NEAS: KZN/EIA/000081/2018
REF NO: DC43/0016/2018

The uMkhunya Phase 4 Bulk Water Supply Scheme

Consultation Basic Assessment Report

Prepared by:

@Gedezar Consulting
Green is the Future!!!

Prepared for:

HARRY GWALA DISTRICT MUNICIPALITY

Client:
Harry Gwala District Municipality

Reference Document as:
Consultation Basic Assessment Report for uMkhunya Phase 4 Bulk Water Supply Scheme

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Competent Authority:
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NOTICE

This document and its appendices is a public document and made available to the Competent Authority [CA], commenting authorities, stakeholders, Interested and Affected Parties [I&APs], and the general public. This **Consultation Basic Assessment Report [cBAR]** is available for comment for a period of **30 days** from **16 March 2018 to 20 April 2018**. This report will then be amended and updated in response to the comments received during this review period. Once finalised the BAR will be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, Sisonke District Office [KZN EDTEA] for decision-making.

Copies of this cBAR are available at strategic public places in the project area [see below] and upon request from At Gedezar Consulting.

- Ward 5 Councillor
- Ixopo Library;
- Harry Gwala District Municipality Offices;

OPPORTUNITIES PUBLIC REVIEW

The following methods of public review of the cBAR are available:

- Completing the comment sheet enclosed with the Background Information Document [BID – which was circulated on 11th July 2017 & 21st August 2017 and can be requested from At Gedezar Consulting];
- Written submissions by post, e-mail or fax; and
- Telephonic submissions.

DUE DATE FOR COMMENT ON CONSULTATION BASIC ASSESSMENT REPORT [cBAR]: 20 April 2018

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Disclaimer

The opinions expressed in this cBAR are been based on the information supplied to At Gedezar Consulting. At Gedezar Consulting has exercised all due care in reviewing the supplied information. Whilst At Gedezar has compared key supplied data with expected outcomes, and duly interrogated all information supplied to us, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. At Gedezar does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of At Gedezar's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this cBAR, about which At Gedezar had no prior knowledge nor had the opportunity to evaluate.

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

APPENDICES

A- UMKHUNYA LOCALITY MAP

A1 – UMKHUNYA SENSITIVITY MAP

A2 – LISTING NOTICE 3 MAP

A3 – UMKHUNYA COORDINATES

B- SITE PHOTOGRAPHS

C - FACILITY ILLUSTRATION

C1 – ABSTRACTION POINT

C2 – SCHEMATIC

C3 – GRIT CHANNELS

C4 – FLOCCULATION CHAMBERS

C5 - CLARIFIER

C6 - FILTERS

C7 – CHLORINE

C8 – PUMP STATION

C9 - PONDS

C10 – SLUDGE BEDS

D1 - MKHUNYA TERRESTRIAL ECOLOGICAL IMPACT REPORT

D2 - WETLAND DELINEATION HEALTH AND FUNCTIONALITY ASSESSMENT

D3 - AQUATIC ASSESSMENT REPORT
D4 - GEOTECHNICAL INVESTIGATION REPORT
D5 – HERITAGE IMPACT ASSESSMENT
D5.1 – PRELIMINARY DESIGN REPORT
D5.2 – REVISED DESIGN REPORT
D5.3 – WATER RESOURCE ASSESSMENT
E – PUBLIC PARTICIPATION SUMMARY REPORT
E1- ENGLISH BACKGROUND INFORMATION DOCUMENT
E1- ZULU BACKGROUND INFORMATION DOCUMENT
E2- PROOF OF ADVERTISEMENT
E3 - PUBLIC MEETING MINUTES
E3.1 - ATTENDANCE REGISTERS
E4 – COMMENTS AND RESPONSE TRAIL
E4.1 – COMMENTS RECEIVED (DAFF)
E5 – NOTIFICATION OF PROJECT TO AUTHORITIES
E6 - I&AP DATABASE
E7 – SITE NOTICE PHOTOGRAPHS
E8 – COMPETENT AUTHORITY ENGAGEMENT
F – ENVIRONMENTAL MANAGEMENT PROGRAMME
G – DETAILS AND EXPERTISE OF EAP
H – WATER USE LICENSE PRE-APPLICATION MEETING

GLOSSARY

Activity [Development] – an action either planned or existing that may result in environmental impacts through pollution or resource use.

Alternative – a possible course of action, in place of another, of achieving the same desired goal of the proposed project. Alternatives can refer to any of the following but are not limited to: site alternatives, site layout alternatives, design or technology alternatives, process alternatives or a no-go alternative.

Applicant – the project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.

Bench Wetland - an area of mostly level or nearly level high ground [relative to the broad surroundings], including hilltops / crests [areas at the top of a mountain or hill flanked by down-slopes in all directions], saddles [relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction], and shelves / terraces / ledges [relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction].

Biodiversity – the diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.

Construction – means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.

Cumulative Impacts – impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities to produce a greater impact or different impacts.

Direct Impacts – impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.

Ecological Reserve – the water that is necessary to protect the water ecosystems of the water resource. It must be safeguarded and not used for other purposes. The Ecological Reserve specifies both the quantity and quality of water that must be left in the national water resource. The Ecological Reserve is determined for all major water resources in the different water management areas to ensure sustainable development.

Ecosystem – a dynamic system of plant, animal [including humans] and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.

Environment – In terms of the National Environmental Management Act [NEMA] [Act No 107 of 1998] [as amended], *"Environment" means the surroundings within which humans exist and that are made up of:*

a) the land, water and atmosphere of the earth;

b) micro-organisms, plants and animal life;

c) any part or combination of [a] or [b] and the interrelationships among and between them; and

d) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Assessment– the generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.

Environmental Authorisation [EA] – an authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.

Environmental Assessment Practitioner – the individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.

Environmental Impact – a change to the environment [biophysical, social and / or economic], whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.

Environmental Impact Assessment [EIA] – the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.

Environmental Issue – a concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.

Environmental Management – ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme – A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation [maintenance] phase and decommissioning phase of the proposed project.

Expansion – means the modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

Fatal Flaw – issue or conflict [real or perceived] that could result in developments being rejected or stopped.

General Waste – household water, construction rubble, garden waste and certain dry industrial and commercial waste which does not pose an immediate threat to man or the environment.

Hazardous Waste – waste that may cause ill health or increase mortality in humans, flora and fauna.

Indirect Impacts – indirect or induced changes that may occur as a result of the activity. These types if impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Integrated Environmental Management – a philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy [and principles] is interpreted as applying to the planning, assessment, implementation and management of any proposal [project, plan, programme or policy] or activity – at local, national and international level – that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools [such as strategic environmental assessment and risk assessment], environmental management

tools [such as monitoring, auditing and reporting] and decision-making tools [such as multi-criteria decision support systems or advisory councils].

Interested and Affected Party – for the purposes of Chapter 5 of the NEMA and in relation to the assessment of the environmental impact of a listed activity or related activity, means an interested and affected party contemplated in Section 24[4] [a] [v], and which includes – *[a] any person, group of persons or organisation interested in or affected by such operation or activity; and [b] any organ of state that may have jurisdiction over any aspect of the operation or activity*.

Mitigate – the implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.

No-Go Option – in this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.

Rehabilitation– a measure aimed at reinstating an ecosystem to its original function and state [or as close as possible to its original function and state] following activities that have disrupted those functions.

Sensitive Environment – any environment identified as being sensitive to the impacts of the development.

Significance – significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change [i.e. magnitude, intensity, duration and likelihood]. Impact significance is the value placed on the change by different affected parties [i.e. level of significance and acceptability]. It is an anthropocentric concept, which makes use of value judgements and science-based criteria [i.e. biophysical, social and economic].

Stakeholder Engagement – the process of engagement between stakeholders [the proponent, authorities and I&APs] during the planning, assessment, implementation and / or management of proposals or activities.

Sustainable Development – development which meets the needs of current generations without hindering future generations from meeting their own needs.

Watercourse – means:

a] *a river or spring;*

b] *a natural channel or depression in which water flows regularly or intermittently;*

c] *a wetland, lake or dam into which, or from which, water flows; and*

d] *any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 [Act No. 36 of 1998] and a reference to a watercourse includes, where relevant, its bed and banks.*

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

ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
BGIS	Biodiversity Geographic Information Systems
BID	Background Information Document
CBA	Critical Biodiversity Area
CBAR	Consultation Basic Assessment Report
CDO	Community Development Officer
CLO	Community Liaison Officer
CMA	Catchment Management Agency
C-PLAN	Conservation Plan
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
KZN EDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment [refers to environmental management tool]
EIA	Early Industrial Age [refers to historical era]
EIS	Ecological Importance and Sensitivity
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
GA	General Authorisation [refers to type of water use licence authorisation]
GA	General Arrangement [refers to drawing / illustration of structures]
GIS	Geographic Information System
GPS	Geographical Positioning System
HGDM	Harry Gwala District Municipality
I&AP	Interested and Affected Parties
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
LLO	Local Liaison Officer
LSA	Later Stone Age
MSA	Middle Stone Age
NBSAP	National Biodiversity Strategy and Action Plans
NEMA	National Environmental Management Act [Act No. 107 of 1998] [as amended]
NEM:BA	National Environmental Management Biodiversity Act [Act No. 10 of 2004]
NEM:WA	National Environmental Management Waste Act [Act No. 36 of 1998] [as amended]
NEM:AQA	National Environmental Management Air Quality Act [Act No. 39 of 2004]

NFA	National Forests Act [Act No. 84 of 1998]
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act
NWA	National Water Act
NGO	Non-Governmental Organisation
OHSA	Occupational Health and Safety Act [Act No. 85 of 1993]
PES	Present Ecological State
PPP	Public Participation Process
PU	Planning Unit
REC	Recommended Ecological Category
SADC	South African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Internet System
SANBI	South African National Biodiversity Institute
SAPS	South African Police Services
SDF	Standard Design Flood
SWL	Static Water Level
SWMP	Storm water Management Plan
ULM	uBuhlebezwe Local Municipality
VEGRAI	[Riparian] Vegetation Response Assessment Index
WMA	Water Management Agency
WUL	Water Use Licence

EXECUTIVE SUMMARY

Project Background and Introduction

Harry Gwala District Municipality (formerly Sisonke District Municipality (SDM) appointed Emzansi Consulting Engineers to provide professional engineering services for the proposed uMkhunya Water Scheme. The scheme involves the design and construction of an abstraction pump station, water treatment works, pipelines, reservoirs, pump stations, standpipes and an off channel storage dam. At Gedezar Consulting are the independent Environmental Assessment Practitioner (EAP) to ensure that the proposed uMkhunya Phase 4 Bulk Water supply Scheme project is in compliance with the EIA Regulations of 2017 as promulgated under the National Environmental Management Act (NEMA) (Act. 107 of 1998)(as amended).

The project will consist of the construction of:

- Abstraction pump station
- A 5000Kl/day water treatment work
- rising mains to existing reservoir

The proposed infrastructure capacities and dimensions are as follows:

- A rising main pipeline with an internal diameter of 350 mm;
- Approximately 6830 m in length for the bulk transportation of water; and

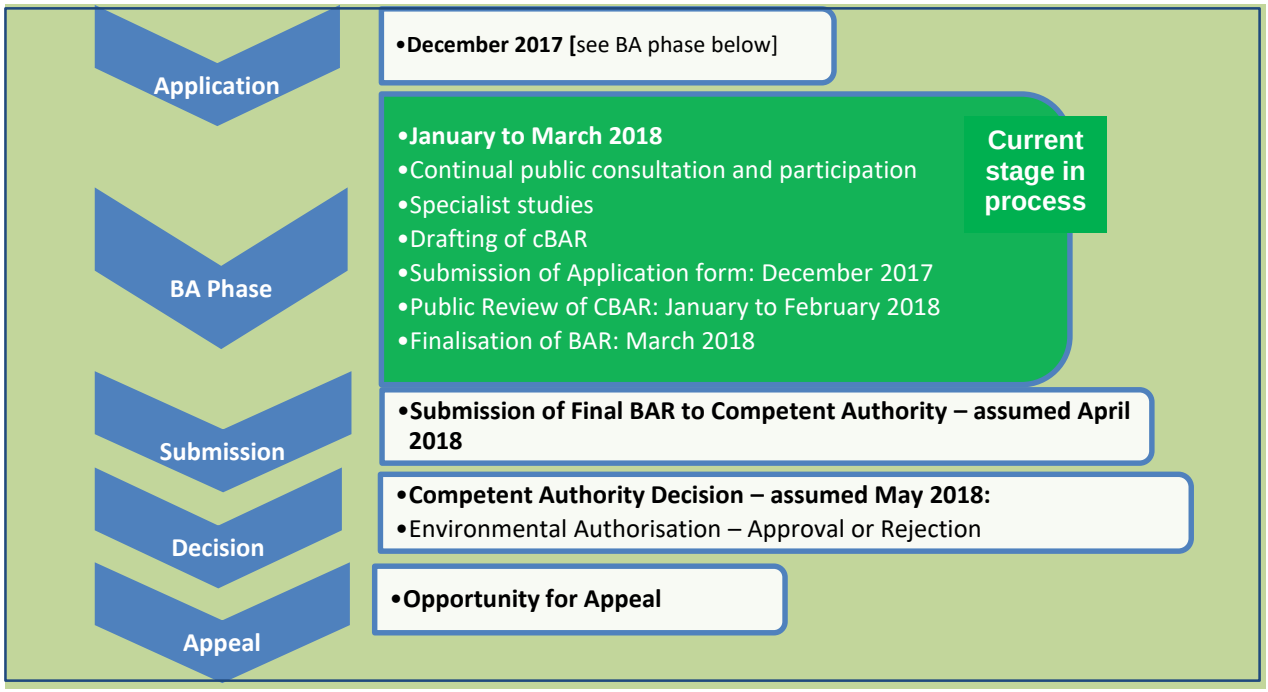
Site Description / Location:

The proposed uMkhunya Phase 4 Bulk Water supply Scheme and associated infrastructure is located within the Harry Gwala District Municipality with the project to service the uMkhunya Villages and surroundings. The uMkhunya's climate is classified as warm and temperate. Rain falls mainly during the summer months of October to January, with a maximum mean monthly precipitation of 82mm in October compared to 10mm in June. Late afternoon summer thunderstorms occur that can deliver torrential rainfall. Summer mean daily maximum temperatures reach highs of 24°C in November, December and April, 25°C in January and March, and 26°C in February. The hottest days of 36°C occur from September to November, 35°C in December, and 34°C in January, February and March. Winter mean daily maximum temperatures reach highs of 21°C in June and July, 22°C in August and 23°C in May. Mean daily minimum temperatures reach lows of 6°C in June and July, 8°C in August and 9°C in May. The coldest nights occur in June and July (0°C) and May and August.

Site and activity alternatives and re-alignment have been proposed as per the specialist recommendations with adequate mitigations in sensitive environments incorporated. The proposed project consisting of enhancement, upgrading and construction water infrastructure in previously disadvantaged communities that have never had provision of potable water supply.

The Basic Assessment [BA]

This BA follows the legislative process prescribed in the EIA Regulations [2014 as amended in 2017], as this application will be lodged under the EIA Regulations [2014, as amended in 2017]. The process is explained in the diagram below.



Principal Objective of Report

This report constitutes the cBAR, which details the environmental outcomes, impacts and residual risks of the proposed activity. The report aims to assess the key environmental issues and impacts associated with the development, and to document I&APs issues and concerns. Furthermore, it provides background information of the proposed project, a motivation and details of the proposed project, and describes the public participation undertaken to date.

The objective of this report is to provide the project's I&APs, stakeholders, commenting authorities, and the CA, with a thorough project description and BA process description. The outcome being to engender productive comment / input, based on all information generated to date and presented herein. The document concludes by proposing what is believed to be a sound and environmentally risk calculated decision. In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of significant portions of environmental legislation that were taken into consideration during this study and are elaborated on in this report.

Technical Project Description of the uMkhunya Phase 4 Bulk Water Supply Scheme

The proposed infrastructure will consist of an abstraction pump station, 5ML/day water treatment plant (package plant). The abstraction point is located on the bank of the uMkomazi River, where the raw water will be pumped to the Water Treatment Works, then to the existing Nkweletsheni reservoir via 6,830m water rising main pipe with an internal diameter of 350 mm. The reservoir is located approximately 4750m South West of the river abstraction point.

Power supply would be from Eskom through their existing bulk network.

Regulatory Environmental Requirements

The KZN EDTEA – Harry Gwala region is the lead / competent authority for this BA process and the development needs to be authorised by this Department in accordance with the NEMA. The EIA Regulations

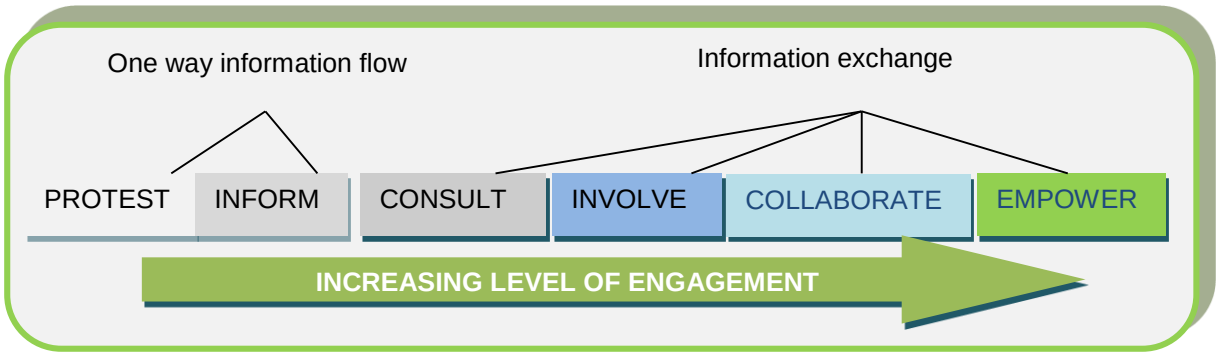
under the NEMA consist of three [3] categories of activities1 namely: Listing Notice 1 Activities [GNR 327 of 2017] which require a BA Process, Listing Notice 2 Activities [GNR 325 of 2017] which require S&EIR process, and Listing Notice 3 Activities [GNR 324 of 2017] which requires a BA process for specific activities in identified sensitive geographical areas.

Furthermore, this application complies with the NWA and the relevant water uses under Section 21 of the NWA are being applied for. The PPP for the WUL Application has therefore been executed in conjunction and combined with this BA process.

Public Participation Process [PPP]

At Gedezar Consulting as the EAP is undertaking the PPP for this project as professional facilitators. It is imperative to note that the study area presents a challenge in that input from the community may be heavily reliant and dependent on the information exchange between the community leaders and a further challenge will be that of jargon barriers. However, the input from the community is essential for a complete assessment of the impacts and benefits associated with the proposed development. As such as an EAP, one is reliant on the indigenous knowledge, which will optimistically be forthcoming by the community.

The figure below depicts the approach taken by At Gedezar Consulting, where one-way information flow is avoided and information exchange is promoted, thereby enabling a higher level of engagement.



Key Findings and Conclusions

Overall, the results of the BA process emerge as having a “negative low” significance after mitigation.

Key findings of the specialist studies are:

The following findings require consideration due to the significant negative and positive impacts they would likely have along the proposed alignment within the study area. The specialist studies conducted identified both positive and negative impacts that would be associated with the proposed development, however sufficient mitigations and options for positive input into the area were given to ensure this project could be considered to deliver the envisaged positive input with negative impacts suitably managed within appropriate timeframes.:

- According to the **Vegetation Assessment Findings**:

The footprint of the proposed water supply scheme development is mainly confined to existing disturbed roadside areas. The uMkhunya Pumphouse, which will be upgraded, is located on the floodplain of the

[1] *Note that a fourth listing notice has been drafted but not yet promulgated and hence not considered in the application of this BA.*

Mkomazi river approximately 50 metres from the river's edge, at the end of the D965 district road. This area is level to very gently sloping and is covered by grassland. A 2 mega-litre water treatment works is proposed, 80 metres east of the pumphouse, in a floodplain area with similar gradient and grassland vegetation. The new 6,657.4-metre long pipeline will be laid next to the D965 and P77 district roads in disturbed roadside areas and will convey treated water, pumped from the Mkomazi River, to the recently completed Nkweletsheni reservoir.

Mkhunya's climate is classified as warm and temperate. Rain falls mainly during the summer months of October to January, with a maximum mean monthly precipitation of 82mm in October compared to 10mm in June. Late afternoon summer thunderstorms occur that can deliver torrential rainfall.

The Mkhunya pumphouse and proposed water treatment works are underlain by alluvial deposits of the Mkomazi River. The geology of most of the pipeline's footprint is formed by the Oribi Gorge Suite in the lower to mid-slope valley areas, while the Natal Group, Dwyka Formation and Dolerite form the geology of the mid to upper slope and crest areas of the Mkomazi valley.

Soils in the study area range from low to very high erodibility and when combined with steep and very steep slopes, together with torrential rainfall, the risk and probability of serious soil erosion is high. This suite of conditions exists to the east of the water pipeline's footprint in the upper reaches of the Mfulomubi river valley and emphasises the importance of rehabilitating the development's footprint with the recommended grass species during the rehabilitation phase.

The perennial Mfulomubi River lies to the immediate east of the pipeline's footprint and will receive most of the drainage from the footprint. In terms of flood risk, one of the flood banks of the Mkomazi River lies adjacent to the pumphouse and proposed water treatment works, making this floodplain area vulnerable to flooding when the river overtops its banks.

Upgrading of the Mkhunya pumphouse and construction of the water treatment works will take place in the Mkomazi floodplain grassland area dominated by *Sporobolus pyramidalis*. Starting near the Mkomazi River and ending at the Nkweletsheni reservoir, the proposed pipeline's five-metre wide construction footprint traverses roadside terrain with disturbed vegetation. Alien plant invaders, dominated by *Lantana camara*, are prominent at the outer edge of the footprint. Historically, the footprint would have passed through Eastern Valley Bushveld, KwaZulu-Natal Hinterland Thornveld and KwaZulu-Natal Sandstone *Sourveld* vegetation types before transformation of the vegetation types occurred by various anthropomorphic factors, such as human settlement, road construction and over-burning and over-grazing of the veld. Important species belonging to these natural vegetation types still remain in, near and further away from the pipeline's footprint.

A number of bird, reptile, spider and insect species were observed in and near the development's footprint, together with cattle, goats and donkeys.

Three natural vegetation types in various stages of transformation lie adjacent to the development's footprint and every effort should be made to minimise the development's impacts on these natural vegetation types. In this context, it is pertinent to mention the conservation status of each of the three vegetation types. Eastern Valley Bushveld, which occurs in the Mkomazi floodplain and lower to mid-slope valley areas, has a Least Threatened conservation status. KwaZulu-Natal Hinterland Thornveld, which is found along the mid to upper slope valley areas, also has a Least Threatened conservation status. KwaZulu-Natal Sandstone *Sourveld*, which occurs at the crest of the valley, has a Critically Endangered conservation status.

Other aspects of conservation importance which are relevant to minimising the development's ecological impacts include the following: The pipeline's footprint lies between irreplaceable Critical Biodiversity Areas (CBA's) for just under half of its length. Two optimal Critical Biodiversity Areas (CBA's) lie close to the proposed development at its northern end, while the Mkhunya pumphouse, proposed water treatment works

and initial length of pipeline lie in the Midlands Landscape Conservation Corridor. The CBA's and Landscape Conservation Corridor have very high conservation values.

No plant species of conservation concern, endemic plant species or protected plant species were found in the study area. Of the fauna which were observed, the Southern *Boubou* is endemic to southern African, while the Cape Sparrow and *Burchell's Coucal* are near-endemics.

Potential negative ecological impacts resulting from the proposed development include the following: 1. Loss of vegetation and habitat in the development's footprint; 2. Loss of vegetation and habitat belonging to Critically Endangered KwaZulu-Natal Sandstone *Sourveld*, irreplaceable Critical Biodiversity Areas and the Midlands Landscape Conservation Corridor near the development's footprint; 3. Loss of vital topsoil in the development's footprint; 4. Erosion of soil from the development's footprint into nearby terrestrial areas, watercourses and wetlands during the construction phase, resulting in sedimentation and smothering of terrestrial, aquatic and wetland habitats, flora and fauna. 5. Alien plant invader colonisation of and dispersal in disturbed footprint areas during the construction and operational phases; 6. Contamination of soil and subsurface water through infiltration of construction-related pollutants during the construction phase; 7. Pollution of watercourses and any wetland areas near the footprint from contaminated runoff during the construction phase, resulting in contamination of aquatic, semi-aquatic and wetland habitats, flora and fauna. Negative ecological impacts range from low-moderate to moderate significance without mitigation, while with mitigation these impacts are likely to be of low significance. Cumulative negative ecological impacts are likely to be of high significance without mitigation and of low significance with mitigation. The likelihood of impacts of low significance with the implementation of mitigation measures emphasises the crucial importance of these measures.

- According to **Wetland Assessment Findings**:

Within the 500 metre buffer of the proposed activities, six (6) *hydrogeomorphic* units (HGM) were identified, however, only one wetland – **HGM Unit 1** – may be impacted upon and was delineated. **HGM Unit 1** is a very small wetland and situated on a gentle slope at the head of a valley, thus at the start of a catchment. Therefore, **HGM Unit 1** has a very limited catchment and if the wetland were not a depression, a wetland of may have not augmented. However, being a depression wetland, hydrological flows are captured and remain resident at the valley head. The head of the wetland is bounded by a dirt road with a servitude area of approximately 12 metres that consists of alien vegetation domination. The toe of the wetland is intersected by footpath and historic pipe line servitude and directs flows towards an incised drainage line that leads down the steep valley floor.

- According to the **Aquatic Assessment**:

The results from the IHAS, IHIA, and SASS5 indicate that the Mkomazi River is experiencing low anthropogenic pressures, or the river is of sufficient size with sufficient water flows to assimilate any impacts exerted on it. This is confirmed in the IHAS results of Largely Natural (PES of B), which is supported by the SASS5 ecological category of Good (B).

The Mkomazi River is located within a steeply incised valley, which provides an added benefit of restricting excessive human traffic into the area and has reduced the immediate pressure on the watercourse with homesteads constructed on the escarpment or outside of the watercourse area. Immediate pressures are associated with grazing, agriculture and harvesting of natural resources.

These impacts are associated with the riparian areas, which provides important buffering to the instream channel, which in turn could affect the aquatic habitat and water quality, if allowed to continue in an unmanaged and unsustainable way.

An increase in residential development is expected within the area, however this could be reduced with the provision of potable water to the escarpment community, applying less pressure on the immediate valley bottom area adjacent the watercourse. The grazing pressures and use of the watercourses natural resources, specifically associated with the riparian areas, will have to be addressed through Municipal management plans to ensure continued deterioration is prevented to safe guard the investment in infrastructure.

- According to the **Heritage Impact Assessment Findings**:

The area was investigated during a field visit and through archival studies. The site was found to be devoid of any heritage sites with significance. It is recommended that obscured, subterranean sites and graves be managed, if they are encountered. The alignment follows the reserve of a newly constructed paved road and any possible damage has already been done. Backfilling for the road made the identification of any heritage sites impossible.

EAP Opinion and Recommendation to CA

This BAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed development of the uMkhunya Phase 4 Bulk Water Supply Scheme. Having duly considered the proposal, there is unlikely to be any significant negative environmental impacts, and the socio-economic benefits are evident.

The findings conclude that there are no environmental fatal flaws that could prevent the proposed development, provided that the recommended mitigation and management measures contained within the EMPr are implemented. Given the findings of the specialist studies conducted, as outlined in summary above, it is safe to say that no significant impacts have been identified by these studies. This has resulted in an impact assessment yielding an overall result of having “negative low” impact. This is attributed mostly to the short-term negative impacts, which are likely to occur during the construction phase, which can be adequately mitigated and rehabilitated to an acceptable state of environment.

