regulations, 2017 and the designated Public Participation Officer will ensure that the PPP is facilitated in a manner which ensures reasonable opportunity for all stakeholders and registered I & AP's to comment and provide input on the proposed project.

A summary of comment received, is listed under Table 15

ENVIRONMENTAL IMPACTASSESSMENT

Planning, Design and Construction Phase

PLANNING, DESIGN AND CONSTRUCTION PHASE			
Potential Flora Impacts:			
Nature of impact: Direct impact on Flora as a result of vegetation clearance		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	48	14	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Flora, Fauna and Avifauna Impacts:			
Nature of impact: Direct impact on Flora, Fauna and Avifauna as a result of vegetation clearance (Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats).		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	57	28	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Terrestrial and aquatic alien invasive species establishment			
Nature of impact: Terrestrial and aquatic alien invasive species establishment		Activity: Proposed development of a water reticulation network	

			network
Evaluation component	Preferred layout alternative		No-Go alternative
	Before mitigation	After mitigation	
Total SP	45	11	-
Significance rating:	Low (L)	Low (L)	-
Cumulative impacts:	Low (L)	Low (L)	-
Potential Dust Impacts:			
Nature of impact: Dust nuisance generated during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	30	9	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Noise Impacts:			
Nature of impact: Noise nuisance generated during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	36	24	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Cultural and Heritage Impacts:			
Nature of impact: Damage and destruction of vertebrate fossils during excavation activities.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Surface and Groundwater Contamination Impacts:			
Nature of impact: Surface and Groundwater Contamination during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	

Total SP:	42	20	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Waste Management Impacts:			
Nature of impact: Waste impacts by means of waste storage and littering during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	18	16	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Traffic Impacts:			
Nature of impact: Traffic impacts by means of additional truck and transportation to and from site during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Fire Risk Impacts:			
Nature of impact: Increase risk of fires during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Soil Contamination Impacts:			
Nature of impact: Increased Soil contamination by means of hazardous substances.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	24	20	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Soil Erosion Impacts:			

Nature of impact: Increased Soil erosion due to construction activities.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	24	9	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Visual Impacts:			
Nature of impact: Increased visual impact due to increased working activities on-site.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	20	5	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Socio-Economic Impacts:			
Nature of impact: Increased socio-economic conditions due to job creation		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	56	75	-
Significance rating:	+ Medium (M)	+ Medium-high (MH)	Medium (M)
Cumulative impact:	+ Medium (M)	+ Medium (M)	Medium (M)

Operational Phase

OPERATIONAL PHASE			
Potential Flora Impacts:			
Nature of impact: Direct impact on Flora as a result of continuous vegetation clearance.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	22	9	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Fauna and Avifauna Impacts:			
Nature of impact: Direct impact on Fauna and Avifauna as a result of cleared vegetation / habitat loss.		Activity: Proposed development of a water reticulation network	

Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	20	18	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Dust Impacts:			
Nature of impact: Dust nuisance generated during the operational phase of the project.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	16	7	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Noise Impacts:			
Nature of impact: Noise nuisance generated during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	24	18	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Cultural and Heritage Impacts:			
Nature of impact: Damage and destruction of vertebrate fossils during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Surface and Groundwater Contamination Impacts:			
Nature of impact: Surface and Groundwater Contamination during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	

Total SP:	42	20	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Waste Management Impacts:			
Nature of impact: Waste impacts by means of waste storage and littering during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	20	18	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Traffic Impacts:			
Nature of impact: Traffic impacts by means of additional truck and transportation to and from site during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Fire Risk Impacts:			
Nature of impact: Increase risk of fires during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Soil Contamination Impacts:			
Nature of impact: Increased Soil contamination by means of hazardous substances.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	20	9	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)

Potential Soil Erosion Impacts:			
Nature of impact: Increased Soil erosion due to operational activities.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	5	3	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Visual Impacts:			
Nature of impact: Increased visual impact due to increased working activities on- site.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	18	5	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Socio-Economic Impacts:			
Nature of impact: Increased socio-economic conditions due to job creation		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	52	75	-
Significance rating:	+ Medium (M)	+ Medium-high (MH)	Medium (M)
Cumulative impact:	+ Medium (M)	+ Medium (M)	Medium (M)

Decommissioning Phase

DECOMMISSIONING PHASE			
Potential Dust Impacts:			
Nature of impact: Dust nuisance generated during the decommissioning phase of the project.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	16	14	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Surface and Groundwater Contamination Impacts:			

Nature of impact: Surface and Groundwater Contamination during the decommissioning phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	18	16	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Soil Contamination Impacts:			
Nature of impact: Increased Soil contamination by means of hazardous substances.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	18	16	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Soil Erosion Impacts:			
Nature of impact: Increased Soil erosion due to decommissioning activities.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	12	1	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Potential Socio-Economic Impacts:			
Nature of impact: Increased socio-economic conditions due to job loss		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative		No-Go Alternative
	Before Mitigation	After Mitigation	
Total SP:	60	22	-
Significance rating:	+ Medium (M)	Low (L)	+ Medium (M)
Cumulative impact:	Low (L)	Low (L)	+ Medium (M)

SUMMARY OF SPECIALIST STUDIES

The section below outlines the main finding of all specialists involved in the EIA process. More detailed insight

may be gathered from the specialist report which is attached as Appendix E.

Ecological and Wetland Specialist study

The majority of the proposed new pipeline routes traverse areas within the existing informal settlement and run along existing dirt roads. The majority of natural surface vegetation has therefore been cleared within these existing informal settlement areas and the areas constitute highly degraded and transformed landscapes.

Only the south-western portion of the proposed new pipeline routes traverse undeveloped, relatively natural areas associated with the relevant Olifantshoek Plains Thornveld vegetation type (SVk 13). Assumed significant historic and continued long term overgrazing by livestock from the local community has however resulted in these areas being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type. This relevant vegetation type, is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

Although no Red Data Listed species were found to be present within the assessment area, individuals of the nationally protected tree species *Bosciaalbitrunca* & *Vachelliaeriolobawere* were found to be present throughout the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes. Most individuals of the former species are very large (≥ 4 m in height) and presumably therefore also very old while most individuals of the latter species are not necessarily significant in size. Such large/old individuals of the former species are considered to be of high conservational significance.

It is therefore recommended that no individuals of these two nationally protected tree species may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.

The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion, while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities.

Due to the presence of the informal residential settlement situated directly adjacent north-east of the undeveloped, relatively natural portion along with continued grazing by livestock from the local community, the area is subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the undeveloped, relatively natural portion for breeding and/or persistence purposes.

Due to the slightly sloping topography of the assessment area, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

Three small ephemeral water drainage lines are traversed by the proposed new pipeline routes. These drainage lines feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area. The construction footprints through the three drainage lines must therefore be adequately rehabilitated as soon as practicably possible after construction in order to ensure their continued flow and ecological integrity.

Heritage Specialist study

A Phase 1 Heritage Impact Assessment was carried out for a new township development located south of the existing Ditlouw Township in Olifantshoek, Northern Cape Province. The proposed pipeline footprint is primarily underlain by palaeontologically insignificant bedrock that is overlain by geologically recent wind-blown sand. Potential impact on palaeontological heritage resources within the proposed footprint is considered low to very low. Potential impact on Quaternary vertebrate fossil resources within the superficial overburden is considered unlikely. As far as the palaeontological heritage is concerned, the proposed development may proceed with no

further palaeontological assessments required.

A pedestrian survey conducted along six transects within the study area revealed no above-ground evidence of *in situ* Stone Age archaeological material, eroding out or distributed as surface scatters on the landscape. There are also no above-ground indications of rock art, prehistoric structures, graves or historically significant structures older than 60 years within the confines of the development footprint. The site is considered to be of low archaeological significance, especially given the well – developed sandy overburden. It is assigned the rating of Generally Protected C (GP.C), provided that any capped archaeological remains in the form of stone tool scatters, found during the construction phase of the project under the sandy overburden (Qs), should be reported to the relevant heritage resources agency so that a heritage professional can assess their importance and proceed with rescue procedures if necessary.

Hydrogeological study

Kimopax (Pty) Ltd (herein referred to as Kimopax) was appointed by Metsweding Consulting Engineers (Pty) Ltd (herein referred to as Metsweding) to conduct hydrogeological investigations to develop groundwater sources within the Olifantshoek communities. This includes hydrogeological investigation activities such as hydrocensus, pumping tests of existing boreholes, geophysical surveys, exploration drilling and water quality assessments and issuing of borehole management recommendations.

A Step Discharge Test (SDT) was carried out before the Constant Discharge Test (CDT). Water level recovery measurements were taken for the full pumping period of the step test and constant discharge tests of each borehole. During the SDT's if the last discharge rate reached pump inlet the yield at pump-inlet was measured as listed in Table 9 (see section 7.1.7).

Borehole test pumping is summarized as follows:

- a) Number of boreholes Tested 6
- b) Number of SDT's 6
- c) Number of 12 hour CDT's 3
- d) Number of 24 hour CDT's 2

Six (6) boreholes (BH01, BH02, BH04, BH05, BH06 and BH07) were subjected to pump testing. A Step Discharge Test (SDT) was carried out before the Constant Discharge Test (CDT). Water level recovery measurements were taken for the full pumping period of the step test and constant discharge tests of each borehole. Summary of the pump testing programme is listed in Table 8 (see section 7.1.7).

In the assessment of safe borehole yields the following conservative assumptions or provisions were made:

- a) Recommended abstraction of other production boreholes within 500 m radius
- b) Available drawdown >7 m
- c) Effective recharge of 0.0 mm/a for 2 year extrapolation period

CONCLUSION

In conclusion, it is the opinion of the Ecological specialist that the potentially significant ecological impacts associated with the continued impeding and contamination of the flow regimes of the three small ephemeral water drainage lines as well as over extraction of domestic use water from the six existing boreholes, can be suitably reduced and mitigated to within acceptable residual levels. The project should therefore be considered by the applicant, Gamagara Local Municipality for approval and be allowed to continue.

The proposed development may however only continue if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project. All necessary authorisations, licenses and permits must also be obtained prior to any commencement.

The groundwater study concluded the following:

- a) The hydrocensus exercise confirmed that there is six existing boreholes within the Olifantshoek and only four (BH01, BH02, BH04, BH05 and BH06) were pump tested successfully. BH03 was found to be collapsed and blocked with stones.
- b) The area is characterised by slightly shallow aquifers with water levels ranging from 16.94 mbgl to 24.4 mbgl, the latter indicates possible dewatering of the groundwater management unit.
- c) Water quality for the two sampled boreholes (BH01 and BH05) returned class I water quality that is suitable for human consumption long-term. BH04 and BH06 returned water quality that exceeds maximum allowable limit according to the SANS241:2015 standards with elevated EC, TDS, CL, Ca, Al, N and Mg parameters.
- d) The current (GAADD) water demand for Olifantshoek communities is estimated at 600 m³/day and the SDD estimated water demand is 15 l/s for 12 hours daily.
- e) Four newly drilled production boreholes were drilled with recommended yield of 6.0 l/s for 12 hours, which makes a combined recommended yield of 15.4 l/s.
- f) The total recommended abstraction from four verified boreholes in Olifantshoek amounts to 15.4 l/s; this indicates a shortfall of 4.6 l/s which includes a standby facility, and this doesn't take into account water balances.

g) The exploration drilling programme is in progress with additional two planned production boreholes, this is anticipated to be completed by mid-April 2019.

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ABBREVIATIONS

BA	Basic Assessment
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CEL	Cost Estimate Letter
CIA	Cumulative Impact Assessment
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
CPA	Communal Property Association
CRR	Comments and Responses Report
CSP	Concentrated Solar Power
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation
DM	District Municipality
DMR	Department of Mineral Resources
DoE	Department of Energy
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
FSR	Final Scoping Report
Ha	Hectares
HTF	Heat Transfer Fluid
I & APs	Interested and Affected Parties
IDP	Integrated Development Plan
IPP	Independent Power Producer
kV	Kilovolt
LED	Local Economic Development
LM	Local Municipality
LSA	Late Stone Age

MAP	Mean Annual Precipitation
MASL	Metres Above Sea Level
MLL	Minimum living level
MSA	Middle Stone Age
MVA	Megavolt ampere
MW	Megawatt
NCPSDF	Northern Cape Provincial Spatial Development Framework
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008)
NERSA	National Energy Regulator of South Africa
NFA	National Forests Act (Act 84 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
NIP	National Infrastructure Plan
NWA	National Water Act (Act 36 of 1998)
PFS	Pre-feasibility Study
PPP	Public Participation Process
PUC	Point of Utility Connection
PoSEIA	Plan of Study for Environmental Impact Assessment
REIPPP	Renewable Energy Independent Power Producers Procurement Programme
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SIA	Social Impact Assessment
SIP	Strategic Integrated Project
ToR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
VIA	Visual Impact Assessment
WRYCM	Water Resource Yield Computer Model
WULA	Water Use Licence Application

1. INTRODUCTION

The proposed development (the construction of a water reticulation network that connects six (6) existing boreholes and two (2) existing reservoirs to supply potable water for the 1179 housing stands development) will be done on undeveloped land without any services. Currently the land is occupied by people who have not been legally allocated with stands and once construction of services starts these residents are expected to vacate the land.

The project is divided into two phases based on recommendations on implementation of the project. The first phase is based on construction of ring supply with standpipes in order to supply the community with potable water while the second phase is based on completion of the entire network and connection to bulk supply from the newly constructed reservoir.

In accordance with the National Environmental Management Act (Act 107 of 1998); Environmental Impact Assessment Regulations of 2017, a full Environmental Impact Assessment (EIA) processes is not required for the proposed project. However, Eco-Con Environmental (Pty) Ltd. was appointed by Gamagara local municipality to act as the independent Environmental Assessment Practitioner(EAP) to facilitate an informal EIA processes for the construction and operational phases of the proposed project.

The following report aims to give context to the proposed development through providing a comprehensive description of the envisaged activities and relevant infrastructure; the identification of significant environmental impacts associated to the proposed project; identification of appropriate alternatives and mitigation measures for reduction of undesired impacts; and communication of results in a clear and concise manner to the competent authority and other relevant parties.

1.1 PROJECT APPLICANT INFORMATION

Table 1: Project applicant information

Company/entity name:	Gamagara local municipality
Registration number:	-
Physical address:	Cnr Frikkey Meyer & Hendrik Van Eck Roads, Civic Centre, Kathu
Postal address:	Box 1001, Kathu, 8446
Contact person:	Mr. K.J. Leserwane
ID number:	6809126095080
Designation:	Municipal Manager
Contact number:	053 723 6000

E-mail address:

protea@gamagara.co.za

2. ENVIRONMENTAL ASSESSMENT PRACTITIONER

2.1 DETAILS OF THE EAP

Eco-Con Environmental (Pty) Ltd. was appointed by Gamagara local municipality as the independent Environmental Assessment Practitioner (EAP) to conduct an EIA process for the proposed project.

Eco-Con Environmental was established in May 2017. Although the formal establishment of the company took place in 2017, it is backed by more than 15 years of collective professional service and experience in the environmental field. The qualifications, expertise and experience of our professional team form the backbone of the company's continued success.

The vision of Eco-Con Environmental is being dedicated to environmental management that fosters a sustainable future and leads to improvements in the communities where we do business. Eco-Con Environmental believes that in time we will become the most respected Environmental Management Consultancy firm in all regions where we work.

The company continuously engages existing and emerging legislation, guidelines and practices in order to ensure the execution of high quality and appropriate studies. Through an integration of skills and expertise, it is envisioned that Eco-Con Environmental will deliver exceptional, competitive services for task execution and to meet deliverables. Eco-Con Environmental, through years of experience and industry presence, assures the seamless execution and roll out of tasks to achieve projected results on time. Our past experience on agricultural projects further benefits our understanding of the required and associated processes and the impacts thereof.

Table 2: Details of the EAP

Company/entity name:	Eco-Con Environmental (Pty) Ltd.
Physical address:	5 Chris Barnard Street, Langenhovenpark, Bloemfontein, 9301
Postal address:	P.O Box 37452, Langenhovenpark, 9330
Contact person:	Mr. Johan Botes
Designation:	Senior Environmental Consultant and Managing Director
Contact number:	082 459 8206
E-mail address:	johan@eco-con.co.za
Qualifications:	B.A Honours in Geography – UFS B.A Geography and Environmental Management – UFS

2.2 EXPERTISE OF THE EAP REPRESENTATIVE

Johan Botes, is a Senior Environmental Specialist Consultant and Managing Director at Eco-Con Environmental (Pty) Ltd. His qualifications include an Honours degree in Geography from the University of the Free State and a Bachelors of Arts in Geography and Environmental Management also from the University of the Free State. Johan Botes has 7 years of environmental management experience. Johan also brings with him a strong background in environmental law and monitoring. He was previously employed at Enviroworks and Savannah Environmental Consultants as a General Manager and Environmental Control Officer respectively.

Relevant Project Experience

Project Management Experience

- Conducting of Environmental Impact Assessment Report for the proposed 45MW Meerkat Hydro Power Facility in the Northern Cape.
- Conducting of Environmental Impact Assessment Report for the proposed 150MW PV Metsimatala Solar Power Project in the Northern Cape.
- Conducting of Basic Assessment processes for the proposed Optic fibre cable installation in and around the town of Lephalale on behalf of NEOTEL.
- Conducting of Basic Assessment processes for the proposed Optic fibre cable installation in and around the town of Thohoyandou on behalf of NEOTEL.
- Conducting of Basic Assessment processes for the proposed Optic fibre cable installation in and around the town of Groblersdal on behalf of NEOTEL.
- Conducting of Basic Assessment processes for the proposed upgrading and widening of Nathen Bridge in Bloemfontein on behalf of the Mangaung Metropolitan Municipality
- Conducting of Basic Assessment processes for the proposed construction of two new roads and the upgrading of one existing road in Botshabeo on behalf of the Mangaung Metropolitan Municipality.

Environmental Impact Assessment Experience

- Conducting of Environmental Impact Assessment Report for the proposed 180 hectare Cecilia Park Residential development in Bloemfontein on behalf of Mzansi Africa Civils Engineering.
- Conducting of Environmental Impact Assessment Report for the proposed construction of a steel galvanizing plant in Botshebelo, Free State Province on behalf of Bombenero Investments.
- Conducting of Environmental Impact Assessment Report for the proposed opening of 3 borrow pits and 1 gravel quarry around the Ladybrand area, Free State Province.