It is therefore the recommendation of the EAP that the environmental authorisation is granted for the proposed development of the uMkhunya Phase 4 Bulk Water Supply Scheme, KwaZulu-Natal.

The following recommendations / conditions, although not exhaustive, may be considered for inclusion in the environmental authorisation:

- The EMPr [including the SWMP and Rehabilitation Plans provided in the Vegetation and Aquatic and Wetland Assessments appended to the EMPr] and conditions thereto must be adhered to;
- An ECO must be appointed and all Contractor staff to be trained on the EMPr requirements prior to commencement of activities;
- Alien vegetation and invader species within the vicinity of construction zone are to be removed and indigenous vegetation, where appropriate, to be introduced and managed;
- Monthly environmental compliance monitoring to be conducted during construction and incidents recorded and addressed accordingly;
- The 30 m buffer must be maintained from wetlands;
- All mitigation measures of the specialist studies must be adhered to, particularly those associated with the 11 wetlands identified within the study area.
- The Rehabilitation plan must be costed for in tender documents, along with the rest of the EMPr.

Way Forward

The impacts identified and assessed by way of risk ratings, have been extensively reported herein. The report at hand [i.e. cBAR] will now be made available for comment [as per the timeline diagram presented above] and amended post comment period to form the final BAR [i.e. fBAR].

The fBAR report will, together with a comprehensive issues trail, the final draft of the EMPr, and all addenda as referred to, will be submitted to the KZN EDTEA, for decision making. The fBAR report will thus be a culmination of scientific specialist studies' findings, public contribution via formal comment, comment made at meetings held, and the drawing of conclusions by the EAP as the environmental specialist.

1 BASIC ASSESSMENT DATA

1.1 Approach to the Study

This Consultation Basic Assessment Report [cBAR] has been compiled in accordance with the stipulated requirements in Government Notice Regulation [GNR] 326 Appendix 1 of the EIA Regulations [2017 as amended in 2017], which outlines the legislative Basic Assessment [BA] process and requirements for assessment of outcomes, impacts and residual risks of the proposed development. The cBAR further incorporates the findings and recommendations of the specialist studies conducted for the project.

The proposed uMkhunya Phase 4 Bulk Water Supply Scheme falls within the uBuhlebezwe Local Municipality [ULM], within the Harry Gwala District Municipality (formerly Sisonke District Municipality) [HGDM] and therefore the Competent Authority [CA] is the Department of Economic Development, Tourism and Environmental Affairs [EDTEA], Harry Gwala Region.

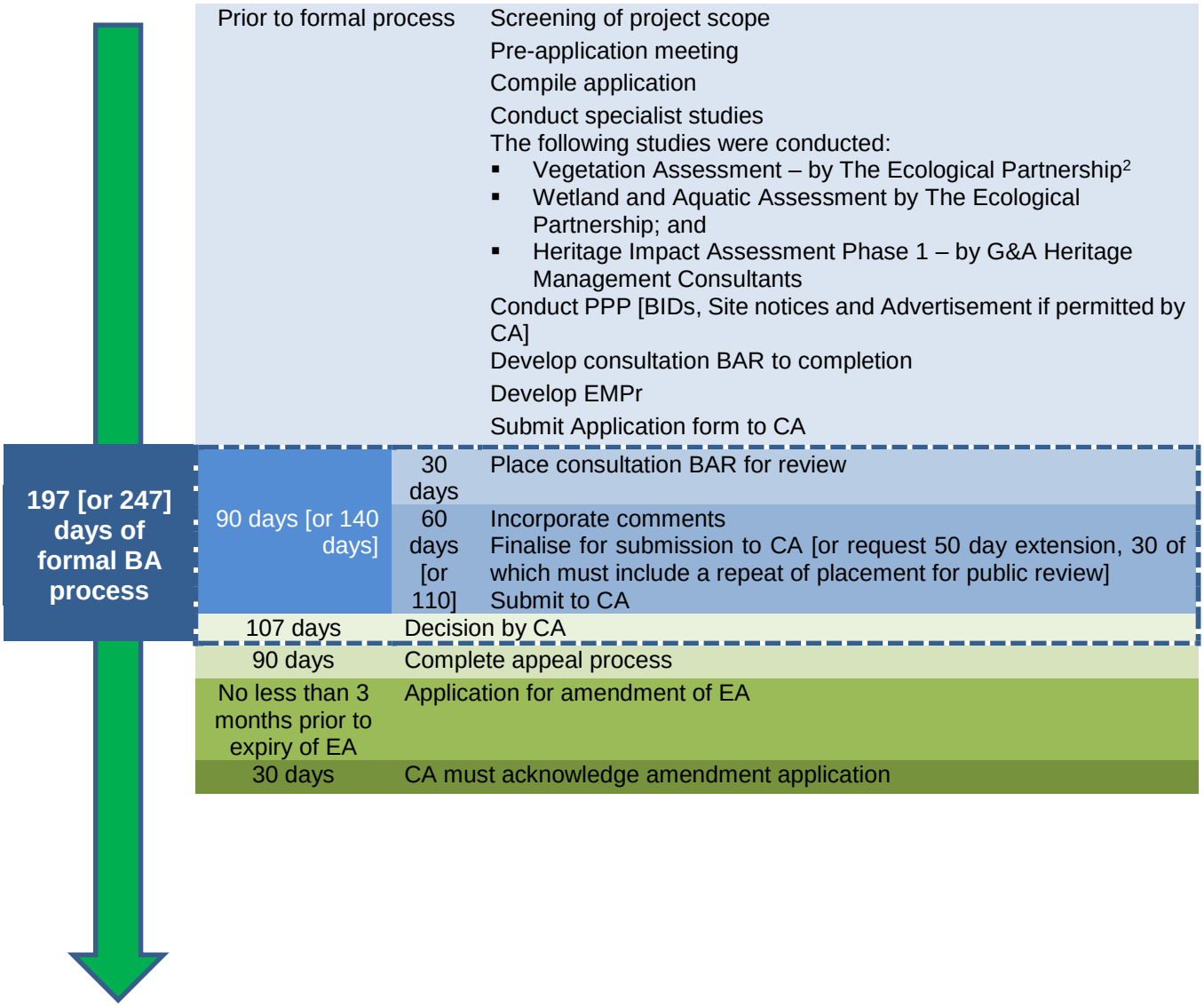
1.2 Objectives of the Study

The BA aims to achieve the following:

- Conduct a consultative process;
- Determine the policy and legislative context within which the proposed activity is undertaken and how the activity complies with and responds to the policy and legislative context;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed project;
- Undertake an impact and risk assessment process inclusive of cumulative impacts [where applicable]. The focus being; determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
    - the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
    - the degree to which these impacts:
        - can be reversed;
        - may cause irreplaceable loss of resources; and
        - can be avoided, managed or mitigated;
- Through a ranking of the site sensitivities and possible impacts the activity will impose on the site to:
    - identify suitable measures to avoid, manage or mitigate identified impacts; and
    - Identify residual risks that need to be managed and monitored.

Figure 1 below illustrates the approach / methodology employed.

Basic Assessment Process – Formal 197 day process [or 247 days]



BA = Basic Assessment
BAR = Basic Assessment Report
CA = Competent Authority [EDTEA Harry Gwala District]
EA = Environmental Authorisation
EMPr = Environmental Management Programme
PPP = Public Participation Process

FIGURE 1: BASIC ASSESSMENT PROCESS

[2] For complete CVs and detailed expertise of specialists refer to Appendix D1 to D3 – Specialist Reports.

1.2.1 *Details of the Project Proponent*

The Applicant for the proposed project is the Harry Gwala District Municipality. The details of the Applicant are as follows:

TABLE 1: APPLICANT DETAILS

Applicant	KwaZulu-Natal Department of Transport
Representative	Mr. D B Makwakwa
Physical Address	40 Main Road, Ixopo
Postal Address	Private Bag X501, Ixopo
Telephone	039 834 8700
Facsimile	039 834 1701
E-mail	makwakwab@harrygwaladm@gov.za

1.2.2 *Details of the Environmental Assessment Practitioner*

The environmental team of At Gedezar Consulting [hereafter referred to as At Gedezar] are appointed as the Environmental Assessment Practitioner [EAP] by the engineers on the project, Emzansi Consulting Engineers. At Gedezar is therefore undertaking the appropriate environmental studies for this proposed project.

At Gedezar has been involved in and / or managed several environmental assessments in South Africa to date. A specialist area of focus is on assessment of linear developments [national and provincial roads, pipelines and power lines], bulk infrastructure and supply [e.g. wastewater treatment works, pipelines, landfills], electricity generation and transmission. For the detailed experience of the EAP, refer to Appendix G of this cBAR.

TABLE 2: EAP DETAILS[3]

	Detail	At Gedezar Consulting
	**Contact Persons**	Mr Andile Mnyandu [EAP]
	Address	64 Paige Place 2 Portsmouth Road Pinetown 3610
	Telephone	082 973 1291
	Facsimile	086 723 4520
	E-mail	andilemn@gedezar.co.za
	Qualification	Bachelor's Degree in Geography and Environmental Management, University of KwaZulu- Natal
	Experience	11 years

1.3 Structure of the Report

This report has been structured to comply with the format required by the National Environmental Management Act [NEMA] [Act No. 107 of 1998] [as amended]. The contents are as follows:

[3] Full curriculum vitae of the above practitioners can be found in Appendix G of this report.

TABLE 3: REPORT STRUCTURE

Chapter	Content
Chapter 1 **Basic Assessment Data**	This chapter includes the approach to the study and details of the project proponent and EAP.
Chapter 2 **Project Context and Motivation**	Contextualises the study area and provides a motivation and need for the proposed development.
Chapter 3 **Technical Data**	Includes a detailed description of the proposed activities.
Chapter 4 **Environmental Legislative Context**	Includes an explanation on all applicable legislation and the relevant listed activities applied for.
Chapter 5 **The Study**	A description of the biophysical and social environment. Consideration of alternatives [design / layout and no-go] for the project. Overview of the public participation process conducted to date. This section also highlights the key findings of the specialist studies conducted and other environmental considerations. Includes the impact assessment methodology. The impacts identified are rated and a significance score obtained.
Chapter 6 **Study Findings & Conclusions**	Conclusions and recommendations of the Environmental Impact Assessment. Declaration of independence by the EAP.

2 PROJECT CONTEXT AND MOTIVATION

2.1 Background

Emzansi Consulting Engineers was appointed by Harry Gwala District Municipality to provide Professional Engineering Services for the development of the uMkhunya Bulk Water Supply Scheme. The project entails the construction of an abstraction works, pump station, 6830m long 350mm bulk rising main and 5ML/day water treatment works.

An investigation by Terratest has indicated that the proposed run-of-river abstraction on the Umkomaas River cannot supply 1.5 Ml/d at the 98% assurance level. In order to meet the required 1.5 Ml/day supply amount, an abstraction capacity of 0.045m3/s, as well as an off-channel storage facility with a capacity of 300 000 m^3 are required.

2.2 Surveyor General Numbers / Property Descriptions:

The proposed activity is situated on the following properties which are both state land. The 21 digit surveyor-general codes are provided in Table 4 below.

TABLE 4: SURVEYOR-GENERAL 21 DIGIT SITE [ERF / FARM / PORTION] REFERENCE NUMBERS

Infrastructures	21 Digit Reference Number & Erf, Farm and Portion Number
Abstraction Point and Water Treatment Works	N0ET00000000474800000
	Farm 4748 Lot 4 Umkonye
Rising Main	N0ET00000001760600000
	Farm 17606 Lot 3 Umkonye
Rising Main to Command Reservoir	N0ET00000001784400000
	Farm 17844 Alderley

2.2.1 *Land Use Zoning*

TABLE 5: LAND USE ZONING

The site is zoned	Residential
Is a change of land use or a consent use application required?	No
Must a building plan be submitted to the local authority?	Yes

2.2.2 *Coordinates*

The proposed development of the uMkhunya Phase 4 Bulk Water Supply Scheme is approximately 7km in total. Refer to Appendix A2 for coordinates at each 250 m of the rising main which will be constructed. The following coordinates are provided for the Water Treatment Works and Abstraction point.

TABLE 6: COORDINATES

Water Treatment Works

Latitude /Longitude	Degrees	Minutes	Seconds
South	30	05	34.44
East	30	24	24.45

Abstraction Works

Latitude /Longitude	Degrees	Minutes	Seconds
South	30	05	32.95
East	30	24	21.79

2.2.3 *Access / Directions*

The site can be accessed via the R612 east towards uMzinto from Ixopo. Travel approximately 31km then take the left turn towards Rydal. Travel 16km on a gravel road then turn right and drive 6,6km and proceed straight for another 8,3km towards Mkhunya. Take a left turn onto a concrete road and drive downhill for 6km until you reach the pump house on the banks of the uMkomazi River, which is where the proposed project will commence.

2.2.4 *Length of the Activity*

TABLE 7: LENGTH OF THE ACTIVITY PER ALTERNATIVE

Proposed Infrastructure	Proposed Length	Width
Abstraction Works The existing abstraction works comprises a 50m^2 building on the banks of the Umkomazi River. A suitable abstraction works with a larger capacity was found to be more adequate for the required designed Water Supply Scheme.		100m^2
Water Treatment Works The scheme currently does not have a water treatment works. A small package plant has been constructed for the processing of 500litres per day. The proposed Water Treatment Works will process 5ML/day per day and supply a larger area with portable water.		250m^2
Rising Main The proposed pipeline will be approximately 6,830m long with an internal diameter of 350mm.	45m	12.62

2.2.5 *Surrounding Land Uses*

TABLE 8: SURROUNDING LAND USES IN PROXIMITY TO THE PROPOSED PROJECT SITE

Natural area	Y	~~Light industrial~~	~~N~~
Low density residential	Y	~~Medium industrial~~	~~N~~
~~Medium density residential~~	~~N~~	~~Heavy industrial~~	~~N~~
~~High density residential~~	~~N~~	~~Power station~~	~~N~~
Informal residential	Y	~~Military or police base/station/compound~~	~~N~~
~~Retail commercial & warehousing~~	~~N~~	~~Spoil heap or slimes dam~~	~~N~~
~~Office/consulting room~~	~~N~~	Dam or reservoir	Y
Quarry, sand or borrow pit	N	Hospital / medical centre	Y
School	Y	~~Tertiary education facility~~	~~N~~
Church	Y	~~Old age home~~	~~N~~
~~Sewage treatment plant~~	~~N~~	~~Train station or shunting yard~~	~~N~~
~~Railway line~~	~~N~~	~~Major road [4 lanes or more]~~	~~N~~
~~Harbour~~	~~N~~	Plantation	P
~~Sport facilities~~	~~N~~	Agriculture	Y
~~Golf course~~	~~N~~	River, stream or wetland	Y
~~Polo fields~~	~~N~~	~~Nature conservation area~~	~~Y~~
~~Filling station~~	~~N~~	Mountain, koppie or ridge	Y
~~Landfill or waste treatment site~~	~~N~~	~~Museum~~	~~N~~
~~Historical building~~	~~N~~	Protected Area	Y
Graveyard	P	Archaeological site	P
~~Airport~~	~~N~~	~~Other:~~	~~N~~

Key: Y = Yes P = Possibly N = No

2.3 Project Motivation and Need and Desirability

The proposed uMkhunya Phase 4 Bulk Water Supply Scheme is to provide potable water to previously disadvantaged communities in the Mkhunya area. Currently, many of these communities are relying on an intermittent water supply with some communities having never experienced water provision to the area. Diseases associated with lack of clean water, e.g. cholera, have affected the rural communities. Community members often walk or travel for long distances to gain access to water, as per 2013-2014 Sisonke District Municipality2 IDP and the 2011 Ingwe IDP3.

The District Municipality has focussed on building capacity and putting appropriate systems in place for Local Government to deliver services to client communities. This is achieved through the Local Municipality's support of the efforts of the various line function departments, as well as the District Municipality, to provide residents with access to basic services.

This proposed project will increase the area to be services in the Harry Gwala District Municipality, improve the water reliability and water quality, which will improve the lifestyle of the community.

TABLE 9: PROPOSED PROJECT NEED, DESIRABILITY AND BENEFITS

Project Need			
1.	**Was the relevant provincial planning department involved in the application?** The Harry Gwala District Municipality is responsible for the provision of water in this area under the Municipal Infrastructure Grant (MIG) and is also the project Applicant.	YES	
2.	**Does the proposed land use fall within the relevant provincial planning framework?** The proposed development fulfils a basic human requirement and is currently a priority for the District Municipality, as per the 2013-2014 Final Sisonke District Municipality – IDP and the Ingwe_IDP_Final_Draft_28_March_2011. The proposed project is essentially the development of bulk water provision infrastructure which will be done within a road servitude and on already disturbed land Therefore, land use will not change.	YES	
3.	**If the answer to questions 1 and / or 2 was NO, please provide further motivation / Explanation** – N/A.		
Desirability			
1.	**Does the proposed land use / development fit the surrounding area?** The development will increase the potable water supply to the District and is designed to follow existing infrastructure. Water is abstracted from the uMkhomazi River and pumped via a rising main to the Water Treatment Plant. The water is treated using flocculation, clarification, filtration, chlorination and thereafter stored in reservoirs. The treated water is pumped to storage reservoirs situated at Nkweletsheni, Phumobala, Butateni, Nongegana, S'qandulweni and Springvale. Under the proposed phasing of the uMkhunya Water Scheme the following are to be constructed. The uMkhunya water supply scheme Phase 4 shall comprise of an Abstraction pump station, including the associated 350mm diameter and 200mm diameter rising mains, a 5 ML/d water treatment works, a high lift pumpstation, a 200mm diameter rising main to the existing reservoir at Nkweletsheni and the extension to the existing reticulation at Nkweletsheni and Mahlubini.	YES	
2.	**Does the proposed land use / development conform to the relevant structure plans, SDF and planning visions for the area?** The proposed project is for the upgrade of the existing abstraction works, a new water treatment works and associated infrastructure for the provision of bulk water. Furthermore, this project is in line with the planning visions of the area. The uBuhlebezwe Local Municipality Spatial Development Framework [SDF] states that: Water, sanitation and shelter developmental infrastructure plans are constantly being aligned between the Water authority (Harry District Municipality) and uBuhlebezwe. Where energy is concerned the Municipality is currently facilitating electricity supply to the household within the vicinity of the Mahehle, **Mkhunya** and Ufafa areas. As a response to the promotion of going green, the Municipality in future will also be engaging with the relevant stakeholders to looking into the housing development in conjunction to the energy saving initiatives fit for human sustainable living [SDF 2017-2018].	YES	

	A provision of basic services such as water & sanitation has been made by the Harry Gwala District Municipality as their field of competency, provision of electricity has been facilitated by the Ubuhlebezwe Local Municipality.		
3.	**Will the benefits of the proposed land use / development outweigh the negative impacts of it?** Indeed the proposed upgrades will have more long-term benefits than negative impacts, the latter of which are more short-termed and associated with the construction phase. The reasons for this are: ▪ Increase in number of households receiving water which is a basic need; and ▪ Contributes to the long term vision of providing sustainable infrastructure to the people of the uMkhunya area, and better access to water. The benefits stated above, far outweigh the negative impacts, which are limited to the construction phase. The proposed project will lead to an improvement to the social, environmental and economic status quo, as they will enable improved access to water for a large area.	YES	
4.	**If the answer to any of the questions 1-3 was NO, please provide further motivation /Explanation –** N/A.		
5.	**Will the proposed land use / development impact on the sense of place?** The pipeline will be underground. The water treatment works, pump stations, pipeline alignment place markers, valve points and associated infrastructure will be the visible aspects of the development.		NO
6.	**Will the proposed land use / development set a precedent?** The IDP is rolling out a number of water infrastructure projects as part of its mandate and commitment. This project fall within this mandate.		NO
7.	**Will any person's rights be affected by the proposed land use / development?** All landowners have been notified. There are no permanently directly affected people that will suffer a contravention of their rights		NO
8.	**Will the proposed land use / development compromise the "urban edge"?**		NO
9.	**If the answer to any of the question 5-8 was YES, please provide further motivation / explanation** – N/A.		
Benefits			
1.	**Will the land use / development have any benefits for society in general?**	YES	
2.	**Explain**: This development will assist in the fulfilling of the citizens' human right to basic water access. This is the principle founded in the Constitution of the Republic of South Africa (1997) as well as the National Water Services Act (Act No. 108 of 1997) and is ensuring effective service delivery for all.		

3.	**Will the land use / development have any benefits for the local communities where it will be located?**	YES	
4.	**Explain**: The supply of water to household properties will lead to an increased standard of living due to increased accessibility, and reduce impacts on health.		

2.3.1 *Socio-Economic Value of the Activity*

TABLE 10: SOCIO-ECONOMIC VALUE OF THE PROPOSED PROJECT

Description	Value
What is the expected capital value of the activity on completion?	R65 000 000.00
What is the expected yearly income that will be generated by or as a result of the activity?	R5 300 000.00
Will the activity contribute to service infrastructure?	YES
Is the activity a public amenity?	YES
How many new employment opportunities will be created in the development phase of the activity?	12
What is the expected value of the employment opportunities during the development phase?	R9.6 million
What percentage of this will accrue to previously disadvantaged individuals?	90%
How many permanent new employment opportunities will be created during the operational phase of the activity?	110
What is the expected current value of the employment opportunities during the first 10 years?	N/A
What percentage of this will accrue to previously disadvantaged individuals?	90%

3 TECHNICAL DATA

3.1 Design Criteria

The treated water is for human consumption and shall comply to SANS 241 class 1. The reservoirs shall have a 48 hour storage. Pipe lines will have a maximum velocity of 1.5m/s with pressures a maintained between 3 and 6 bar where possible. Reticulation pipe lines will be sized to accommodate an 80l/c/d flow rate with a seasonal peak factor of 2.4 and an instantaneous peak factor of 1.5. No fire fighting capacities will be considered. The system shall be designed for a 20 hour pumping time.

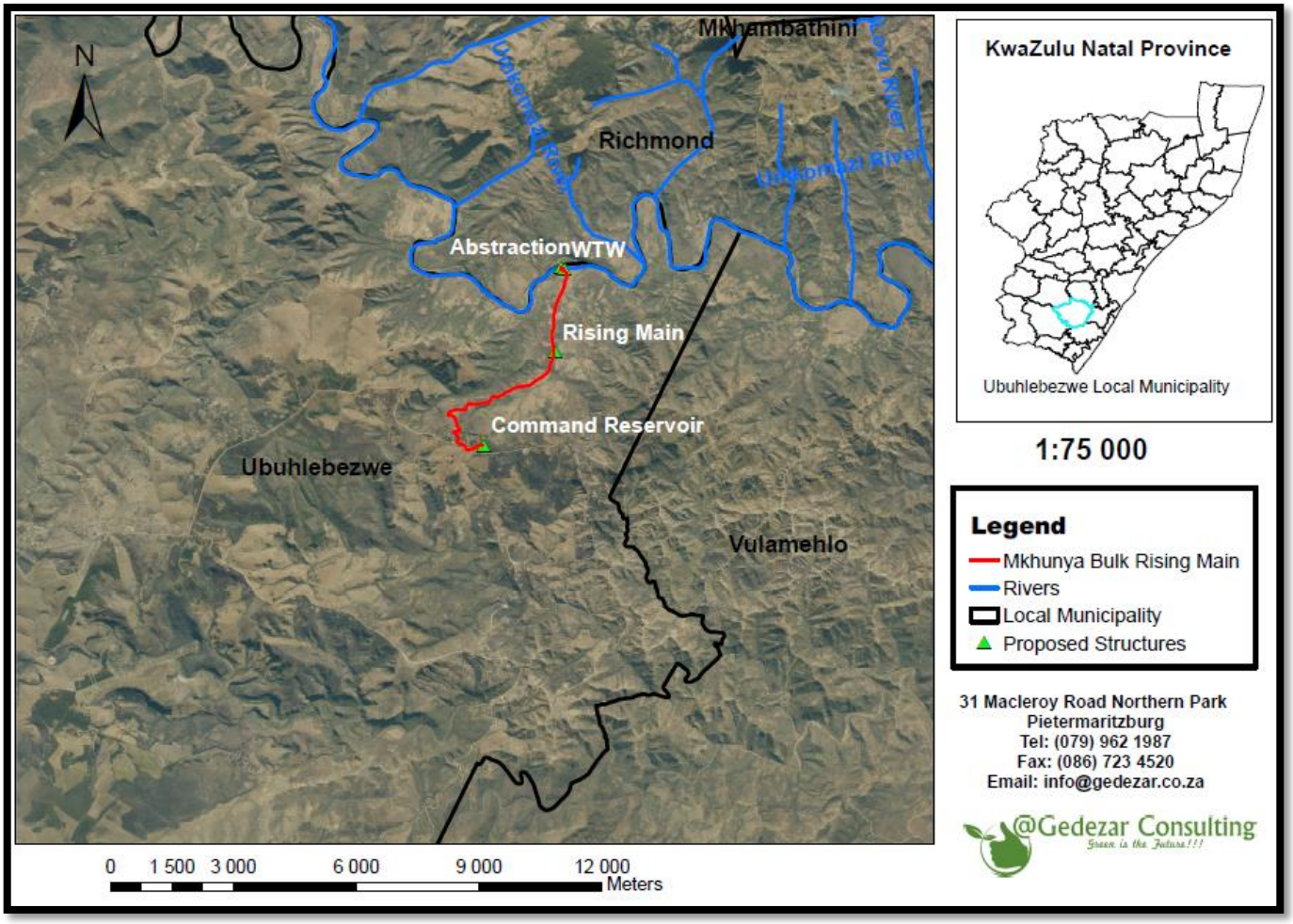


FIGURE 2: THE PROPOSED UMKHUNYA BULK WATER SUPPLY SCHEME LOCALITY MAP

The schematics of the proposed components for the project can be seen in Figure 3.

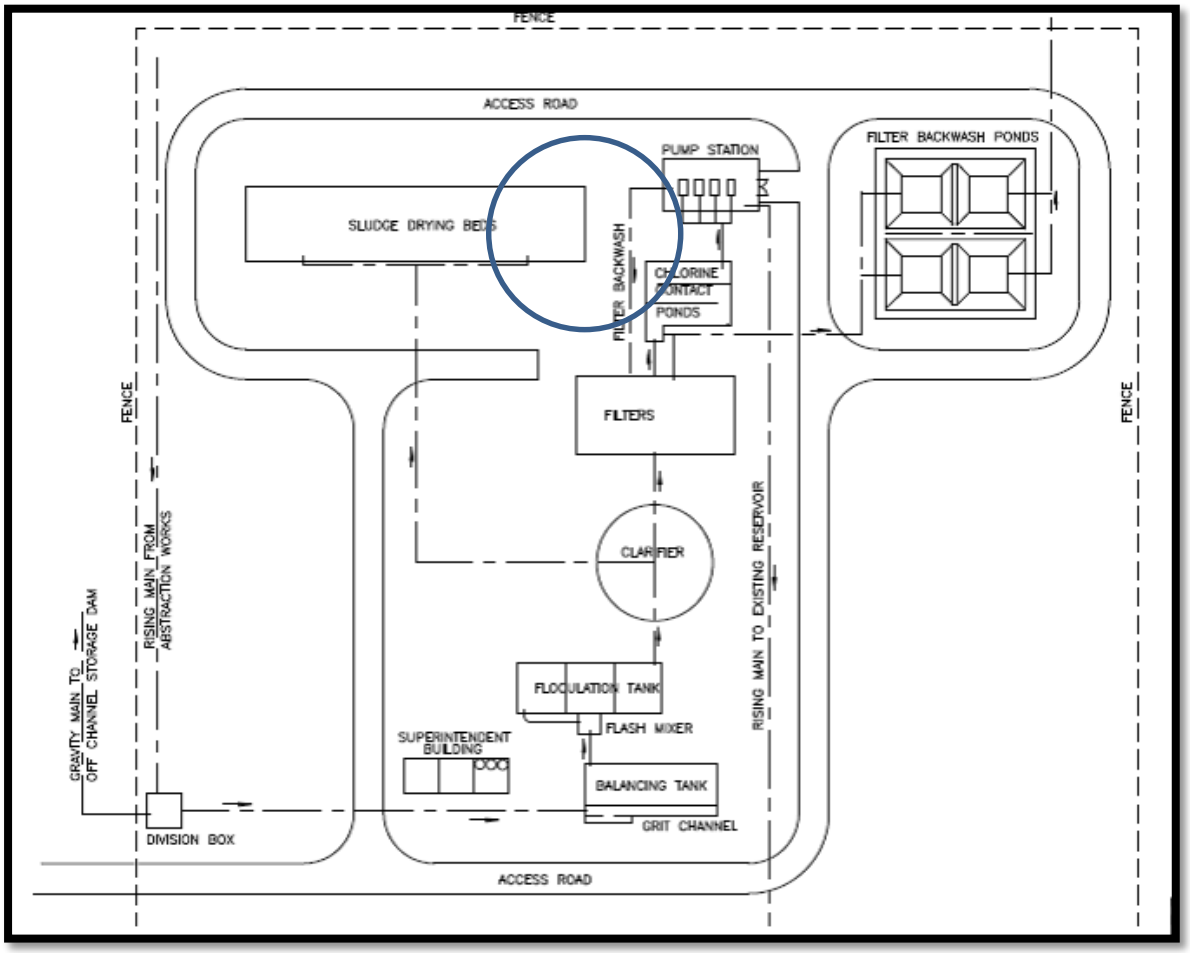


FIGURE 3: WATER TREATMENT WORKS

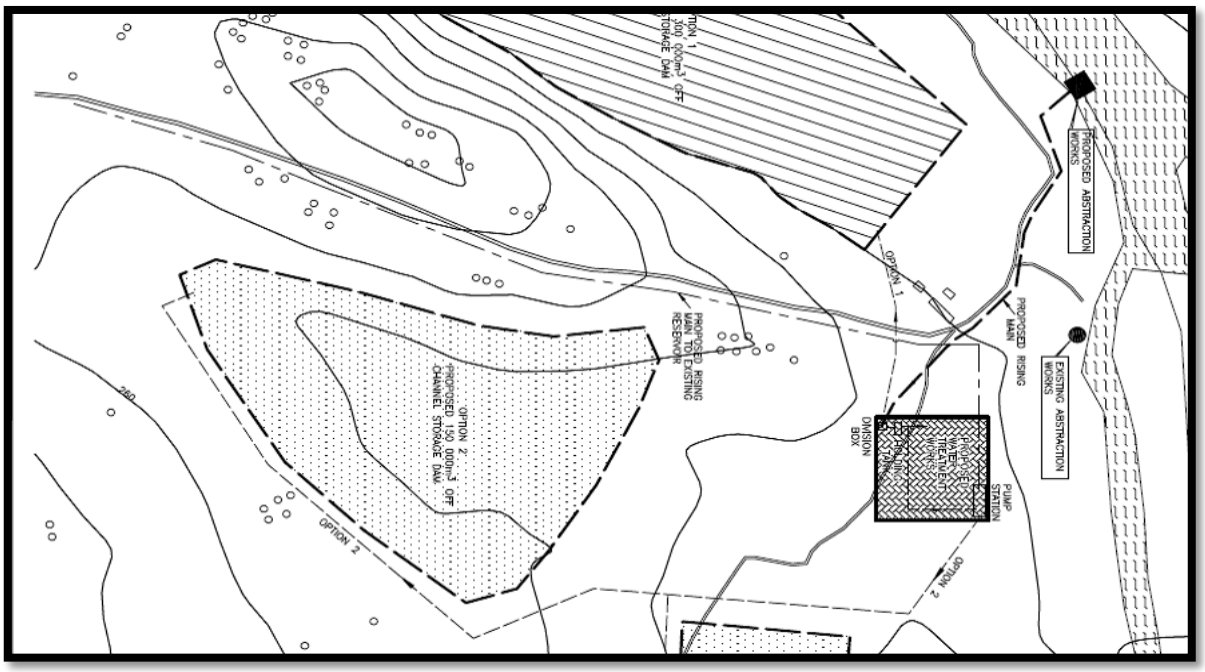


FIGURE 4: WATER TREATMENT WORKS

Water is abstracted from the uMkhomazi River and pumped via a rising main to the Water Treatment Plant. The water is treated using flocculation, clarification, filtration, chlorination and thereafter stored in reservoirs. The treated water is pumped to storage reservoirs situated at Nkweletsheni, Phumobala, Butateni, Nongegana, S'qandulweni and Springvale.

3.1.1 *Abstraction works*

The abstraction pump station shall comprise of three submersible pump sets housed in a pump station situated in the river. The walls of this pump station shall be constructed with gabions / concrete with the base of the pump station founded on rock. Each of the pump sets shall be capable of delivering 27.8 l/s @ 20m head. • When there is low flow in the river, one pump set is to be operating with the discharge (27.8 l/s) being utilized by the water treatment works. When there is high flow in the river, two pumps are to be operating with halve the discharge being utilised by the water treatment works and the other halve flowing into the off channel storage dam. The third pump set shall be the standby one. When there is no river abstraction, water from the off channel storage dam is to be utilised by the water treatment works. Immediately after the pump sets on the delivery side, there shall be a non return valve followed by an isolation valve.

3.1.2 *Water treatment works*

Grit channel and holding tank

Raw water abstracted from the river is pumped to a division box located on a high spot within the Treatment works. The water is divided between the Treatment Works and the off channel storage dam. Flow meters are to be installed on both of these branches. The raw water flowing into the treatment works then enters the grit channel where the grit settles into a scour chamber and the grit is removed by scouring. The channel is designed to maintain a velocity of 0.25m/s. The grit channel shall be cleaned manually on a daily basis.

Flash mixer and Flocculation chambers

The primary purpose of the coagulation/flocculation process is the removal of turbidity from the water. Turbidity is a cloudy appearance of water caused by small particles suspended therein. In the flash mixer, coagulant chemicals are added to the water and the water is mixed quickly and violently. The purpose of this step is to evenly distribute the chemicals through the water. Flash mixing typically lasts a minute or less.

Filters

From the clarifier the effluent flows into the filters. The prime function of a filter is to remove suspended matter and thereby removing pathogenic organisms from the water.

Most of these organisms are bound up in the coagulated floc particles entering the filter. The conventional rapid sand filter uses one grade of sand (0.45 - 0.55 mm and a S.G. of 2.65) approximately 75 cm thick underlaid by graded layers of gravel as supporting media. Normally under these conditions, the actual entrapment of suspended matter is restricted to the top several centimetres of the sand bed. The remaining sand acts as insurance against a serious turbidity breakthrough. The normal design filter rate for a rapid sand filter producing potable water, was 80 – 160 lpm per sq. m of filter bed-area.

Chlorine Contact Tank

From the filters the water flows into the Chlorine contact tank. The contact (retention) time in chlorination is that period between introduction of the disinfectant and when the water is used. A long interaction between chlorine and the microorganisms results in an effective disinfection process. Contact time varies with chlorine concentration, the type of pathogens present, pH, and temperature of the water.

Minutes required = K / Chlorine residual (mg/l)

If the highest pH anticipated is 7.5 and the lowest water temperature is 42 °F, the "K" value is 15. Therefore, a chlorine residual of 0.5 mg/l necessitates 30 minutes contact time. A residual of 0.3 mg/l requires 50 minutes contact time for adequate disinfection. Thus use a 100m³ tank for 1 hour retention.

Pump Station

From the chlorine contact tank the water flows into the pump station. The pump station is to house the following pump sets:

- Pump sets for pumping to the two proposed break pressure tanks (TWL ±478m).
- Pump sets for filter backwashing
- Booster pump set for jet pump in abstraction pump station
- Pump sets for pumping to dam (to be confirmed)

All pump sets to have isolating vales on the suction and isolation and non-return valves on the delivery.

Rising main from WTW

From the pump station water is pumped to the reservoir A via a 200mm diameter rising main.

Reticulation to Nkweletsheni and Mahlubini.

Reticulation under this phase will be an extension to the existing reticulation network previously constructed. All household within these areas will be serviced under the 200m walking distance as recommended in the “Guidelines of Human Settlement and Planning” and a provisional amount has been allocated for in the bill of quantities to cover reticulation, associated fittings and standpipes.

Pipelines ranging from 200mm to 110mm diameter uPVC, and 75mm to 40mm diameter HDPe, including 43N° standpipes is required to complete the reticulation.

3.1.3 *Hydrology and Hydraulics*

The catchment has the following characteristics:

TABLE 11: CATCHMENT DATA

Component	
Catchment area, U10L	207.2km^2
Rainfall Station Number	0239566 A
Rainfall Station Name	Little Harmony
Gauge Map (mm)	831
Licensed water Use	1.107

The following plates provide a photographic context of the existing infrastructure.

PLATE 1: ABSTRACTION POINT

PLATE 2: PUMP STATION

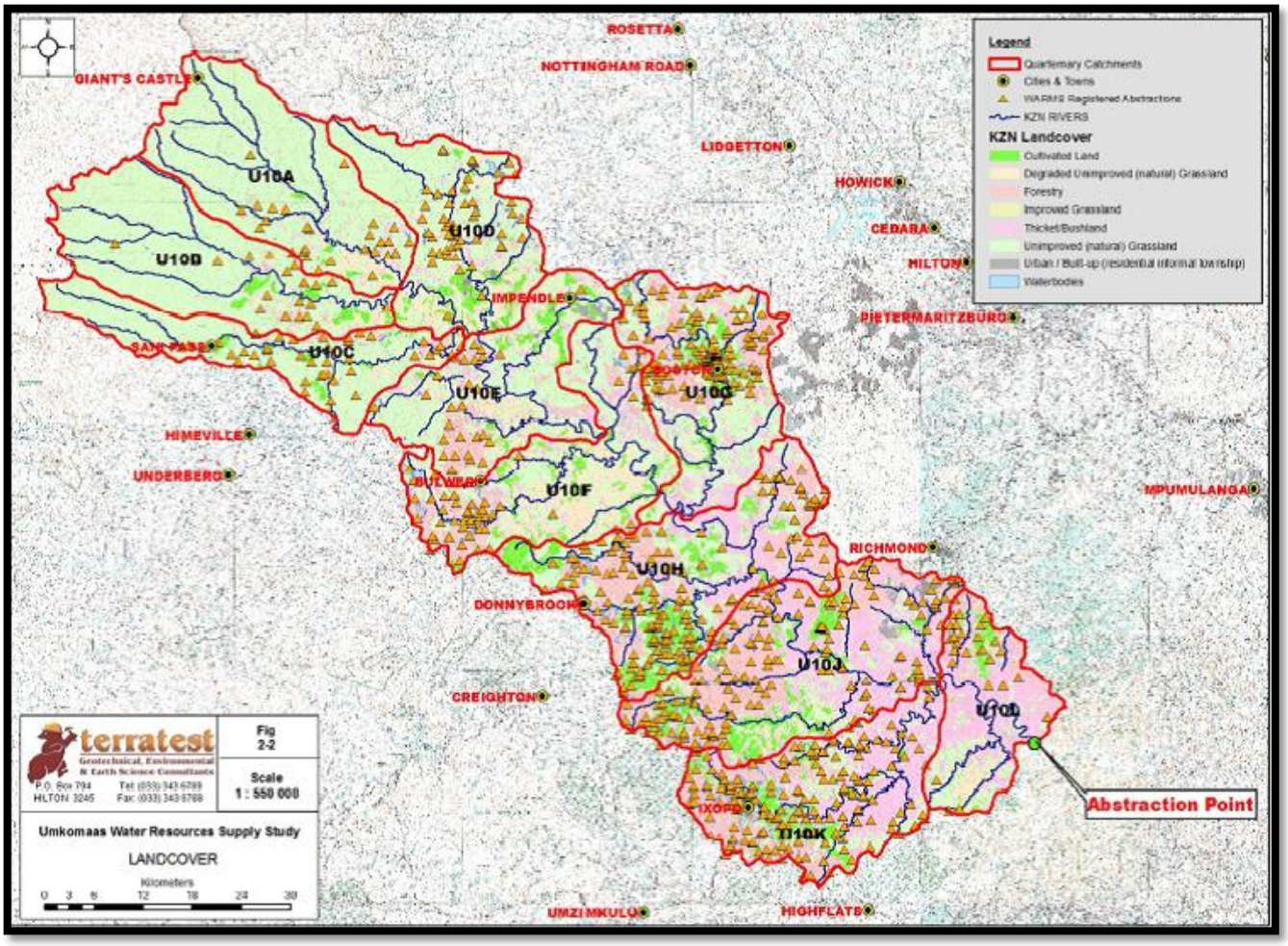


FIGURE 5: UMKHUNYA PROJECT CATCHMENT AREA

Hydrological Investigation

The aim of the hydrological analysis was to determine whether the required 1.5 Ml/day demand can be supplied from the Umkomaas River at the 98% assurance of supply level (i.e. the demand can be met 98% of the time, that is to say there will be supply failures once every 50 years, on average) without requiring any form of storage to augment the supply. However, if this was proven to be impossible, the yield of the system would have to be estimated using various off-channel storage volumes and river abstraction/pumping rates.

4 ENVIRONMENTAL LEGISLATIVE CONTEXT

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of significant pieces of environmental legislation that need to be considered during this study. These include the following items of legislation.

4.1 The Constitution of South Africa

Section 24 of the Constitution of South Africa [No. 108 of 1996] states that

> "*…everyone has the right – … [a] to an environment that is not harmful to their health or well-being; and … [b] to have the environment protected, for the benefit of present and future generations through reasonable*

legislative and other measures that … [c] secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development. These principles are embraced in the NEMA and given further expression.

4.2 National Legislation and Regulations

This section outlines the applicable national legislation which needs to be taken cognisance of.

4.3 National Environmental Management Act [Act No. 107 of 1998]

The National Environmental Management Act [Act No. 107 of 1998] [as amended], or otherwise known as NEMA, is South Africa's overreaching environmental legislation and has, as its primary objective to provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state, and to provide for matters connected therewith.

The principles of the Act are the following:

- Environmental management must place people and their needs at the forefront of its concern;
- Development must be socially, environmentally and economically sustainable;
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated;
- Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person;
- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued;
- Responsibility for the environmental health and safety consequences of a policy, programme, project or activity exists throughout its life cycle.
- The participation of all interested and affected parties in environmental governance must be promoted;
- Decisions must take into account the interests needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge including traditional and ordinary knowledge;
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness;
- The social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessment;
- The right of workers to refuse work that is harmful to human health or the environment;
- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the low;
- There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment;
- The environment is held in public trust for the people, the beneficial use of the environment resources must serve the public interest and the environment must be protected as the people's common heritage;
- The cost of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment; and

- The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.

4.3.1 *EIA Regulations [2014] [as amended in 2017]*

On April 7th 2017, the Minister of Environmental Affairs, Bomo Edith Edna Molewa, made amendments to the EIA Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24[5] and 44 of the NEMA, 1998 [Act No. 107 of 1998], as well as to Listing Notice 1 of 2014, published under Government Notice No. 983 in Gazette No. 38282 on 4 December 2014, as well as Listing Notice 2 of 2014, published under Government Notice No. 984 in Gazette No. 38282 on 4 December 2014, and Listing Notice 3 of 2014, published under Government Notice No. 985 in Gazette No. 38282 on 4 December 2014 in terms of sections 24[2], 24[5], 24D and 44, read with section 47A[1][b] of the NEMA, 1998 [Act No. 107 of 1998]. For ease of reading, the 2017 Amendments of the EIA Regulations, 2014 are published in full, inclusive of amendments made thereto. These amendments commenced on the date that these regulations were published in the Gazette, 07 April 2017.

The nature of the proposed project includes activities listed in the following Listing Notices – GNR 327 [Listing Notice 1] and GNR 324 [Listing Notice 3] of the EIA Regulations [2014 as amended in 2017] – refer to

Table 12 below.

TABLE 12: LISTED ACTIVITIES OF THE EIA REGULATIONS [2014 AS AMENDED IN 2017]

Relevant notice	Activity No[s]	Description [Verbatim and as per applicability to proposed development]
Government Notice Regulation No. [GNR] 327 of 2017	9	The development of infrastructure exceeding 1 000m in length for the bulk transportation of water or stormwater- (i) with an internal diameter of 0.36 m or more; or, (ii) with a peak throughput of 120 ℓ/s or more; **The project will consist of a network of pipelines exceeding 1000 m in length for the bulk transportation of water. These pipelines vary in diameter and throughput capacity, however, it is expected that portions will:** **i. Have an internal diameter of 0.36 m or more; and** **ii. Have a peak throughput capacity of 120 ℓ/s.**
	Activity 12	*The development of [iii] bridges exceeding 100 square metres in size and [vi] bulk storm water outlet structures exceeding 100 square metres in size; where such development occurs [a] within a watercourse; or [c] if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse.* **The project entails the construction of a Water Treatment works with an area exceeding 100m^2 in extent within 32m of the Umkomaas River.**
Government Notice Regulation No. [GNR] 325 of 2017	*No relevant activities*	
Government Notice Regulation No. [GNR] 985 of 2014	Activity 14 (x) and [xii] [aa].	The development of— *(x) Buildings exceeding 10 square metres insize;* *(xii) infrastructure or structures with a physical footprint of 10 square metres or more;]* *where such development occurs—*

Relevant notice	Activity No[s]	Description [Verbatim and as per applicability to proposed development]
		(a) within a watercourse; *in [d] KwaZulu-Natal* vii. Critical biodiversity areas or ecological support areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; x. Outside urban areas: [aa] Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core area of a biosphere reserve **The project entails the construction of construction of a Water Treatment works with an area exceeding 100m^2 in extent within 32m of the Umkomaas River. These sites fall within CBA's.**

4.3.2 *National Water Act [Act No. 36 of 1998] [as amended]*

The National Water Act [NWA] is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country, which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

Water use in South Africa is managed through a water use authorisation process, which requires that every water use is authorised by the Department of Water and Sanitation [DWS, previously known as the Department of Water Affairs] or an established Catchment Management Agency [CMA, if applicable for that region], once the water requirements for the Reserve have been determined.

A water use must be licenced unless it [a] is listed in Schedule 1, [b] is an existing lawful use, [c] is permissible under a general authorisation [GA], or [d] if a responsible authority waives the need for a licence. If none of these are relevant a so-called water use licence [WUL] must be applied for and obtained prior to the commencement of such listed activity. In terms of such a WUL, the Minister may choose to limit the amount of water, which a responsible authority [e.g. CMA, water board, municipality] may allocate. In making regulations and determining items such as GAs, the Minister may differentiate between different water resources, classes of water resources, and geographical areas.

The NWA defines a water resource to be a watercourse, surface water, estuary, or groundwater [aquifer]. Included under surface water are manmade water channels, estuaries and watercourses.

As the proposed development involves the abstraction of water as well as the crossing of watercourses, a WUL application will be submitted to the DWS for both consumptive and non-consumptive water uses. The NWA, as applicable to the proposed development [see comment in brackets after each item], defines the identified water uses, which are potentially applicable under Section 21 as follows:

The following water uses of Section 21 of the NWA are being applied for the WUL:

- *[a] Abstraction of water from a watercourse* [abstraction of water from the Umkomaas River for construction purposes];

The project team met with the DWS on 26th October 2017 for the WUL Application pre-application meeting. The signed register and pre-application record of this meeting can be found in **Appendix H and H1**.

4.3.3 *National Environmental Management: Biodiversity Act [Act No. 10 of 2004]*

The project must comply with the National Environmental Management: Biodiversity Act [Act No. 10 of 2004] [NEM: BA] in providing the cooperative governance in biodiversity management and conservation.

NEM: BA provides for the Minister to publish a notice in the Government Gazette that issues norms and standards, and indicators for monitoring progress for the achievement of any of the objectives of the Act.

The NEM: BA also provides for:

- The National Biodiversity Framework;
- Bioregional Plans;
- Biodiversity Management Plans;
- Biodiversity Management Agreements;
- The identification, listing and promotion of threatened or protected ecosystems; and
- Alien invasive species control and enforcement.

Ezemvelo KZN Wildlife's Terrestrial Systematic Conservation Assessment shows irreplaceable Critical Biodiversity Areas that have very high conservation value, which the study area traverses. For further detail, refer to Chapter 5 of this cBAR.

4.3.3.1 *National Spatial Biodiversity Assessments [2004, 2011]*

This informs the policies, plans and day-to-day activities of a wide range of sectors both public and private. A spatial biodiversity assessment can take place at different spatial scales, from global to local.

It involves mapping information about biodiversity features such as species, habitats and ecological processes, protected areas and current and future patterns of land and resource use. It provides a national context for assessments at the sub national scale and points to broad priority areas where further investigation, planning and action are warranted.

It identifies three keys strategies for conserving South Africa's biodiversity existence from the assessment, namely:

- Pursuing opportunities to link biodiversity and socio-economic development in priority geographic areas;
- Focusing on emergency action on threaten ecosystem, to prevent further loss of ecosystem functioning; and
- Expanding of the protected area network.

4.3.3.1 *National Biodiversity Strategy and Action Plans [2005]*

The National Biodiversity Strategy and Action Plans [NBSAP] aims to conserve and manage terrestrial and aquatic biodiversity to ensure sustainable and equitable benefits to the people of South Africa, now and in the future.

In South Africa, terrestrial, inland water, coastal and marine ecosystems and their associated species are widely used for commercial, semi-commercial and subsistence purposes through both formal and informal markets.

While some of this use is well managed and / or is at levels within the capacity of the resource for renewal, much is thought to be unsustainable. “Use” in this case refers to direct use, such as collecting, harvesting, hunting, fishing, etc. for human consumption and production, as well as more indirect use such as ecotourism.

4.3.4 *National Environmental Management: Protected Areas Act [Act No. 57 of 2003]*

Protected areas are a fundamental tool for achieving biodiversity objectives and protecting essential natural heritage areas and ecosystems services, since these often provide greater security for conservation-worthy land than the agreements or land use limitations provided for in the National Environmental Management: Biodiversity Act.

The National Environmental Management: Protected Areas Act [Act No. 57 of 2003] [NEM:PAA] creates a legal framework and management system for all protected areas in South Africa as well as establishing the South African National Parks [SANParks] as a statutory board. Each conservation area will have its own set of land use restrictions or regulations that stem either from generic restrictions under NEM: PAA, or customized regulations for individual protected areas.

4.3.5 *KZN Nature Conservation Ordinance [Ordinance No. 15 of 1974]*

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation.

In KwaZulu-Natal, the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from Ezemvelo KZN Wildlife to remove or destroy any plants listed in the Ordinance.

No red data species were identified to be impacted by the proposed development. There have been a number of protected species identified.

If, protected plant species are to be disturbed, the Applicant must pursue the necessary permit / licencing requirements from the Department of Agriculture, Forestry and Fisheries [DAFF] and Ezemvelo KZN Wildlife [EKZNW] prior to clearing of vegetation.

4.3.6 *National Environmental Management: Waste Act [Act No. 59 of 2008] [as amended]*

The National Environmental Management Waste Act [Act No. 59 of 2008] [NEM:WA] – the ‘Waste Act’ reforms the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licencing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

The objectives of this Act are:

a) “to protect health, well-being and the environment by providing reasonable measures for –

- *i. minimising the consumption of natural resources;*
- *ii. avoiding and minimising the generation of waste;*
- *iii. reducing, re-using, recycling and recovering waste;*
- *iv. treating and safely disposing of waste as a last resort;*
- *v. preventing pollution and ecological degradation;*

vi. securing ecologically sustainable development while promoting justifiable economic and social development;

vii. promoting and ensuring the effective delivery of waste services;

viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and

ix. achieving integrated waste management reporting and planning;

b) to ensure that people are aware of the impact of waste on their health, well-being and the environment;

c) to provide for compliance with the measures set out in paragraph [a]; and

d) generally to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being."

The NEM: WA has been considered, however, no activities have been identified for the proposed development. Construction waste will be disposed of at a registered landfill and not dumped illegally.

4.3.7 *National Heritage Resources Act [Act No. 25 of 1999]*

In terms of Section 38 of the National Heritage Resources Act [NHRA] [subject to the provisions of subsections [7], [8] and [9] of the Act], any person who intends to undertake a development categorised as:

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- The construction of a bridge or similar structure exceeding 50 m in length;
- Any development or other activity which will change the character of a site:
- Exceeding 5 000 m² in extent;
- Involving three or more existing erven or subdivisions thereof; or
- Involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- The costs of which will exceed a sum set in terms of regulations by the South African Heritage Resource Agency [SAHRA] or a provincial heritage resources authority;
- The re-zoning of a site exceeding 10 000 m² in extent; or
- Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

4.3.8 *National Forests Act [Act No. 84 of 1998]*

According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that;

> *'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.*

In essence the National Forests Act [NFA] prohibits the destruction of indigenous trees in any natural forest without a licence.

In terms of the NFA and Government Notice 1339 of 6 August 1976 [promulgated under the Forest Act, 1984 [Act No. 122 of 1984] for protected tree species], the removal, relocation or pruning of any protected plants will require a licence.

4.3.9 *Occupational Health and Safety Act [Act No. 85 of 1993]*

The Occupational Health and Safety Act [OHSA] provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work, against hazards to health and safety arising out of or in connection with the activities of persons at work.

4.3.10 *Sustainable Development*

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa [Act No. 108 of 1996] and given effect by NEMA. Section 1[29] of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations.

Therefore, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- The disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- Waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

4.3.11 *National Environmental Management: Air Quality Act [Act No. 39 of 2004]*

The NEMA Air Quality Management Act [NEM: AQA] states the following as it primary objective:

> *"To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government, for specific air quality measures, and for matters incidental thereto.*
>
> *Whereas the quality of ambient air in many areas of the Republic is not conducive to a healthy environment for the people living in those areas let alone promoting their social and economic advancement and whereas the burden of health impacts associated with polluted ambient air falls most heavily on the poor, And whereas air pollution carries a high social, economic and environmental cost that is seldom borne by the polluter, And whereas atmospheric emissions of ozone-depleting substances, greenhouse gases and other substances have deleterious effects on the environment both locally and globally, and whereas everyone has the constitutional right to an environment that is not harmful to their health or well-being, and whereas everyone has the constitutional right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*
>
> - *Prevent pollution and ecological degradation;*
> - *Promote conservation; and*

- *Secure ecologically sustainable development and use of natural resources.*

And whereas minimisation of pollution through vigorous control, cleaner technologies and cleaner production practices is key to ensuring that air quality is improved, and whereas additional legislation is necessary to strengthen the Government's strategies for the protection of the environment and, more specifically, the enhancement of the quality of ambient air, in order to secure an environment that is not harmful to the health or well-being of people."

4.3.12 *Hazardous Substance Act [Act No. 15 of 1973] and Regulations*

The object of the Act is *inter alia* to

'*provide for the control of substances which may cause injury or ill health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain circumstances; for the control of electronic products; for the division of such substances or products into groups in relation to the degree of danger; for the prohibition and control of such substances'*.

In terms of the Act, substances are divided into schedules, based on their relative degree of toxicity, and the Act provides for the control of importation, manufacture, sale, use, operation, application, modification, disposal and dumping of substances in each schedule.

Pollution control in South Africa is affected through numerous national statutes, provincial ordinances and local authority by-laws. Only the more significant legislation pertaining to the regulation of water, air, noise and waste pollution is dealt with in this section.

4.4 Climate Change Consideration

The proposed project is concerned mainly with the development of infrastructure on disturbed land and a pipeline within the road servitude. As the project is not anticipated to have major environmental impacts, an impact or contribution to climate change is not considered applicable.

5 THE STUDY

5.1 Project Alternatives

In terms of the EIA Regulations [2014 as amended in 2017], feasible alternatives are required to be considered as part of the environmental investigations. In addition, the obligation that alternatives are investigated is also a requirement of Section 24[4] of the NEMA [Act No. 107 of 1998] [as amended].

An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity; and
- the option of not implementing the activity.