Basic Assessment Experience

- Conducting of Basic Assessment report for the proposed construction of the Lucas Steyn Filling station in Bloemfontein, Free State Province.
- Conducting of Basic Assessment report for the proposed construction of Gabions in the Bath River in Caledon, Western Cape Province.
- Conducting of Basic Assessment report for the proposed expansion of the Nicsha Petroleum Depot in Bloemfontein, Free State Province.
- Conducting of Basic Assessment report for the proposed fuel Zone Petroleum Depot in Welkom, Free State Province.
- Conducting of Section 24 G Rectification application for the already established residential development on the farm Protea of 217, Delportshoop, Northern Cape.
- Conducting of Basic Assessment processes for the proposed opening of 9 borrow pits around the Ladybrand area, Free State Province.
- Conducting of Basic Assessment processes for the proposed Optic fibre cable installation between Prince Albert and Oudtshoorn on behalf of NEOTEL.
- Conducting of Basic Assessment report for the proposed Nooitgedach Retirement Village in White River, Mpumalanga.
- Conducting of Basic Assessment processes for the proposed construction of 19 signalling masts in the railway reserves of Cape Town and Stellenbosch on behalf of the Passenger Rail Association of South Africa (PRASA).
- Conducting of Basic Assessment processes for the proposed construction of 1 signalling mast in the railway reserve at St James Station, Cape Town on behalf of the Passenger Rail Association of South Africa (PRASA).
- Conducting of Basic Assessment processes for the proposed construction of 1 signalling mast in the railway reserve at Clovelly Station, Cape Town on behalf of the Passenger Rail Association of South Africa (PRASA).
- Conducting of Basic Assessment processes for the proposed upgrading and widening of Nathen Bridge in Bloemfontein on behalf of the Mangaung Metropolitan Municipality.
- Conducting of Basic Assessment processes for the proposed construction of two new roads and the upgrading of one existing road in Botshabeo on behalf of the Mangaung Metropolitan Municipality.

Experience in Auditing and as an Environmental Control Officer

- Annual Environmental Audit in Terms of Section 34 of Government Notice 982 for the Mission Point Mining near Sasolburg, Free State Province.

- Environmental Gap Audit for the Meadow Meats Abattoir in Vryheid, KwaZulu-Natal.
- Environmental Gap Audit for the Meadow Meats Abattoir in Wesselbron, Free State Province.
- Environmental Control Officer (ECO) for the Mission Point Sand Mining facility near Sasolburg, Free State Province.
- Environmental Control Officer (ECO) for the Rooikraal Truck stop facility near Vrede, Free State Province.
- Environmental Control Officer (ECO) for the widening of bridge structures over the Orange River for BVi on behalf of SANRAL, near Hopetown, Northern Cape
- Environmental Control Officer (ECO) for the construction of a 2.7 km Bus route, ThabaNchu, Free State Province.
- Environmental as an Environmental Control Officer (ECO) for the installation of optic fibre cables in and around the town of Nelspruit on behalf of NEOTEL.
- Environmental as an Environmental Control Officer (ECO) for the construction of the Khi Solar One Concentrated Solar Power facility near Upington.
- Environmental as an Environmental Control Officer (ECO) for the construction of a 132kV Substation in Bloemfontein for Dihlase Consulting Engineers.
- Environmental as an Environmental Control Officer (ECO) for the installation of optic fibre cables in and around the town of Thohoyandou on behalf of NEOTEL.
- Environmental as an Environmental Control Officer (ECO) for the installation of optic fibre cables in and around the town of Lephaale on behalf of NEOTEL.
- Environmental as an Environmental Control Officer (ECO) for the installation of optic fibre cables in and around the town of Grobersdal on behalf of NEOTEL.
- Environmental as an Environmental Control Officer (ECO) for the installation of optic fibre cables in and around the town of Kathu on behalf of NEOTEL.

Experience in Permits and Licencing

- Water Use Licence Application for the installation of carbon optic fibre cable within 32 metres of a watercourse on behalf of NEOTEL.
- Water Use Licence Application (General Authorisation) for the installation of carbon optic fibre cable within 500 metres of a wetland on behalf of NEOTEL.
- Waste Management Licence for the storage and reuse of hazardous waste water for the Bombenero Galvanizing Steel Facility in Botshabelo, Free State Province on behalf of Bombenero Investments.

Experience in Environmental Risk Assessments

- Conducting of Environmental Risk Assessment for the proposed establishment of a Diesel Depot in Welkom, Free State Province.
- Compiling Environmental Risk Assessment for the proposed optic fibre cable installation in and around the town of Groblersdal on behalf of NEOTEL.
- Compiling Environmental Risk Assessment for the proposed optic fibre cable installation in and around the town of Lephalale on behalf of NEOTEL.
- Compiling Environmental Risk Assessment for the proposed optic fibre cable installation in and around the town of Thohoyandou on behalf of NEOTEL.
- Compiling Environmental Risk Assessment for the proposed optic fibre cable installation in and around the town of Nelspruit on behalf of NEOTEL.
- Compiling Environmental Risk Assessment for the proposed optic fibre cable installation in and around the town of Kathu on behalf of NEOTEL.
- Compiling Environmental Risk Assessment for the proposed optic fibre cable installation in and around the town of Groblersdal on behalf of NEOTEL.

Other Experience

- Compilation of Fire Management Plan for the Proposed 150MW Metsimatale CSP Facility, Postmansburg, Northern Cape.
- Calculating Financial Provisions (Quantum Calculations) for the Mission Point Mining near Sasolburg, Free State Province.
- Compilation of construction and operational phase Waste Management Plan for the proposed Cecilia Park Residential Development, Bloemfontein, Free State Province.
- Training of construction personnel and environmental advisory services for personnel of the Khi Solar One Concentrated Solar Power facility near Upington.
- GIS mapping and technical support for various projects, including the drawing of locality and sensitivity maps.
- Public participation processes and assistance to several projects.
- Compilation of Bitumen Waste Report for Penny Farthing Engineering, Venterstad, Eastern Cape.

See Appendix A for Curriculum Vitae of the EAP.

2.3 PUBLIC PARTICIPATION OFFICER

The entire Public Participation Process will also be conducted and coordinated by Mr. Johan Botes.

See Appendix A for Curriculum Vitae.

3. RELEVANT ENVIRONMENTAL LEGISLATION AND GUIDELINES

3.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT 108 OF 1996)

Section 24 of the Constitution of South Africa provides the main national legislative obligation towards sustainable environmental management and development. This section forms the foundation of all other subsequent environmental legislation and governance in South Africa. Section 24 states the following:

every person shall have the right -

- (a) to an environment that is not harmful to their health nor well-being; and
- (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that-
 - (i) prevent pollution and ecological degradation;
 - (ii) promote conservation; and
 - (i) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

The following sections provide an overview of the relevant environmental legislation and guideline documents applicable to the proposed project.

3.2 OTHER RELEVANT ENVIRONMENTAL LEGISLATION

Aside from NEMA, other key environmental legislation, policies, plans and guidelines will also be applicable to this proposed project, whilst others shall provide strategic goals and priorities for different resources and sectors.

The environmental legislation relevant to the proposed project and which has been taken into account in the preparation of the Final EIA is summarised below:

3.2.1 National

3.2.1.1 National Environmental Management Act (Act 107 of 1998) (NEMA)

NEMA is the principle/framework legislation governing EIA and subsequent EA processes under the authority of the National Department of Environmental Affairs.

NEMA makes provisions for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment; institutions that will promote co-operative governance; procedures for co-ordinating environmental functions exercised by Organs of State and to provide for matters connected there with.

Section 2 of the Act establishes a set of principles, which apply to the activities of all Organs of State that may significantly affect the environment. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised and positive impacts enhanced; and
- Responsibility for the environmental health and safety consequences of a policy, project, product or service exists throughout its entire lifecycle.

These principles are taken into consideration when a Governmental Department needs to exercise its powers for example, during the processes of granting permits or Environmental Authorisations or the enforcement of existing legislation or conditions of approval.

Section 23 of NEMA furthermore provides for general objectives of Integrated Environmental Management. In alignment with these objectives, the potential impacts on the biophysical and socio-economic environments are identified and evaluated. These potential environmental impacts have been assessed and mitigation measures are provided where relevant.

The subsequent Environmental Impact Assessment Regulations, 2017 (Government Notices R327, R325 and R324 of April 2017, which are also referred to as Listing Notices 1, 2 and 3 respectively, list development activities which will trigger the necessity to conduct either a Basic Assessment or a full Scoping & EIA process prior to EA being obtained for a proposed project. Listing notices 1 & 3 activities require only a Basic Assessment to be conducted while listing notice 2 activities trigger the requirement for a full Scoping & EIA process to be conducted.

Considering the nature and scale of the development activities and the fact that no listing notices are triggered by the proposed project, it was only demanded by the Gamagara local municipality that an EIA process be conducted to provide sufficient information to the competent authority regarding the proposed project.

Only once the EA is granted and the required supporting permits have been issued, may the applicant lawfully commence with the proposed project. The EIA process is therefore a critical component in the feasibility and planning stage of any proposed project.

3.2.1.2 National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA)

NEMBA aims to provide for the management and conservation of the country's rich biodiversity within the framework of NEMA. It aids in the protection of species and ecosystems which warrant national protection and provides for the sustainable usage of the country's indigenous biological resources.

NEMBA and its Regulations was therefore utilised for determining the ecological/biodiversity significance, value and subsequently the adequate management of the proposed project area with regards to ecosystems, habitats and individual species.

The Department of Environmental Affairs is responsible for the implementation and overseeing of this legislation along with the South African National Biodiversity Institute (SANBI).

3.2.2.3 National Forests Act (Act 84 of 1998) (NFA)

The aim of the NFA is to promote the sustainable usage, management and development of forests for the benefit of all in South Africa. The Act also makes special provisions for the protection of specific forests and tree species which duly require formal protection in order to ensure their prolonged existence.

The National Forests Act was therefore utilised to determine the potential presence of any protected forests or tree species in the proposed project area in order to ensure that the correct processes are followed for the approval of any listed activities for which a permit may be necessary regarding such forests or species, should it be required.

Permit applications in terms of the National Forests Act are lodged with the Department of Agriculture, Forestry and Fisheries.

3.2.1.4 Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA)

CARA aims to provide for the protection and control over utilization of the country's agricultural resources in order to promote conservation of soils, water and natural vegetation as well as the combating of weeds and invader plants. Sustainable utilization is a key objective.

CARA was therefore used for determining the agricultural significance, value and subsequently the adequate management of the proposed project area.

It is overseen by The Department of Agriculture, Land Reform and Rural Development in the Northern Cape Province.

3.2.1.5 National Water Act (Act 36 of 1998) (NWA)

The NWA aims to ensure sustainable use of water through the protection of the quality of water resources for

the benefit of all water users. Its principal focus is the rectification and equitable allocation and use of the scarce and disproportionately distributed water resources of South Africa.

The property of the proposed project will apply for a water use licence (WULA). Section 21 of NWA defines the types of water uses which require a Water Use License to be applied for. The Act stipulates that a Water Use License Application must be submitted if a development takes place within 500 m of a natural watercourse.

The Department of Water and Sanitation is responsible for the implementation and overseeing of this legislation and is also the responsible authority for the issuing of permits for water use.

3.2.1.6 National Heritage Resources Act (Act 25 of 1999) (NHRA)

The NHRA aims to provide for the integrated and interactive management and conservation of the national heritage resources in South Africa so that they may be bequeathed for future generations.

Section 38 lists categorized development processes which require the South African Heritage Resources Agency(SAHRA) to be notified and furnished with an archaeological and palaeontological study of a proposed project area in order to obtain project authorization. The following development processes are triggered during the construction and operational phases of the proposed project:

- (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as -
- (c) any development or other activity which will change the character of a site-
 - (i) exceeding 5 000m² in extent; or

The South African Heritage Resources Agency (SAHRA) has a mandate, in terms of the NHRA, to enforce the conditions of the NHRA, and hence oversees the management of heritage resources together with provincial heritage agencies.

3.2.1.7 National Development Plan – 2030 (NDP)

The executive summary of the National Development Plan (NDP) initiates with the following paragraph, *“The National Development Plan aims to eliminate poverty and reduce inequality by 2030. South Africa can realise these goals by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society.”*

3.2.2 Provincial

3.2.2.1 Northern Cape Nature Conservation Act (Act 9 of 2009)

In addition to the NFA, the Northern Cape Nature Conservation Act also makes provision for the protection and sustainable utilisation of wild animals, aquatic biota and plants on a provincial scale in the Northern Cape Province. It is therefore used in conjunction with the NFA to determine the ecological/biodiversity significance, value and subsequent management of the proposed project area.

The Northern Cape Nature Conservation Act was utilised to determine the potential presence of any provincially protected or specially protected species in the proposed project area in order to ensure that the correct processes are followed for the approval of any listed activities for which a permit may be necessary regarding such species, should it be required.

Permit applications in terms of the Northern Cape Nature Conservation Act (Act 9 of 2009) are lodged with the relevant provincial authority, which in this case is the Department of Environment and Nature Conservation in the Northern Cape Province.

3.2.2.2 Northern Cape Provincial Spatial Development Framework

The Northern Cape Provincial Spatial Development Framework (NCPSDF) was formulated in 2011 to meet the requirements of the Northern Cape Planning and Development Act, 1998 (Act 7 of 1998) and the Municipal Systems Act, 2000 (Act 32 of 2000). Prepared in accordance with a bioregional planning approach adapted to suit the site-specific requirements of the Northern Cape, the NCPSDF recognises that no region or area should be planned and managed as an 'island' in isolation from its surroundings. Together, unit areas form part of the broader environment and the mutual relationships and linkages between adjacent units must be understood and applied.

The framework aims to act as a policy and strategy providing direction and guidance for:

- future land use,
- spatial context for provincial sectoral strategies,
- promoting a developmental state,
- alignment of environmental management priorities, and
- mobilising the overarching objective of the Northern Cape Provincial Growth and Development Strategy (PGDS) to build prosperous, sustainable and growing provincial economy to eradicate poverty and improve social development.

A focus for achieving sustainable development as discussed in the framework, requires four areas of capital,

being environmental, human, infrastructure and monetary. The plan further stresses the need for integrative participation, positive interventions and innovative finance. The SDF makes specific reference to the importance of agriculture and capacity increase in this sector in the Northern Cape Province.

The proposed project will make a positive contribution towards various objectives of the SDF.

3.2.2.3 Northern Cape Provincial Growth and Development Strategy (NCPGDS)

The Northern Cape Provincial Growth and Development Strategy(NCPGDS), (2004–2014) highlights the most significant growth and development challenge as the reduction of poverty, and that only through long-term sustainable economic growth and development shall this be achieved. Important areas where growth can be achieved include agriculture and agro-processing, transport and tourism. In support of such growth areas the creation of opportunities for life-long learning, improvement of labour force skills to enhance productivity and expanding access to education and knowledge shall lead to the further realisation of such growth.

The inclusion of macro-level objectives shall mobilize these primary growth areas. Such objectives include the developing of human and social capital, improving the efficiency and effectiveness of governance and associated institutions and enhancing infrastructure for economic growth and development.

3.2.3 District and Local

3.2.3.1 John Taolo Geatsewe District Municipality Integrated Development Plan 2017-2022

The District Municipality has developed its vision, development priorities, objectives and strategies with specific outcomes and outputs for the 2017-2022 financial years.

Vision:

“Working together for a better life in all the district”.

Mission:

“Accelerating the implementation of the integrated development initiatives and providing support to local municipalities”

The objectives of local government are:

- To provide democratic and accountable government for local communities;
- To ensure the provision of services to communities in a sustainable manner;
- To promote social and economic development;
- To promote a safe and healthy environment; and
- To encourage the involvement of communities and community organisations in the matters of local government

The proposed project will be able to contribute positively to these objectives through job creation and sustainable capacity building (skills development and experience).

3.2.3.2 Gamagara Local Municipality Integrated Development Plan 2017/2022

The following vision and mission is engrained into the Integrated Development Plan (IDP) of the Gamagara local municipality:

Vision:

“Build prosperous and sustainable communities”.

Mission:

The following will guide the municipality over the five year term:

- Providing universal access to basic services
- Attain safe and healthy environment
- Strengthening stakeholders relations
- Promoting active citizenry in Local Government affairs
- Providing sustainable services to our communities
- Being developmental focus institution
- Promote social and economic development

The proposed project will be able to contribute positively to these objectives through job creation and sustainable capacity building (skills development and experience).

3.3 RELEVANT GUIDELINES

The table (table 3) below lists the Guideline Documents that are applicable to the proposed project, and which are considered as part of the EIA process, as are required in terms of the NEMA EIA Regulations; 2017.

Table 3: Applicable guideline documents

1	DETEA EIA Guideline and Information Document Series
1.1	<i>Draft Guideline on the Need and Desirability in terms of the EIA Regulations of 2010. Integrated Environmental Management Guideline Series 9, Government Notice 792 of 2012.</i>
2	DEA & DP EIA Guideline and Information Document Series

2.1	<i>Guideline on Generic Terms of Reference for EAPs and Project Schedules, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning, March 2013.</i>
2.2	<i>Guideline on Need and Desirability, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning, March 2013.</i>
2.3	<i>Guideline on Alternatives, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning, March 2013.</i>
2.4	<i>Guideline on Public Participation, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning, March 2013.</i>
3	DEA&DP Guideline Document Series for Involving Specialists in the EIA Process, and others
3.1	<i>Guideline for Environmental Management Plans. CSIR Report No ENV-S-C2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town (Lochner, P. 2005).</i>

3.4 NEMA LISTED ACTIVITIES TRIGGERED BY THE PROPOSED PROJECT

No activities according to the National Environmental Management Act (Act107of1998): Environmental Impact Assessment Regulations, 2017 (Government Notices R327, R325 and R324 in Government Gazette No. 38282 of April 2017) were triggered by the proposed project, however the Gamagara local municipality still demanded that a full informal EIA was to be conducted.

The maximum proposed water pipelines which is 355mm in diameter is not a listed item in terms of the latest amended National Environmental Management Act and it will also be constructed on the existing servitude.

3.5 NEMA REGULATION 23 IMPACT ASSESSMENT REPORT INFORMATION COMPLIANCE

Regulation 23(3) of the Environmental Impact Assessment Regulations, 2017 (R326) refers to Appendix 3 which provides the content requirements for an Impact Assessment Report.

The table below (table5) lists the relevant requirements for the Impact Assessment Report as per Appendix3 of the Regulations as well as providing cross-references to where the relevant information is located in this document and/or its appendices.

Table 4: Information required in the Impact Assessment Report as per Appendix 3 of GNR.326 of the EIA Regulations, 2017

EIA Regulations 2017 - Appendix 3 – Scope of assessment and content of environmental impact assessment reports	Location in this Document
(a) details of-	
(i) the EAP who prepared the report; and	Section 2.1
(ii) the expertise of the EAP, including a curriculum vitae;	Section 2.2
(b) the location of the activity, including-	Section 4.1
(i) the 21 digit Surveyor General code of each cadastral land parcel;	Section 4.1
(ii) where available, the physical address;	Section 4.1
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 4.1
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is-	Section 4.1
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	N/A
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	N/A
(d) a description of the scope of the proposed activity, including-	
(i) all listed and specified activities triggered and being applied for; and	Section 3.4
(ii) a description of the associated structures and infrastructure related to the development;	Section 4.2
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	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 5
(h) a full description of the process followed to reach the proposed development footprint within the approved site, including:	Section 4.1
(i) details of the development footprint alternatives considered;	Section 6
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 8
(iii) 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;	Section 8

(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7
(v) the impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 9
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 9.1
(vii) 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 geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 9.2
(viii) the possible mitigation measures that could be applied and level of residual risk;	Section 9.2
(ix) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	N/A
(x) a concluding statement indicating the preferred alternative development location within the approved site;	Section 9.6
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity the associated structures and infrastructure will impose on the preferred location through the life of the activity including:	Section 9
(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and;	Section 9.2
(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 9.4
(j) an assessment of each identified potentially significant impact and risk, including;	Section 9.4
i) cumulative impacts	Section 9.4
ii) the nature, significance and consequences of the impact and risk;	Section 9.
iii) the extent and duration of the impact and risk	Section 9.
iv) the probability of the impact and risk occurring	Section 9.4
v) the degree to which the impact and risk can be reversed	Section 9.4
vi) the degree to which the impact and risk may cause irreplaceable loss of resources and;	Section 9.4
vii) the degree to which the impact and risk can be mitigated	Section 9.4
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 of these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report	Section 7
(l) an environmental impact statement which contains-	Section 11.2
i) a summary of the key findings of the environmental impact assessment:	Section 11.2

ii) 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;	Section 7 Appendix B
iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 9.3
(m) based on the assessment and where applicable, recommendations from specialist reports, the recording of proposed management objectives, and the impact management outcomes for the development for inclusion in the EMP as well as for inclusion as conditions of authorization	Section 7
(n) the final proposed alternatives which respond to the impact management measures, avoidance and mitigation measures identified through the assessment	Section 9.4 Section 11.1
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are not to be included as conditions of authorisation	N/A
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	Section 10
(q) 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 the authorization	Section 11
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements Finalized	N/A
(s) an undertaking under oath or affirmation by the EAP in relation to-	Appendix D
(i) the correctness of the information provided in the report;	
(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and	Appendix C
iii) the inclusion of inputs and recommendations from the specialist reports where relevant	Appendix E
(iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Appendix C
(t) where applicable, details of any financial provisions for the rehabilitation, closure and ongoing post decommissioning management of negative environmental Impacts	N/A
(u) an indication of any deviation from the approved scoping report, including the plan of study including-	N/A
i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks and	N/A
ii) a motivation for the deviation	N/A

(v) any specific information that may be required by the competent authority and	N/A
(w) any other matter required in terms of section 24(4)(a) and (b) of the Act.	N/A

4. PROJECT LOCATION AND DESCRIPTION

The following section provides an overview of the proposed project location as well as a detailed description of the proposed project.

4.1 PROJECT LOCATION

The proposed area of development is located to the far south-east of Olifantshoek’s town, south of Skepdraai and west of Diepsloot. The handheld GPS coordinates are 27°57'36.49"S and 22°44'33.57"E.

The property falls inside Gamagara Local Municipality which, In turn, forms part of the greater John Taolo Gaetswe District Municipality. Access to the assessment area is obtained via the N 14 national road.

See locality map below.



Figure 1: Locality Map

The coordinate points for the existing as boreholes to be used are as follow:

- BH01 -27.94298°S; 22.75660°E
- BH02 (G5NC) -27.94337°S; 22.76092°E
- BH04 (Police station) -27.94742°S; 22.73772°E
- NH05 (Farm) -27.94865°S; 22.73263°E
- BHO6 (Municipal office) -27.93828°S; 22.73764°E
- BH07 (Hospital) -27.93755°S; 22.73457°E

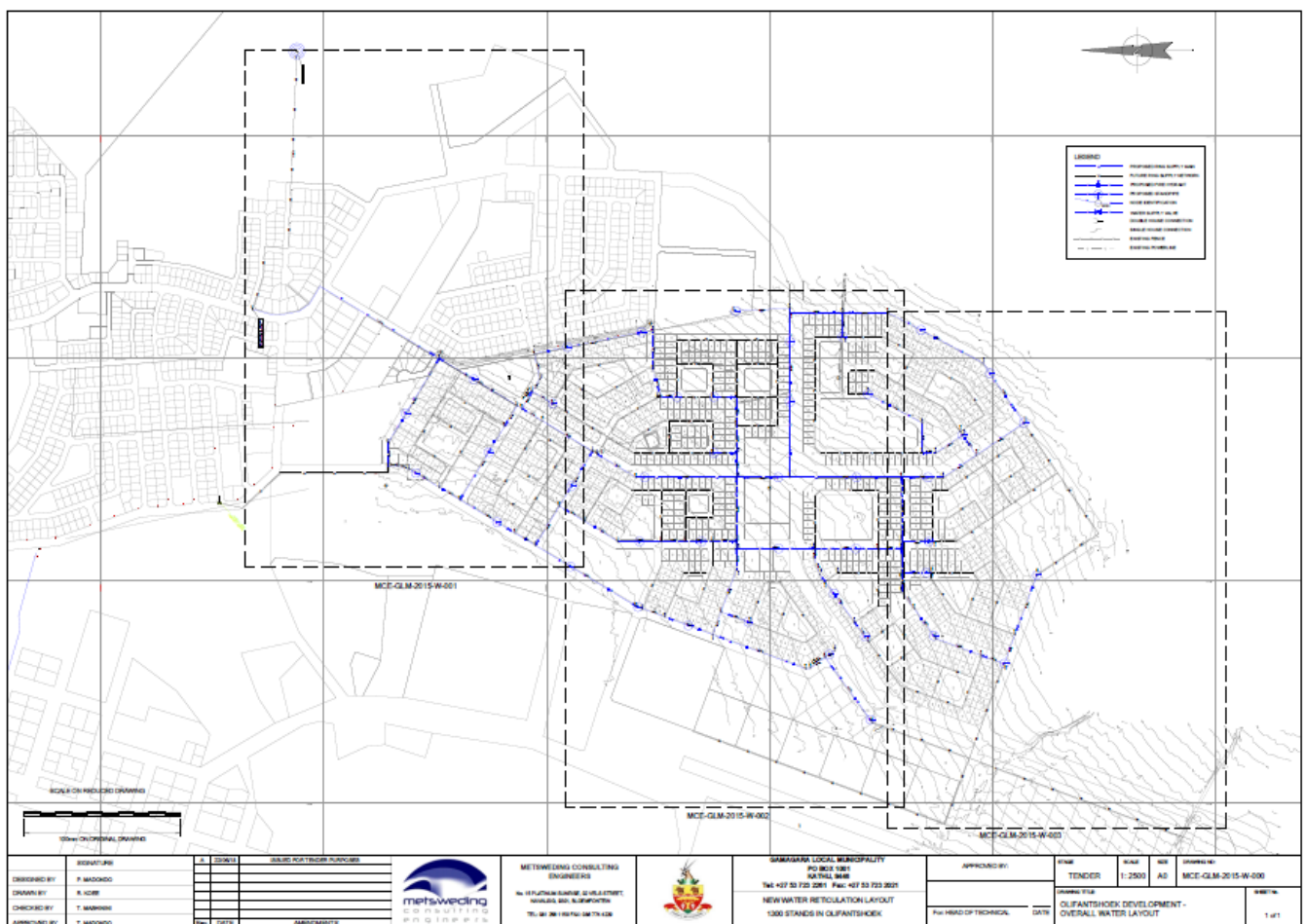


Figure 2: Pipeline Infrastructure (see appendix H1 for detailed drawing)

Table 5: Details of relevant land owner

Company/entity name:	Gamagara local municipality
Registration number:	-
Physical address:	Cnr Frikkey Meyer & Hendrik Van Eck Roads, Civic Centre, Kathu
Postal address:	Box 1001, Kathu, 8446
Contact person:	Mr. K.J. Leserwane
ID number:	6809126095080
Designation:	Municipal Manager
Contact number:	053 723 600
E-mail address:	protea@gamagara.co.za



Figure 3: Image visually illustrating the general vegetation cover



Figure 4: Image visually illustrating the general vegetation ncover

4.2 PROJECT DESCRIPTION

The Gamagara local municipality is proposing to commence with the construction of a water reticulation network that connects six (6) existing boreholes and two (2) existing reservoirs for the supply of clean potable water for the proposed 1179 housing development stands in the town of Olifantshoek, Northern Cape Province. The proposed development will be done on undeveloped land without any services. Currently the land is occupied by informal settlers and once construction of services starts these residents is expected to

vacate the land.

In order to achieve the above, the following are proposed:

Site / Property Alternatives

No viable site/property alternatives were considered for the project as the design and layout plans have already been planned and implemented.

Layout Alternatives

The following layout has been proposed.

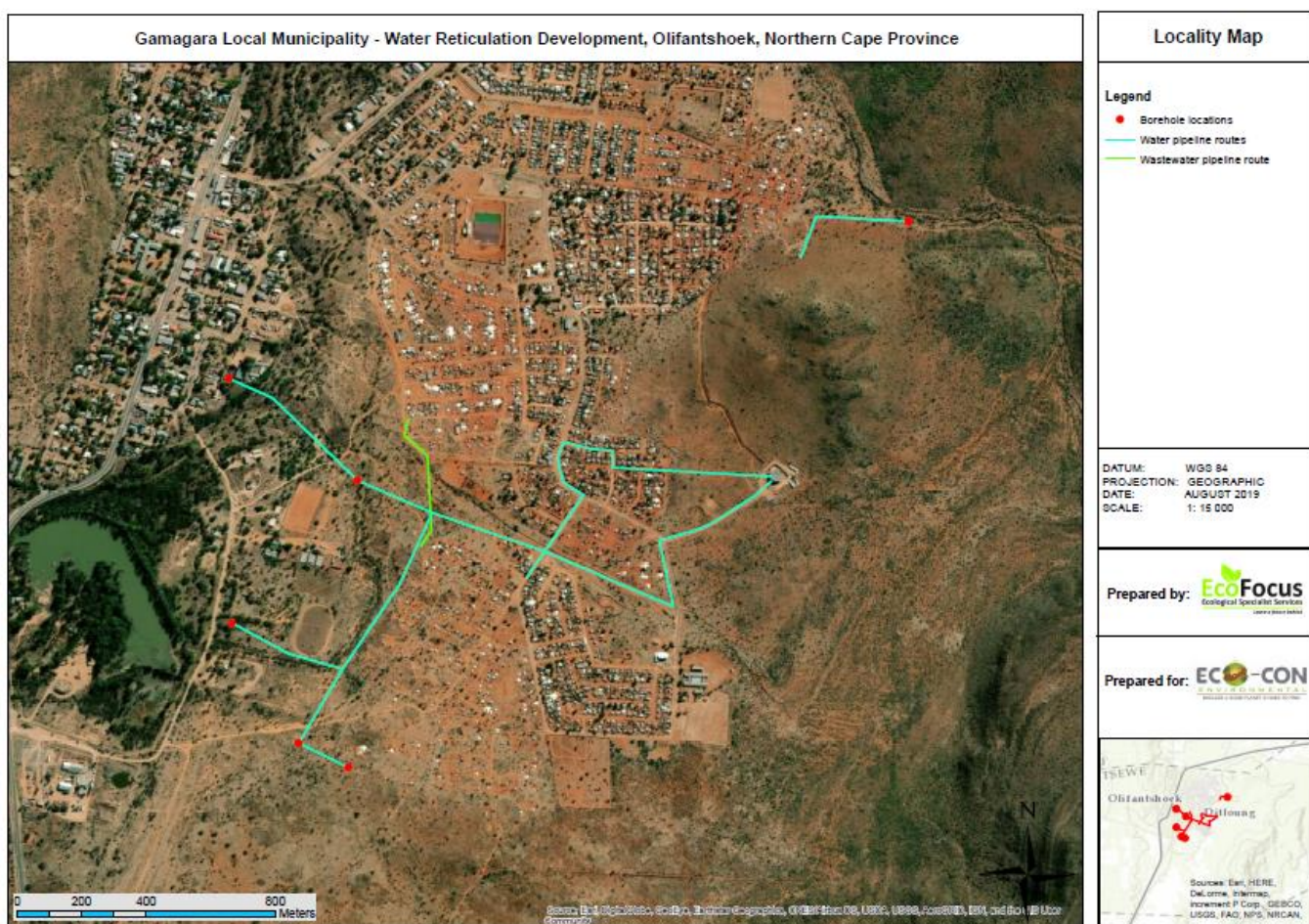


Figure 5: Gamagara water reticulation network Alternative 1 (Preferred Alternative)

The project is divided into two phases based on recommendations on implementation of the project. The first phase is based on construction of ring supply with standpipes in order to supply the community with potable water while the second phase is based on completion of the entire network and connection to bulk supply from the newly constructed reservoir.

4.2.1 Construction of ring supply:

- Construction of ring supply with uPVC pipelines class 9 ranging from 110mm to 355mm in diameter. Refer to drawing no MCE-GLM-2015_03-W-DWG001-ROOA
- Construction of standpipes within a radius of 200m from each other
- Construction of isolating valves on ring supply network
- Construction of fire hydrants on ring supply network
- Cost estimate for construction of this phase.

4.2.2 Completion of the entire network and connection to bulk supply from the newly constructed reservoir:

4.2.2.1 Isolation valves and fire hydrants

- The standard details to be used for valves and fire hydrants will be as indicated on drawings except if the local authority has a different preference.
- All valves shall be Class 12 Ainsworth RSV double socketed with non-rising spindle, anti-clockwise closing. Tamperproof Woodlands type hydrants with 65 mm instantaneous coupling will be used. All valves and all hydrants must be installed opposite erf boundary pegs.
- All valve bodies shall be factory tested according to SABS 664 at twice the specified working pressure. In addition, each type of valve shall be subjected to the appropriate test for the particular type according to SABS 664.

4.2.2.2 Excavation

- Shallow excavations in soft material will be done by hand using local labour. Machine excavations will be used for hard and intermediate material.

4.2.2.3 Bedding for pipes

- Bedding for pipes shall be as classified in SABS 1200 LB and appropriately selected.

4.2.2.4 Depth and cover

- All pipes to have a minimum cover of 0.8 m.

4.3.5 Specifications

All materials and workmanship shall comply with the requirements of the relevant SABS specifications as listed below:

- Bedding for pipes : SABS 1200LB
- Earthworks (pipe trenches) : SABS 1200DB

- Concrete work : SABS 1200G
- Medium pressure pipelines : SABS 1200L
- Erf Connections : SABS 1200LF

5. NEEDS AND DESIRABILITY OF THE PROJECT

Various key factors must be taken into consideration as motivation/incentive for the potential benefits involved with the proposed project. These factors have been summarised below:

With the exponential increase in human populations, the need for housing and potable water is also increasing. It is thus of vital importance to increase the amount of available residences and high-quality water in order to meet this increasing demand.

5.1 FAVOURABLE LOCATION:

The location (the far south-east of Olifantshoek, south of Skepdraai and west of Diepsloot) is the most favourable site for the proposed project. The handheld GPS coordinates are 27°57'36.49"S and 22°44'33.57"E).

6. ALTERNATIVES CONSIDERED

According to Chapter 1 of NEMA EIA Regulations of April 2017, Notice R326, "Alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to-

- (a) The **property** on which or **location** where it is proposed to undertake the activity;
- (b) The **type** of activity to be undertaken;
- (c) The **design** or **layout** of the activity;
- (d) The **technology** to be used in the activity;
- (e) The **operational** aspects of the activity; and
- (f) The option of **not implementing** the activity.

These NEMA EIA Regulations 2017, Notice R326, recognises that details on alternatives need to include "a description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity".

The consideration of alternatives is therefore a key component of an EIA process. While an EIA process should investigate and comparatively **consider** all alternatives that have been identified, only those found to be

“feasible” and “reasonable” must be comparatively **assessed**, in terms of the advantages and disadvantages that the proposed activity and alternatives will have on the environment and on the socio-economic aspects of communities that may be affected by the activity.

The “feasibility” and “reasonability” of an alternative are measured by:

- the general purpose and requirements of the activity;
- the need and desirability of the activity;
- opportunity costs;
- the need to avoid and/or minimise negative impacts;
- the need to maximise benefits; and
- how it impacts on the community that may be affected by the activity (DEA&DP,2013b).

Alternatives considered for the proposed water reticulation networks include no alternatives and a no-go option. The following section describes those alternatives that have been considered (i.e. identified and investigated) and indicate which alternatives are deemed to be “feasible” and “reasonable” and therefore preferred. It also indicates and compares the advantages and disadvantages of these alternatives

6.1 LOCATION ALTERNATIVES

An alternative viable site location was not identified and evaluated for the project. The specific proposed location for the water reticulation network is preferred as it is the only viable portion of land available in that vicinity which is up for procurement. Procurements arrangements have been made between the applicant and the current land owner. This will render the project viable from an economic and logistic perspective.

6.2 LAYOUT ALTERNATIVES

Only one layout alternative has been considered for this project. This alternative is described below:

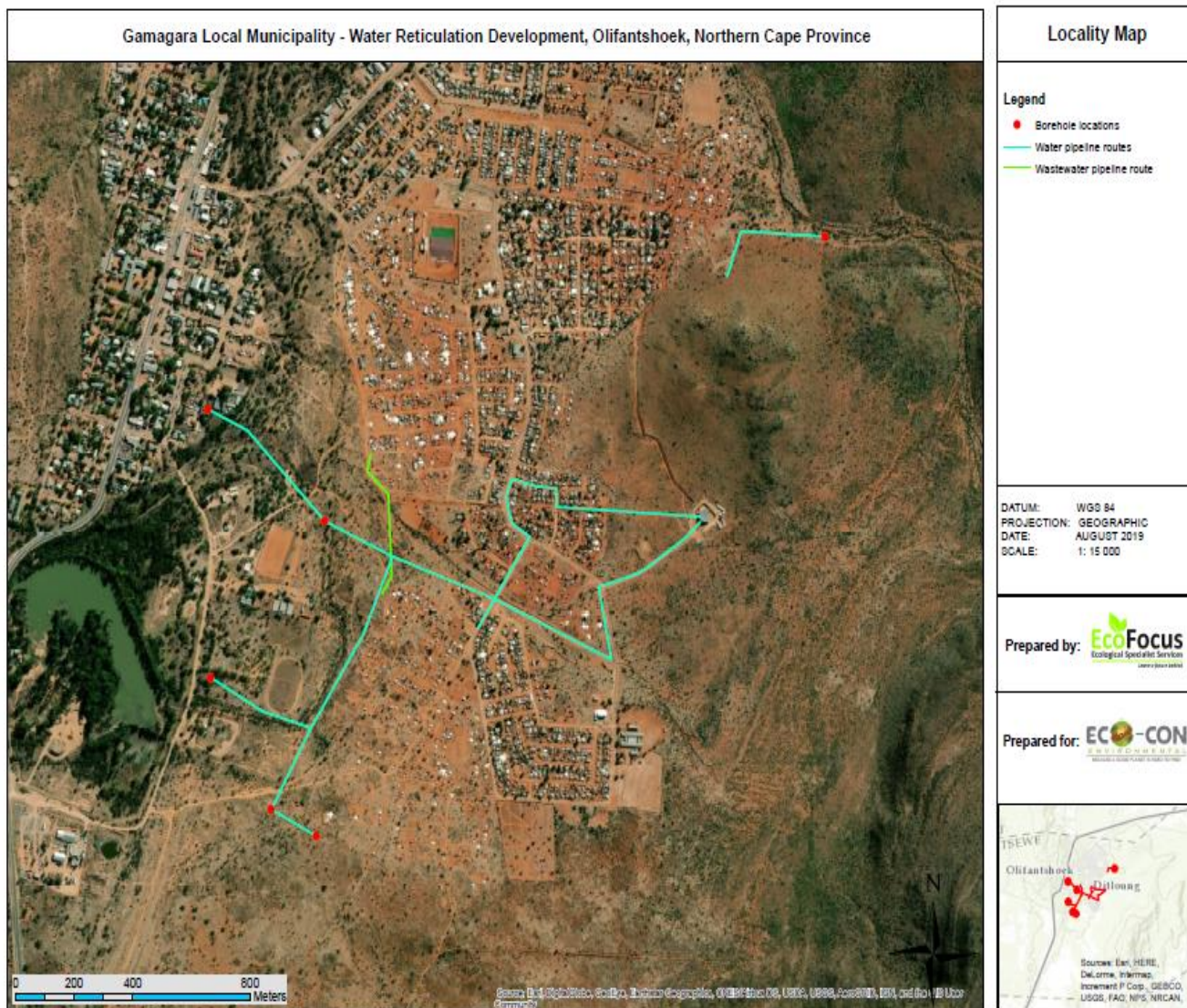
Site / Property Alternatives

No viable site/property alternatives were considered for the project as the design and layout plans have already been planned and implemented.