5.2 Site and Type of Activity Alternatives

Route alternatives have been investigated in the specialist assessments with the emphasis on retention of activities within already impacted road or services servitudes and following routes that achieve potable water provision to communities that require additional infrastructure or are being provided potable water connections for the first time to the specific previously disadvantaged area.

The project involves the development of infrastructure where the Water Treatment Works is located next to the abstraction point, and a pipeline will follow the same route as the existing pipeline only slightly realigned but still within the same road servitude; therefore, no off-site or other site-specific alternatives have been investigated.

No-Go option are not envisaged, as this is a priority to the municipality to ensure service delivery to all communities that were previously disadvantaged. The No-Go option has been discussed within this document

5.3 Layout and Design Alternatives

A layout plan has been produced for the development indicating infrastructure positioning and pipeline alignments, illustrated via an alignment map and supporting coordinates table in **Appendix A3.**

For the purposes of this BA, alternatives have been considered for the design of the bulk water supply scheme. These alternative designs are explained below.

5.3.1 *Design Alternative Considerations*

In selecting alternatives suitable for the proposed abstraction point, pipeline and water treatment works, the following design goals were considered:

- Constructability;
- Durability and sustainability;
- Economy; and
- Aesthetics.

The preferred infrastructure had to adequately meet all of the above motioned design goals. The criteria, upon which the design of the infrastructure is based, encumber numerous factors such as:

- Surrounding topography;
- Geology;
- Construction costs associated with dimensions of the infrastructure;
- Environmental sensitivities;
- Impact to watercourses;
- Consideration of future maintenance of the structure;
- Socio-economic need; and
- Hydrology / Aquatics.

When selecting an appropriate design for infrastructure required, several factors need to be considered. To begin with, the need for such a structure must be demonstrated from a socio-economic perspective, notwithstanding the considerations given to the guidelines for assessing and demonstrating the needs and desirability of the project and development as a whole [General Notice 891 [DEA, 2014]]. The location must ensure that the proposed structure adds value by creating key linkages for as many communities as possible, and specifically, for the target communities. In this way, the aspect of safety is also addressed, as the structures are designed taking into consideration safety design requirements. Once a location is identified that is suitable to address the needs of the target communities, structural and environmental factors must be considered. These factors include: [i] the use of existing structures and infrastructure, [this case]; [ii] identifying hydrological, geological and ecological constraints

and ensuring the design is according to engineering best practice guidelines and principles; [iii] carrying out an assessment of various options to ensure a cost-effective solution is obtained; and [iv] implementing best practice procedures during detailed design and construction.

Engineering requirements can be addressed in a number of ways. It is a basic principle of best practice to consider a range of options to address any river engineering problem or need and to carry out an options appraisal. Without considering a range of options it is not possible to determine if the chosen approach represents the most suitable option [i.e. the option that minimises ecological harm at a cost that is not disproportionately expensive].

With the above taken into consideration, the following design alternatives were considered.

5.3.2 *No-go Alternative*

The no-go alternative will result in no new impact to the receiving environment, however the objectives of the Harry Gwala District Municipality to achieve basic human requirement of water delivery to previously disadvantaged communities will not be achieved.

The no-go alternative will see the status *quo* of area remain. This will not be ideal as the area does not have adequate portable water, and the supply is erratic due to the existing infrastructure being unable to supply the right amount of water needed to supply the area. Additionally, the upgrade of the development of the uMkhunya bulk Water Supply Scheme is identified in the SDF as a priority project for the provision of basic services of water and sanitation. Should the status *quo* remain, the direct and indirect socio-economic benefits will not be realised.

The inability to provide potable water away from existing natural wetland and river systems could add additional strain to the Environment via increased human and livestock impacts. These systems are already highly impacted and could severely impact downstream water quality levels through high erosion and sediment loads, and result in poor water quality due to ineffective ability of the natural processes of wetlands and river habits to process the water to useable levels.

5.4 Description of the Study Area

5.4.1 *Biophysical Environment*

5.4.1.1 *Climate*

uMkhunya's climate is classified as warm and temperate. Rain falls mainly during the summer months of October to January, with a maximum mean monthly precipitation of 82mm in October compared to 10mm in June. Late afternoon summer thunderstorms occur that can deliver torrential rainfall. Summer mean daily maximum temperatures reach highs of 24°C in November, December and April, 25°C in January and March, and 26°C in February. The hottest days of 36°C occur from September to November, 35°C in December, and 34°C in January, February and March. Winter mean daily maximum temperatures reach highs of 21°C in June and July, 22°C in August and 23°C in May. Mean daily minimum temperatures reach lows of 6°C in June and July, 8°C in August and 9°C in May. The coldest nights occur in June and July (0°C) and May and August.

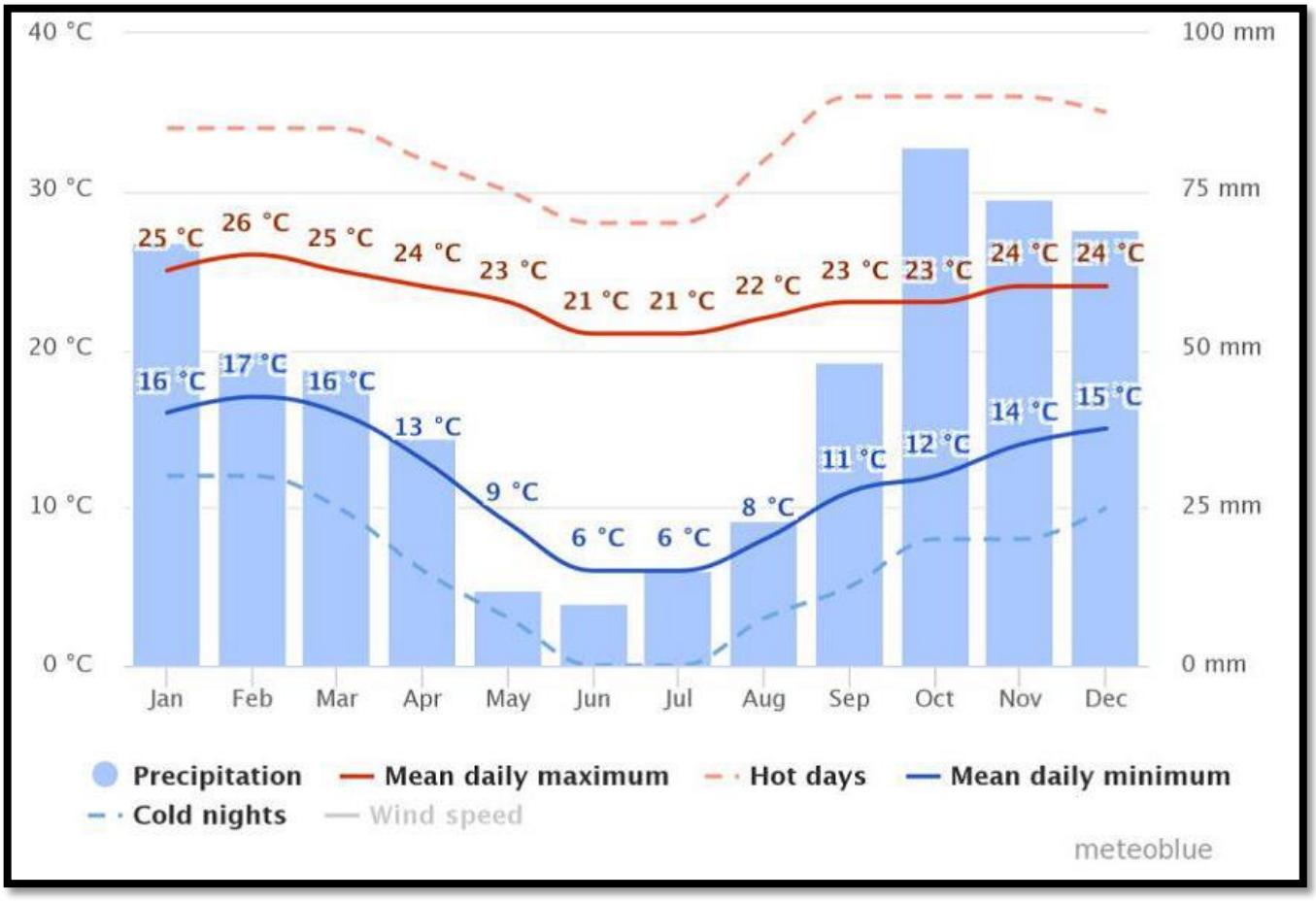


FIGURE 6: CLIMATE DIAGRAM FOR MKHUNYA

The Climate diagram for uMkhunya shows mean monthly precipitation [blue bar graph] and mean daily maximum and minimum temperatures together with the mean of the hottest day and coldest night for each month. The climate diagram is based on 30 years of hourly weather model simulations [http://www.meteoblue.com].

5.4.1.1 *Geology and Soils*

The Mkhunya pumphouse and proposed water treatment works are underlain by alluvial deposits of the Mkomazi River. The geology of most of the pipeline's footprint is formed by the Oribi Gorge Suite, which is composed of very coarse grained porphyritic granite and *charnockite*. The footprint then passes along terrain underlain by the Natal Group, comprising of basal conglomerate, red-brown, coarse to fine-grained arkose to *subarkose*, light grey *quartzarenite*, *micaceous* sandstone, grit, conglomerate, subordinate *micaceous* siltstone and mudstone. The footprint then passes along terrain underlain by the *Dwyka* Formation, which is composed of *tillite*, minor shale, *varved* shale and sandstone. Dolerite forms the geology of the final length of the pipeline's footprint and the Nkweletsheni reservoir.

The level to gently sloping footprint of the Mkhunya pumphouse, water treatment works and initial length of pipeline occurs on soils with low to very high erodibility. The next length of the pipeline's footprint is located on moderately sloping land with soils of very high erodibility. The following length of the moderately sloping pipeline's footprint lies adjacent to steep and very steep downslopes that have soils with low to very high erodibility. The final length of the pipeline's footprint ending at the Nkweletsheni reservoir occurs on land with soils of low to moderate erodibility.

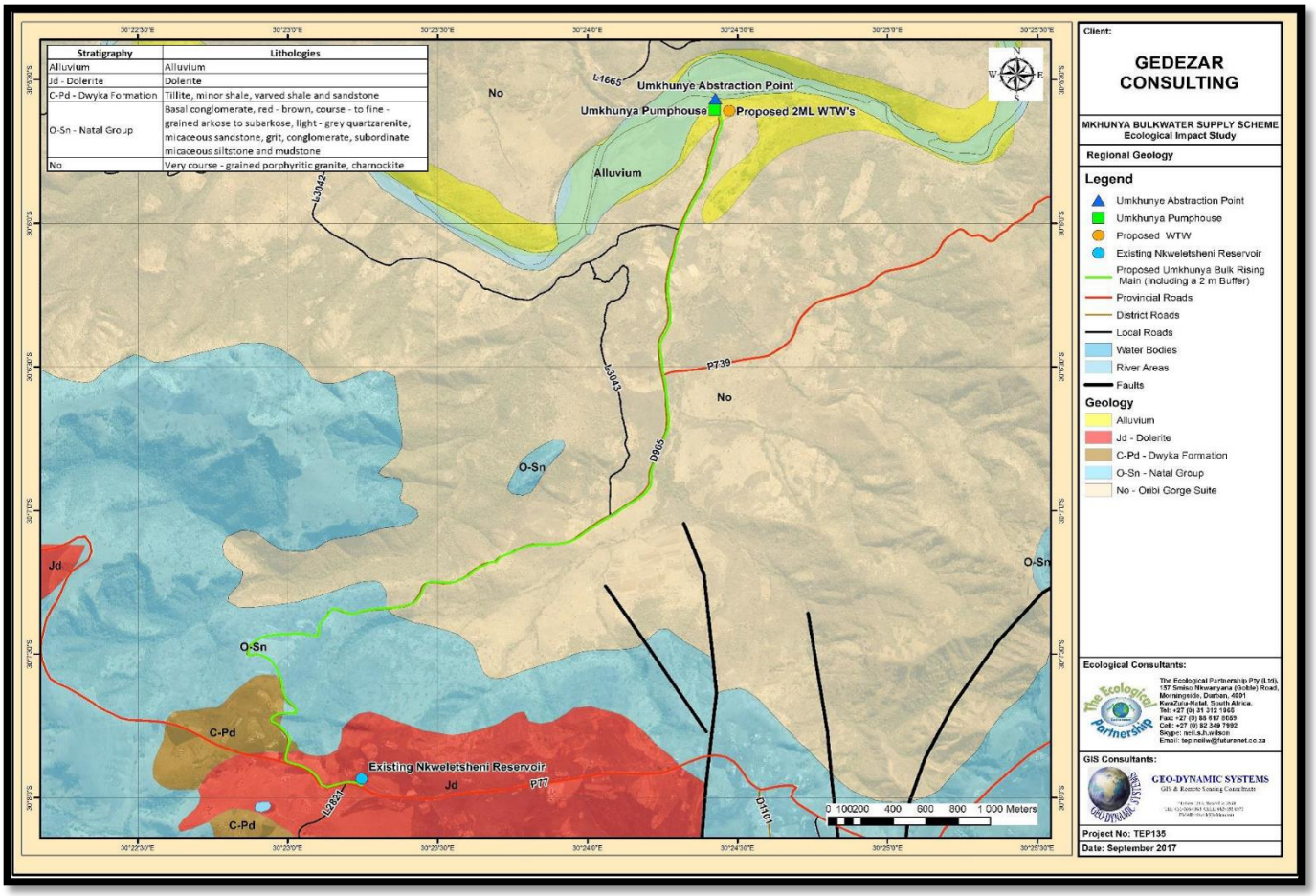


FIGURE 7: GEOLOGY OF THE STUDY AREA [TEP, 2016]

5.4.1.1 *Vegetation*

Most of the vegetation in the footprint of the proposed development is disturbed roadside vegetation. Upgrading of the Mkhunya pumphouse and construction of the water treatment works will take place in a grassland area dominated by *Sporobolus pyramidalis*. Starting near the Mkomazi River and ending at the Nkweletsheni reservoir, the proposed pipeline's five-metre wide construction footprint traverses roadside terrain with disturbed roadside vegetation. Alien plant invaders, dominated by *Lantana camara*, are prominent at the outer edge of the footprint. Historically, the footprint would have passed through Eastern Valley Bushveld, KwaZulu-Natal Hinterland Thornveld and KwaZulu-Natal Sandstone *Sourveld* vegetation types before transformation of the vegetation types occurred by various anthropomorphic factors, such as human settlement, road construction and over-burning and over-grazing of the veld. Important species belonging to these natural vegetation types still remain in, near and further away from the pipeline's footprint.

In its natural state, Eastern Valley Bushveld is composed of semi-deciduous savanna woodlands in a mosaic with thickets, which are often succulent and dominated by species of Euphorbia and Aloe (Rutherford et al., 2010; Scott-Shaw & Escott, 2011). KwaZulu-Natal Hinterland *Thornveld* is composed of open *thornveld*, dominated by *Vachellia* species (Rutherford et al., 2010; Scott-Shaw & Escott, 2011). KwaZulu-Natal Sandstone Sourveld is a short, species-rich grassland with scattered low shrubs and *geoxylic suffrutices* (Rutherford et al., 2010; Scott-Shaw & Escott, 2011).

5.4.1.1 *Hydrology*

During rainfall, surface water drains towards the Mkhunya pumphouse and proposed water treatment works from more elevated areas and into the Mkomazi River. Surface water largely drains away from the pipeline's footprint towards the Mfulomubi River which lies immediately to the east of the footprint. Water will drain rapidly from the pipeline's footprint towards this river down the steep and very steep slopes which are present in its upper reaches.

The Mkhunya abstraction point is located in the Mkomazi River and the pumphouse and proposed water treatment works are situated close to this perennial river on its floodplain. One of the flood banks of the river lies adjacent to the pumphouse and proposed water treatment works making this floodplain area vulnerable to flooding when the Mkomazi River overtops its banks.

5.4.1.1 *Socio-economic Environment*

Rural house dominate the area on both sides of the proposed pipeline route, along at the top section near the Nkweletsheni reservoir houses are on the left side as the right side is too steep however the number of houses increases towards the bottom section of the pipeline near the river.

The cultural landscape in the study area is strongly associated with rural living and subsistence farming. There is still a strong community feeling here with a dominance of traditional authority.

5.4.1.1 *Heritage*

This area is home to all three of the known phases of the Stone Age, namely: the Early-- (2.5 million – 250 000 years ago), Middle-- (250 000 – 20 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoekhoen cultural groups. Early to Middle Stone Age sites are uncommon in this area, however rock--art sites and Late Stone Age sites are much better known.

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter--gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Middle Stone Age (MSA), as defined by Goodwin and Van Riet Lowe (1929), was viewed as a switch in technology from core tools to flake tools, and was thought to represent an intermediate technology between the Earlier and Later Stone Age (LSA). Triangular flakes with convergent dorsal scars and faceted butts distinguished the MSA, and radial and discoidal types, along with single and double platform examples, dominated cores. The 'type fossil' was considered to be the worked flake point. Due to both the relatively long time span encompassed by the MSA (c. 250 000--20 000BP) and the high degree of regional variation, it has proved difficult to include all MSA assemblages within Goodwin and Van Riet Lowe's criteria. More recent attempts have been made to revise the definition of the MSA (Klein 1970;; Beaumont & Vogel 1972;; Volman1984) and to establish a cultural sequence but with limited success. As a result, identifying and understanding the end of the MSA is still difficult. Disagreement concerning the MSA/LSA transition in southern Africa centres on four issues: 1) the definition of what constitutes final MSA technology;; 2) the existence of a transitional MSA/LSA industry;; 3) the dating of the MSA/LSA transition;; and 4) the existence of an Early LSA (ELSA) which represents a distinct industry that is not part of the earliest recognized LSA, the Robberg (Clark, 1997).

The 1985 excavation at Umhlatuzana rock shelter in Natal by Kaplan yielded a long Middle Stone Age (MSA) to the Later Stone Age (LSA), including the MSA/LSA transition, and early LSA microlithic bladelet assemblages. The change from the MSA to the beginning of the LSA took place between 35 000 and 25 000 BP. Robberg--like

assemblages recovered from Umhlatuzana are the first to be positively identified in Natal. Pre--dating 18 000 BP and post--dating 12 000 BP, they show that assemblages of this nature were produced earlier and later in Natal than elsewhere in the country.

Changes in the Umhlatuzana stone artefact assemblages were not the result of the introduction from elsewhere of new types of tools, but took place locally, as the result of a single evolving cultural tradition in a trajectory of cultural and social change (Kaplan, 1986).

Recent research by Wadley on the Middle Stone Age of Sibudu Cave north of Durban indicated that distinctions between the Middle Stone Age and the Late Stone Age based on backed blades could be misleading (Wadley, 2005). Although research on MSA sites is limited, this research illustrates the potential value of investigating Stone Age sites in KZN closer.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter--gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades.

A large representation of Rock--Art sites is located in this area. During 1981 Mazel completed a survey of the Drakensberg and Southern Natal and documented over 400 rock art sites with more than 20 000 paintings (Mazel, 1981). The occurrence of these sites is however subject to very specific environmental parameters, none of which are present in the study area and detailed sequence of stone artefacts, which covered the time range from the

5.5 Public Participation Process

Public participation is a process that is designed to enable all interested and affected parties [I&APs] to voice their opinion and / or concerns which enables the practitioner to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising its adverse effects.

I&APs include all interested stakeholders, technical specialists, and the various relevant organs of state who work together to produce better decisions.

The primary aims of the public participation process are:

- to inform I&APs and key stakeholders of the proposed application and environmental studies;
- to initiate meaningful and timeous participation of I&APs;
- to identify issues and concerns of key stakeholders and I&APs with regards to the application for the development [i.e. focus on important issues];
- to promote transparency and an understanding of the project and its potential environmental [social and biophysical] impacts [both positive and negative];
- to provide information used for decision-making;
- to provide a structure for liaison and communication with I&APs and key stakeholders;
- to ensure inclusivity [the needs, interests and values of I&APs must be considered in the decision-making process];
- to focus on issues relevant to the project, and issues considered important by I&APs and key stakeholders, and;
- to provide responses to I&AP queries.

The public participation process must adhere to the requirements of Regulations 41 and 42 [GNR 982] under the NEMA [as amended].

The public participation process will be undertaken according to the phases outlined below.

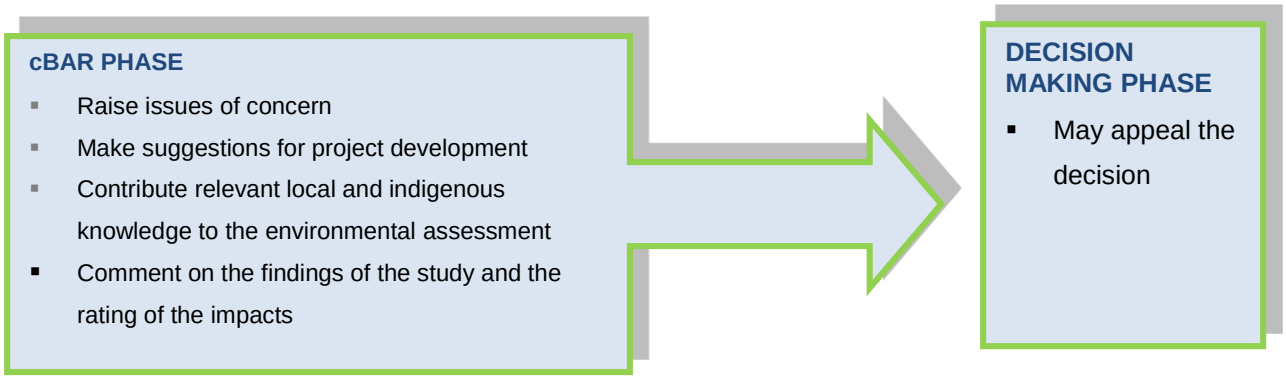


FIGURE 8: RESPONSIBILITIES OF I&APS IN THE DIFFERENT PPP STAGES

Figure 9 [below] depicts the approach taken by At Gedezar, where one way information flow is avoided and information exchange is promoted, thereby enabling a higher level of engagement.

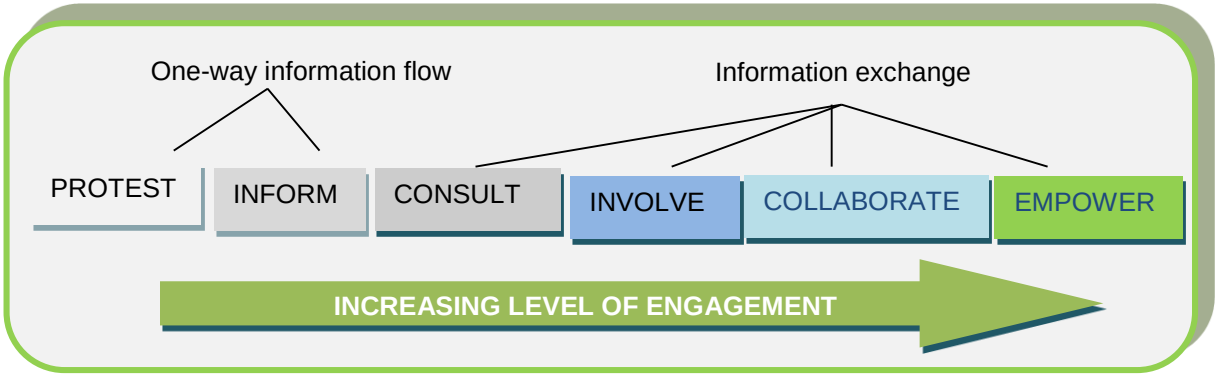


FIGURE 9: THE STAKEHOLDER ENGAGEMENT SPECTRUM [DEAT, 2002]

In order to achieve a higher level of engagement, a number of key activities have taken place and will continue to take place. These included the following:

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to the communities of wards of residential dwellings which surround the proposed development;
- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The convening of focused meetings with stakeholders during the BA process; this included engaging with community leaders forming part of the Sangcwaba Traditional Council. The continued engagement of public leaders to whom the public generally turn for information, keeping such individuals well informed about process and progress;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings / forums as the need arises;
- The preparation of reports based on information gathered throughout the BA via the PPP and feeding that into the relevant decision-makers;
- The PPP includes distribution of pamphlets or Background Information Documents [BIDs] and other information packs; and

- Where appropriate site visits may be organised, as well as targeted coverage by the media.
- Specifically, the proposed uMkhunya Phase 4 Bulk Water Supply Scheme, BA PPP has entailed the following activities as outlined in the following Sections.

5.5.1 *Authority Consultation*

The competent authority which is the KZN EDTEA is required to provide an environmental authorisation [EA] [whether positive or negative] for the project. The KZN EDTEA has been consulted from the outset of this study, and has been engaged throughout the project process.

Authority consultation included the following activities:

- Pre-application consultation in the form of a meeting with Mr Ndumiso Masuku of the KZN EDTEA on the 16th of May 2016.
- Submission of an application for environmental authorisation in terms of Section 26 of the EIA Regulations [2017].
- Approval of the application documentation by KZN EDTEA.
- The date of receipt of approval of the application documentation 14th March 2018 and the KZN EDTEA reference number **NEAS: KZN/EIA/000081/2018 REF NO: DC43/0016/2018**

5.5.2 *Consultation with Other Relevant Stakeholders*

Consultation with other relevant key stakeholders were, and will continue to be undertaken through telephone calls and written email correspondence in order to actively engage these stakeholders throughout the process and to provide background information about the project during the BA process.

Relevant key stakeholders were consulted and sent pamphlets or BIDs and other information packs [where requested].

All relevant stakeholders will be allowed an opportunity to comment on the cBAR.

The identified stakeholders of this project include:

TABLE 13: KEY STAKEHOLDERS CONTACTED AS PART OF THE PUBLIC PARTICIPATION PROCESS

OWNERS AND OCCUPIERS OF LAND ADJACENT TO THE SITE	
Ingonyama Trust Board	
LOCAL AUTHORITY	
Harry Gwala District Municipality	
PROVINCIAL AUTHORITY	
Mrs Bernadet Pawandiwa	Amafa KwaZulu-Natal
Mr Ndumiso Masuku	KwaZulu-Natal Department of Economic Development Tourism and Environmental Affairs [uMkhanyakude District]
Mr. Blake McKenzie	Department of Transport
Ms Nerissa Pillay	Ezemvelo KZN Wildlife
STATE DEPARTMENTS	
Ms. Lwandle Sibango	National Department of Water and Sanitation

5.5.3 *Site Notification*

The EIA Regulations [2017] require that a site notice be fixed at a place conspicuous to the public at the boundary or on the fence of the site where the activity is proposed to occur. In addition, at points of access or high through traffic. The purpose of this is to notify the public of the project and to invite the public to register as stakeholders and inform them of the PP Process.

At Gedezar Consulting erected a number of notices in Zulu on 11th July 2017 at various high traffic locations around the perimeter of the site and at the start and end of the project [refer to Appendix E7].

5.5.4 *Identification of Interested and Affected Parties*

I&APs were identified and continue to be identified throughout the BA process primarily from responses received from the notices mentioned above. A number of stakeholders were also identified in the focus group meeting held with the Sangcwaba Traditional Council.

E-mails were sent to key stakeholders and other known I&APs, informing them of the application for the project, the availability of the cBAR for review and indicating how they may become involved in the project.

Additionally, hard copies of the cBAR will be made available at the offices of the local Councillor.

The contact details of all identified I&APs are updated on the project database, which is included in Appendix E5. This database will be updated on an on-going basis throughout the BA process.

5.5.5 *Briefing Paper*

A briefing paper or BID for the proposed project was compiled in Zulu [refer to Appendix E1.2] and distributed to key stakeholders on 11th July 2017.

The aim of this document is to provide a brief outline of the application and the nature of the development. It is also aimed at providing preliminary details regarding the BA process, and explains how I&APs could become involved in the project.

The briefing paper was distributed to all identified I&APs and stakeholders, together with a registration / comment sheet inviting I&APs to submit details of any issues, concerns or inputs they might have with regards to the project. BIDs were also distributed *via* email to relevant Departments. Refer to Appendix E1.1 and E5.

5.5.6 *Focus Group Meeting*

Following consultation with KZN EDTEA, the EAP convened a Focus Group Meeting with the local as representatives of all local I&AP's affected by the proposed project on the 11th July 2017.

Refer to Appendix E3.1, E3.2 and E3.3 for meeting minutes and attendance registers.

5.5.7 *Advertising*

In compliance with the EIA Regulations [2017], notification of the commencement of the BA process for the project was advertised in a local newspaper in Zulu in the Mountain Echo newspaper.

I&APs have been requested to register their interest in the project and become involved in the BA process. The primary aim of the advertisement is to ensure that the widest group of I&APs possible is informed and invited to provide input, through questions and comments on the project.

5.5.8 *Issues Trail*

Issues and concerns raised in the public participation process during the BA process have been and will continue to be compiled into an Issues Trail.

The Issues Trail is attached as Appendix E4, in which all comments received and responses provided to date have been captured.

5.5.9 *Key Issues Raised by the Public [Summarised]*

- Given that there has already been upgrades and construction of a water supply scheme albeit the scheme is not yet in operation, Will this be addition to the scheme or a new scheme altogether?
- Given that there has already been upgrades and construction of a water supply scheme albeit the scheme is not yet in operation. Is the municipality responsible for the water and if so, the municipality must come and explain to the community why is the existing scheme not yet functional?
- When will construction of the proposed project begin?
- Employment opportunities during the construction period.

5.5.10 *Public Review of the draft Consultation BAR*

All registered I&APs will be notified of the availability of the report through the local ward councillor.

The cBAR will be made available for authority and public review for a total of 30 days from 16th March 2018 to 20th April 2018.

The report will be made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Ward 5 Councillor; and
- Ixopo Library – and
- Harry Gwala District Municipality Offices- 40 Main Road Ixopo

5.5.11 *Final Consultation BAR*

The final stage in the BA process entails the capturing of responses and comments from I&APs on the cBAR in order to refine the BAR, and ensure that all issues of significance are addressed.

The final BAR [i.e. fBAR] will be the product of all comments and studies, before being submitted to KZN EDTEA for review and decision-making.

5.5.12 *PPP Summary*

TABLE 14: SUMMARY OF PUBLIC PARTICIPATION PROCESS THUS FAR

Activity	Description	Reference
Identifying stakeholders	Stakeholders were identified and a database of all I&APs were compiled.	Appendix E6
Publishing newspaper adverts	Advertisements regarding inter alia the proposed project scope of works, location, and date for draft Basic Assessment Report review as well as details of EAP were placed in the Mountain Echo publication.	Appendix E2
Distribution of a BID	BIDs were distributed electronically and by hand to I&APs on 11th July 2017 and 21st August 2017.	Appendix E5
Erection of site notices	A number of A2 site notices were erected on the perimeter of the site on 11th July 2017.	Appendix E7

Activity	Description	Reference
Preparation of an on-going Issues Trail	Comments, issues of concern and suggestions received from stakeholders thus far have been captured in a Comment and Response Report.	Appendix E4
Release of Draft Reports	This Consultation Basic Assessment Report [cBAR] has been advertised and made available for a period of 30 days for public review and comment. This cBAR is now available for review until the 20th April 2018.	
Public Meetings / Open Days	A public Meeting was held with the local residents on 11th July 2017.	Appendix E3
Release of final Reports	The final Basic Assessment Report will be the product of all comments and studies, before being submitted to KZN EDTEA for review and decision-making.	__

5.6 Summary of Key Specialist Findings

5.6.1 *Wetland Impact Assessment*

This assessment was conducted by **Dr Richard Kinvig and Mr Luke Bodman of Kinvig and Associates Environmental Consultants [KAEC]**. For the full report, refer to Appendix D2.

5.6.1.1 *Methodology*

Wetland Delineation

The outer temporary boundaries of the wetlands on-site were delineated using the method contained within the DWAF guideline 'A practical field procedure for the identification and delineation of wetlands and riparian areas' (**DWAF, 2005**). This guideline document stipulates that consideration be given to four specific wetland indicators required to determine the outer edge of the temporary boundary of a wetland. These indicators are:

- **Terrain Unit** - identify those parts of the landscape where wetlands are most likely to occur e.g. valley bottoms and low-lying areas.
- **Soil Form** - identify the soil forms associated with prolonged and frequent saturation.
- **Soil Wetness** - identify the soil morphological "signatures" that develop in soils characterised by prolonged and frequent saturation.
- **Vegetation** - identify the presence of hydrophilic vegetation associated with frequently saturated soils.

Wetland Classification:

The wetlands identified on-site were classified into individual hydro-geomorphic (HGM) units as per the Classification System developed by **SANBI** through the user manual - *'Classification System for Wetlands and other Aquatic Ecosystems in South Africa'* – compiled by **Ollis et al. (2013**). This was achieved by observing the topographical and geomorphic setting, and the general hydrology of the wetland units.

Wetland Health Description and Present Ecological Status (PES)

The current health of the assessed wetland systems was determined using the WET-Health tool developed by **Macfarlane et al. (2009)**. A Level 1 assessment was utilised in accordance with the requirements set out by DWS.

Wetland Ecosystem Services Assessment:

The current value of the affected wetland units was determined using the WET-EcoServices tool developed by **Kotze et al. (2009)**. Specific information required to be entered into the predesigned WET-EcoServices spread sheet was gathered during the field visit and during a desktop analysis using GIS software. Once all the required information was entered into the spread sheet, the effectiveness, opportunity and overall functional scores for each the ecosystem services provided by the wetland units was generated. Each overall functional score was then rated accordingly.

Wetland Ecological Importance and Sensitivity (EIS):

The ecological importance of a water resource is an expression of its importance for the maintenance of ecological diversity and functioning on local and wider scales **(DWAF, 1999)**. The ecological sensitivity refers to a system's ability to resist disturbance and its capacity to recover from disturbance once it has occurred **(DWAF, 1999)**. The ecological importance and sensitivity (EIS) can be calculated according to the determinants listed in below and attributing a score to each. Once calculated the **EIS Category** (EISC) can be determined. The **Category** ranges from A to D, with A being Very High and D being Low / Marginal, respectively.

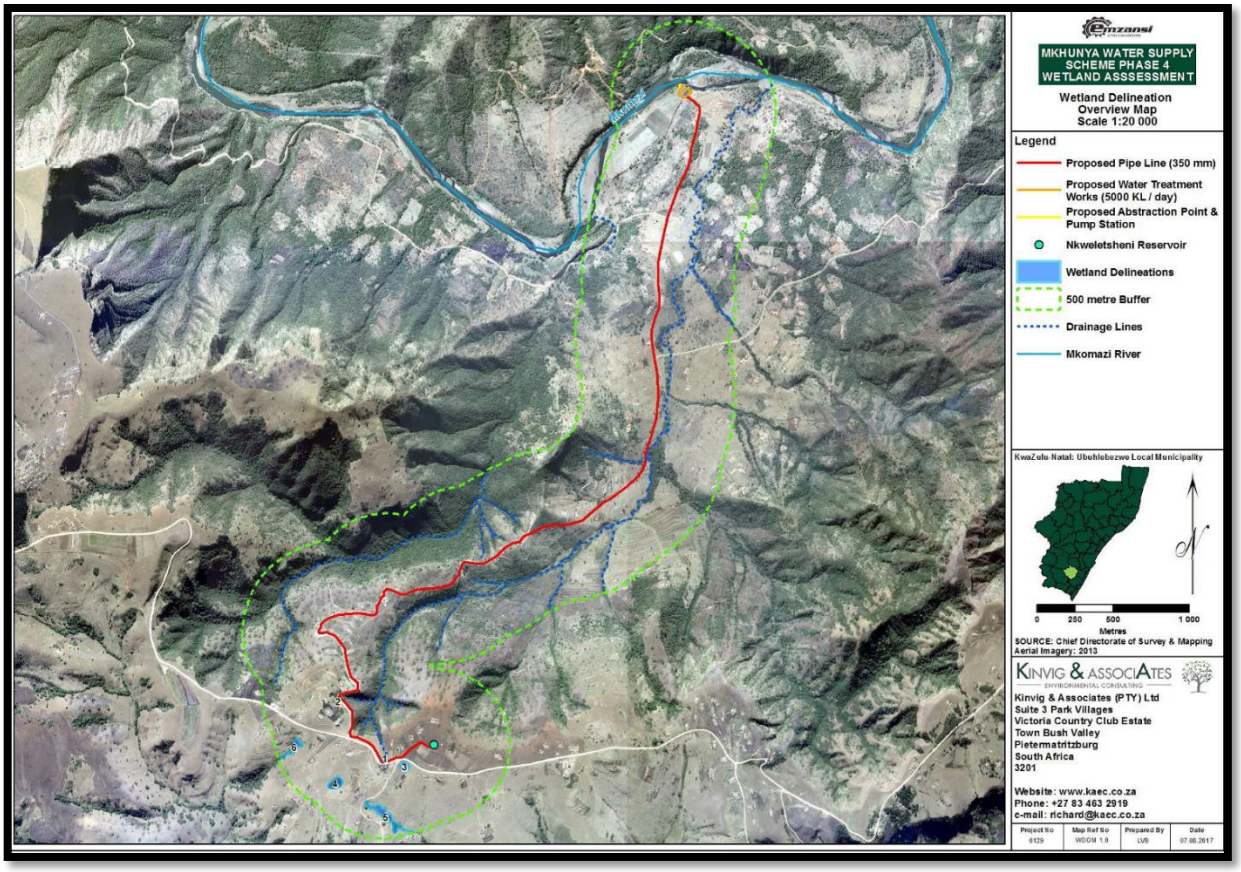


FIGURE 10: MAP OF THE STUDY AREA SHOWING THE 500 METRE BUFFER

Figure 10 above illustrate the study area showing the 500 metre radius from the proposed infrastructure that defines the boundary of the study area. The numerous non-perennial and perennial streams together with the Umkomaas River characterize the study area.

5.6.1.1 *Study Findings*

A wetland delineation assessment was undertaken for the proposed activities. Map of the wetland delineation overviews are provided in **Figures 11** illustrates the contours of the site and elevation of the wetlands delineated.

Only one National Freshwater Ecosystem Priority Area (NFEPA) has been intersected by the proposed WTW and pump station. The NFEPA wetland had been labelled as a channeled valley bottom wetland which is inaccurate as it should be labelled as the associated floodplain of the *Mkomazi* River. However, the NFEPA wetland desktop delineations have been conducted at a high resolution which results in the spatial layers being relatively inaccurate. Upon ground truthing the site, it was evident that the WTW and pump station are both situated on an elevated platform above the *Mkomazi* River and associated floodplain and thus do not impact upon these systems.

Within the 500 metre buffer of the proposed activities (**Figure 10**), six (6) hydrogeomorphic units (HGM) were identified, however, only one wetland – **HGM Unit 1** – may be impacted upon and was delineated. The wetland unit and the HGM category are provided in **Table 15** below.

TABLE 15: WETLAND UNIT AFFECTED BY THE PROPOSED PROJECT

HGM Unit	Hydro-Geomorphic Type (Under natural conditions)	Area (ha)
1	Depression	0.09

The following wetland hydrogeomorphic unit was identified in the study area:

One depression wetland.

The wetlands assessed comprised of various wetland zones (temporary, seasonal, permanent) due to:

- Past and current activities and disturbances;
- The wetlands presence on a valley head bounded by a dirt road;
- High alien invasive plant species abundance, and;
- A large variance between summer and winter rainfall.

HGM Unit 1 is a very small wetland and situated on a gentle slope at the head of a valley, thus at the start of a catchment. Therefore, **HGM Unit 1** has a very limited catchment and if the wetland were not a depression, a wetland of may have not augmented. However, being a depression wetland, hydrological flows are captured and remain resident at the valley head. The head of the wetland is bounded by a dirt road with a servitude area of approximately 12 metres that consists of alien vegetation domination. The toe of the wetland is intersected by footpath and historic pipe line servitude and directs flows towards an incised drainage line that leads down the steep valley floor.

The current impacts being imparted on the wetlands are as a result of:

- Dirt road;
- Footpath;
- Earthen storm water drainage channel;
- High alien invasive plant species infestation;
- Erosion;
- Sedimentation;
- Historic pipe line servitude;
- Desiccation;
- Cattle grazing, trampling, paths, defecation and;

- General disturbance due to the wetland system being close to the gravel road.

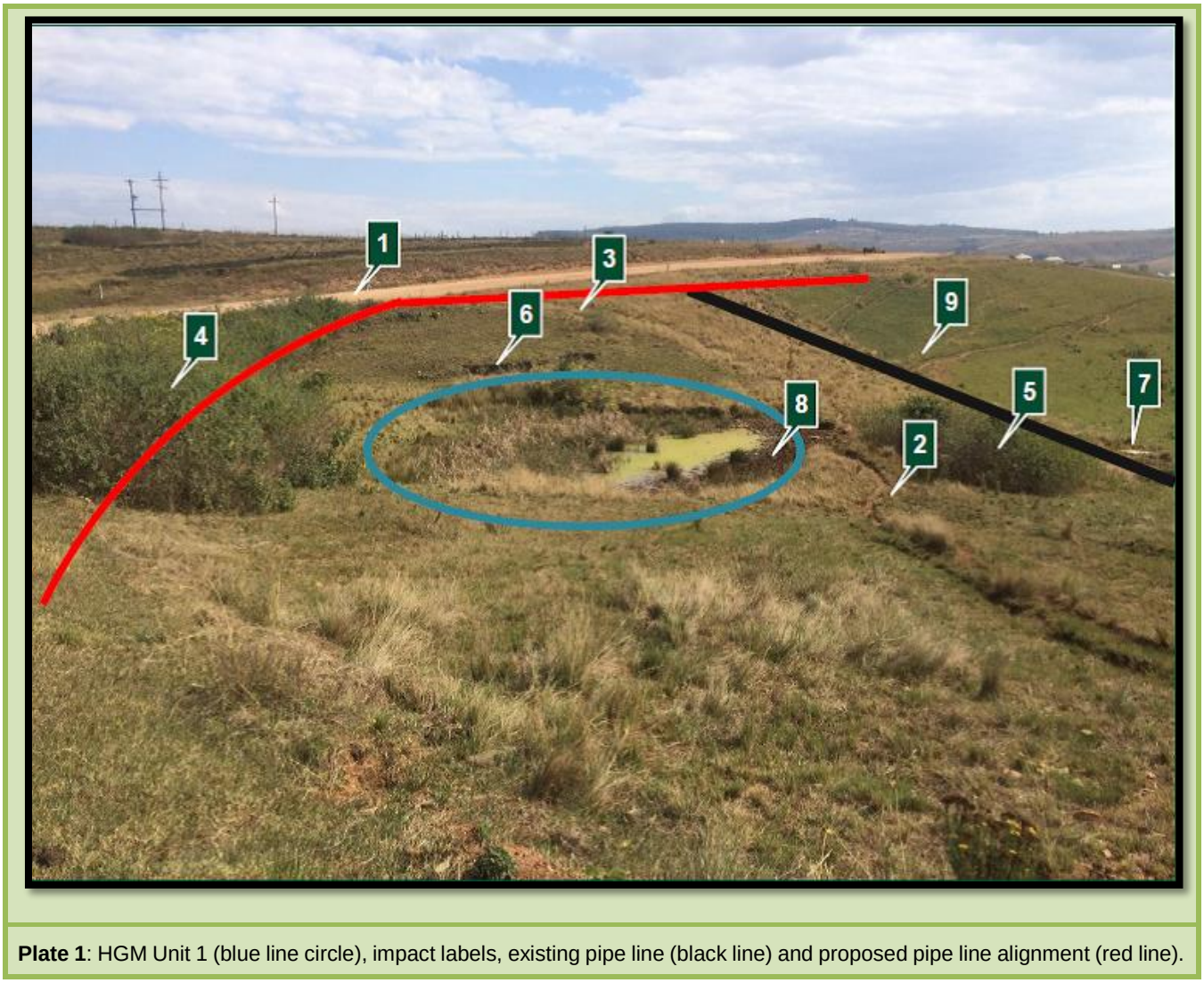


Plate 1: HGM Unit 1 (blue line circle), impact labels, existing pipe line (black line) and proposed pipe line alignment (red line).

A summary of the present hydrological, geomorphic and vegetation states and associated impacts are tabularised below for **HGM Unit 1**:

TABLE 16: IMPACTS OF HGM UNIT 1.

HGM Unit	HGM	Impacts On Wetland Hydrology	Impact On Wetland Geomorphology	Impacts On Wetland Vegetation
1	**Depression**	▪ Decrease in wetland saturation (zonation). ▪ Road runoff. ▪ Crossings. ▪ Pollution (water quality). ▪ Existing pipe line disturbing flow regime.	▪ General disturbance, crossings, domestic animal impacts. ▪ Alteration of erosion and deposition regime. ▪ Roads (Hardening and source of sediment) ▪ Bare soils (increased erosion and sediment yield). ▪ Existing pipe line servitude.	▪ High prevalence of alien invasive vegetation. ▪ Decrease in ecological complexity. ▪ Fragmentation. ▪ Degradation of vegetation.

Present Ecological Status

HGM Unit 1 (**Figure 11**) is 0.09 hectares in extent and is bounded by a dirt road at the valley head. The current anthropogenic impacts are; road infrastructure, stormwater drainage outfalls, servitude intersections, erosion, sediment deposition and domestic animal disturbances. These impacts have all had a significant effect on the integrity of the wetland.

The present ecological state for HGM Unit 1 is found to be largely modified. This translates into a large change in ecosystem processes and loss of natural habitat and biota has occurred.

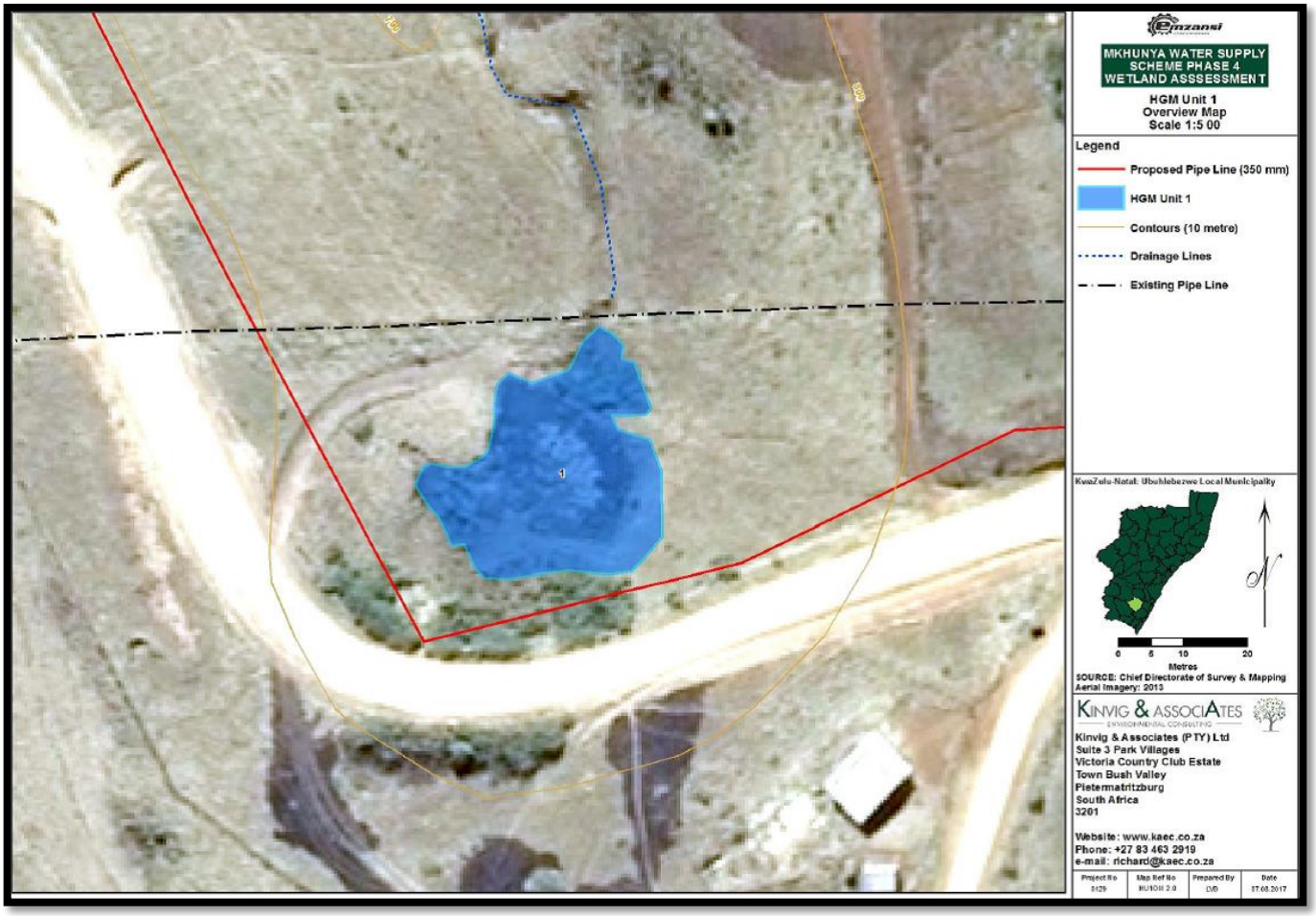


FIGURE 11: MAP ILLUSTRATING HGM UNIT 1.

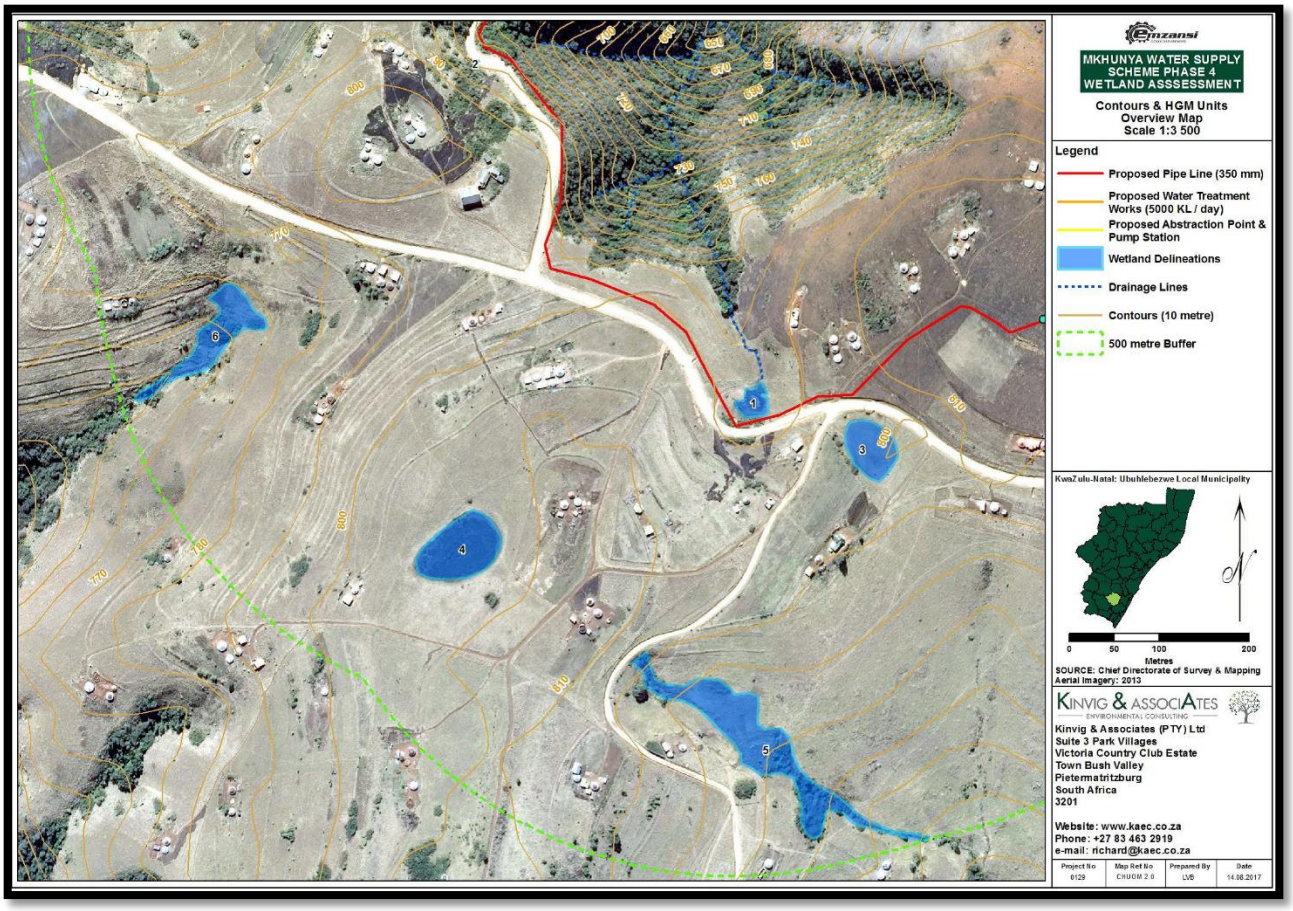


FIGURE 12: MAP OF THE WETLANDS WHICH WERE IDENTIFIED AND DELINEATED IN THE STUDY AREA

Figure 12 above illustrate the Wetlands which were identified and delineated in the study area that are shown by blue shading and numbers.

HGM Unit 1 is within a gently sloped area where the head of the wetland is bounded by a dirt road. HGM Unit 1 is situated at the head of the valley and captures hydrological flows from the microcatchment of the surrounding slopes, run-off from the dirt road and the constructed earthen storm water drain. **HGM Unit 1**, as a depression wetland, has not been lost, due to its clayey soils resulting in the residency times of the captured hydrological flows being extended.

This wetland 'bowl' at the valley head in times of increased storm events does direct flows diffusely towards an incised drainage line at the toe of the wetland. There is a pool of water within the depression (Figure 12) that is a result of hoof action by cattle, seeking water that has triggered bioturbation disturbance in the wetland. The livestock trampling and their utilisation of the wetland plants as a food resource has also contributed to the wetland having standing water. The algal bloom in the water is as a result of the defecation by cattle, resulting in increased nutrients (phosphates and nitrates) in the water and shallow stagnant open water that is prone to elevated water temperatures both of which support an algal bloom.

The earthen berm storm water drain directs flows from the dirt road, into the wetland. This has resulted in the wetland area receiving uncontrolled storm water inputs, resulting in scouring out of the wetland. Sediment has also been deposited at the single discharge area, when flows are reduced during normal rainfall events. Some diffuse flows do enter the wetland as portions of the slope are vegetated with grass species. However, footpaths and cattle paths channel flows at an increased velocity (due to no vegetation) towards the wetland, resulting in sedimentation

and erosion. Hence the embankment around the wetland has some areas which are denuded of vegetation and as a result there are some small erosion gullies present. Livestock, through trampling, have caused a significant portion of the toe of the wetland (**Plate 2**) to be desiccated; due to bioturbation and destruction of vegetation. The wetland desiccation at the toe of the wetland has been further exaggerated by the presence of an existing pipe line which provides potable water to the surrounding community. Therefore, this area of the wetland has been impacted upon significantly, which overtime will result in a reduced wetland zone and possible increased channel formation.

The vegetation composition within the wetland was mostly hydrophilic species (water-loving) such *asTypha capensis and Juncus cf. effusus*. The terrestrial zone between the dirt road and head of the wetland comprised an elevated woody species component, which was dominated by alien invasive plant species, namely; *Lantana camara* and *Caesalpinia decapetala*. Both alien invasive plant species were also surrounding the wetland in small pockets which overtime may infest the entire area, as a result of the current impacts which are driving the ecology of the area. These infestations will contribute to the further desiccation of the wetland.

The following photographic is the wetland unit HGM 1 delineated.

Plate 2: Illustration of the pooled water and area prone to cattle seeking water resulting in hoof action that disturbs the wetland soils. The yellow arrow indicates the alien invasive plant species above the wetland and adjacent the road.