Layout Alternatives

The following layout has been proposed.

Layout Alternative



Gamagara water reticulation network preferred Alternative (Alternative 1)

6.3 NO-GO OPTION

6.3.1 Advantages of not Developing

The negative environmental impacts associated with the proposed project as identified under Section 10 will be avoided if the proposed project is not implemented. However, the proposed project will contribute to local job creation by means of the appointment of approximately 16 staff. The socio-economic and overall living conditions of the local community will be changed and developed which will have a positive influence on local economic growth.

6.3.2 Disadvantages of not developing

If the proposed project however does not go ahead, the local communities will forego the economic benefits

which the project will have on the areas such as immediate additional employment opportunities and revenue streams and most importantly, the provision of residences for the local community.

7. DESCRIPTION OF THE ENVIRONMENT

The following section provides an overview of the bio-physical as well as the socio-economic environments of the proposed project. The table below (table 8) indicates the list of specialist studies that were conducted during the assessment process:

Table 6: List of Specialist Studies Conducted

Specialist Name	Organisation	Specialist Assessment Type
Mr. Rikus Lamprecht	EcoFokus	Ecological and Wetland Impact Assessment
Mr. Rikus Lamprecht	EcoFokus	Rehabilitation and Alien Invasive Species Management Plan
Mr. Rikus Lamprecht	EcoFokus	Protected Species Relocation Management Plan
Dr. Lloyd Rossouw	Palaeo Field Services	Archaeological and Palaeontological Impact Assessment (Heritage Assessment)
	Kimopax	Geohydrological Assessment

7.1 BIO-PHYSICAL DESCRIPTION

This section provides a comprehensive description of the bio-physical environment of the proposed project area.

7.1.1 Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 342 mm (www.climate-data.org). The maximum average monthly temperature is approximately 24.9°C in the summer months while the minimum average monthly temperature is approximately 11.1°C during the winter. Maximum daily temperatures can reach up to 32.6°C in the summer months and dip to as low as 2.4°C during the winter.

7.1.2 Geology and Soils

According to Mucina & Rutherford (2006) the geology of the landscape and associated vegetation type can be described as the following:

Red aeolian sand of tertiary or recent age (Kalahari Group) with silcrete and calcrete and some andesitic and basaltic lava of the Griqualand West Supergroup. Deep Hutton soils are overwhelmingly dominant.

7.1.3 Topography

Due to the slightly sloping topography of the assessment area, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

7.1.4 Ecological and Vegetation Conservation Status

According to SANBI (2006-), the entire assessment area falls within the Olifantshoek Plains Thornveld vegetation type (SVk 13) which mainly consists of wide plains with an open tree and shrubland layer and usually a sparse grass layer. This vegetation type is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

See vegetation and conservation status maps below.

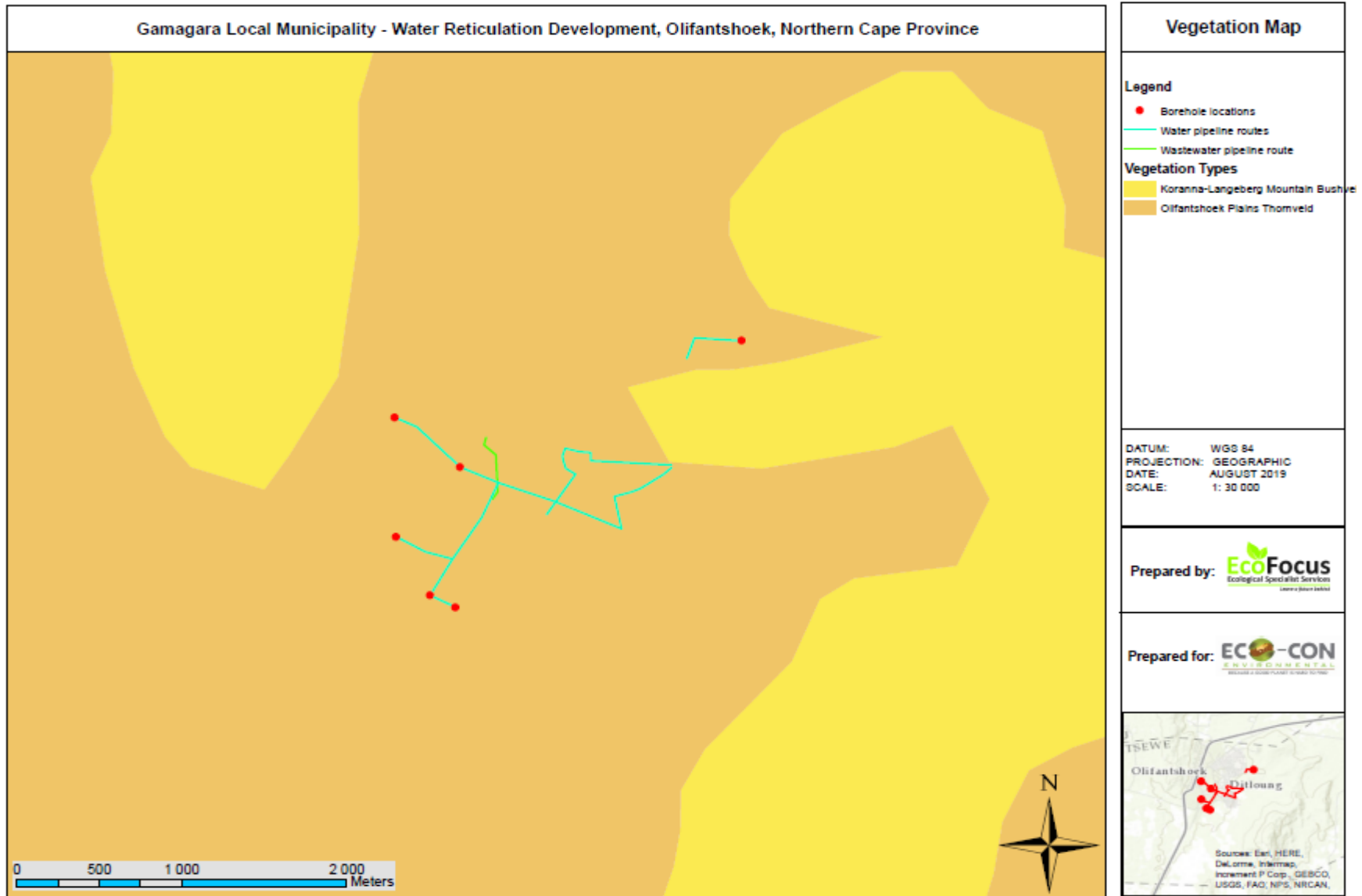


Figure 8: Vegetation map (see appendix B for A3 size version)

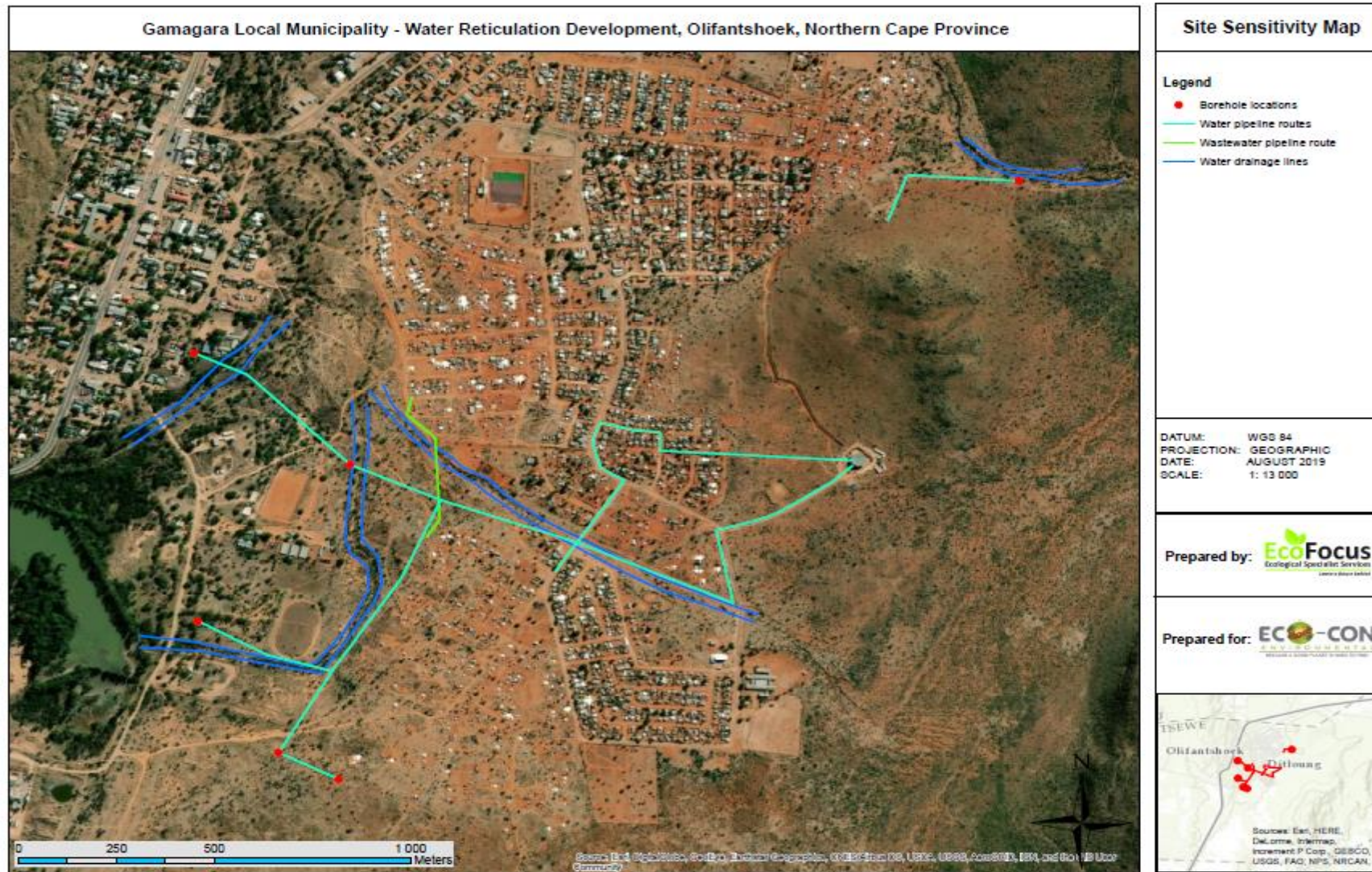


Figure 9: Ecological sensitivity map of the proposed project layout (see Appendix B for an A3 size version)

7.1.4.1 Terrestrial environment

Current Existing Vegetation and Site Condition:

The undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes constitute a homogenous flat to slightly sloping open savannah landscape associated with the relevant Olifantshoek Plains Thornveld vegetation type (SVk 13). The woody component is mainly dominated by tree individuals of the species *Boscia albitrunca* while tree and shrub individuals of the species *Vachellia erioloba* are also well represented (both of these species are listed as nationally protected).

The average density of *Boscia albitrunca* individuals within this undeveloped, relatively natural portion, amounts to approximately 10 trees/ha of which most individuals are very large (≥ 4 m in height) and presumably therefore also very old. Such large/old individuals of this species are considered to be of high conservational significance.

The average density of *Vachellia erioloba* individuals within this undeveloped, relatively natural portion, amounts to approximately 5 trees/ha. Most individuals of this species are however not necessarily significant in size (≤ 4 m in height) and are therefore considered to be of slightly less conservationally significant relative to the *Boscia albitrunca* individuals present.

It is however recommended that no individuals of these two nationally protected tree species may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.

Tree and shrub individuals of the species *Vachellia tortilis* are also well represented throughout the undeveloped, relatively natural portion. Other tree and shrub species also found to be sparsely present include *Senegalia mellifera*, *Ziziphus mucronata*, *Grewia flava*, *Ehretia alba* as well as the legally declared invasive species *Prosopis* spp. (Category 3) & *Opuntia* sp. (Category 1b).

Due to the assumed continued long term overgrazing, the low growing karroid shrub species *Rhigozum trichotomum* is dominant within the undeveloped, relatively natural portion, while the karroid shrub species

Monechma incanum, *Hertiapallens* & *Crotalaria orientalis* are also well represented. The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained prior to the commencement of any such removal and relocation activities.

Forb species found to be present within the assessment area include *Dipcadi crispum*, *Cassia italica*, *Albuca setosa*, *Ledebouria undulata*, *Tribulus cristatus* & *Ipomoea bathycolpos*.

As mentioned earlier, the undeveloped, relatively natural portion is virtually completely devoid of a well-established grass layer mainly due to assumed significant continued long term overgrazing by livestock from the local community. The existing graminoid layer is completely dominated by small seedlings of what appears to be the nut-sedge species *Cyperus rotundus*. No other grass species were found to be well represented within the undeveloped, relatively natural portion as would otherwise have been expected in the natural climactic state of the relevant vegetation type.

No Red Data Listed species or any other species of conservational significance were found to be present within the undeveloped, relatively natural portion. The undeveloped, relatively natural portion and surrounding landscape also does not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important_bird_areas/iba-map). No important bird species, unique or specialised bird habitats were observed or are expected to utilise the area for breeding and/or persistence purposes.

Due to the presence of the informal residential settlement situated directly adjacent north-east of the undeveloped, relatively natural portion along with continued grazing by livestock from the local community, the

area is subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the undeveloped, relatively natural portion for breeding and/or persistence purposes.

See photographs below.



Image illustrating an example of a more natural area in close proximity to the assessment area, which possesses a well-established grass layer more reminiscent of the natural climactic state of the relevant vegetation type

Three small ephemeral water drainage lines are traversed by the proposed new pipeline routes. The lack of constant water flow through the assessment area, has resulted in these drainage lines not possessing any distinct riparian zone or variation in vegetation species composition relative to the surrounding savannah. These drainage lines however feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area.



Image illustrating an example of the small ephemeral water drainage lines which are traversed by the proposed new pipeline routes

Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS):

The Present Ecological State (PES) of the majority of the proposed new pipeline routes which traverse areas within the existing informal settlement, is classified as Class F as these areas are critically/extremely modified. Transformation has reached a critical level and the ecosystem has been completely modified with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is deemed irreversible.

The Present Ecological State (PES) of the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes is classified as Class C as it is moderately modified. Moderate loss and transformation of natural habitat and biota have occurred mainly due to assumed significant continued long term overgrazing by livestock from the local community, but the basic ecosystem functionality has still remained predominantly unchanged.

The Ecological Importance and Sensitivity (EIS) of the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on provincial scale mainly due to the significant presence of nationally and provincially protected species individuals. Biodiversity is however still relatively ubiquitous in the broader area. The undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes are therefore viewed as being of moderate conversational significance for habitat preservation and

ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and nationally and provincially protected species.

The three small ephemeral water drainage lines which are traversed by the proposed new pipeline routes, feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The Ecological Importance and Sensitivity (EIS) of the three small ephemeral water drainage lines which are traversed by the proposed new pipeline routes, is classified as Class C (moderate) as they are viewed as being ecologically important and sensitive on local and possibly provincial scale mainly due to them forming an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area.

7.1.4.1 Conclusions and Recommendations

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

The majority of the proposed new pipeline routes traverse areas within the existing informal settlement and run along existing dirt roads. The majority of natural surface vegetation has therefore been cleared within these existing informal settlement areas and the areas constitute highly degraded and transformed landscapes.

Only the south-western portion of the proposed new pipeline routes traverse undeveloped, relatively natural areas associated with the relevant Olifantshoek Plains Thornveld vegetation type (SVk 13). Assumed significant historic and continued long term overgrazing by livestock from the local community has however resulted in these areas being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type. This relevant vegetation type, is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

Although no Red Data Listed species were found to be present within the assessment area, individuals of the nationally protected tree species *Boscia albitrunca* & *Vachellia erioloba* were found to be present throughout the

undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes. Most individuals of the former species are very large (≥ 4 m in height) and presumably therefore also very old while most individuals of the latter species are not necessarily significant in size. Such large/old individuals of the former species are considered to be of high conservational significance.

It is therefore recommended that no individuals of these two nationally protected tree species may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.

The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion, while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities.

Due to the presence of the informal residential settlement situated directly adjacent north-east of the undeveloped, relatively natural portion along with continued grazing by livestock from the local community, the area is subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the undeveloped, relatively natural portion for breeding and/or persistence purposes.

Due to the slightly sloping topography of the assessment area, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

Three small ephemeral water drainage lines are traversed by the proposed new pipeline routes. These drainage lines feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area. The construction footprints through the three drainage lines must therefore be adequately rehabilitated as soon as practicably possible after construction in order to ensure their continued flow and ecological integrity.

It is the opinion of the specialist that the potentially significant ecological impacts associated with the continued impeding and contamination of the flow regimes of the three small ephemeral water drainage lines as well as over extraction of domestic use water from the six existing boreholes, can be suitably reduced and mitigated to within acceptable residual levels. The project should therefore be considered by the applicant, Gamagara Local Municipality for approval and be allowed to continue.

The proposed development may however only continue if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project. All necessary authorisations, licenses and permits must also be obtained prior to any commencement.

See specialist report in Appendix E1.

7.1.5 Heritage

Assessment area:

The proposed development footprint is located within a basin that is capped by well-developed, wind-blown sandy deposits (Qs), reaching depths of more than 1 m. The terrain has been moderately degraded by informal residential development, and associated cattle herding activities. A large, formal cemetery is located at the north-eastern boundary of the footprint. The cemetery will not be affected by the proposed development.

Impact statement and recommendations:

The proposed development footprint is primarily underlain by palaeontologically insignificant bedrock that is overlain by geologically recent, wind-blown sandy deposits. Potential impact on palaeontological heritage resources within the proposed footprint is considered low to very low. Potential impact on Quaternary vertebrate fossil resources within the superficial overburden is considered unlikely. As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required.

A pedestrian survey conducted along six transects within the study area revealed no above-ground evidence of *in situ* Stone Age archaeological material, eroding out or distributed as surface scatters on the landscape. There are also no above-ground indications of rock art, prehistoric structures, graves or historically significant structures older than 60 years within the confines of the footprint. This site is considered to be of low archaeological significance, especially given the well – developed sandy overburden.

It is assigned the rating of Generally Protected C (GP.C) (**Table 7**), provided that any capped archaeological remains in the form of stone tool scatters, found during the construction phase of the project under the sandy overburden (Qs), should be reported to the relevant heritage resources agency so that a heritage professional can assess their importance and proceed with rescue procedures if necessary.

Table 7: Field rating categories as prescribed by SAHRA

Field Rating	Grade	Significance	Mitigation
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

See specialist report in Appendix E2.

7.1.6 Geohydrological study

The following tables summarize the results and recommendations concluded by Kimopax (Pty) Ltd:

Table 8: Geohydrological results

Borehole Number	Latitude	Longitude	Borehole Depth (m)	Measured WL (mbgl)	Borehole -Testing						
					NO: SDT	Date	Test Type	Final SDT Yield	PI	CDT Yield	CDT Duration
						Completed	SDT/CDT	l/s	l/s	l/s	hrs
BH01	-27.94298	22.75660	105.00	19.22	4	24/01/2018	CDT	1.91	0.68	0.60	12
BH02 (G57NC)	-27.94337	22.76092	120.00	23.30	2	24/01/2019	No CDT	0.70	0.34	--	--
BH03	-27.95027	22.74128	Not Test	--	--	--	--	--	--	--	--
BH04 (Police Station)	-27.94742	22.73772	78.10	24.40	5	29/01/2018	CDT	6.55	--	5.00	24
BH05 (Farm)	-27.94865	22.73263	102.00	16.94	3	26/01/2018	CDT	1.01	0.51	0.50	12
BH06 (Municipal Office)	-27.93828	22.73764	76.46	19.45	4	02-Jan-18	CDT	7.00	--	6.50	24
BH07 (Hospital)	-27.93755	22.73457	85.00	33.86	3	23/03/2019	CDT	1.02	0.65	0.52	12

Table 9: Geohydrological recommendations

Borehole No.	Latitude	Longitude	Depth (m)	SWL (m)	Water Quality			Management Recommendation					
					EC (mg/l)	N (mg/l)	DWA (class)	Yield (l/s)	Duty (hrs/day)	Pump Set	T (m ² /d)	Dynamic WL	Comments
BH01	-27.94298	22.75660	105.00	19.22	55.6	1.6	Class I	0.5	12	80	2.3	47	Production Borehole
BH02 (G57NC)	-27.94337	22.76092	120.00	23.30	--	--	Class I	--	--	--	--	--	Low yielding borehole
BH03	-27.95027	22.74128	--	--	--	--	--	--	--	--	--	--	Borehole Destroyed
BH04 (Police Station)	-27.94742	22.73772	78.10	24.40	171	13	Class II	4.0	12	60	49.1	35	Production Borehole
BH05 (Farm)	-27.94865	22.73263	102.00	16.94	108	0.5	Class I	0.4	10	90	1.9	46	Standby Borehole
BH06 (Municipal Office)	-27.93828	22.73764	76.46	19.45	207	16	Class II	4.0	12	50	12.1	44	Production Borehole
BH07 (Hospital)	-27.93755	22.73457	85.00	33.86	--	--	Await Chem.	0.5	12				Production/Standby Borehole
Totals								9.4	12				

The preliminary borehole management recommendations from the four tested boreholes indicate that the combined yield amounts to **9.4 l/s** which is equivalent to **406,080l** per day which can supply a total population of **5 076 per day using 80 l/p/d**.

See specialist report in Appendix E3.

7.2 SOCIO-ECONOMIC DESCRIPTION

The proposed project does not hold any overriding negative social impacts to suggest a no development option. The investment, employment and income generation potential linked to the project will positively contribute to the socio-economic development objectives described in the local IDP.

The Department of Economic Development and Tourism in the Northern Cape has recently concluded the development of its Provincial Local Economic Development (LED) Strategy in line with the Northern Cape Growth and Development Strategy. The LED is an approach to sustainable economic development that

encourages residents of local communities to work together to stimulate local economic activity that will result in, inter alia, an improvement in the quality of life for all in the local community. These Strategies provide the foundation for Integrated Economic Development Planning throughout the Northern Cape. A development such as the proposed project would present a definite benefit and addition to the LED through local job creation and skills development and contribute to the alleviation of poverty and unemployment in the local municipality. This will enable a better livelihood and a higher quality of life to individuals involved.

The following section will provide a brief insight as to the socio-economic conditions in the respective municipal areas:

Gamagara Local Municipality:

Employment:

The municipality has a total population of 41 617 people with 79,9% falling within the working age (16-65). The unemployment rate stands at 17,7% with the youth unemployment rate standing at 22,4%.

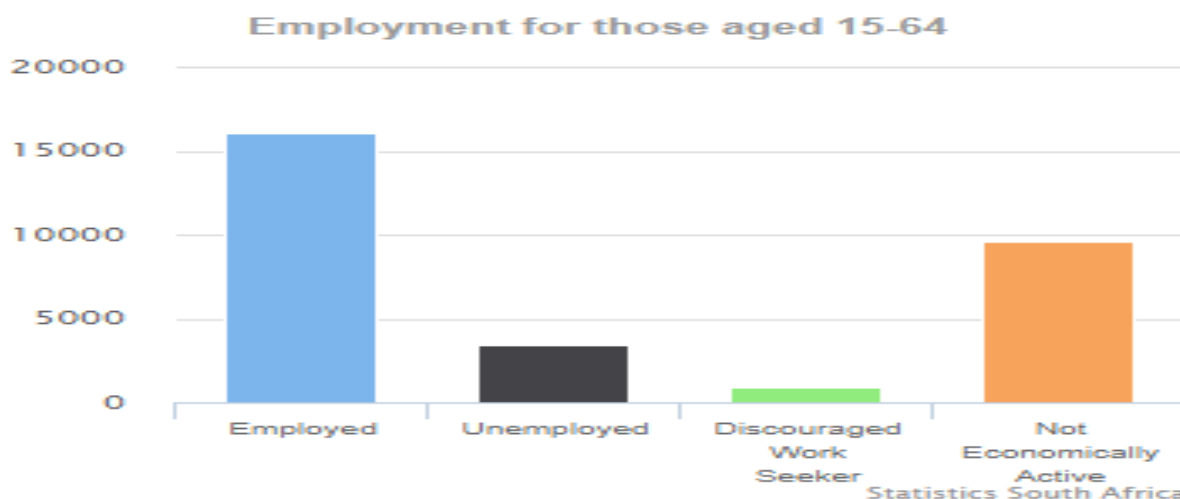


Figure8: Employment Graph for those aged 15-64

Economic profile:

The Economic Profile of the Gamagara Local Municipality is summarized below. It is clear that the sixth highest percentage of people have no income. This project will contribute by providing new working opportunities during the construction/preparations phase and operational phases.

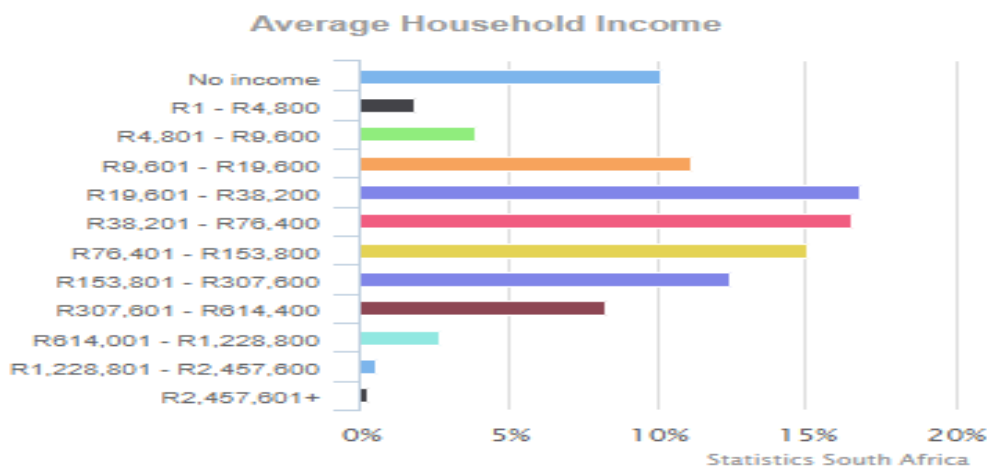


Figure 9: Economic profile graph indicating household income

Level of Education:

According to the Census, Gamagara Local Municipality has a total population of 41 617 people. The majority of the population in the municipality are black at 55%, 28,7% are coloured, 14% are White, 0,6% are Indian/Asian, with the other population groups making up the remaining 1,7%.

6,3% have completed primary school, 30,9% have some secondary education, 13,5% have completed matric and 1,5% have some form of higher education. Of the mentioned age group (all ages), 4,2% have no form of schooling.

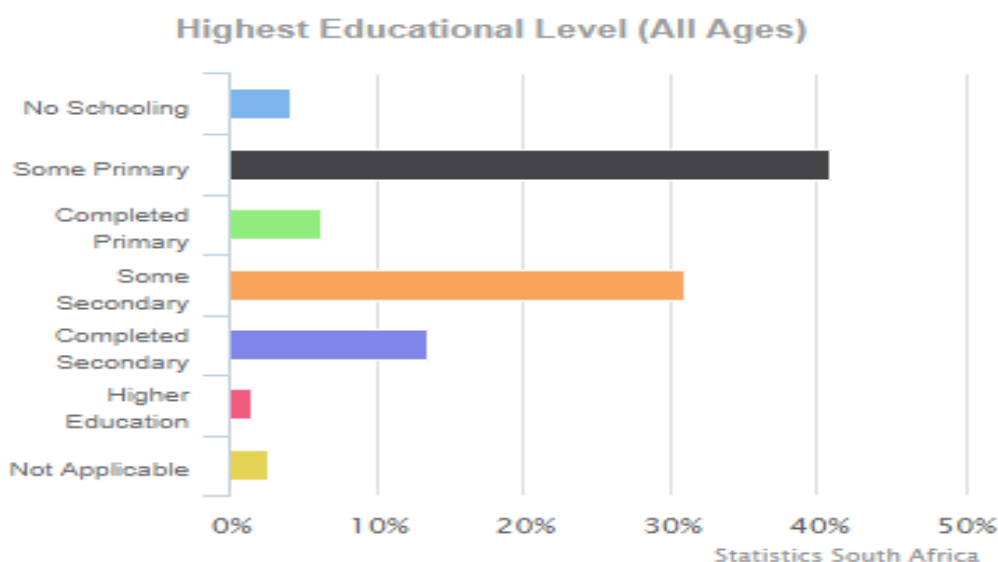


Figure 16: Education graph indicating education levels

Construction and operational phase job creation (local employment) and sustainable capacity building (skills, experience and resources development) of this project will aid in immediate and continuous local community

upliftment and poverty alleviation and are therefore regarded as significant socio-economic benefits associated with the proposed project to motivate the need and desirability.

Living conditions:

The number of households in the Gamagara local municipality is 10 808 of which formal dwellings constitute 74,4%. 77,6 of households are flush toilets connected to a sewage system and only 59,1% of households consists of piped water inside the dwelling and 87,9% of households use electricity for lighting.

From the information above of stats SA it is clear that the overall living conditions of the local community shows room for improvement. The proposed project will thus enhance the overall living conditions and help enhance the socio-economic conditions for the local people.

8. PUBLIC PARTICIPATION PROCESS

A continual and comprehensive Public Participation Process (PPP) will be undertaken throughout the entire EIA process with all stakeholders and Interested and Affected Parties (I & AP's), including the relevant organs of state and competent authority (Northern Cape Department of Environment and Nature Conservation).

The PPP will be conducted in accordance with the requirements of Regulation 41 of the EIA Regulations, 2017 and the designated Public Participation Officer will ensure that the PPP is facilitated in a manner which ensures reasonable opportunity for all stakeholders and registered I & AP's to comment and provide input on the proposed project.

8.1 Impact Assessment PUBLIC PARTICIPATION

The PPP for the proposed project is still to be completed.

All stakeholders and I&AP's will be adequately notified of the Public Participation Processes taking place as well as the availability of the relevant documents for comment as per Regulation 41 of the EIA Regulations, 2017.

An I & AP's register containing the names and contact details of all relevant stakeholders and I & AP's was established and will be submitted to the competent authority along with this Final EIA Report as per Regulation 42 of the EIA Regulations, 2017 (see Appendix C).

8.1.1 Comments received and responses provided during the Impact Assessment phase

All comments received from the stakeholders and I & AP's with the subsequent responses provided will be incorporated into the initial Public Participation Report which was submitted to the competent authority along

with the Final Report.

See table below providing the summary of all comments and responses:

Table 10: Comments Received during the 30-day Public Participation period

TO BE COMPLETED ONCE THE PPP IS COMPLETED
--

8.2 LIST OF STAKEHOLDERS / ORGANS OF STATE / LANDOWNERS AND ADJACENT LANDOWNERS NOTIFIED

The following table (table 11) list all identified Stakeholders / Organs of State / Organisations / Interested and Affected Parties which were notified of the proposed project.

Table 11: Stakeholders / Organs of State / Organisations / Interested and Affected Parties notified

Name and Surname	Organisation	Department	Email / Postal:	Tel:
Mr. K.J Leserwane	Gamagara Local Municipality	Acting Municipal Manager		053 723 6000
Mr Pierre Burger	Gamagara Local Municipality	Environmental Department	pierreb@gamagara.co.za	084 090 6650
Mr Bithumelo Likgadi	Gamagara Local Municipality	Ward Councillor (Ward26)	likgadid@gamagara.co.za	081 017 6958
Mr D Molaole	John Taolo District Municipality	Municipal Manager	dmolaole@gmail.com	053 712 8700
Mr Johnny Swart	John Taolo District Municipality	Environmental Department	swartj@taologaetsewe.gov.za	082 593 1331
Mr A P Van Wyk	Department of water and sanitation	Water and sanitation	-	054 338 5800
Mr Jaco Roelofse	Department of roads and public works	Director	Roelofse.j@vodamail.co.za	076 811 6206

8.3 COMMENTS AND RESPONSES

All comments received from the I & AP's, stakeholders and organs of state together with the subsequent responses provided will be incorporated into a Public Participation Report which is submitted to the competent authority.

9. ENVIRONMENTAL IMPACTASSESSMENT

The following section identifies the potential environmental impacts (both positive and negative) which the construction as well as operational phases of the proposed project will have on the surrounding environment.

Once the potential environmental impacts are identified, they are assessed by rating their Environmental Risk after which the final Environmental Significance is calculated and rated for each identified environmental impact.

The same Environmental Risk rating process is then followed for each environmental impact to determine the Environmental Significance if the recommended mitigation measures were to be implemented.

The objective of this section is therefore firstly to identify all the potential environmental impacts of the proposed project and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance. The potential environmental impacts which are still rated as highly significant, even after implementation of mitigations, can then be identified in order to specifically focus on implement of effective management strategies for them.

9.1 METHODOLOGY FOR IMPACT ASSESSMENT AND RISK RATING

The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential environmental impacts.

Each potential environmental impact is scored for each of the Evaluation Components as per the table below.

Table 12: Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/criteria
MAGNITUDE of NEGATIVE IMPACT (at the indicated spatial scale)	<p>10 - Very high: Bio-physical and/or social functions and/or processes might be <i>severely</i> altered.</p> <p>8 - High: Bio-physical and/or social functions and/or processes might be <i>considerably</i> altered.</p> <p>6 - Medium: Bio-physical and/or social functions and/or processes might be <i>notably</i> altered.</p> <p>4 - Low : Bio-physical and/or social functions and/or processes might be <i>slightly</i> altered.</p> <p>2 - Very Low: Bio-physical and/or social functions and/or processes might be <i>negligibly</i> altered.</p> <p>0 - Zero: Bio-physical and/or social functions and/or processes will remain <i>unaltered</i>.</p>
MAGNITUDE of POSITIVE IMPACT (at the indicated	<p>10 - Very high (positive): Bio-physical and/or social functions and/or processes might be <i>substantially</i> enhanced.</p> <p>8 - High (positive): Bio-physical and/or social functions and/or processes might be <i>considerably</i> enhanced.</p> <p>6 - Medium (positive): Bio-physical and/or social functions and/or processes might be <i>notably</i> enhanced.</p> <p>4 - Low (positive): Bio-physical and/or social functions and/or processes might be <i>slightly</i> enhanced.</p> <p>2 - Very Low (positive): Bio-physical and/or social functions and/or processes might be <i>negligibly</i> enhanced.</p>

spatial scale)	0 - Zero (positive): Bio-physical and/or social functions and/or processes will remain <i>unaltered</i> .
DURATION	<p>5 – Permanent</p> <p>4 - Long term: Impact ceases after operational phase/life of the activity > 60 years.</p> <p>3 - Medium term: Impact might occur during the operational phase/life of the activity – 60 years.</p> <p>2 - Short term: Impact might occur during the construction phase - < 3 years.</p> <p>1 – Immediate</p>
EXTENT (or spatial scale/influence of impact)	<p>5 - International: Beyond National boundaries.</p> <p>4 - National: Beyond Provincial boundaries and within National boundaries.</p> <p>3 - Regional: Beyond 5 km of the proposed development and within Provincial boundaries.</p> <p>2 - Local: Within 5 km of the proposed development.</p> <p>1 - Site-specific: On site or within 100 m of the site boundary.</p> <p>0 –None</p>
IRREPLACEABLE loss of resources	<p>5 – Definite loss of irreplaceable resources.</p> <p>4 – High potential for loss of irreplaceable resources.</p> <p>3 – Moderate potential for loss of irreplaceable resources.</p> <p>2 – Low potential for loss of irreplaceable resources.</p> <p>1 – Very low potential for loss of irreplaceable resources.</p> <p>0 – None</p>
REVERSIBILITY of impact	<p>5 – Impact cannot be reversed.</p> <p>4 – Low potential that impact might be reversed.</p> <p>3 – Moderate potential that impact might be reversed.</p> <p>2 – High potential that impact might be reversed.</p> <p>1 – Impact will be reversible.</p> <p>0 – No impact.</p>
PROBABILITY (of occurrence)	<p>5 - Definite: >95% chance of the potential impact occurring.</p> <p>4 - High probability: 75% - 95% chance of the potential impact occurring.</p> <p>3 - Medium probability: 25% - 75% chance of the potential impact occurring</p> <p>2 - Low probability: 5% - 25% chance of the potential impact occurring.</p>
	1 - Improbable: <5% chance of the potential impact occurring.
Evaluation Component	Rating Scale and Description/criteria

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

Once the Environmental Risk Ratings have been evaluated for each potential environmental impact, the Significance Score of each potential environmental impact is calculated by using the following formula:

$$SS(\text{Significance Score}) = (\text{magnitude} + \text{duration} + \text{extent} + \text{irreplaceable} + \text{reversibility}) \times \text{probability.}$$

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential environmental impact as per Table 14 below. The Environmental Significance rating process is completed for all identified potential environmental impacts both before and after implementation of the recommended mitigation measures.