The wetlands in the study **area** perform the following valuable functions:

- Flood attenuation
- Stream flow regulation

- Sediment trapping
- Phosphate trapping
- Nitrate removal
- Toxicant removal
- Erosion control
- Carbon storage
- Maintenance of biodiversity
- Water supply for human use
- Natural resources
- Cultivated foods
- Cultural significance
- Tourism and recreation
- Education and research

HGM Unit 1 functions at a moderately high level for the majority of the assessed ecosystem goods and services. This is due to the wetland being a depression wetland that can absorb some impacts and offer good and services that are useful to the rural community. For example, the depression is able dissipate flows from the surrounding slopes and retain flows for use by the community; either for subsistence use or livestock watering.

HGM Unit 1 is functioning at a level where it is able to provide some ecosystem good and services that lessen impacts on the downstream systems such as being the initial recipient of hydrological flows and sediment in the catchment.

Therefore, **HGM Unit 1** has a **moderately high to intermediate** ecosystem service delivery in regard to stream flow regulation, toxicant removal, nitrate removal, phosphate trapping, natural resources, sediment trapping, erosion control, carbon storage, flood attenuation and water supply for human use.

HGM Unit 1 functionality may be improved through the reduction of the encroaching alien invasive plant species and deactivation of the gullies directed into the wetland.

Conservation Importance of Watercourses & Wetlands in the Study Area

HGM Unit 1 scored a **Class D (Low)**. This depression wetland is not considered to be ecologically important and sensitive at any scale. The biodiversity of this wetland is ubiquitous and not sensitive to flow and habitat modifications. This wetland does have a highly reduced role in moderating the quantity and quality of water on site due to its very small size.

Ecological Impacts and Mitigation Measures

Of the proposed activities, only the installation of the bulk water pipe line may impact upon **HGM Unit 1**. The impacts will not be direct impacts, but rather indirect impacts that may potentially be imparted as a result of poor planning and construction monitoring. The pipe line to be installed has a diameter of 350 mm

Due to the proposed activity having a low impact and risk upon the wetland identified, the rehabilitation plan attached at **Appendix D2** and the recommendations to be followed must be utilised to avoid impacting on **HGM Unit 1** and the site as a whole.

Regarding the pipe line, the direct impacts include:

- The excavation of the trench;
- Compaction of vegetation and soils;
- Possible erosion as a result of poor back-filling, and;

- Creation of preferential flow paths within the excavated channel as a result of soil subsidence.
- Indirect disturbances that may arise include, but are not limited to:
- Erosion (clearing of the surrounding vegetation);
- Sedimentation, and;
- Likely alien invasive plant species infesting the disturbed areas.

Traversing near any watercourses will need to abide to this reports recommendation below to ensure the impact is mitigated to further reduce any potential impacts being imparted.

All impacts as extracted from the specialist report are explained, rated and assessed in Section 5.7 below. Furthermore, the Wetlands and Aquatic Impact Assessment [KAEC, 2017] offers a detailed Rehabilitation Plan [Section 6 of the full report in Appendix D2 of this cBAR] which must be included in the EMPr.

5.6.2 *Aquatic Assessment*

This assessment was conducted by **Mr. Jonathan Bailey of Kinvig and Associates Environmental Consultants [KAEC]**. For the full report, refer to Appendix D3.

5.6.2.1 *Methodology*

The site was visually assessed during a field assessment conducted on the 22nd November 2017. The Invertebrate Habitat Assessment System (IHAS), Intermediate Habitat Assessment Integrity Assessment (IHIA), and the South African Scoring System version 5 (SASS5) were conducted in order to assess the risks to the aquatic and riparian ecology, in addition to the analyses of biota specific, water quality.

The following investigations were undertaken:

- Initial Desktop Assessment;
- Bio-assessment using the South African Scoring System (SASS), version 5 was undertaken by a DWS Accredited SASS practitioner on the Mkomazi River;
- In-field water quality readings were taken for the Mkomazi River;
- An Integrated Habitat Assessment System (IHAS) was conducted in alignment with the SASS5 sampling;
- An Intermediate Habitat Integrity Assessment (IHIA) was conducted for the Mkomazi River and its immediate catchment area, and;
- Site observations, existing impacts and potential risks were recorded, and potential mitigation measures were provided.

5.6.2.1 *Study findings*

Water Quality

During the field surveys the in situ water quality did not appear to represent a significant limiting factor to the occurrence of aquatic biodiversity within the study area. A point to note is the high turbidity associated with the *Mkomazi* River, which will require removal during the water purification process at the WTW. It is, however, often the rate of change that is most critical to the well-being of aquatic biota.

TABLE 17: IN SITU WATER QUALITY RESULTS.

Site	Temp. (°C)	pH	Electrical conductivity (mS / m)	Dissolved Oxygen (DO) (mg / l & %)	Clarity (cm)
Mkomazi River	24.8	7.9	8.35 (83.5 µS / cm)	7.96 mg / l; 96 %	17

Integrated Habitat Integrity Assessment Results

The Mkomazi River sample site had good habitat available for sampling, however sampling access was restricted due to fast and deep water flows. A good mix of Stones In Current (SIC), Stones Out Of Current (SOOC), with limited bedrock was available. Stretches of Gravel, Sand and Mud (GSM) and Vegetation biotopes were available for sampling. The SASS5 Biotope Score (64 %) confirmed this IHAS assessment.

The in-stream and riparian zones were analysed separately, and the final assessment was then made separately for each, in accordance with **Kleynhans' (1999)** approach to Habitat Integrity Assessment. By calculating the mean of the in-stream and riparian Habitat Integrity scores, an overall Habitat Integrity score can be obtained for the site. This method describes the Present Ecological State (PES) of the in-stream and riparian habitats of the sites, along with the final combined PES for the system.

The In-stream Habitat Integrity indicates that the *Mkomaz*i River has an Integrity Class of B: Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.

The Riparian Habitat Integrity indicates the *Mkomazi* River has an Integrity Class of C / B: Largely natural with moderate modifications. A loss and small change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.

The combined IHI Integrity Class (PES) for the *Mkomazi* River is B (Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged).

The results from the application of the IHIA indicates that there are existing impacts on the present watercourse systems, however these are more closely associated with riparian areas with the ecosystem function remaining intact and essentially unchanged.

The *Mkomaz*i River shows areas of high impacts, where access onto the watercourse embankment and into the watercourse channel are available. The riparian areas have been transformed through livestock grazing, informal sand mining and resource harvesting, however due to the large size of the river and consistently fast and deep waters the river channel has remained intact.

The more significant impacts are associated with the riparian habitat and are associated with *vegetation removal, exotic vegetation encroachment, bank erosion, channel modification and water abstraction*, which must be adequately considered for this proposed development.

These impacts have led to a moderate change in the riparian habitat buffering the watercourse channel, however due to access restrictions into the valley, and the rivers steep and often rocky embankments and the homesteads being well removed from the *Mkomazi* River and its embankments, the **Present Ecological State (PES) is classified as Largely Natural**.

The SASS5 biomonitoring investigation on the Mkomazi River identified eighteen (18) aquatic *macroinvertebrate* taxa, with a SASS score of one hundred and twenty-two (122) and an Average Score Per Taxa (ASPT) of six point eight (6.8). The taxa identified were consistent with those expected in a large river within the lower foothills during the summer period, and predominantly the taxa showed a *moderate to high sensitivity* to water quality impairments. The specialist was re-assured to see a number of *Perlidae sp., Heptageniidae sp. and Psephenidae sp*. within the sample sets, which are highly sensitive to poor water quality and habitat changes, indicating the system is in good health.

The SASS interpretation guidelines (**Dallas 2007**) of the **North Eastern Coastal Belt** (Lower) Ecoregion places this site within the health class of Good (B), which indicates that the *ecosystem is essentially in a good state; biodiversity largely intact, however some human-related disturbance is present but mostly of at a low impact level*.

5.6.2.1 *Conclusion*

The results from the IHAS, IHIA, and SASS5 indicate that the *Mkomazi* River is experiencing low anthropogenic pressures, or the river is of sufficient size with sufficient water flows to assimilate any impacts exerted on it. This is confirmed in the IHAS results of **Largely Natural (PES of B)**, which is supported by the SASS5 ecological category of **Good (B)**.

The *Mkomazi* River is located within a steeply incised valley, which provides an added benefit of restricting excessive human traffic into the area and has reduced the immediate pressure on the watercourse with homesteads constructed on the escarpment or outside of the watercourse area. Immediate pressures are associated with grazing, agriculture and harvesting of natural resources.

These impacts are associated with the riparian areas, which provides important buffering to the instream channel, which in turn could affect the aquatic habitat and water quality, if allowed to continue in an unmanaged and unsustainable way. An increase in residential development is expected within the area, however this could be reduced with the provision of potable water to the escarpment community, applying less pressure on the immediate valley bottom area adjacent the watercourse. The grazing pressures and use of the watercourses natural resources, specifically associated with the riparian areas, will have to be addressed through Municipal management plans to ensure continued deterioration is prevented to safe guard the investment in infrastructure.

5.6.3 *Vegetation Assessment*

This assessment was conducted by **Dr Neil Wilson of The Ecological Partnership**. The full report can be found in Appendix D1 of this cBAR.

5.6.3.1 *Methodology*

Field work was carried out on 22nd September 2017 in the footprint of the proposed development, which henceforth is referred to as the study area (Fig. 2). Field data were obtained to describe the baseline environment and determine the general ecological state of the study area. Plant samples were taken in this area for identification. Details of any animals which were observed were recorded for identification purposes. A search was undertaken for plant and animal species of conservation concern, in addition to protected and specially protected plant and animal species.

5.6.3.1 *Study Findings*

TABLE 18: A SAMPLE OF PLANT SPECIES IDENTIFIED ON EITHER SIDE OF THE PROJECT FOOTPRINT

PLANT SPECIES	PLANT TYPE & LOCATION
***Aloe arborescens* (Krantz Aloe)**[1]	Succulent shrub; near pipeline's footprint in EVB & KZNHT areas.
Aloe barberae (Tree Aloe)	Tree; near pipeline's footprint in EVB area.
***Aristida junciformis subsp. junciformis* (Gongoni Three-awn)**[2,3]	Grass; dominant in & near pipeline's footprint from Nkweletsheni reservoir along P77; in & near pipeline's footprint in KZNHT area.
Berkheya sp.	Perennial herb; in pipeline's footprint in EVB area.
*Bidens pilosa** (Common Black-jack)	Introduced herbaceous weed; along pipeline's footprint.

Boophone disticha (Fan-leaved Boophone)	Herbaceous bulb; near pipeline's footprint in Nkweletsheni reservoir area.
Capparis sepiaria var. citrifolia (Long-hair Caper-bush)	Scrambling shrub; near pipeline's footprint in KZNHT area.
Carissa bispinosa (Num-num)	Small tree; near pipeline's footprint in KZNHT area.
Celtis africana (White-stinkwood)	Tree; near pipeline's footprint in KZNHT area.
Chaetacanthus burchellii (Fairy Stars)	Shrublet; in pipeline's footprint from Nkweletsheni reservoir along P77.
***Coddia rudis* (Small Bone-apple)[2]**	Shrub; near pipeline's footprint in KZNHT area.
Combretum kraussii (Forest Bushwillow)	Tree; near pipeline's footprint in KZNHT area.
***Cussonia spicata* (Cabbage-tree)[2]**	Tree; near pipeline's footprint in KZNHT area.
Eragrostis capensis (Heart-seed Love Grass)	Grass; in & near pipeline's footprint from Nkweletsheni reservoir along P77.
***Eragrostis racemosa* (Narrow Heart Love Grass)[3]**	Grass; in & near pipeline's footprint from Nkweletsheni reservoir along P77.
***Euphorbia ingens* (Naboom Euphorbia)[1,2]**	Succulent tree; near pipeline's footprint in EVB & KZNHT areas.
***Euphorbia tirucalli* (Hedge Euphorbia)[1]**	Succulent tree; in & near pipeline's footprint in EVB area.
Ficus burtt-davyi (Scrambling Fig)	Scrambler; near pipeline's footprint in KZNHT area.
Ficus glumosa (Mountain Fig)	Tree; near pipeline's footprint in KZNHT area.
Ficus sur (Broom-cluster Fig)	Tree; near pipeline's footprint in KZNHT area.
Gerbera ambigua (Pink & White Gerbera)	Perennial herb; in & near pipeline's footprint from Nkweletsheni reservoir along P77.
Helichrysum aureonitens (Golden Everlasting)	Perennial herb; in & near pipeline's footprint along P77.
Helichrysum odoratissimum (Impepho)	Perennial herb; in & near pipeline's footprint from Nkweletsheni reservoir along P77.
Indigofera sp.	Herb; in & near pipeline's footprint from Nkweletsheni reservoir along P77.
*Lantana camara*** (Lantana)	Shrub; Category 1b invader; dominant along length of pipeline's footprint.
Leucas lavandulifolia	Robust annual herb; in & near proposed water treatment works.
*Melia azedarach*** (Seringa)	Tree; Category 1b invader; Scattered near homesteads in EVB area.
***Melinis repens subsp. repens* (Natal Red Top)[1]**	Grass; in & near proposed water treatment works.
Paspalum sp.	Grass; in pipeline's footprint in KZNHT area.
Pentanisia prunelloides (Broad-leaved Pentanisia)	Herb; in & near pipeline's footprint along P77.
Phymaspermum acerosum (Geelblombos)	Shrublet; along pipeline's footprint near Nkweletsheni reservoir.
*Ricinus communis*** (Castor-oil Plant)	Annual herb or shrub; Category 2 invader; scattered in & near pipeline's footprint.
Sclerocroton integerrimum (Duiker-berry)	Tree; near pipeline's footprint in EVB area.
Senecio bupleuroides (Yellow Starwort)	Perennial herb; along pipeline's footprint near Nkweletsheni reservoir.
Senegalia caffra (Common Hook Thorn)	Small tree; near pipeline's footprint in KZNHT area.
*Senna didymobotrya*** (Peanut Butter Cassia)	Evergreen shrub; Category 1b invader; scattered in & near pipeline's footprint.
Sida dregei (Spider-leg)	Shrublet; in & near pipeline's footprint from Nkweletsheni reservoir along P77; in pipeline's footprint in KZNHT area.
Solanum duplo-sinuatum (Bitter Apple)	Erect herb; along pipeline's footprint near Nkweletsheni reservoir.
*Solanum mauritianum*** (Bugweed)	Shrub/small tree; Category 1b invader; scattered along length of pipeline's footprint.
Sporobolus africanus (Ratstail Dropseed)	Grass; widespread in & near pipeline's footprint.

***Sporobolus pyramidalis* (Catstail Dropseed)1**	Grass; common in pipeline's footprint in EVB area; dominant in & near pumphouse & proposed water treatment works.
Tephrosia capensis	Shrublet; in & near proposed water treatment works.
Tetradenia riparia (Misty Plume Bush)	Slightly succulent shrub; near pipeline's footprint in KZNHT area.
Vachellia nilotica subsp. *kraussiana* (Scented-pod Thorn)	Young tree; in pipeline's footprint near Nkweletsheni reservoir.
Vachellia robusta1	Tree; near proposed water treatment works; near pipeline's footprint in EVB area.
***Ziziphus mucronata* (Buffalo-thorn)2**	Tree; near pipeline's footprint in KZNHT area.

*[Fp denotes field point – see fig. 2]. Declared plant invaders are indicated with a double asterisk**. Category 1b plant invaders are prohibited according to the national environmental management biodiversity act and must be removed, while category 2 plant invaders require a permit to be retained [government gazette, 2014]. Protected plant species are shown in bold according to schedule 7 of the KwaZulu-Natal nature conservation management amendment act [1999]. Facultative wetland species [fw] usually grow in wetlands, but occasionally are found in non-wetland areas; facultative species [f] are equally likely to grow in wetlands and non-wetland areas [DWAF, 2005].*

The following plates provide photographic context of the terrestrial vegetation identified in the study area.

Plate 3: View of the disturbed pipeline's footprint near the Nkweletsheni reservoir. The P77 district road can be seen in the top right field of view.

Plate 4: View of the disturbed pipeline's footprint near the Nkweletsheni reservoir. The P77 district road can be seen in the top right field of view.

Plate 5: View of the footprint of the proposed Water Treatment Works lies in the immediate foreground on the floodplain of the Mkomazi River.

Plate 6: View of the existing pumphouse that will be upgraded and the adjacent area on the floodplain of the Mkomazi river.

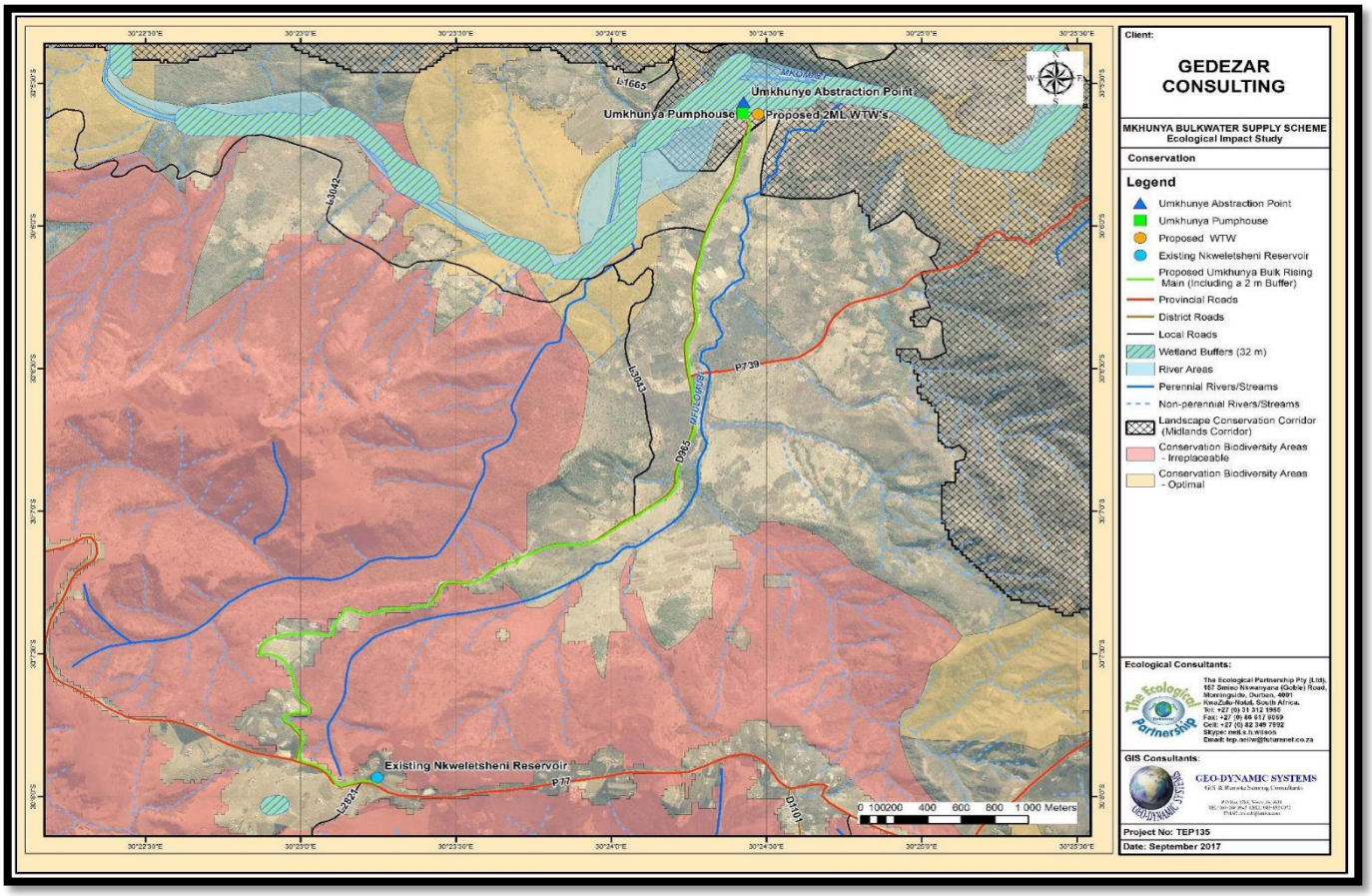


FIGURE 13: MAP OF THE VEGETATION TYPES FOUND IN THE STUDY AREA

Figure 12 above illustrates Ezemvelo KZN Wildlife's Terrestrial Systematic Conservation Assessment shows Critical Biodiversity Areas (irreplaceable & optimal CBA's) and a Landscape Conservation Corridor (Midlands Corridor) that have very high conservation value in or near the footprint of the proposed water supply scheme.

Conservation Importance of the Terrestrial Vegetation in the Study Area

Although the present study focuses on the existing disturbed roadside footprint of the proposed water supply scheme development, it is pertinent to emphasise the conservation importance of the adjacent natural vegetation types, namely Eastern Valley Bushveld, KwaZulu-Natal Hinterland Thornveld and KwaZulu-Natal Sandstone Sourveld.

Eastern Valley Bushveld has a Least Threatened conservation status **(Jewitt, 2011)**. A vegetation type or ecosystem is Least Theatened when the best available evidence indicates that it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened (IUCN, 2012). In 2008, 100,046ha (31.9%) of this vegetation type had been transformed and 213,704ha (68.1%) remained in the natural state in KwaZulu-Natal **(Jewitt, 2011).** Only 605.6ha (0.2%) are statutorily protected. The conservation target is 78,438ha (25%), which is far from being met (Jewitt, 2011).

KwaZulu-Natal Hinterland Thornveld has a Least Threatened conservation status **(Jewitt, 2011;).** A vegetation type or ecosystem is Least Theatened when the best available evidence indicates that it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened (IUCN, 2012). In 2008, 52,780ha (34.6%) of this vegetation type had been transformed and 99,761ha (65.4%) remained in

the natural state in KwaZulu-Natal **(Jewitt, 2011).** Only 397.3ha (0.3%) are statutorily protected. The conservation target is 38,135ha (25%), which is far from being met **(Jewitt, 2011).**

KwaZulu-Natal Sandstone Sourveld has a Critically Endangered conservation status **(Jewitt, 2011).** A vegetation type or ecosystem is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the vegetation type or ecosystem is facing an extremely high risk of extinction **(IUCN, 2012)**. In South Africa, Critically Endangered ecosystems are classified as those that have undergone severe degradation of ecological structure, function or composition resulting from human activities and are subject to an extremely high risk of irreversible change **(Government Gazette, 2011)**; In 2008, 159,105ha (88.6%) of this vegetation type had been transformed and 20,566ha (11.4%) remained in the natural state in KwaZulu-Natal **(Jewitt, 2011)**. Only 194ha (0.1%) are statutorily protected. The conservation target is 44,918ha (25%), which is far from being met **(Jewitt, 2011).**

The footprint of the proposed pipeline lies between irreplaceable Critical Biodiversity Areas (CBA's) for just under half of its length. Two optimal Critical Biodiversity Areas (CBA's) lie close to the proposed development at its northern end, while the Mkhunya pumphouse, proposed water treatment works and initial length of pipeline lie in the Midlands Landscape Conservation Corridor. The CBA's and Landscape Conservation Corridor have very high conservation value.

No plant species of conservation concern, endemic plant species or protected plant species were found in the study area. Of the fauna, the Southern Boubou is endemic to southern African, while the Cape Sparrow and Burchell's Coucal are near-endemics **(Sinclair, Hockey, Tarboton & Ryan, 2011).**

The specific impacts and their ratings from the Vegetation Assessment have been incorporated into the impact assessment of this BA, refer to Section 5.7. The Rehabilitation Plan found within the Vegetation Assessment must be included in the EMPr.

5.6.4 *Heritage Impact Assessment*

The Heritage Impact Assessment [HIA] was conducted by G&A Heritage Management. The full report is attached to this cBAR as Appendix D5.

5.6.4.1 *Methodology*

This study defines the heritage component of the BA process being undertaken for the Proposed Mkhunya Bulk Water Supply Scheme. It is described as a first phase [HIA]. This report attempts to evaluate both the accumulated heritage knowledge of the area as well as information derived from direct physical observations.

Evaluating Heritage Impacts

A combination of document research as well as the determination of the geographic suitability of areas and the evaluation of aerial photographs determined which areas could and should be accessed. After plotting of the site on a Geographic Positioning System [GPS] the areas were accessed using suitable combinations of vehicle access and access by foot.

Sites were documented by digital photography and geo--located with GPS readings using the WGS 84 datum. Further techniques [where possible] included interviews with local inhabitants, visiting local museums and information centres and discussions with local experts. All this information was combined with information from an extensive literature study as well as the result of archival studies based on the South African Heritage Resource Agency [SAHRA] provincial databases.

The HIA relies on the analysis of written documents, maps, aerial photographs and other archival sources combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study;

- South African National Archive Documents
- South African Heritage Resource Internet System [SAHRIS] Database of Heritage Studies
- Internet Search
- Historic Maps
- 1963, 1976, 1989 and 2000 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2016 imagery
- Published articles and books
- JSTOR Article Archive

Fieldwork

Fieldwork for this study was performed on the 5th of July 2017. Most of the areas were found to be accessible on foot. The survey was tracked using GPS and a track file in GPX format is available on request.

The Heritage Impact Assessment report goes into further detail in terms of the impact assessment methodology and ratings used. This is not repeated here, but can be found in Appendix D5 of this cBAR.

5.6.4.1 *Study Findings*

The area was investigated during a field visit and through archival studies. The site was found to be devoid of any heritage sites with significance. It is recommended that obscured, subterranean sites and graves be managed, if they are encountered. The alignment follows the reserve of a newly constructed paved road and any possible damage has already been done. Backfilling for the road made the identification of any heritage sites impossible.

PLATE 7: GRAVES ALONGSIDE THE PROPOSED MKHUNYA BULK RISING MAIN

These seem to be the remains of the old Riverside Shop and consists of several buildings with extensive security in the form of stout burglar bars on the windows. The buildings are now abandoned. It is not expected that these will be of any historic nature since their age could not be verified on the historic maps.

PLATE 8: RUINS OF THE RIVERSIDE SHOP

The following findings are applicable to the study area:

TABLE 19: HISTORIC SIGNIFICANCE

NO	CRITERIA	SIGNIFICANCE RATING
1	**Are any of the identified sites or buildings associated with a historical person or group?** No	N/A

2	**Are any of the buildings or identified sites associated with a historical event?** No	N/A
3	**Are any of the identified sites or buildings associated with a religious, economic social or political or educational activity?** No	N/A
4	**Are any of the identified sites or buildings of archaeological significance?** No	N/A
5	**Are any of the identified buildings or structures older than 60 years?** No	N/A

TABLE 20: ARCHITECTURAL SIGNIFICANCE

NO	CRITERIA	SIGNIFICANCE RATING
1	***Are any of the buildings or structures an important example of a building type?*** No	N/A
2	***Are any of the buildings outstanding examples of a particular style or period?*** No	N/A
3	***Do any of the buildings contain fine architectural details and reflect exceptional craftsmanship?*** No	N/A
4	***Are any of the buildings an example of an industrial, engineering or technological development?*** No	N/A
5	***What is the state of the architectural and structural integrity of the building?*** No	N/A
6	***Is the building's current and future use in sympathy with its original use (for which the building was designed)?*** N/A	-
7	***Were the alterations done in sympathy with the original design?*** N/A	-
8	***Were the additions and constructions done in sympathy with the original design?*** N/A	-
9	***Are any of the buildings or structures the work of a major architect, engineer or builder?*** No	N/A

TABLE 21: SPATIAL SIGNIFICANCE

NO	CRITERIA	SIGNIFICANCE RATING
1	***Can any of the identified buildings or structures be considered a landmark in the town or city?*** No	-
2	***Do any of the buildings contribute to the character of the neighbourhood?*** No	-
3	***Do any of the buildings contribute to the character of the square or streetscape?*** No	-
4	***Do any of the buildings form part of an important group of buildings?*** No	-

TABLE 22: CULTURAL LANDSCAPE

LANDSCAPE TYPE	DESCRIPTION	OCCURRENCE STILL POSSIBLE?	IDENTIFIED ON SITE?
Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Barberton Greenstones	Yes, sub--surface	No
Archaeological	Evidence of human occupation associated with the following phases – Early--, Middle--, Late Stone Age, Early--, Late Iron Age, Pre--Contact Sites, Post--Contact Sites	Yes, sub-surface	No
Historic Built Environment	– Historical townscapes/streetscapes – Historical structures; i.e. older than 60 years – Formal public spaces – Formally declared urban conservation areas – Places associated with social identity/displacement	Yes	No
Historic Farmland	These possess distinctive patterns of settlement and historical features such as: – Historical farm yards – Historical farm workers villages/settlements – Irrigation furrows – Tree alignments and groupings – Historical routes and pathways – Distinctive types of planting – Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting.	No	No
Historic rural town	– Historic mission settlements – Historic townscapes	No	No
Pristine natural landscape	– Historical patterns of access to a natural amenity – Formally proclaimed nature reserves – Evidence of pre--colonial occupation – Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages – Historical structures/settlements older than 60 years – Pre--colonial or historical burial sites – Geological sites of cultural significance.	No	No
Relic Landscape	– Past farming settlements – Past industrial sites – Places of isolation related to attitudes to medical treatment – Battle sites – Sites of displacement,	No	No
Burial grounds and grave sites	– Pre--colonial burials (marked or unmarked, – known or unknown) – Historical graves (marked or unmarked, known – or unknown) – Graves of victims of conflict – Human remains (older than 100 years) – Associated burial goods (older than 100 years) – Burial architecture (older than 60 years)	Yes	No
Associated Landscapes	– Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes – Sites associated with displacement & contestation – Sites of political conflict/struggle – Sites associated with an historic event/person	No	No

	– Sites associated with public memory		
Historical Farmyard	– Setting of the yard and its context – Composition of structures – Historical/architectural value of individual structures – Tree alignments – Views to and from – Axial relationships – System of enclosure, e.g. defining walls – Systems of water reticulation and irrigation, e.g. furrows – Sites associated with slavery and farm labour – Colonial period archaeology	No	No
Historic institutions	– Historical prisons – Hospital sites – Historical school/reformatory sites – Military bases	No	No
Scenic visual	– Scenic routes	No	No
Amenity landscape	– View sheds – View points – Views to and from – Gateway conditions – Distinctive representative landscape conditions – Scenic corridors	No	No

The impacts and their ratings from the HIA have been incorporated into the impact assessment of this BA, refer to Section 5.7.

5.7 Impacts and Residual Risks Assessment

5.7.1 *Introduction*

Impact assessment must take into account the nature, scale and duration of effects on the environment, whether such effects are positive [beneficial] or negative [detrimental].

It is also imperative that each issue / impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase.

Where necessary, the proposal for mitigation or optimisation of an impact is noted.

The environmental impact assessment is focused on the following phases of the project namely: **Pre-Construction, Construction, and Operational Phases** only. The impacts associated with decommissioning phase are not applicable to this project, however, responsible methods of post-construction clean-up are provided in the EMPr.

As the project entails rehabilitation of existing infrastructure which will be permanent, decommissioning is not applicable to this project, however, impacts associated with post construction clean-up are considered.

5.7.2 *Methodology*

The potential environmental impacts associated with the project are evaluated according to it nature, extent, duration, intensity, probability and significance of the impacts, whereby:

- ***Nature***: A brief written statement of the environmental aspect being impacted upon by a particular action or activity;

- ***Extent***: The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- ***Duration***: Indicates what the lifetime of the impact will be;
- ***Intensity***: Describes whether an impact is destructive or benign;
- ***Probability***: Describes the likelihood of an impact actually occurring; and
- ***Cumulative***: In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

TABLE 23: CRITERIA TO BE USED FOR THE RATING OF IMPACTS

Criteria	Description			
EXTENT	**National (4)** The whole of South Africa	**Regional (3)** Provincial and parts of neighbouring provinces	**Local (2)** Within a radius of 2 km of the construction site	**Site (1)** Within the construction site
DURATION	**Permanent (4)** Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	**Long-term (3)** The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-transitory	**Medium-term (2)** The impact will last for the period of the construction phase, where after it will be entirely negated	**Short-term (1)** The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase
INTENSITY	**Very High (4)** Natural, cultural and social functions and processes are altered to extent that they permanently cease	**High (3)** Natural, cultural and social functions and processes are altered to extent that they temporarily cease	**Moderate (2)** Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way	**Low (1)** Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
PROBABILITY OF OCCURRENCE	**Definite (4)** Impact will certainly occur	**Highly Probable (3)** Most likely that the impact will occur	**Possible (2)** The impact may occur	**Improbable (1)** Likelihood of the impact materialising is very low

Significance is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

TABLE 24: CRITERIA FOR THE RATING OF CLASSIFIED IMPACTS

	Class	Description
+	**Any value**	Any positive / beneficial 'impact', i.e. where no harm will occur due to the activity being undertaken.
–	**Low impact**	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.

	Class	Description
	(4 -6 points)	
	Medium impact (7 -9 points)	Mitigation is possible with additional design and construction inputs.
	High impact (10 -12 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
	Very high impact (12 - 14 points)	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status		Denotes the perceived effect of the impact on the affected area.
Positive (+)		Beneficial impact.
Negative (-)		Deleterious or adverse impact.
Neutral (/)		Impact is neither beneficial nor adverse.
It is important to note that the status of an impact is assigned based on the *status quo* – i.e. should the project not proceed. Therefore, not all negative impacts are equally significant.		

The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented. Mitigation measures identified as necessary will be included in an EMPr

5.7.3 *Potential Impacts and Significance*

The following sections will provide a description of the potential impacts as identified by the specialists, EAP and through the PPP as well as the assessment according to the criteria described in Table 21 and Table 22.

All potential impacts associated by the proposed development through the construction and operation of the development life-cycle have been considered and assessed in the following sections. As the infrastructure is expected to be permanent, the decommissioning phase impacts have not been considered.

5.7.4 *Impact Assessment*

This section presents the impact assessment according the methodology in the preceding sections, in a tabular form.

5.7.4.1 *Soil*

TABLE 25: SOILS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing). **Impact:** Physical degradation due to the removal and compaction of soil during construction activities.	**Without**	2	2	2	2	-8	Medium
		With	1	1	1	1	-4	Low
		Mitigation measures: ▪ Strip topsoil prior to any construction activities. ▪ Topsoil must be kept separate from overburden and must not be mixed with other layer of soil and sub-soil. ▪ Topsoil must not be stockpiled for an extended period of time. ▪ Soil must be returned to the trench in the correct order, with topsoil on top. The top-soil must then be de-compacted.						
	Aspect: Construction activities (site clearing). **Impact:** Physical degradation due to soil erosion as a result of exposed soil and topsoil.	**Without**	2	2	2	3	-9	Medium
		With	1	1	1	2	-5	Low
		Mitigation measures: ▪ Soil erosion is related to the water velocity and volume as well as the presence of well-established vegetation. ▪ Mitigation measures therefore include the development of velocity barriers for stormwater run-off and ensuring exposed areas are rehabilitated as detailed in the EMPr.						
	Aspect: Establishment of contractor laydown area (camp). **Impact:** Impact on land use and land capability – disturbance of soils and/or agricultural land use potential due to the location of the construction camp and associated infrastructure.	**Without**	1	2	2	2	-7	Medium
		With	1	1	1	1	-4	Low
		Mitigation measures: ▪ The contractor laydown area must be placed in an area where agricultural activities are not undertaken. ▪ The contractor laydown area may not be placed in or in close proximity to any watercourse. ▪ No material may be stored or equipment repaired beyond the boundaries of the contractor laydown area.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing). **Impact:** Physical degradation due to the removal and compaction of soil during construction activities.	**Without**	2	2	2	2	-8	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ Strip topsoil prior to any construction activities. ▪ Topsoil must be kept separate from overburden and must not be mixed with other layer of soil and sub-soil. ▪ Topsoil must not be stockpiled for an extended period of time. ▪ Soil must be returned to the trench in the correct order, with topsoil on top. This must then be de-compacted.						
	Aspect: Construction activities (site clearing). **Impact:** Physical degradation due to soil erosion as a result of exposed soil and topsoil.	**Without**	2	2	2	3	-9	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Soil erosion is related to the water velocity and volume as well as the presence of well-established vegetation. Mitigation measures therefore include the development of velocity barriers for stormwater run-off and ensuring exposed areas are rehabilitated as detailed in the EMPr.						
	Aspect: Establishment of contractor laydown area (camp). **Impact:** Impact on land use and land capability – disturbance of soils and/or agricultural land use potential due to the location of the construction camp and associated infrastructure.	**Without**	1	2	2	2	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ The contractor laydown area must be placed in an area where agricultural activities are not undertaken. ▪ The contractor laydown area may not be placed in or in close proximity to any watercourse. ▪ No material may be stored or equipment repaired beyond the boundaries of the contractor laydown area.						

5.7.4.1 *Geology & Topography*

TABLE 26: GEOLOGY & TOPOGRAPHY

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Foundations. **Impact:** Disturbance of surface geology and topography resulting in site instability due to inadequate drainage and/or inappropriate engineering planning and interventions.	**Without**	1	2	3	3	-9	**Medium**
		With	1	2	1	2	-6	**Low**
		Mitigation measures: ▪ It is important to allow for on-site inspections and evaluations by an experienced engineering geologist / geotechnical engineer so that stability problems can be timeously identified and remedied. ▪ All earthworks should be carried out in a manner to promote stable development of all infrastructure. ▪ It is recommended that earthworks be carried out along the guidelines given in SANS 1200 (current version). ▪ Earthworks and drainage measures should be designed in such a way as to prevent ponding of, or high concentrations of, stormwater or groundwater anywhere on the sites. ▪ The geology must be returned to its pre-construction condition.						
	Aspect: Construction activities (site clearing). **Impact:** Gully or 'donga' erosion by concentrated, uncontrolled water-flow.	**Without**	1	2	2	2	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ Cut embankments must be protected against surface erosion by the establishment of vegetation immediately after construction. ▪ Suitable subsoil drainage, stormwater control and preventable solutions to avoid soil erosion will be required in areas with sandy soils, and particularly in close proximity to watercourses.						

5.7.4.1 *Aquatic*

TABLE 27: AQUATIC IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Removal of vegetation buffering watercourses for construction purposes and for associated activities. **Impact:** Direct loss of watercourse and riparian habitat; altering the banks of a watercourse	**Without**	1	1	3	3	-8	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: ▪ Ensure sufficient buffer between the watercourse and construction areas is provided. Limit the number of watercourse impact points. ▪ Reduced construction servitudes must be enforced at all drainage lines, storm water outlets and watercourse impact areas, in agreement with the ECO. ▪ Concrete encasing of pipe lines within the riparian edge and at all drainage lines, storm water outlets and watercourse impact points must occur. ▪ Rehabilitation of the impacted area to pre-construction or better must occur. ▪ Note: Those watercourses authorised for crossing or working within must be clearly identified and all NO-GO areas must be clearly demarcated to ensure access into them is prevented. ▪ Watercourse impact areas for construction must be limited to permitted points only.						
	Aspect: Sediment input into aquatic ecosystems **Impact:** Degradation of the watercourse, impeding, diverting and altering the watercourse and its embankments; Reduced water quality and sediment entering watercourse.	**Without**	1	2	1	2	-6	Low
		With	2	2	2	2	-8	Medium
		Mitigation measures: ▪ Storm water management into the buffer zones and the 100 year flood lines must be implemented to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. The use of berms, cut off drains, silt curtains, attenuation structures and other engineering solutions must occur to prevent sediment entering the watercourse.						
	Aspect: Pollution inputs into the watercourse, e.g. litter, hydrocarbons, etc. **Impact:** Degradation of the watercourse and riparian habitat; Reduction in water quality	**Without**	1	2	2	2	-7	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: ▪ Pollution sources must be removed from the watercourse and buffer areas and must be at least 100 m away from any watercourse. Waste, hydrocarbons, sewage, vehicle access and other pollutants must be managed in accordance to a construction EMPr, with sufficient mitigations to identify and manage construction concerns.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Removal of vegetation within the watercourse, alteration of the banks and watercourse bed. **Impact:** Direct loss of watercourse and riparian habitat; altering the banks of a watercourse	**Without**	1	1	3	3	-8	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: ▪ Limit the number of areas of impacts associated with drainage lines, storm water outlets and watercourse and keep to existing impacted areas. ▪ Drainage lines, storm water outlets and watercourse impact areas for construction must be limited to approved points only and servitude restrictions must be enforced. ▪ Construction within the Mkomazi River and its associated old riverbed must occur during the low flow (winter) period. ▪ The abstraction point must be isolated from the active Mkomazi River channel via shutter or other sturdy engineering methods during the construction phase. ▪ Storm water management into the buffer zones and the 100 year flood lines must be implemented to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. ▪ Rehabilitation of the impacted area to pre-construction or better must occur.						
	Aspect: Sediment input into aquatic ecosystems **Impact:** Degradation of the watercourse, impeding, diverting and altering the watercourse and its embankments; Reduced water quality and sediment entering watercourse.	**Without**	1	2	1	2	-6	Low
		With	2	2	2	2	-8	Medium
		Mitigation measures: ▪ Storm water management into the buffer zones and the 100 year flood lines must be implemented to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. ▪ The construction within drainage lines, storm water outlets and the Mkomazi River must be scheduled for the dry months. ▪ The use of berms, silt curtains, attenuation structures, shuttering and other engineering solutions must occur to prevent sedimentation of the watercourse						
	Aspect: Pollution inputs into the watercourse, e.g. litter, hydrocarbons, etc. **Impact:** Degradation of the watercourse and riparian habitat; Reduction in water quality	**Without**	1	2	2	2	-7	Medium
		With	1	2	1	2	-6	Low
		Mitigation measures: ▪ Pollution sources must be removed from entering all drainage lines, watercourses and buffer areas and must be at least 100 m away from any watercourse and preferably outside of the 100 year flood line. Waste and sewage areas must be contained and serviced regularly to prevent build up. Hydrocarbons and other pollutants must be store in a bunded, roofed and lockable storage unit and managed in accordance to an EMPr. ▪ Water quality monitoring must occur on a weekly and monthly basis at all watercourse impact points up-stream and downstream of the impacted area. Weekly water quality readings and photographic records must be taken, with monthly water samples sent for analysis at a SANAS accredited laboratory.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Operation	**Aspect:** Temporary impoundment or alteration of drainage lines and watercourses. **Impact:** Flow alterations and aquatic fauna movement restrictions due to temporary impoundment or alteration.	**Without**	1	1	3	3	-8	**Medium**
		With	1	2	1	2	-6	**Low**
		Mitigation measures: ▪ Water flow must be maintained at all drainage lines and watercourse impact points through the use of cofferdams and flume pipe networks. Construction within the drainage lines, storm water outlets and watercourse, specifically the Mkomazi River must occur in the low rainfall months (Winter) with isolation of the abstraction point via shuttering or other engineering options to be implemented prior to construction occurring.						
	Aspect: WTW backwash and flocculent water discharges, overflows and incidents. **Impact:** Reduction in water quality, increased sedimentation, waste and pollution.	**Without**	1	2	1	2	-6	**Low**
		With	2	2	2	2	-8	**Medium**
		Mitigation measures: ▪ A Management Plan must be implemented for the development addressing chemical (coagulant / flocculent and chlorine) use and discharge during the backwashing and WTW maintenance procedure, along with maintenance procedures for emergency and routine works at the abstraction point, WTW and pipe line. ▪ All operational waste products emanating from the development must be clearly identified and method of disposal and control must be provided.						
	Aspect: Long term impacts of Infrastructure operations and maintenance associated with the buffer areas and watercourses. **Impact:** Cumulative impact	**Without**	1	2	2	2	-7	**Medium**
		With	1	2	1	2	-6	**Low**
		Mitigation measures: ▪ A monitoring programme must be implemented on a monthly and biannual basis to ensure the watercourse and associated riparian vegetation is managed in compliance to Legal requirements. ▪ This must include monthly water quality sampling on the Mkomazi River (up-stream and downstream) bi-annual biomonitoring using SASS5, along with fixed point photography at the watercourse impact points. ▪ Note: Waste and pollutants must be managed at source and must not impact on the watercourse..						

5.7.4.1 *Vegetation*

TABLE 28: VEGITATION IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Clearing of vegetation for the construction of the pipeline. **Impact:** Upgrading of the pumphouse and construction of the water treatment works will result in the loss of and disturbance to floodplain grassland areas	**Without**	1	1	2	3	-7	Medium
		With	1	1	1	1	-4	Low
		Mitigation measures: ▪ Excavation of the pipeline's trench in the existing disturbed roadside area only; ▪ Restriction of all construction activities to the construction area by way of clear demarcation and toolbox talks; ▪ Rehabilitation of any damaged areas outside the construction footprint according to the rehabilitation plan.						
	Aspect: Clearing of riparian vegetation for construction of pipeline and reservoir. **Impact:** loss of ecosystem functions or species	**Without**	1	3	1	3	-8	Medium
		With	1	1	1	1	+4	Low
		Mitigation measures: ▪ Strict excavation of the pipeline's trench in the existing disturbed roadside area; restricting all construction activities to the construction area by way of clear demarcation and toolbox talks; rehabilitating any damaged areas outside the construction footprint according to the rehabilitation plan.						
Construction	**Aspect:** Upgrading of the pumphouse, construction of the water treatment works and laying of the pipeline **Impact:** Negative ecological impacts are likely to be of moderate-high significance without mitigation, resulting in a large loss of habitat, biota and basic ecosystem functions	**Without**	1	1	2	3	-7	Medium
		With	1	1	1	1	-4	Low
		Mitigation measures: ▪ During upgrading of the pumphouse and construction of the water treatment works, topsoil and indigenous grassland vegetation should be removed carefully so that they can be used during the rehabilitation phase once upgrading and construction have been completed. ▪ During excavation of the 1m wide and 1.5m deep pipeline trench, topsoil must be kept separate from the subsoils. Topsoil should be placed on one side of the trench in the 2m wide work buffer area, while subsoils are deposited on the other side of the trench in the other 2m wide work buffer area. ▪ During filling of the trench, the subsoils should be placed in the trench first, followed by the topsoil; rehabilitation of affected areas according to the rehabilitation plan.						

Aspect: Erosion of soil from the development's footprint into nearby terrestrial areas. **Impact:** Loss and change of natural habitats and biota with some changes in basic ecosystem functions, but no species' loss	Without	**1**	**3**	**1**	**3**	**-8**	Medium
	With	1	1	1	1	+4	**Low**
	Mitigation measures: ▪ After upgrading of the pumphouse and construction of the water treatment works, topsoil and indigenous grassland vegetation that were carefully removed, should be used to rehabilitate any affected areas; after filling the 1m wide and 1.5m. 25 deep pipeline trench with subsoils and topsoil, the seeds of a suitable soil-binding grass species should be sown in the pipeline's footprint; rehabilitation of affected areas according to the rehabilitation plan.						
Aspect: Alien plant invaders at disturbed roadside environment along the footprint of the proposed pipeline. **Impact:** Alien plant invader colonisation and dispersal are likely to have negative ecological impacts on the indigenous vegetation types which are present near the development's footprint.	**Without**	1	1	2	3	-7	**Medium**
	With	1	1	1	1	-4	**Low**
	Mitigation measures: ▪ Removal and destruction of all alien plant invaders which are present in and near the development's footprint BEFORE construction begins; ▪ Restriction of all construction activities to the construction area by way of clear demarcation and toolbox talks; ▪ Prevention of damage and disturbance to indigenous vegetation outside the development's footprint by way of clear demarcation and toolbox talks; ▪ Regular checks of the development's footprint for new growth of alien plant invaders during the construction and operational phases, and destruction of any plant invaders, if found.						
Aspect: Construction-related pollutants during the construction phase **Impact:** Contamination may affect the various habitats, plants and animals and infiltrate the water-table in and near the development's footprint.	**Without**	1	2	2	1	-6	**Medium**
	With	1	1	1	1	-4	**Low**
	Mitigation measures: ▪ Restricting all construction activities to the construction area by way of clear demarcation and toolbox talks; ▪ Careful control of all hazardous substances and compulsory use of drip-trays or impermeable bunding; ▪ Cleaning-up liquid and solid hazardous waste spillages immediately; hazardous spillages and contaminated soil should be taken to an authorised waste disposal centre; immediate rehabilitation of any polluted areas.						
Aspect: Construction related runoff. **Impact:** Pollution of watercourse and wetland areas near the development's footprint	**Without**	1	1	2	3	-7	**Medium**
	With	1	1	1	1	-4	**Low**
	Mitigation measures: ▪ Restricting all construction activities to the construction area by way of clear demarcation and toolbox talks; ▪ Careful control of all hazardous substances and compulsory use of drip-trays or impermeable bunding;						

		▪ Cleaning up liquid and solid hazardous waste spillages immediately; hazardous spillages and contaminated soil should be taken to an authorised waste disposal centre; ▪ Immediate rehabilitation of any polluted areas.						
Cumulative	**Aspect:** Overgrazing and overburning of the veld. **Impact:** Small negative change in habitats and biota with minimal disruption of ecosystem functions	**Without**	1	1	2	3	+7	**Medium**
		With	1	1	1	2	+7	**Medium**
		Mitigation measures: ▪ Mitigation involves effective implementation of all mitigation measures mentioned above.						

5.7.4.1 *Wetlands*

TABLE 29: WETLANDSIMPACT ASSESSMENT

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Removal of vegetation for construction purposes and for associated activities **Impact:** Reduction in water quality and altered flows	**Without**	2	2	2	3	-9	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ Storm water must be kept outside of the wetland buffer zones to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. ▪ Storm water management from the gravel road must be improved and the flows must be dissipated, through the use of dissipation blocks or reno-mattresses, which will promote reduction in water velocities and promote infiltration. ▪ Rehabilitation of the impacted area to pre-construction or better must occur. ▪ Correct procedures to follow and ensure the ROW is utilised. ▪ Pollution sources must be removed from the watercourse, conservation and buffer areas and must be at least 100 metres away from any watercourse. Waste, hydrocarbons, sewage and other pollutants must be managed in accordance to a construction EMPr. All hazardous substances must be located at least 100 metres away from a watercourse and store in a bunded, roofed and lockable storage unit. ▪ Sediment control measure must be implemented on the downward slopes of all stripped areas. ▪ Water quality monitoring must occur, in accordance to a proposed construction and operational water quality monitoring programme. No informal fires should be permitted in within the study area. ▪ Ensure that an adequate number of rubbish bins are provided so as to prevent litter and ensure the proper disposal of waste generated during construction activities. ▪ Edge effects of activities, particularly erosion and alien/weed control need to be strictly managed. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as medium to high sensitivity areas within the project site.						

	Without	**2**	**1**	**2**	**2**	**-7**	Medium
	With	1	1	1	1	-4	**Low**
Aspect: Sediment input into watercourses **Impact:** Degradation of the watercourse, impeding, diverting and altering the watercourse and its embankments; Reduced water quality and sediment entering watercourse**.**	**Mitigation measures:** ▪ Storm water must be kept outside of the wetland buffer zones to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. ▪ Storm water management from the gravel road must be improved and the flows must be dissipated, through the use of dissipation blocks or reno-mattresses, which will promote reduction in water velocities and promote infiltration. ▪ Rehabilitation of the impacted area to pre-construction or better must occur. ▪ Correct procedures to follow and ensure the ROW is utilised. ▪ Pollution sources must be removed from the watercourse, conservation and buffer areas and must be at least 100 metres away from any watercourse. Waste, hydrocarbons, sewage and other pollutants must be managed in accordance to a construction EMPr. All hazardous substances must be located at least 100 metres away from a watercourse and store in a bunded, roofed and lockable storage unit. ▪ Sediment control measure must be implemented on the downward slopes of all stripped areas. ▪ Water quality monitoring must occur, in accordance to a proposed construction and operational water quality monitoring programme. No informal fires should be permitted in within the study area. ▪ Ensure that an adequate number of rubbish bins are provided so as to prevent litter and ensure the proper disposal of waste generated during construction activities. ▪ Edge effects of activities, particularly erosion and alien/weed control need to be strictly managed. ▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as medium to high sensitivity areas within the project site.						
	Without	1	1	3	1	-6	**Medium**
	With	1	2	2	2	-7	**Medium**
Aspect: Pollution inputs into watercourses, eg. litter, hydrocarbons, etc.. **Impact:** Degradation of the watercourse and riparian habitat; Reduction in water quality	**Mitigation measures:** ▪ Storm water must be kept outside of the wetland buffer zones to dissipate flows, reduce sediment movement and prevent waste and pollution concerns. ▪ Storm water management from the gravel road must be improved and the flows must be dissipated, through the use of dissipation blocks or reno-mattresses, which will promote reduction in water velocities and promote infiltration. ▪ Rehabilitation of the impacted area to pre-construction or better must occur. ▪ Correct procedures to follow and ensure the ROW is utilised. ▪ Pollution sources must be removed from the watercourse, conservation and buffer areas and must be at least 100 metres away from any watercourse. Waste, hydrocarbons, sewage and other pollutants must be managed in accordance to a construction EMPr. All hazardous substances must be located at least 100 metres away from a watercourse and store in a bunded, roofed and lockable storage unit. ▪ Sediment control measure must be implemented on the downward slopes of all stripped areas. ▪ Water quality monitoring must occur, in accordance to a proposed construction and operational water quality monitoring programme. No informal fires should be permitted in within the study area.						

<table>
<tr><td></td><td></td><td colspan="7">▪ Ensure that an adequate number of rubbish bins are provided so as to prevent litter and ensure the proper disposal of waste generated during construction activities.
▪ Edge effects of activities, particularly erosion and alien/weed control need to be strictly managed.
▪ The EMPr will advise on special (and on-going) monitoring activities that will target areas that have been identified as medium to high sensitivity areas within the project site.</td></tr>
<tr><td rowspan="3">Post-Construction</td><td rowspan="3">Aspect:
Re-instituting indigenous vegetation and clearing of alien invasive species.

Impact:
Rehabilitation not occurring or conducted in a poor manner.</td><td>Without</td><td>2</td><td>1</td><td>2</td><td>2</td><td>-7</td><td>Medium</td></tr>
<tr><td>With</td><td>1</td><td>1</td><td>1</td><td>1</td><td>-4</td><td>Low</td></tr>
<tr><td colspan="7">Mitigation measures:
▪ Monitoring programme to include assessment conducted by a vegetation specialist to ensure rehabilitation has been conducted in an acceptable manner.</td></tr>
<tr><td rowspan="3">Operation</td><td rowspan="3">Aspect:
Accidental potable water discharges & leaks.

Impact:
Possible degradation to watercourse habitat</td><td>Without</td><td>2</td><td>1</td><td>2</td><td>2</td><td>-7</td><td>Medium</td></tr>
<tr><td>With</td><td>1</td><td>1</td><td>1</td><td>1</td><td>-4</td><td>Low</td></tr>
<tr><td colspan="7">Mitigation measures:
▪ Infrastructure to be monitored and incidents to be responded to immediately.</td></tr>
</table>

5.7.4.1 *Air Quality and Odour*

TABLE 30: AIR QUALITY AND ODOUR IMPACT ASSESSMENT

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing; operation of vehicles, equipment etc.). **Impact:** Fugitive dust emissions from debris handling and debris piles; mobile plant/machinery and general construction activities.	**Without**	2	2	2	3	-9	Medium
		With	1	1	1	2	-5	Low
		Mitigation measures: ▪ Dust must be suppressed on the construction site during dry periods by the regular application of water. ▪ Water used for this purpose must be used in quantities that will not result in the generation of run-off. ▪ Dust dispersion from construction activities, roads, soil stockpiles and other construction locations will be limited and suppressed to the maximum extent practical. ▪ Surplus fill material sites and stockpiles will be positioned such that they are not vulnerable to wind erosion. ▪ Cover skips and trucks which are loaded with construction materials. ▪ All piles should be maintained for as short a time as possible and should be enclosed by wind-breaking enclosures of similar height to the pile. ▪ Stockpiles should be situated away from the site boundary, watercourses and nearby receptors and should take into account the predominant wind direction. ▪ A speed limit of 40 km/hr should be set for all vehicles travelling over exposed areas or near stockpiles. ▪ Dust and mud should be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary.						
	Aspect: Construction activities (site clearing; operation of vehicles, equipment etc.). **Impact:** Generation of fumes from vehicle emissions may pollute the air.	**Without**	2	1	3	3	-9	Medium
		With	2	1	2	2	-7	Medium
		Mitigation measures: ▪ All mobile plant and equipment must be in good working order. ▪ A register must be maintained for vehicle maintenance. ▪ All mobile plants that are unable to be repaired immediately must be removed from service until such time as they are in good working condition.						
	Aspect: Chemical toilets. **Impact:** Release of odours as a result of the chemical toilets on-site.	**Without**	1	2	3	2	-8	Medium
		With	1	1	1	2	-5	Low
		Mitigation measures: ▪ Chemical toilets must be provided and cleaned on a regular (weekly) basis. ▪ Servicing receipts must be maintained and kept on site within the site environmental file.						