Table 14: Scale used for the evaluation of the Environmental Significance Ratings

Significance Score	Environmental Significance	Description/criteria
125 – 150	Very high (VH)	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	High (H)	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	Medium-high (MH)	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.
40 – 74	Medium (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	Low (L)	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

9.2 DESCRIPTION OF POTENTIAL IMPACTS AND THEIR RECOMMENDED MITIGATION MEASURES

The following section provides a list of potential environmental impacts which the proposed project will have as well as the recommended mitigation measures to be implemented for each impact.

9.2.1 Construction Phase

The potential environmental impacts associated with the construction / development phase of the proposed development.

9.2.1.1 Flora Impacts

A direct impact on flora will arise as a result of vegetation clearance.

Mitigation measures to reduce these potential impacts:

- The linear project construction footprints of the proposed new pipeline routes must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.
- No site construction camps to be established within the surrounding natural areas outside the project footprint area.
- Adequately cordon off the construction area and ensure that no construction activities, machinery or equipment operate or impact within the natural surrounding areas outside the cordoned off area.
- Adequate operational procedures for machinery and equipment must be developed in order to strictly govern movement of machinery only within project footprint area and ensure environmentally responsible construction practices and activities.
- Existing roads and farm tracks in close proximity to the proposed project area must be used during construction.
- No new roads or tracks to be constructed or implemented outside the footprint areas of the proposed development.
- Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction.

9.2.1.2 Flora, Fauna and avifauna Impacts

A direct impact on flora, fauna and avifauna will arise as a result of destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area:

Mitigation measures to reduce potential impacts:

- The linear project construction footprints of the proposed new pipeline routes must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.
- It is recommended that no individuals of these two nationally protected tree species *Boscia albitrunca* & *Vachellia erioloba* may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.
- It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species (*Aloe hereroensis*, *Ammocharis coranica* & *Bulbin eabyssinica*) be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.
- It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.
- These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities.
- A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities.
- An adequate Plant Relocation Management Plan must be compiled by a suitably qualified and experienced ecologist.

9.2.1.3 Dust Impacts

Dust nuisance generated during the development / preparation of the water network.

Mitigation measures to reduce potential impacts:

- Implement suitable dust management and prevention measures during the construction phase.
- Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction in order to prevent significant dust emissions from occurring.

9.2.1.4 Impeding and contamination of the flow regimes of the three small ephemeral water drainage lines and subsequent downstream third order watercourse

Mitigation measures to reduce potential impacts:

- Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done to ensure and sufficiently manage storm water runoff, clean/dirty water separation towards the three small ephemeral water drainage lines in order to maintain their ecological functionality and integrity.
- The construction footprints through the three small ephemeral water drainage lines must also be adequately rehabilitated as soon as practicably possible after construction in order to ensure their continued flow and ecological integrity. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.
- If hydrocarbons or other chemicals are to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible from the three small ephemeral water drainage lines.
- Hydrocarbon and other chemical storage areas must be adequately bunded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units.
- Adequate hydrocarbon and other chemical storage, handling, usage and spillage clean-up procedures must be developed and all relevant construction personnel must be sufficient trained on- and apply these procedures during the entire construction phase.
- Spill kits must be readily available on the construction site. All employees must be adequately trained on the correct procedure and use of the spill kits.
- A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation in accordance with the National Water Act (Act 36 of 1998).

9.2.1.5 Cultural and Heritage Impacts

Damage and destruction of vertebrate fossils during excavation activities may occur.

Mitigation measures to reduce potential impacts:

- Should any heritage resources (including but not limited to fossils, coins, indigenous and/or colonial ceramics, any articles of value or antiquity, stone artefacts or bone remains, structures and or built features, rock art and rock engravings) be exposed during excavations for the purpose of construction, construction in the vicinity of the finding must be stopped. A trained palaeontologist or heritage specialist must be notified to assess the finds, and this must then be reported to the applicable heritage authority.
- Heritage remains uncovered or disturbed during earthworks must not be disturbed further until the necessary approval has been obtained from the heritage authority. A registered heritage specialist must be called to the site for inspection and removal once authority to do so, has been given.
- Under no circumstances shall any heritage material be destroyed or removed from site.

- Excavations must be limited to the footprint area and be maintained in a narrow corridor.
- All operations of excavation equipment must be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures must be followed:
 - All construction in the immediate 50 metre vicinity of the site must be ceased.
 - The heritage practitioner must be informed as soon as possible.
 - In the event of obvious human remains SAPS must be notified.
 - Mitigation measures (such as refilling) must not be attempted.
 - The area in a 50 metre radius of the find must be barricaded with visible taping.
- Public access must be limited and the area must be placed under guard.

9.2.1.6 Surface and Groundwater Contamination Impacts

Surface and Groundwater Contamination during the development phase.

Mitigation measures to reduce potential impacts:

- Ensure that excavation areas have a predetermined stockpile area for excavated materials.
- Use overburden for rehabilitation.
- Any remaining overburden to be disposed of at a licensed waste site.
- Alternatively, concrete can be mixed on mixing trays only and not on exposed soil. Concrete must be mixed only in areas which have been specially demarcated for this purpose.
- Material Safety Data Sheets (MSDS) must be available on site for all chemicals and hazardous substances to be used on site, including information on their ecological impacts and how to minimise the impacts in case of any leakages.
- All spills must be cleaned as soon as they occur. A spill kit must be used and proof of cleanup must be given to the ECO.
- Spillages of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bioremediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring onsite.
- Provide suitable and sufficient ablution facilities (1 for every 15 personnel on site and 1 for each gender).
- Vehicles and machinery must be regularly serviced to avoid spillages.
- Drip trays must be placed beneath all stationary construction equipment and beneath all generators present onsite.

9.2.1.7 Waste Management Impacts

Waste impacts by means of waste storage and littering during the development / preparation of the water

network.

Mitigation measures to reduce potential impacts:

- An adequate number of scavenger proof litter bins are to be placed throughout the site, dumping of waste on the site is prohibited.
- Waste sorting and separations should form part of the environmental induction and awareness program to encourage and educate personnel to recycle.
- Keep all work sites including storage areas, offices and workshops neat and tidy.
- All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site.
- Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill site. If needed, a tarpaulin can be utilised.
- The burning and burying of solid waste on site is prohibited.
- Littering by construction workers shall not be permitted.
- General waste shall be removed from site on a weekly basis to an approved landfill site.
- Minimise waste by sorting waste into recyclable and non-recyclable materials.

9.2.1.8 Traffic Impacts

Traffic impacts by means of additional truck and transportation to and from site during the development / preparation of the water network.

Mitigation measures to reduce potential impacts:

- Abnormal loads should be timed to avoid times of the year when traffic volumes are likely to be higher, as would be expected over national holidays, weekends and school holiday periods.
- All vehicles should be roadworthy, be maintained to prevent fuel or oil leaks and drivers are to be licensed appropriately for the driving of their assigned vehicle.
- Any damage to public roads is to be reported to the management authority and repaired to its original condition.
- Signage is to be placed on vehicles at all times.

9.2.1.9 Fire Risk Impacts

Increase risk of fires during the development / preparation of the water network.

Mitigation measures to reduce potential impacts:

- Ensure the work site and the contractor's camp is equipped with adequate firefighting equipment.

- All construction equipment must have at least one firefighting extinguisher.
- Workers must be adequately trained in the handling of firefighting equipment.
- No open fires are permitted anywhere on site due to the handling of gas on site. No fires will be permitted for heating or cooking purposes onsite.
- Fuel and chemicals must be stored in an area that is acceptable for the client.
- No smoking will be allowed within close vicinity of the site.

9.2.1.10 Soil Contamination Impacts

Increased Soil contamination by means of hazardous substances.

Mitigation measures to reduce potential impacts:

- No leaked oil or fuel tankers may contaminate soil
- All tanks and pipes containing fuel or oil must be inspected on a regular basis
- Spills outside the bund area must be treated with a spill kit
- All significant leaks must be reported to the competent authority in terms of NEMA
- UST must be fitted with leak detectors in order to alert when a leak is occurring.
- Overfill and spillages during tanker refuelling and fuel dispensing should be prevented by the installation of automatic cut off devices.
- Tanker delivery drivers must be present during delivery of fuel with the emergency cut off switch and a fire extinguisher
- A closed coupling must be used when fuel is being transferred from the bulk delivery vehicle to the USTs to prevent fugitive emissions.
- All personnel working with fuel must undergo spill kit training
- The oil/water separator must be inspected on a regular basis and the inspection report must be provided to the ECO and relevant authority.
- Following a leak or accidental spill, a remediation plan must be compiled and executed.
- Fuel stock must be monitored on a daily basis in order to identify if the tank is leaking.

9.2.1.11 Soil Erosion Impacts

Increased Soil erosion due to construction activities.

Mitigation measures to reduce potential impacts:

- During construction, un-channelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw or hay bales, or bundles of cut vegetation sourced with the ECO's knowledge and consent, should be dug into the soil in contours to slow surface wash and capture eroded soil. The method may also be used where surface run-off becomes concentrated,
- All water flow must be controlled using storm water management techniques before discharge into the existing natural drainage line,
- Temporary cut off drains may be required to capture storm water and promote infiltration,
- All storm water management features must be constructed in a manner that will ensure the continued functioning of the emergent vegetation. Construction must coincide with the dry season.
- Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation in order to prevent any significant erosion from occurring.
- Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction in order to prevent significant erosion from occurring.

9.2.1.12 Visual Impacts

Increased visual impact due to increased working activities on-site.

Mitigation measures to reduce potential impacts:

- All waste must be placed in bins during operational phase. Keeping the area litter free.
- Construction activities may only take place during normal working hours.

9.2.1.13 Socio-Economic Impacts

Increased socio-economic conditions due to job creation.

Mitigation measures to reduce potential impacts:

- Ensure that low-, medium- and high skilled workers use provided working opportunities.
- Low-, medium- and high skilled workers must be sourced locally.
- Where practically possible, previously disadvantaged individuals should be provided preference with regards to employment opportunities.
- Individuals must be trained and continuously developed.

9.2.2 Operational Phase

The potential environmental impacts associated with the operational phase of the proposed development.

9.2.2.1 Flora Impacts

Direct impact on flora as a result of continuous vegetation clearance.

Mitigation measures to reduce potential impacts:

- Any accidental fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- The project construction footprint must be kept as small as practicably possible to reduce the actual surface impact on vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.
- Natural veld situated in-between the proposed project area(s) must not be impacted upon and must be left in situ.
- Existing roads and in close proximity to the proposed project area must be used during operation.
- Alien and invasive species need to be eradicated and controlled.

9.2.2.2 Fauna Impacts

Continuous impact on Fauna as a result of cleared vegetation / habitat loss.

Mitigation measures to reduce potential impacts:

- Natural veld situated in-between the proposed project area(s) must not be impacted upon and must be left in situ.
- Existing roads and in close proximity to the proposed project area must be used during operation.
- No hunting of any animal is to take place onsite.
- Special care is to be taken not to work near or disturb any vulture nests, especially during breeding seasons.

9.2.2.3 Dust Impacts

Dust nuisance generated during the operational phase of the project.

Mitigation measures to reduce potential impacts:

- Dust Management measures must be implemented in order to manage and minimize undesired dust emissions.
- Access roads need to be well maintained and dust suppression need to be applied during windy days.

9.2.2.4 Noise Impacts

Noise nuisance generated during the operational phase of the water network.

Mitigation measures to reduce potential impacts:

- Limit working hours of noisy equipment to daylight hours.
- Fit silencers to equipment.
- Unless otherwise specified, normal working hours will apply (i.e. from 07:00 to 17:00 Mondays to Fridays).
- Ensure that Employees and staff conduct themselves in an acceptable manner while on site, both during work hours and afterhours.
- No loud music is permitted on site or in the camp.

9.2.2.5 Cultural Heritage Impacts

Damage and destruction of vertebrate fossils during the operational phase.

Mitigation measures to reduce potential impacts:

- Should any heritage resources (including but not limited to fossils, coins, indigenous and/or colonial ceramics, any articles of value or antiquity, stone artefacts or bone remains, structures and or built features, rock art and rock engravings) be exposed during excavations, all works in the vicinity of the finding must be stopped. A trained palaeontologist or heritage specialist must be notified to assess the finds, and this must then be reported to the applicable heritage authority.
- Heritage remains uncovered or disturbed during earthworks must not be disturbed further until the necessary approval has been obtained from the heritage authority. A registered heritage specialist must be called to the site for inspection and removal once authority to do so, has been given.
- Under no circumstances shall any heritage material be destroyed or removed from site.
- Excavations must be limited to the footprint area and be maintained in a narrow corridor.
- All operations of excavation equipment must be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures must be followed:
 - All construction in the immediate 50 metre vicinity of the site must be ceased.
 - The heritage practitioner must be informed as soon as possible.
 - In the event of obvious human remains SAPS must be notified.
 - Mitigation measures (such as refilling) must not be attempted.
 - The area in a 50 metre radius of the find must be barricaded with visible taping.
- Public access must be limited and the area must be placed under guard.

9.2.2.6 Surface and Groundwater Impacts

Surface and Groundwater Contamination during the operational phase by means of fertilizer and/or any other hazardous substances or pesticides.

Mitigation measures to reduce potential impacts:

- Material Safety Data Sheets (MSDS) must be available on site for all chemicals and hazardous substances to be used on site, including information on their ecological impacts and how to minimise the impacts in case of any leakages.
- All spills must be cleaned as soon as they occur. A spill kit must be used and proof of clean up must be given to the ECO.
- Spillages of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bioremediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring onsite.
- Provide suitable and sufficient ablution facilities (1 for every 15 personnel on site and 1 for each gender).
- Vehicles and machinery must be regularly serviced to avoid spillages.
- Drip trays must be placed beneath all stationary equipment and beneath all generators present onsite.

9.2.2.7 Waste Management Impacts

As per the construction phase the area poses no archaeological and palaeontological significance or value.

Mitigation measures to reduce potential impacts:

- An adequate number of scavenger proof litter bins are to be placed throughout the site, dumping of waste on the site is prohibited.
- Waste sorting and separation should form part of the environmental induction and awareness programme to encourage and educate personnel to recycle.
- Keep all work sites including storage areas, offices and workshops neat and tidy.
- All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site.
- Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill site. If needed, a tarpaulin can be utilised.
- The burning and burying of solid waste on site is prohibited.
- Littering by workers shall not be permitted.
- General waste shall be removed from site on a weekly basis to an approved landfill site.
- Minimise waste by sorting waste into recyclable and non-recyclable materials.

9.2.28 Traffic Impacts

Traffic impacts by means of additional truck and transportation to and from site during the operational phase of the water network.

Mitigation measures to reduce potential impacts:

- Abnormal loads should be timed to avoid times of the year when traffic volumes are likely to be higher,

as would be expected over national holidays, weekends and school holiday periods.

- All vehicles should be road worthy, be maintained to prevent fuel or oil leaks and drivers are to be licensed appropriately for the driving of their assigned vehicle.
- Any damage to public roads is to be reported to the management authority and repaired to its original condition.
- Signage is to be placed on vehicles at all times.

9.2.2.9 Fire Risk Impacts

Increase risk of fires during the operational phase of the water network.

Mitigation measures to reduce potential impacts:

- Ensure the work site is equipped with adequate firefighting equipment.
- All equipment must have at least one firefighting extinguisher.
- Workers must be adequately trained in the handling of firefighting equipment.
- No open fires are permitted anywhere onsite.
- No fires will be permitted for heating or cooking purposes onsite.
- Fuel and chemicals must be stored in an area that is acceptable for the client.
- Dedicated smoking areas are to be provided.

9.2.2.10 Soil Contamination Impacts

Increased Soil contamination by means of hazardous substances.

Mitigation measures to reduce potential impacts:

- No leaked oil or fuel tankers may contaminate soil
- All tanks and pipes containing fuel or oil must be inspected on a regular basis
- Spills outside the bund area must be treated with a spill kit
- All significant leaks must be reported to the competent authority in terms of NEMA
- UST must be fitted with leak detectors in order to alert when a leak is occurring.
- Overfill and spillages during tanker refuelling and fuel dispensing should be prevented by the installation of automatic cut off devices.
- Tanker delivery drivers must be present during delivery of fuel with the emergency cut off switch and a fire extinguisher
- A closed coupling must be used when fuel is being transferred from the bulk delivery vehicle to the USTs to prevent fugitive emissions.

- All personnel working with fuel must undergo spill kit training
- Following a leak or accidental spill, a remediation plan must be compiled and executed.
- Fuel stock must be monitored on a daily basis in order to identify if the tank is leaking.

9.2.2.11 Soil Erosion Impacts

Increased Soil erosion due to operational activities.

Mitigation measures to reduce potential impacts:

- During the operational phase, un-channelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw or hay bales, or bundles of cut vegetation sourced with the ECO's knowledge and consent, should be dug into the soil in contours to slow surface wash and capture eroded soil. The method may also be used where surface run-off becomes concentrated,
- All water flow must be controlled using storm water management techniques before discharge into the existing natural drainage line,
- Temporary cut off drains may be required to capture storm water and promote infiltration,
- All stormwater management features must be constructed in a manner that will ensure the continued functioning of the emergent vegetation. Construction must coincide with the dry season.

9.2.2.12 Visual Impacts

Increased visual impact due to increased working activities during the operational phase.

Mitigation measures to reduce potential impacts:

- All waste must be placed in bins during operational phase. Keeping the area litter free.
- Construction activities may only take place during normal working hours.

9.2.2.13 Socio-Economic Impacts

Increased socio-economic conditions due to job creation.

Mitigation measures to reduce potential impacts:

- Ensure that low-, medium- and high skilled workers use provided working opportunities.
- Low-, medium- and high skilled workers must be sourced locally.
- Were practically possible, previously disadvantaged individuals should be provided preference with regards to employment opportunities.
- Individuals must be trained and continuously developed

9.2.3 Decommissioning Phase

The potential environmental impacts associated with the decommissioning phase of the proposed development.

9.2.3.1 Dust Impacts

Dust nuisance generated during the decommissioning phase of the project.

Mitigation measures to reduce potential impacts:

- Dust Management measures must be implemented in order to manage and minimize undesired dust emissions.

9.2.3.2 Surface and Groundwater Contamination Impacts

Surface and Groundwater Contamination during the decommissioning phase by means of hazardous substances.

Mitigation measures to reduce potential impacts:

- Material Safety Data Sheets (MSDS) must be available on site for all chemicals and hazardous substances to be used on site, including information on their ecological impacts and how to minimise the impacts in case of any leakages.
- All spills must be cleaned as soon as they occur. A spill kit must be used and proof of clean up must be given to the ECO.
- Spillages of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bioremediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring onsite.
- Provide suitable and sufficient ablution facilities (1 for every 15 personnel on site and 1 for each gender).
- Vehicles and machinery must be regularly serviced to avoid spillages.
- Drip trays must be placed beneath all stationary equipment and beneath all generators present onsite.

9.2.3.3 Waste Management Impacts

Waste impacts by means of waste storage and littering during the decommissioning phase of the water network.

Mitigation measures to reduce potential impacts:

- An adequate number of scavenger proof litter bins are to be placed throughout the site, dumping of waste on the site is prohibited.

- Waste sorting and separation should form part of the environmental induction and awareness programme to encourage and educate personnel to recycle.
- Keep all work sites including storage areas, offices and workshops neat and tidy.
- All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site.
- Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill site. If needed, a tarpaulin can be utilised.
- The burning and burying of solid waste on site is prohibited.
- Littering by workers shall not be permitted.
- General waste shall be removed from site to an approved landfill site.