5.7.4.1 *Noise*

TABLE 31: NOISE IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Constructions staff, vehicles and equipment. **Impact:** Increase in noise pollution from construction vehicles and construction staff.	**Without**	1	1	3	3	-8	Medium
		With	1	1	1	2	-5	Low
		Mitigation measures: ▪ All construction activities must be undertaken according to daylight working hours. ▪ The Contractor may consider providing all equipment with standard silencers. Maintain silencer units in vehicles and equipment in good working order. ▪ All mobile plant and equipment must be regularly maintained to ensure their integrity and reliability. ▪ Construction staff working in an area where the 8-hour ambient noise levels exceed 75 dBA must have the appropriate Personal Protective Equipment (PPE). ▪ All operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No. 85 of 1993). ▪ Surrounding communities and adjacent landowners are to be notified upfront of noisy construction activities (blasting and excavations). ▪ A Complaints Register is to be kept at the Site Office at all times.					

5.7.4.1 *Visual*

TABLE 32: VISUAL IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** During construction the clearing and grading of the site would create a visual scar in the landscape. Exposed bare soil would contrast with the prominently green multi-crop fields. Large construction vehicles and equipment may also be visible to receptors within the study area.	**Without**	2	3	2	1	-8	Medium
		With	2	2	1	1	-6	Low
		Mitigation measures: ▪ Limited clearing of vegetation on the development site. This will retain the screening function of natural vegetation. ▪ Carefully plan to reduce the construction period. ▪ Locate the construction camp and storage areas in zones of low visibility i.e. behind dense bush or in lower lying areas. ▪ Minimise vegetation clearing and use a phased approach, only clearing vegetation when required. ▪ Areas of dense bush on the boundaries of the development site should be left intact. ▪ Rehabilitate cleared areas as soon as possible. ▪ Dust suppression techniques should be made use of.					

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		▪ Maintain a neat construction site by removing rubble and waste materials regularly.					

5.7.4.1 *Traffic*

TABLE 33: TRAFFIC IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Increase in traffic from construction vehicles.	**Without**	1	2	2	3	-8	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Arrangements must be made with local communities in order to accommodate construction vehicles on existing road networks. ▪ All damaged roads must be repaired by the contractor. ▪ Construction vehicles are to avoid main roads during peak traffic hours. ▪ All vehicles entering the site are to be roadworthy. ▪ Seatbelts are to be worn at all times. ▪ When using heavy or large vehicles / equipment, "spotters" are to be present to assist the driver with his blind spots. ▪ Any incident or damage to a vehicle must be reported immediately.						

5.7.4.1 *Stormwater*

TABLE 34: STORMWATER IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Increased run-off as a result of construction activities and bare, exposed ground. Potential knock-on impacts to nearby watercourses and their related wetlands through erosion and siltation.	**Without**	1	2	3	3	-9	Medium
		With	1	1	1	2	-5	Low
		Mitigation measures: ▪ Sandbag berms must be placed at regular intervals on all steep slopes on the trench line before and after backfilling in order to minimise erosion and contaminate stormwater run-off into water courses. ▪ When the trench line runs across sloping ground, the topsoil excavated from the trench must be stored on the down-slope side of the trench and the sub-soil on the up-slope side. o This is important for two reasons, firstly, the larger volume of soil is stored upslope of the trench so that if soil fines and silt are washed off the stockpile during rainfall events, these are washed into the trench and not into a water course, and secondly, it is important to separate the two so that the topsoil is placed on top of the subsoil when the trench is backfilled. o This is essential to promote rapid growth of vegetation during the rehabilitation phase. ▪ Newly excavated pipeline trenches on steep slopes must have sandbag berms placed on either side of the trench line radiating out from the soil stockpiles at 10 m intervals. o The berms must point very slightly downhill to prevent stormwater build up. o These berms will greatly reduce the volume of stormwater polluted with silt and soil fines which could impact on rivers and streams below the pipelines and will minimise erosion of bare areas. o Silt and soil fines that build up on the inside of these berms must be removed and placed back on the soil stockpiles. o Stone packs should be placed at the discharge points at the ends of these berms to prevent erosion if necessary. ▪ Once the trenches have been backfilled and the soil compacted, sandbag berms must be placed across the trench lines at 10 m intervals. o Berms must be angled just off 90º to the slope to prevent the build-up of stormwater on the inside of the berm. o Wattle or Gum poles must be pegged in place between the berms to further slowdown the flow of stormwater. The poles must be at least 130 mm in diameter. o The berms will minimise erosion and pollution and will contribute to vegetation growth in a shorter time frame. o Stone packs should be placed at the ends of the berms to prevent erosion at discharge points if necessary. ▪ Suitable erosion control measures shall be implemented at stormwater discharge points, exposed areas and embankments. These measures could include: o The suitable use of sandbags or soil saver; o The prompt rehabilitation of exposed embankment areas with indigenous vegetation; and o The removal of vegetation, only as it becomes necessary for work to proceed.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)
		▪ Over-wetting, saturation and unnecessary run-off during dust control activities and irrigation must be avoided. ▪ Surface water and stormwater must be minimised and not allowed to flow down cut or fill slopes or along pipeline routes without erosion protection measures, as previously discussed, being in place. ▪ All overflow and scours channels shall be lined with stone pitching along their length and at their points of discharge to prevent soil erosion. The point of discharge from these channels must be at a point where there is dense natural grass cover or should have a suitable diffuser mechanism linked to the discharge point. ▪ Channels shall not discharge straight down the contours. These must be aligned at such an angle to the contours that they have the least possible gradient. ▪ All run-off must be collected and channelled to discharge via surface spreaders into drainage lines. ▪ Upon completion of backfilling, sandbag berms must be placed across the bare area created by the trench line. These berms must be angled just off 90º. ▪ The intention is to have a minimum distance of open trench with stockpiled soils exposed to rainfall and stormwater flow at any one time. It is essential that construction and rehabilitation is completed as quickly as is reasonably possible.					

5.7.4.1 *Socio-economic & Health*

TABLE 35: SOCIO-ECONOMIC AND HEALTH IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Expected to provide in excess of 60 jobs during the construction phase.	**Without**	2	3	3	4	+12	**High**
		With	3	3	3	4	+13	**Very High**
		Mitigation measures: ▪ All labour (skilled and unskilled) and Contractors should be sourced locally where possible. ▪ A labour and recruitment policy will be developed, displayed and implemented by the contractor. ▪ Recruitment at the construction site will not be allowed. ▪ Where possible, labour intensive practices (as opposed to mechanised) should be implemented. ▪ The principles of equality, BEE, gender equality and non-discrimination will be implemented.						
	Aspect: Construction activities. **Impact:** Job creation during the construction	**Without**	2	2	2	2	-8	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ If possible all labour should be sourced locally. ▪ Contractors and their families may not stay on-site.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
	phase could result in the influx of people to the area.	▪ No informal settlements will be allowed.						
	Aspect: Construction activities. **Impact:** Contractors, the influx of people and potential job creation will result in the proliferation of social ills and issues such as crime, prostitution, the spread of HIV/AIDS, informal settlements etc. Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to a surface water resource.	**Without**	2	2	3	2	-9	**Medium**
		With	2	2	1	1	-6	**Medium**
		Mitigation measures: ▪ The developers need to be actively involved in the prevention of social ills associated with contractors. ▪ If possible all labour should be sourced locally. ▪ Contractors and their families may not stay on-site. ▪ No informal settlements will be allowed. ▪ Contractors must be educated about the risk of prostitution and spread of HIV and AIDS. ▪ Strict penalties will be built into tenders to deal with issues such as petty crime, stock theft, fence cutting, trespassing etc. ▪ No poaching of wildlife or selling of firewood will be allowed.						
	Aspect: Construction activities. **Impact:** Public safety during construction.	**Without**	2	2	2	1	-7	**Medium**
		With	1	2	1	1	-5	**Low**
		Mitigation measures: ▪ Members of the public adjacent to the construction-site should be notified of construction activities in order to limit unnecessary disturbance or interference. ▪ Construction activities will be undertaken during daylight hours.						
	Aspect: Construction activities. **Impact:** Contractor's staff safety during construction.	**Without**	1	2	3	2	-8	**Medium**
		With	1	2	1	1	-5	**Low**
		Mitigation measures: ▪ Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction. ▪ All construction staff must have the appropriate PPE. ▪ The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents. ▪ Report and record any environmental, health and safety incidents to the responsible person.						

5.7.4.1 *Heritage*

TABLE 36: HERITAGE IMPACTS

Phase	Potential Aspect and/or Impact	Mitigation	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Significance (E+D+I+P)	
Construction	**Aspect:** Graves. **Impact:** Pipeline construction	**Without**	1	1	1	2	-5	Low
		With	2	1	1	1	-5	Low
		Mitigation measures: ▪ Provided the construction crew is made aware of their location, the development should have no significant impact on these burial sites.						
	Aspect: Ruins. **Impact:** Pipeline construction.	**Without**	2	2	2	2	-8	Medium
		With	2	1	1	1	-5	Low
		Mitigation measures: ▪ The ruins are not considered to be of historic nature and the pipeline is also not expected to impact on them.						
		With	1	2	1	1	-5	Low
		Mitigation measures: ▪ Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction. ▪ All construction staff must have the appropriate PPE. ▪ The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents. ▪ Report and record any environmental, health and safety incidents to the responsible person.						

6 STUDY FINDINGS AND CONCLUSIONS

6.1 ENVIRONMENTAL IMPACT STATEMENT

6.1.1 *Introduction*

Potential environmental impacts [biophysical and social] associated with the proposed uMkhunya Phase 4 Bulk Water Supply Scheme, in KwaZulu-Natal, have been identified herein.

This BA assesses and addresses all potentially significant environmental issues in order to provide the KZN EDTEA with sufficient information to make an informed decision regarding the proposed project.

6.1.2 *Key Findings of the Study*

Overall, the results of the BA process emerge as having a "***negative low***" environmental significance after mitigation.

The socio-economic impacts are however strongly positive, in that the development will result in a better condition of transportation infrastructure for the receiving community.

The following are key findings and recommendations of the impact assessment.

6.1.3 *Key Conclusions and Recommendations of the Specialist Studies*

6.1.3.1 *Wetland and Aquatic Impact Assessment*

It is recommended that the following is to be conducted to ensure HGM Unit 1 and the site as a whole is protected and not further degraded:

- An alien invasive vegetation management plan for the proposed activities footprint and for HGM Unit 1, must be compiled;
- A detailed monitoring plan to be included as part of the EMPr and contractual documentation, and;
- The Contractor responsible for laying the pipe line is to provide a method statement for traversing HGM Unit 1 buffer zone and for the entire pipe line. This method statement, must be commented on by the wetland specialist and approved by the overseeing Engineer.

6.1.3.1 *Vegetation Assessment*

Soils in the study area range from low to very high erodibility and when combined with steep and very steep slopes, together with torrential rainfall, the risk and probability of significant soil erosion is high. This suite of conditions exists to the east of the water pipeline's footprint in the upper reaches of the Mfulomubi river valley. This emphasises the importance of rehabilitating the development's footprint with the recommended grass species during the rehabilitation phase.

In terms of flood risk, one of the flood banks of the Mkomazi River lies adjacent to the pumphouse and proposed water treatment works, making this floodplain area vulnerable to flooding when the river overtops its banks.

Upgrading of the Mkhunya pumphouse and construction of the water treatment works will take place in the Mkomazi floodplain grassland area dominated by Sporobolus pyramidalis. Starting near the Mkomazi River and ending at the Nkweletsheni reservoir, the proposed pipeline's five-metre wide construction footprint traverses roadside terrain with disturbed vegetation. Alien plant invaders, dominated by Lantana camara, are prominent at the outer edge of

the footprint. Historically, the footprint would have passed through Eastern Valley Bushveld, KwaZulu-Natal Hinterland Thornveld and KwaZulu-Natal Sandstone Sourveld vegetation types before transformation of the vegetation types occurred by various anthropomorphic factors, such as human settlement, road construction and over-burning and over-grazing of the veld. Important species belonging to these natural vegetation types still remain in, near and further away from the pipeline's footprint.

A number of bird, reptile, spider and insect species were observed in and near the development's footprint, together with cattle, goats and donkeys.

Three natural vegetation types in various stages of transformation lie adjacent to the development's footprint and every effort should be made to minimise the development's impacts on these natural vegetation types. In this context, it is pertinent to mention the conservation status of each of the three vegetation types. Eastern Valley Bushveld, which occurs in the Mkomazi floodplain and lower to mid-slope valley areas, has a Least Threatened conservation status. KwaZulu-Natal Hinterland Thornveld, which is found along the mid to upper slope valley areas, also has a Least Threatened conservation status. KwaZulu-Natal Sandstone Sourveld, which occurs at the crest of the valley, has a Critically Endangered conservation status.

Other aspects of conservation importance which are relevant to minimising the development's ecological impacts include the following: The pipeline's footprint lies between irreplaceable Critical Biodiversity Areas (CBA's) for just under half of its length. Two optimal Critical Biodiversity Areas (CBA's) lie close to the proposed development at its northern end, while the Mkhunya pumphouse, proposed water treatment works and initial length of pipeline lie in the Midlands Landscape Conservation Corridor. The CBA's and Landscape Conservation Corridor have very high conservation values.

No plant species of conservation concern, endemic plant species or protected plant species were found in the study area. Of the fauna which were observed, the Southern Boubou is endemic to southern African, while the Cape Sparrow and Burchell's Coucal are near-endemics.

Potential negative ecological impacts resulting from the proposed development include the following: 1. Loss of vegetation and habitat in the development's footprint; 2. Loss of vegetation and habitat belonging to Critically Endangered KwaZulu-Natal Sandstone Sourveld, irreplaceable Critical Biodiversity Areas and the Midlands Landscape Conservation Corridor near the development's footprint; 3. Loss of vital topsoil in the development's footprint; 4. Erosion of soil from the development's footprint into nearby terrestrial areas, watercourses and wetlands during the construction phase, resulting in sedimentation and smothering of terrestrial, aquatic and wetland habitats, flora and fauna. 5. Alien plant invader colonisation of and dispersal in disturbed footprint areas during the construction and operational phases; 6. Contamination of soil and subsurface water through infiltration of construction-related pollutants during the construction phase; 7. Pollution of watercourses and any wetland areas near the footprint from contaminated runoff during the construction phase, resulting in contamination of aquatic, semi-aquatic and wetland habitats, flora and fauna. Negative ecological impacts range from low-moderate to moderate significance without mitigation, while with mitigation these impacts are likely to be of low significance. Cumulative negative ecological impacts are likely to be of high significance without mitigation and of low significance with mitigation.

The rehabilitation plan which is included in this report endeavours to minimise ecological impacts resulting from the proposed development. A crucial part of this plan is the revegetation of the development's footprint with the recommended grass species during the rehabilitation phase.

Recommendations of this ecological impact study are the following: All mitigation measures and the Rehabilitation Plan should be implemented effectively; the construction phase should take place during the drier winter months

when negative ecological impacts associated with rainfall, especially torrential rainfall, will be minimised; provided that all mitigation measures and the Rehabilitation Plan are implemented effectively, there is no good ecological reason why the proposed Mkhunya Water Supply Scheme Development should not proceed.

There are no major gaps, assumptions or limitations in this ecological impact assessment that are likely to influence the significance of the findings.

6.1.3.1 *Heritage Impact Assessment*

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy plant cover in other areas. The following indicators of unmarked sub--surface sites could be encountered:

- Ash deposits [unnaturally grey appearance of soil compared to the surrounding substrate];
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub--surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of subsurface heritage features and the following procedures should they be encountered.
- All construction in the immediate vicinity [50 m radius of the site] should cease.
- The heritage practitioner should be informed as soon as possible.
- In the event of obvious human remains the South African Police Services [SAPS] should be notified.
- Mitigation measures [such as refilling etc.] should not be attempted.
- The area in a 50 m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyze the finds.
-

The Proposed Mkhunya Bulk Water Supply Scheme in the Harry Gwala District Municipality, KwaZulu-Natal was investigated and it was found to be limited in sites of heritage significance.

Provided the recommendations in this report is followed there is no reason, from a heritage point of view, why this development cannot continue.

6.1.4 *Sensitivity Map*

The following map consolidates the sensitivities of the study area as identified in the BA process and by each of the specialist studies. This map must be considered when assessing this application, noting that each of these sensitivity findings have been addressed and mitigation measures have been provided for any possible impacts associated with these areas of sensitivity.

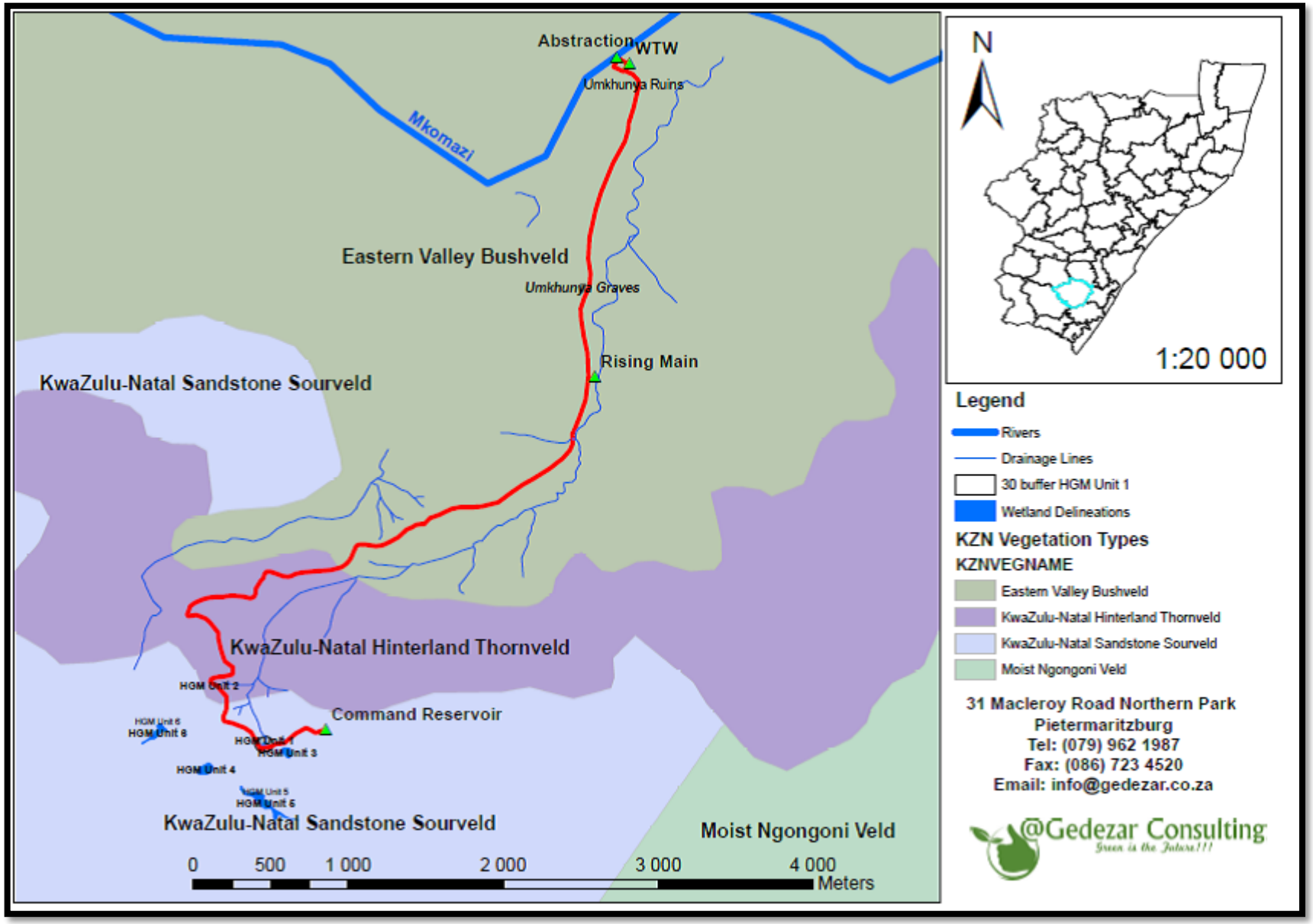


FIGURE 14: SENSITIVITY MAP FOR THE DEVELOPMENT OF THE UMKHUNYA PHASE 4 BULK WATER SUPPLY SCHEME

6.1.5 *EAP Opinion*

This BAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed uMkhunya Phase 4 Bulk Water Supply Scheme, KwaZulu-Natal.

Having duly considered the proposal, there is unlikely to be any significant negative environmental impacts, and the socio-economic benefits are evident.

The findings conclude that there are no environmental fatal flaws that could prevent the proposed development, provided that the recommended mitigation and management measures contained within the EMPr are implemented.

Given the findings of the specialist studies conducted, as outlined in summary above, it is safe to say that no significant impacts have been identified by these studies. This has resulted in an impact assessment yielding an overall result of having “negative low” impact. This is attributed mostly to the short-term negative impacts, which are likely to occur during the construction phase, which can be adequately mitigated and rehabilitated to an acceptable state of environment. It is therefore the recommendation of the EAP that the environmental authorisation is granted for the proposed UMkhunya Phase 4 Bulk Water Supply Scheme, KwaZulu-Natal.

Indeed the proposed development will have more long-term benefits than negative impacts, the latter of which are short-term and associated with the construction phase. The reasons for this are:

- Upkeep, rehabilitation and required upgrades cater to the betterment of the infrastructure;
- Improved stormwater management; and
- Contributes to the long-term vision of providing sustainable water infrastructure to the people of the area, and improved sanitation.

The benefits stated above, far outweigh the negative impacts, which are limited to the construction phase. The development will lead to an improvement in the social, environmental and economic status *quo*, as the water supplied by the proposed infrastructure will enable improved health and sanitation of the communities in the area.

The following recommendations / conditions, although not exhaustive, may be considered for inclusion in the environmental authorisation:

- After upgrading the pumphouse and construction of the water treatment works, any damaged areas of grassland should be landscaped and then receive saved topsoil and grass sods. The topsoil and grass sods of the existing natural grassland (*Sporobolus pyramidalis*) should have been saved prior to the construction of the water treatment works for use during rehabilitation of damaged upgrade and construction related Mkomazi floodplain areas (Plates 1-2). *Sporobolus pyramidalis* is effective in preventing soil erosion (**van Oudtshoorn, 1999**). After the pipeline has been laid, the trench should be filled first with saved *subsoils* and then with saved topsoil. During excavation of the trench, subsoils should have been placed in the work buffer on one side of the trench, while topsoil should have been placed in the work buffer on the other side of the trench for later use during rehabilitation.
- A permit may be required from Ezemvelo KZN Wildlife for the removal of any protected plant species that maybe removed from the site for the development of the water supply or they may need to be transplanted to a safe area, should there be a likelihood of them being affected by the upgrade.
- The EMPr [including the SWMP and Rehabilitation Plans provided in the Vegetation and Aquatic and Wetland Assessments appended to the EMPr] and conditions thereto must be adhered to;
- An ECO must be appointed and all Contractor staff to be trained on the EMPr requirements prior to commencement of activities;

- Alien vegetation and invader species within the vicinity of construction zone are to be removed and indigenous vegetation, where appropriate, to be introduced and managed;
- Monthly environmental compliance monitoring to be conducted during construction and incidents recorded and addressed accordingly;
- The 30 m buffer must be maintained from wetlands;
- A suitably qualified Botanist must be appointed to undertake the demarcation, and relocation of all the protected plant species as well as obtain the relevant licences and permits required from EKZN Wildlife and DAFF respectively.
- All mitigation measures of the specialist studies must be adhered to, particularly those associated with the 11 wetlands identified within the study area.
- The Rehabilitation plan must be costed for in tender documents, along with the rest of the EMPr.

6.1.6 *Conclusion*

This study provided a quantified analysis of the impacts associated with the proposed development. The EAP is of the opinion that the project should be positively authorised, outlining the key findings of the study.

The BA process and report complies with the EIA Regulations of 2014 [as amended in 2017], under which this project has applied and therefore meets all relevant requirements.

The project is envisaged to have a "***negative low***" significance rating post application of mitigations proposed by the relevant specialists.

6.1.7 *Assumptions, Gaps and Limitations of the study*

The BA process followed the legislated process required and as governed and specified by the EIA Regulations [2014 as amended in 2017]. Inevitably, when undertaking scientific studies, challenges and limitations are encountered. For this specific BA, the following challenges were encountered:

6.1.7.1 *Wetland and Aquatic Impact Assessment*

There are no major gaps in the aquatic and wetland ecological impact assessment that are likely to influence the significance of the findings. The main assumption is that the aquatic and wetland samples which were taken are representative of aquatic and wetland environments in the whole study area. The two days of field work constitutes the main limitation for a relatively large aquatic and wetland study.

6.1.7.1 *Vegetation Assessment*

There are no major gaps in the terrestrial vegetation ecological impact assessment that are likely to influence the significance of the findings. The main assumption is that the plant samples which were taken are representative of the vegetation in the whole study area. The three days of field work constitute the main limitation for a relatively large vegetation study.

6.1.7.1 *Heritage Impact Assessment:*

- It is assumed that the SAHRIS database locations are correct.
- It is assumed that the paleontological information collected for the project is comprehensive.
- It is assumed that the social impact assessment and public participation process of the BA will result in the identification of any intangible sites of heritage potential.

6.1.8 *Recommendations*

6.1.8.1 *Recommendations to the CA*

It is advised that the application be assessed holistically, taking into consideration the study area and the fact that the development is confined to an existing road servitude and the project required in order to meet the water needs of the area. As such, the proposed project is not for a new development, but rather for an upgrade. The impacts associated with the development is significantly lower as there is an existing pipeline and the area has been highly transformed.

The project, in the EAP's opinion, does not pose a detrimental impact on the receiving environment and it inhabitants and can be mitigated to an acceptable level.

The Applicant should be bound to stringent conditions to maintain compliance and a responsible execution of the project.

The construction period is planned to commence in July 2018 and span 10 months till July 2019. The Environmental Authorisation [EA] is therefore requested to be valid for three years from date of issue, to accommodate any unforeseen delays.

No post-construction monitoring is specified in this BA, however, it remains the duty of the Applicant to ensure the infrastructure is kept in sound condition.

6.1.8.1 *Recommendations to the Applicant*

The Applicant must adhere to the recommendations provided by the specialist and the EAP. The EMPr summarises these recommendations.

The Applicant must take full responsibility for the execution of the project in a manner which does not negatively impact on the environment by ensuring that responsible decisions are made.

6.2 DECLARATIONS BY THE EAP

The following is hereby affirmed by the EAP to be included in this report:

- the correctness of the information provided in the reports;
- the inclusion of all comments and inputs from stakeholders and I&APs;
- the inclusion of all inputs and recommendations from the specialist reports where relevant; and
- any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by interested and affected parties.

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Andile Mnyandu [EAP]