9.2.3.4 Soil Contamination Impacts

Increased Soil contamination by means of hazardous substances.

Mitigation measures to reduce potential impacts:

- No leaked oil or fuel tankers may contaminate soil
- Spills outside the bund area must be treated with a spill kit
- All significant leaks must be reported to the competent authority in terms of NEMA
- Following a leak or accidental spill, a remediation plan must be compiled and executed.

9.2.3.5 Soil Erosion Impacts

Increased Soil erosion due to decommissioning activities.

Mitigation measures to reduce potential impacts:

- During the decommissioning phase, un-channelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw or hay bales, or bundles of cut vegetation sourced with the ECO's knowledge and consent, should be dug into the soil in contours to slow surface wash and capture eroded soil. The method may also be used where surface run-off becomes concentrated,
- All water flow must be controlled using storm water management techniques before discharge into the existing natural drainage line,
- Temporary cut off drains may be required to capture storm water and promote infiltration,

9.2.3.6 Socio-Economic Impacts

Increased socio-economic conditions due to job loss.

Mitigation measures to reduce potential impacts:

- Ensure that low-, medium- and high skilled workers working at the farm are given advance notice in terms of the decommissioning.
- Assist Low-, medium- and high skilled worker in finding other possible vacancies.

9.3 RISK RATINGS OF POTENTIAL IMPACTS

The following section provides the Environmental Risk as well as the Environmental Significance Ratings for the potential environmental impacts for the proposed project both before and after implementation of the recommended mitigation measures.

9.4 IMPACT ASSESSMENT

9.4.1 Planning, Design and Construction Phase

PLANNING, DESIGN AND CONSTRUCTION PHASE			
Potential Flora Impacts:			
Nature of impact: Direct impact on Flora as a result of vegetation clearance		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	4	1	-
Duration:	4	2	-
Extent:	2	1	-
Irreplaceable:	2	2	-
Reversibility:	4	2	-
Probability:	3	2	-
Total SP:	48	14	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> The linear project construction footprints of the proposed new pipeline routes must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. No site construction camps to be established within the surrounding natural areas outside the project footprint area. Adequately cordon off the construction area and ensure that no construction activities, machinery or equipment operate or impact within the natural surrounding areas outside the cordoned off area. Adequate operational procedures for machinery and equipment must be developed in order to strictly govern movement of machinery only within project footprint area and ensure environmentally responsible construction practices and activities. Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented outside the footprint areas of the proposed development. Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction. 		
Potential Fauna and Avifauna Impacts:			
Nature of impact: Direct impact on Flora, Fauna and Avifauna as a result of vegetation clearance Direct impact on Flora, Fauna and Avifauna as a result of vegetation clearance (Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats).		Activity: Proposed development of water reticulation network	

Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	6	1	-
Duration:	4	1	-
Extent:	2	2	-
Irreplaceable:	3	2	-
Reversibility:	4	3	-
Probability:	3	2	-
Total SP:	57	18	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Restoration measures will be required to reinstate functionality in the disturbed soil and vegetation. The linear project construction footprints of the proposed new pipeline routes must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. It is recommended that no individuals of these two nationally protected tree species <i>Bosciaalbitrunca</i> & <i>Vachelliaeriolobam</i> may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m. It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species (<i>Aloe hereroensis</i>, <i>Ammochariscoranica</i> & <i>Bulbineabyssinica</i>) be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from. It is also recommended that any individuals of the provincially protected species <i>Aloe grandidentata</i> be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from. These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities. An adequate Plant Relocation Management Plan must be compiled by a suitably qualified and experienced ecologist. 		
Terrestrial and aquatic alien invasive species establishment			
Nature of impact: Terrestrial and aquatic alien invasive species establishment during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation component	Preferred layout alternative (alternative 1)		No-Go alternative
	Before mitigation	After mitigation	
Magnitude:	4	2	-
Duration:	4	3	-
Extent:	3	2	-
Irreplaceable:	2	2	-

Reversibility:	2	2	-
Probability:	3	1	-
Total SP:	45	11	-
Significance rating:	Medium (M)	Low (L)	
Cumulative impact	Low (L)	Low (L)	
Proposed Mitigation	<ul style="list-style-type: none"> Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction and operational phases. Such a management plan must be compiled by a suitably qualified and experienced ecologist. Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction in order to prevent significant alien invasive species establishment. 		

Potential Dust Impacts:

Nature of impact: Dust nuisance generated during the development phase		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	2	-
Extent:	2	1	-
Irreplaceable:	2	2	-
Reversibility:	2	2	-
Probability:	3	2	-
Total SP:	30	18	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Implement suitable dust management and prevention measures during the construction phase. Access roads need to be well maintained and dust suppression need to be applied during windy days. Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction in order to prevent significant dust emissions from occurring. 		

Potential Noise Impacts:

Nature of impact: Noise nuisance generated during the development phase		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	

Magnitude:	2	2	-
Duration:	2	2	-
Extent:	1	1	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	3	3	-
Total SP:	36	24	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> • Limit working hours of noisy equipment to daylight hours. • Fit silencers to equipment. • Unless otherwise specified, normal working hours will apply (i.e. from 07:00 to a single:00 Mondays to Fridays). • Ensure that Employees and staff conduct themselves in an acceptable manner while on site, both during work hours and afterhours. • No loud music is permitted on site or in the camp. 		
Potential Cultural and Heritage Impacts:			
Nature of impact: Damage and destruction of vertebrate fossils during construction.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	1	-
Extent:	1	1	-
Irreplaceable:	2	1	-
Reversibility:	2	1	-
Probability:	1	1	-
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)

Proposed Mitigation:	<ul style="list-style-type: none"> Should any heritage resources (including but not limited to fossils, coins, indigenous and/or colonial ceramics, any articles of value or antiquity, stone artefacts or bone remains, structures and or built features, rock art and rock engravings) be exposed during excavations for the purpose of construction, construction in the vicinity of the finding must be stopped. A trained palaeontologist or heritage specialist must be notified to assess the finds, and this must then be reported to the applicable heritage authority. Heritage remains uncovered or disturbed during earthworks must not be disturbed further until the necessary approval has been obtained from the heritage authority. A registered heritage specialist must be called to the site for inspection and removal once authority to do so, has been given. Under no circumstances shall any heritage material be destroyed or removed from site. Excavations must be limited to the footprint area and be maintained in a narrow corridor. All operation of excavation equipment must be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures must be followed: <ul style="list-style-type: none"> All construction in the immediate 50 metre vicinity of the site must be ceased. The heritage practitioner must be informed as soon as possible. In the event of obvious human remains SAPS must be notified. Mitigation measures (such as refilling) must not be attempted. The area in a 50 metre radius of the find must be barricaded with visible taping. Public access must be limited and the area must be placed under guard. 		
Potential Surface and Groundwater Contamination Impacts:			
Nature of impact: Surface and Groundwater Contamination during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	4	2	-
Duration:	2	2	-
Extent:	2	2	-
Irreplaceable:	3	2	-
Reversibility:	3	2	-
Probability:	3	2	-
Total SP:	42	20	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Ensure that excavation areas have a predetermined stockpile area for excavated materials. Use overburden for rehabilitation. Any remaining overburden to be disposed of at a licensed waste site. Alternatively, concrete can be mixed on mixing trays only and not on exposed soil. Concrete must be mixed only in areas which have been specially demarcated for this purpose. Material Safety Data Sheets (MSDS) must be available on site for all chemicals and hazardous substances to be used on site, including information on their ecological impacts and how to minimise the impacts in case of any leakages. All spills must be cleaned as soon as they occur. A spill kit must be used and proof of clean up must be given to the ECO. 		

	<ul style="list-style-type: none"> • Spillages of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bioremediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring onsite. • Provide suitable and sufficient ablution facilities (1 for every 15 personnel on site and 1 for each gender). • Vehicles and machinery must be regularly serviced to avoid spillages. • Drip trays must be placed beneath all stationary construction equipment and beneath all generators present onsite.
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Potential Waste Management Impacts:

Nature of impact: Waste impacts by means of waste storage and littering during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	1	-
Duration:	2	2	-
Extent:	1	2	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	2	2	-
Total SP:	18	16	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)

Proposed Mitigation:	<ul style="list-style-type: none"> • An adequate number of scavenger proof litter bins are to be placed throughout the site, dumping of waste on the site is prohibited. • Waste sorting and separation should form part of the environmental induction and awareness programme to encourage and educate personnel to recycle. • Keep all work sites including storage areas, offices and workshops neat and tidy. • All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site. • Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill site. If needed, a tarpaulin can be utilised. • The burning and burying of solid waste on site is prohibited. • Littering by construction workers shall not be permitted. • General waste shall be removed from site on a weekly basis to an approved landfill site. • Minimise waste by sorting waste into recyclable and non-recyclable materials.
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Potential Traffic Impacts:

Nature of impact: Traffic impacts by means of additional truck and transportation to and from site during the development phase.	Activity: Proposed development of a water reticulation network
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Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	1	-
Extent:	1	1	-
Irreplaceable:	2	1	-
Reversibility:	2	1	-
Probability:	1	1	-
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Abnormal loads should be timed to avoid times of the year when traffic volumes are likely to be higher, as would be expected over national holidays, weekends and school holiday periods. All vehicles should be roadworthy, be maintained to prevent fuel or oil leaks and drivers are to be licensed appropriately for the driving of their assigned vehicle. Any damage to public roads is to be reported to the management authority and repaired to its original condition. Signage is to be placed on vehicles at all times. 		
Potential Fire Risk Impacts:			
Nature of impact: Increase risk of fires during the development phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	1	1	-
Extent:	2	1	-
Irreplaceable:	2	1	-
Reversibility:	2	1	-
Probability:	1	1	-
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Ensure the work site and the contractor's camp is equipped with adequate firefighting equipment. All construction equipment must have at least one firefighting extinguisher. Workers must be adequately trained in the handling of firefighting equipment. No open fires are permitted anywhere on site due to the handling of gas on site. No fires will be permitted for heating or cooking purposes onsite. 		

	<ul style="list-style-type: none"> Fuel and chemicals must be stored in an area that is acceptable for the client. No smoking will be allowed within close vicinity of the site. 		
Potential Soil Contamination Impacts:			
Nature of impact: Increased Soil contamination by means of hazardous substances.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	2	-
Extent:	2	2	-
Irreplaceable:	3	2	-
Reversibility:	3	2	-
Probability:	3	2	-
Total SP:	24	20	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> No leaked oil or fuel tankers may contaminate soil All tanks and pipes containing fuel or oil must be inspected on a regular basis Spills outside the bund area must be treated with a spill kit All significant leaks must be reported to the competent authority in terms of NEMA UST must be fitted with leak detectors in order to alert when a leak is occurring. Overfill and spillages during tanker refuelling and fuel dispensing should be prevented by the installation of automatic cut off devices. Tanker delivery drivers must be present during delivery of fuel with the emergency cut off switch and a fire extinguisher A closed coupling must be used when fuel is being transferred from the bulk delivery vehicle to the USTs to prevent fugitive emissions. All personnel working with fuel must undergo spill kit training The oil/water separator must be inspected on a regular basis and the inspection report must be provided to the ECO and relevant authority. Following a leak or accidental spill, a remediation plan must be compiled and executed. Fuel stock must be monitored on a daily basis in order to identify if the tank is leaking. 		
Potential Soil Erosion Impacts:			
Nature of impact: Increased Soil erosion due to construction activities.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	4	2	-
Duration:	2	1	-

Extent:	2	1	-
Irreplaceable:	2	1	-
Reversibility:	2	1	-
Probability:	2	1	-
Total SP:	24	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> • During construction, un-channelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw or hay bales, or bundles of cut vegetation sourced with the ECO's knowledge and consent, should be dug into the soil in contours to slow surface wash and capture eroded soil. The method may also be used where surface run-off becomes concentrated, • All water flow must be controlled using storm water management techniques before discharge into the existing natural drainage line, • Temporary cut off drains may be required to capture storm water and promote infiltration, • All storm water management features must be constructed in a manner that will ensure the continued functioning of the emergent vegetation. Construction must coincide with the dry season. • Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation in order to prevent any significant erosion from occurring. • Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction. 		
Potential Visual Impacts:			
Nature of impact: Increased visual impact due to increased working activities on-site.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	4	2	-
Duration:	2	1	-
Extent:	1	1	-
Irreplaceable:	2	1	-
Reversibility:	1	0	-
Probability:	2	1	-
Total SP:	20	5	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> • All waste must be placed in bins during operational phase. Keeping the area litterfree. • Construction activities may only take place during normal working hours. 		
Potential Socio-Economic Impacts:			

Nature of impact: Increased socio-economic conditions due to job creation			Activity: Proposed development of a water reticulation network
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	6	8	-
Duration:	2	1	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	2	2	-
Probability:	4	5	-
Total SP:	56	75	-
Significance rating:	+ Medium (M)	+ Medium-high (MH)	Medium (M)
Cumulative impact:	+ Medium (M)	+ Medium (M)	Medium (M)
Proposed Mitigation:	<ul style="list-style-type: none"> • Ensure that low-, medium- and high skilled workers use provided working opportunities. • Low-, medium- and high skilled workers must be sourced locally. • Where practically possible, previously disadvantaged individuals should be provided preference with regards to employment opportunities. • Individuals must be trained and continuously developed 		

9.4.2 Operational Phase Impacts

OPERATIONAL PHASE			
Potential Flora Impacts:			
Nature of impact: Direct impact on Flora as a result of continuous vegetation clearance.			Activity: Proposed development of a water reticulation network
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	1	1	-
Extent:	2	2	-
Irreplaceable:	3	2	-
Reversibility:	3	2	-
Probability:	2	1	-
Total SP:	22	9	-

Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Restoration measures will be required to reinstate functionality in the disturbed soil and vegetation. Any accidental fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. The project construction footprint must be kept as small as practicably possible to reduce the actual surface impact on vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. Natural veld situated in-between the proposed project area(s) must not be impacted upon and must be left in situ. An additional ecological walkthrough is to be conducted prior to the commencement of the project during the flowering period of underground bulbous plant species. Areas within and immediately surrounding the proposed project footprint must be adequately rehabilitated to prevent significant alien invasive species establishment. Alien and invasive species need to be eradicated and controlled. Alternative 1 is recommended for development due to its significantly lower impact on the north-eastern portion of the assessment area. 		
Potential Fauna and Avifauna Impacts:			
Nature of impact: Direct impact on Fauna and Avifauna as a result of habitat loss.	Activity: Proposed development of a water reticulation network		
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	1	1	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	3	2	-
Probability:	2	2	-
Total SP:	20	18	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> The project construction footprint must be kept as small as practicably possible to reduce the actual surface impact on vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. Natural veld situated in-between the proposed project area(s) must not be impacted upon and must be left in situ. Areas within and immediately surrounding the proposed project footprint must be adequately rehabilitated to prevent significant alien invasive species establishment. 		
Potential Dust Impacts:			
Nature of impact: Dust nuisance generated during the operational phase.	Activity: Proposed development of a water reticulation network		
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	

Magnitude:	2	1	-
Duration:	1	1	-
Extent:	1	1	-
Irreplaceable:	2	2	-
Reversibility:	2	2	-
Probability:	2	1	-
Total SP:	16	7	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Dust Management measures must be implemented in order to manage and minimize undesired dust emissions. Access roads need to be well maintained and dust suppression need to be applied during windy days. 		
Potential Noise Impacts:			
Nature of impact:	Noise nuisance generated during the operational phase.		Activity: Proposed development of a water reticulation network
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	2	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	2	2	-
Total SP:	24	18	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Limit working hours of noisy equipment to daylight hours. Fit silencers to equipment. Unless otherwise specified, normal working hours will apply (i.e. from 07:00 to a single:00 Mondays to Fridays). 		
	<ul style="list-style-type: none"> Ensure that Employees and staff conduct themselves in an acceptable manner while on site, both during work hours and afterhours. No loud music is permitted on site or in the camp. 		
Potential Cultural and Heritage Impacts:			
Nature of impact:	Damage and destruction of vertebrate fossils during excavation activities.		Activity: Proposed development of a water reticulation network

Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	1	-
Extent:	1	1	-
Irreplaceable:	2	1	-
Reversibility:	2	1	-
Probability:	1	1	-
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Should any heritage resources (including but not limited to fossils, coins, indigenous and/or colonial ceramics, any articles of value or antiquity, stone artefacts or bone remains, structures and or built features, rockart and rock engravings) be exposed during excavations for the purpose of construction, construction in the vicinity of the finding must be stopped. A trained palaeontologist or heritage specialist must be notified to assess the finds, and this must then be reported to the applicable heritage authority. Heritage remains uncovered or disturbed during earthworks must not be disturbed further until the necessary approval has been obtained from the heritage authority. A registered heritage specialist must be called to the site for inspection and removal once authority to do so, has been given. Under no circumstances shall any heritage material be destroyed or removed from site. Excavations must be limited to the footprint area and be maintained in a narrow corridor. All operationsofexcavationequipmentmustbemadeawareofthepossibilityoftheoccurrenceofsub-surfaceheritagefeaturesandthefollowingproceduresmustbefollowed: <ul style="list-style-type: none"> All construction in the immediate 50 metre vicinity of the site must be ceased. The heritage practitioner must be informed as soon as possible. In the event of obvious human remains SAPS must be notified. Mitigation measures (such as refilling) must not be attempted. The area in a 50 metre radius of the find must be barricaded with visible taping. Public access must be limited and the area must be placed under guard. 		
Potential Surface and Groundwater Contamination Impacts:			
Nature of impact: Surface and Groundwater Contamination during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	4	2	-
Duration:	2	2	-
Extent:	2	2	-
Irreplaceable:	3	2	-
Reversibility:	3	2	-

Probability:	3	2	-
Total SP:	42	20	-
Significance rating:	Medium (M)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Ensure that excavation areas have a predetermined stockpile area for excavated materials. Use overburden for rehabilitation. Any remaining overburden to be disposed of at a licensed waste site. Alternatively, concrete can be mixed on mixing trays only and not on exposed soil. Concrete must be mixed only in areas which have been specially demarcated for this purpose. Material Safety Data Sheets (MSDS) must be available on site for all chemicals and hazardous substances to be used on site, including information on their ecological impacts and how to minimise the impacts in case of any leakages. All spills must be cleaned as soon as they occur. A spill kit must be used and proof of clean up must be given to the ECO. Spillages of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bioremediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring onsite. Provide suitable and sufficient ablution facilities (1 for every 15 personnel on site and 1 for each gender). Vehicles and machinery must be regularly serviced to avoid pillages. Drip trays must be placed beneath all stationary construction equipment and beneath all generators present onsite. Irrigation and fertilisation practices must be adequately managed in order to prevent over-fertilisation or over-irrigation which could lead to significant leaching and contamination of groundwater. A suitably qualified and experienced agricultural specialist must be consulted in order to advise on appropriate management practices. 		
Potential Waste Management Impacts:			
Nature of impact: Waste impacts by means of waste storage and littering during the operational phase.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	2	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	2	2	-
Total SP:	20	18	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)

Proposed Mitigation:	<ul style="list-style-type: none"> • An adequate number of scavenger proof litter bins are to be placed throughout the site, dumping of waste on the site is prohibited. • Waste sorting and separation should form part of the environmental induction and awareness programme to encourage and educate personnel to recycle. • Keep all work sites including storage areas, offices and workshops neat and tidy. • All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site. • Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill site. If needed, a tarpaulin can be utilized. • The burning and burying of solid waste on site is prohibited. • Littering by construction workers shall not be permitted. • General waste shall be removed from site on a weekly basis to an approved landfill site. • Minimise waste by sorting waste into recyclable and non-recyclable materials.
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Potential Traffic Impacts:

Nature of impact: Traffic impacts by means of additional truck and transportation to and from site during the operational phase.	Activity: Proposed development of a water reticulation network
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Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	1	-
Extent:	1	1	-
Irreplaceable:	2	1	-
Reversibility:	2	1	-
Probability:	1	1	-
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)

Proposed Mitigation:	<ul style="list-style-type: none"> • Abnormal loads should be timed to avoid times of the year when traffic volumes are likely to be higher, as would be expected over national holidays, weekends and school holiday periods. • All vehicles should be roadworthy, be maintained to prevent fuel or oil leaks and drivers are to be licensed appropriately for the driving of their assigned vehicle. • Any damage to public roads is to be reported to the management authority and repaired to its original condition. • Signage is to be placed on vehicles at all times.
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Potential Fire Risk Impacts:

Nature of impact: Increase risk of fires during the operational phase.	Activity: Proposed development of a water reticulation network
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Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-

Duration:	1	1	-
Extent:	2	1	-
Irreplaceable:	2	1	-
Reversibility:	2	1	-
Probability:	1	1	-
Total SP:	9	6	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> • Ensure the work site and the contractor's camp is equipped with adequate firefighting equipment. • All construction equipment must have at least one firefighting extinguisher. • Workers must be adequately trained in the handling of firefighting equipment. • No open fires are permitted anywhere on site due to the handling of gas on site. No fires will be permitted for heating or cooking purposes onsite. • Fuel and chemicals must be stored in an area that is acceptable for the client. • No smoking will be allowed within close vicinity of the site. 		
Potential Soil Contamination Impacts:			
Nature of impact: Increased Soil contamination by means of hazardous substances.	Activity: Proposed development of a water reticulation network		
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	2	2	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	2	1	-
Total SP:	20	9	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> • No leaked oil or fuel tankers may contaminate soil • All tanks and pipes containing fuel or oil must be inspected on a regular basis • Spills outside the bund area must be treated with a spillkit 		

	<ul style="list-style-type: none"> • All significant leaks must be reported to the competent authority in terms of NEMA • UST must be fitted with leak detectors in order to alert when a leak is occurring. • Overfill and spillages during tanker refuelling and fuel dispensing should be prevented by the installation of automatic cut off devices. • Tanker delivery drivers must be present during delivery of fuel with the emergency cut off switch and a fire extinguisher • A closed coupling must be used when fuel is being transferred from the bulk delivery vehicle to the USTs to prevent fugitive emissions. • All personnel working with fuel must undergo spill kit training • The oil/water separator must be inspected on a regular basis and the inspection report must be provided to the ECO and relevant authority. • Following a leak or accidental spill, a remediation plan must be compiled and executed. • Fuel stock must be monitored on a daily basis in order to identify if the tank is leaking.
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Potential Soil Erosion Impacts:

Nature of impact: Increased Soil erosion due to operational phase activities.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	1	1	-
Extent:	0	0	-
Irreplaceable:	1	0	-
Reversibility:	1	0	-
Probability:	1	1	-
Total SP:	5	3	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)

Proposed Mitigation:	<ul style="list-style-type: none"> • During construction, un-channelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw or hay bales, or bundles of cut vegetation sourced with the ECO's knowledge and consent, should be dug into the soil in contours to slow surface wash and capture eroded soil. The method may also be used where surface run-off becomes concentrated, • All water flow must be controlled using storm water management techniques before discharge into the existing natural drainage line, • Temporary cut off drains may be required to capture storm water and promote infiltration, • All storm water management features must be constructed in a manner that will ensure the continued functioning of the emergent vegetation. Construction must coincide with the dry season. • Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation in order to prevent any significant erosion from occurring. • Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction.
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Potential Visual Impacts:

Nature of impact:	Activity:
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Increased visual impact due to increased working activities on-site.			Proposed development of a water reticulation network
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	4	2	-
Duration:	1	1	-
Extent:	1	1	-
Irreplaceable:	2	1	-
Reversibility:	1	0	-
Probability:	2	1	-
Total SP:	18	5	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> All waste must be placed in bins during operational phase. Keeping the area litter free. Construction activities may only take place during normal working hours. 		
Potential Socio-Economic Impacts:			
Nature of impact: Increased socio-economic conditions due to job creation		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	6	8	-
Duration:	1	1	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	2	2	-
Probability:	4	5	-
Total SP:	52	75	-
Significance rating:	+ Medium (M)	+ Medium-high (MH)	Medium (M)
Cumulative impact:	+ Medium (M)	+ Medium (M)	Medium (M)
Proposed Mitigation:	<ul style="list-style-type: none"> Ensure that low-, medium- and high skilled workers use provided working opportunities. Low-, medium- and high skilled workers must be sourced locally. Where practically possible, previously disadvantaged individuals should be provided preference with regards to employment opportunities. Individuals must be trained and continuously developed 		

9.4.3 Decommissioning Phase Impacts

DECOMMISSIONING PHASE			
Potential Dust Impacts:			
Nature of impact: Dust nuisance generated during the decommissioning phase of the project.			Activity: Proposed development of a water reticulation network
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	1	1	-
Extent:	1	1	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	2	2	-
Total SP:	16	14	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> Dust Management measures must be implemented in order to manage and minimize undesired dust emissions. Access roads need to be well maintained and dust suppression need to be applied during windy days. 		
Potential Surface and Groundwater Contamination Impacts:			
Nature of impact: Surface and Groundwater Contamination during the decommissioning phase.			Activity: Proposed development of a water reticulation network
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	1	1	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	2	2	-

Total SP:	18	16	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> • Ensure that excavation areas have a predetermined stockpile area for excavated materials. • Use overburden for rehabilitation. • Any remaining overburden to be disposed of at a licensed waste site. • Alternatively, concrete can be mixed on mixing trays only and not on exposed soil. Concrete must be mixed only in areas which have been specially demarcated for this purpose. • Material Safety Data Sheets (MSDS) must be available on site for all chemicals and hazardous substances to be used on site, including information on their ecological impacts and how to minimise the impacts in case of any leakages. • All spills must be cleaned as soon as they occur. A spill kit must be used and proof of clean up must be given to the ECO. • Spillages of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bioremediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring onsite. • Provide suitable and sufficient ablution facilities (1 for every 15 personnel on site and 1 for each gender). • Vehicles and machinery must be regularly serviced to avoid spillages. • Drip trays must be placed beneath all stationary construction equipment and beneath all generators present onsite. • Irrigation and fertilisation practices must be adequately managed in order to prevent over-fertilisation or over-irrigation which could lead to significant leaching and contamination of groundwater. A suitably qualified and experienced agricultural specialist must be consulted in order to advise on appropriate management practices. 		
Potential Soil Contamination Impacts:			
Nature of impact: Increased Soil contamination by means of hazardous substances.	Activity: Proposed development of a water reticulation network		
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	2	-
Duration:	1	1	-
Extent:	2	2	-
Irreplaceable:	2	2	-
Reversibility:	2	1	-
Probability:	2	2	-
Total SP:	18	16	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)

Proposed Mitigation:	<ul style="list-style-type: none"> • No leaked oil or fuel tankers may contaminate soil • All tanks and pipes containing fuel or oil must be inspected on a regular basis • Spills outside the bund area must be treated with a spillkit • All significant leaks must be reported to the competent authority in terms of NEMA • UST must be fitted with leak detectors in order to alert when a leak is occurring. • Overfill and spillages during tanker refuelling and fuel dispensing should be prevented by the installation of automatic cut off devices. • Tanker delivery drivers must be present during delivery of fuel with the emergency cut off switch and a fire extinguisher • A closed coupling must be used when fuel is being transferred from the bulk delivery vehicle to the USTs to prevent fugitive emissions. • All personnel working with fuel must undergo spill kit training • The oil/water separator must be inspected on a regular basis and the inspection report must be provided to the ECO and relevant authority. • Following a leak or accidental spill, a remediation plan must be compiled and executed. • Fuel stock must be monitored on a daily basis in order to identify if the tank is leaking.
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Potential Soil Erosion Impacts:

Nature of impact: Increased Soil erosion due to decommissioning activities.		Activity: Proposed development of a water reticulation network	
Evaluation Component:	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
	Before Mitigation	After Mitigation	
Magnitude:	2	0	-
Duration:	1	1	-
Extent:	1	0	-
Irreplaceable:	1	0	-
Reversibility:	1	0	-
Probability:	2	1	-
Total SP:	12	1	-
Significance rating:	Low (L)	Low (L)	Low (L)
Cumulative impact:	Low (L)	Low (L)	Low (L)
Proposed Mitigation:	<ul style="list-style-type: none"> • During construction, un-channelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw or hay bales, or bundles of cut vegetation sourced with the ECO's knowledge and consent, should be dug into the soil in contours to slow surface wash and capture eroded soil. The method may also be used where surface run-off becomes concentrated, • All water flow must be controlled using storm water management techniques before discharge into the existing natural drainage line, • Temporary cut off drains may be required to capture storm water and promote infiltration, • All storm water management features must be constructed in a manner that will ensure the continued functioning of the emergent vegetation. Construction must coincide with the dry season. • Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation in order to prevent any significant erosion from occurring. • Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction. 		

Potential Socio-Economic Impacts:			
Nature of impact: Decreased socio-economic conditions due to job loss		Activity: Proposed development of a water reticulation network	
	Preferred Layout Alternative (Alternative 1)		No-Go Alternative
Evaluation Component:	Before Mitigation	After Mitigation	
Magnitude:	6	4	-
Duration:	3	2	-
Extent:	2	2	-
Irreplaceable:	2	1	-
Reversibility:	2	2	-
Probability:	4	2	-
Total SP:	60	22	-
Significance rating:	+ Medium (M)	Low (L)	+ Medium (M)
Cumulative impact:	Low (L)	Low (L)	+ Medium (M)
Proposed Mitigation:	<ul style="list-style-type: none"> Ensure that low-, medium- and high skilled workers use provided working opportunities. Low-, medium- and high skilled workers must be sourced locally. Where practically possible, previously disadvantaged individuals should be provided preference with regards to employment opportunities. Individuals must be trained and continuously developed 		

9.5 CUMULATIVE IMPACTS

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes. The proposed development should therefore not pose any significant residual cumulative impacts.

Significant quantities of water will however be extracted from the six existing boreholes for domestic use purposes within the proposed new residential development. This, along with existing municipal water extraction could potentially lead to cumulative over extraction of ground water and drying up of the underground aquifers if not adequately managed.

Extraction of the allotted sustainable yield volumes as per the geo-hydrological study of the six boreholes, may not be exceeded at any time. Follow up geo-hydrological studies should be conducted on a minimum bi-annual basis (every two years) in order to ensure the sustainability and integrity of the underground aquifers is not being significantly compromised.

Other than that, it is not anticipated that the proposed development would pose any significant potential long term residual cumulative ecological impacts within the broader region if all the recommended mitigation measures are adequately implemented.

9.6 PREFERRED ALTERNATIVE CONCLUDING STATEMENT

In identifying, evaluating and comparing impacts associated with the proposed water reticulation network and financial and logistic feasibility, it has been concluded that alternative one is the best possible alternative (since it is also the only available and viable alternative for this project).

10. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

Various assumptions need to be made during the assessment process at the hand of the relevant specialist. It is therefore assumed that:

- all relevant project information provided by the applicant and engineering design team to the ecological specialist was correct and valid at the time that it was provided.
- the proposed linear pipeline routes as provided by the engineering design team is correct and will not be significantly deviated from as these were the only areas assessed.

- strategic level investigations undertaken by the applicant prior to the commencement of the informal Environmental Impact Assessment process, determined that the proposed development footprint represents a potentially suitable and technically acceptable location.
- the public, local communities, relevant organs of state and landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed project during the informal Environmental Impact Assessment process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed project is based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints.
- the informal EIA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts associated with the construction and operational phases of the proposed project.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making.

Given that an informal EIA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the informal EIA process, namely process-related and prediction-related.

- Uncertainty of prediction is critical at the data collection phase as observations and conclusions are made, only based on professional specialist opinion. Final certainty will only be obtained upon actual implementation of the proposed development. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the informal EIA process. Continual two-way communication and coordination between EAP's and relevant authorities should however decrease the
- uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.

- The principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed development and the subsequent public reaction/opinion which will be received during the Public Participation Process (PPP).

Gaps in knowledge can be attributed to:

- The ecological study process was undertaken prior to the availing of certain information which would only be derived from the final project design and layout. The design layout had not been finalised yet at the time of the ecological study.
- The potential of future similar developments in the same geographical area, which could lead to cumulative impacts cannot be meaningfully anticipated.

EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner based on professional specialist opinion.

11. PROFESSIONAL OPINION OF THE EAP AND ENVIRONMENTAL IMPACT STATEMENT

11.1 PROFESSIONAL OPINION OF THE EAP

Based on all information that was captured in this report, the proposed development will lead to some, but no major, impacts. There are no clear environmental concerns regarding this project and this project could only enhance the socio-economic conditions for the Gamagara local municipality. If the project were not to continue it would ultimately mean that a tremendous amount of job opportunities would be lost in the process. It would also mean that the Gamagara local municipality would lose an opportunity to supply its local people with clean potable water and sanitation.

The project should therefore be considered by the competent authority for approval. As mentioned previously in the report, there is no second alternative for the proposed project as there is only one viable alternative and this preferred alternative does not consist of any clear environmental concerns.

The proposed development may however only continue if all recommended mitigation measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project.

11.2 PRELIMINARY ENVIRONMENTAL IMPACT STATEMENT

The key findings of the Impact Assessment phase can be summarised as follows:

11.2.1 The Receiving Environment

According to SANBI (2006-), the entire assessment area falls within the Olifantshoek Plains Thornveld vegetation type (SVk 13) which mainly consists of wide plains with an open tree and shrubland layer and usually a sparse grass layer. This vegetation type is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

The proposed project also poses significant potential local socio-economic benefits which, according to the EAP, may outweigh the potential negative impacts.

11.2.2 Public Participation

To support public interest and inform the EIA process, a continual public consultation process will be undertaken throughout the duration of the assessment processes. A diverse mix of authorities, stakeholders and I & AP's will be consulted during this time, representing the environment, social, economic and political sectors of local, regional and provincial bodies.

12. CONCLUSION

In conclusion, there are minor ecologically issues to be addressed in the proposed project. It will be possible to suitably reduce and mitigate these impacts to within acceptable residual levels in the preferred layout alternative for the water reticulation network.

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

The majority of the proposed new pipeline routes traverse areas within the existing informal settlement and run along existing dirt roads. The majority of natural surface vegetation has therefore been cleared within these existing informal settlement areas and the areas constitute highly degraded and transformed landscapes.

Only the south-western portion of the proposed new pipeline routes traverse undeveloped, relatively natural areas associated with the relevant Olifantshoek Plains Thornveld vegetation type (SVk 13). Assumed significant historic and continued long term overgrazing by livestock from the local community has however resulted in these areas being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type. This relevant vegetation type, is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

Although no Red Data Listed species were found to be present within the assessment area, individuals of the nationally protected tree species *Boscia albitrunca* & *Vachelli aerioloba* were found to be present throughout the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes. Most individuals of the former species are very large (≥ 4 m in height) and presumably therefore also very old while most individuals of the latter species are not necessarily significant in size. Such large/old individuals of the former species are considered to be of high conservational significance.

It is therefore recommended that no individuals of these two nationally protected tree species may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.

The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion, while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities.

Due to the presence of the informal residential settlement situated directly adjacent north-east of the undeveloped, relatively natural portion along with continued grazing by livestock from the local community, the area is subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the undeveloped, relatively natural portion for breeding and/or persistence purposes.

Due to the slightly sloping topography of the assessment area, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

Three small ephemeral water drainage lines are traversed by the proposed new pipeline routes. These drainage lines feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area. The construction footprints through the three drainage lines must therefore be adequately rehabilitated as soon as practicably possible after construction in order to ensure their continued flow and ecological integrity.

It is the opinion of the EAP that the potentially significant ecological impacts associated with the continued impeding and contamination of the flow regimes of the three small ephemeral water drainage lines as well as over extraction of domestic use water from the six existing boreholes, can be suitably reduced and mitigated to within acceptable residual levels. The project should therefore be considered by the applicant, Gamagara Local Municipality for approval and be allowed to continue.

The proposed development may however only continue if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project. All necessary authorisations, licenses and permits must also be obtained prior to any commencement.

The following conclusions and recommendations were made from the groundwater study:

- a) The hydrocensus exercise confirmed that there are six existing boreholes within the Olifantshoek and only four (BH01, BH02, BH04, BH05 and BH06) were pump tested successfully. BH03 was found to be collapsed and blocked with stones.
- b) The area is characterised by slightly shallow aquifers with water levels ranging from 16.94 mbgl to 24.4 mbgl, the latter indicates possible dewatering of the groundwater management unit.
- c) Water quality for the two sampled boreholes (BH01 and BH05) returned class I water quality that is suitable for human consumption long-term. BH04 and BH06 returned water quality that exceeds maximum allowable limit according to the SANS241:2015 standards with elevated EC, TDS, CL, Ca, Al, N and Mg parameters.
- d) The current (GAADD) water demand for Olifantshoek communities is estimated at 600m³/day and the SDD estimated water demand is 15 l/s for 12 hours daily.
- e) Four newly drilled production boreholes were drilled with recommended yield of 6.0 l/s for 12 hours, which makes a combined recommended yield of 15.4 l/s.
- f) The total recommended abstraction from four verified boreholes in Olifantshoek amounts to 15.4 l/s; this indicates a shortfall of 4.6 l/s which includes a standby facility, and this doesn't take into account water balances.
- g) The exploration drilling programme is in progress with additional two planned production boreholes, this is anticipated to be completed by mid-April 2019.

Recommendations:

Based on the above discussions and conclusions the following is recommended:

- a) Production boreholes must be protected by a fenced area/pump house and be equipped with a water monitoring and sampling facility;
- b) Critical water levels as indicated in the borehole management recommendations must not be exceeded. Once these levels are reached daily abstraction rates must be reduced;
- c) Water levels and abstraction should be monitored and recorded monthly;

d) Monthly water quality monitoring of production boreholes, samples to be analysed for macro chemical elements as well as bacteriological analysis (fit for human consumption).

e) Boreholes that exceeds maximum allowable limit water quality should be blended at storage with potable water obtain acceptable standards.

f) In view of the complexity and heterogeneity of the study area aquifers, a 3D numerical groundwater flow model is essential to identify target areas for additional source development, calculate water balances in respective compartment units and predict long-term aquifer response to current abstraction.

13. REFERENCES

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