DRAFT EMPR: BLIKANA BULK WATER SUPPLY SCHEME

PROJECT NAME:

THE PROPOSED BLIKANA RIVER BULK DAM BULK SUPPLY SCHEME, SENQU MUNICPALITY, EASTERN CAPE PROVINCE.

DEDEAT REFERENCE: EC142/JG/LN2/M/25/12

WULA REFERENCE: WU45065

REPORT TITLE:

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

DATE: 04 MAY 2026

EAP

ABANTU ENVIRONMENTAL SERVICES

CONSULTING ENGINEER

GIBB INFRASTRUCTURE & TRANSPORT

FUNDER

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

APPLICANT

SIYA PHAMBILI - ASIJIKI
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DOCUMENT REVISION STATUS

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DATE	February 2026	February 2026	February 2026
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DATE	April 2026	April 2026	May 2026

ACKNOWLEDGEMENTS

The authors acknowledge Gibb (Pty) Ltd for their assistance with project information, layouts and the associated project background Information documents (BIDs) as well as for responding to technical queries related to the project.

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TERMS AND DEFINITIONS

TERMS	DEFINITION
AUDIT	Regular inspection and verification of Construction activities for implementation of the approved EMP
CONSTRUCTION ACTIVITY	A Construction activity is any action taken by the contractor, his subcontractors, suppliers or personnel during the Construction process.
CONTRACTOR	Construction companies are appointed on behalf of the client to undertake the Construction activities, as well as their subcontractors and suppliers.
DWS	Department of Water and Sanitation.
EMERGENCY SITUATION	An incident, which potentially has the ability to significantly impact on the environment, and which, could cause irreparable damage to sensitive environmental features. Typical situations entail amongst others the:- • Spill of petroleum products and lubricants into the aquatic system; • Potential damage, erosion and slumping of unstable river embankments or drainage channels; • Potential event of impeding the continuous flow of water to downstream water users dependent on the flow.
EMPR	Environnemental Management Programme Report. The EMPR for the project sets out general instructions that will be included in a contract document for the Construction phase of the project. The EMPR will ensure the Construction activities are conducted and managed in an environmentally sound and responsible manner.
ENVIRONMENT	The environment means the surroundings within which humans exist and that could be made up of water, air, soil, sand, plants and animals.
EAP	Environmental Assessment Practitioner.
ENVIRONMENTAL IMPACT	An impact or environmental impact is the change to the environment, whether desirable or undesirable, that will result from the effect of a Construction activity. An impact may be the direct or indirect consequence of a Construction activity.
ENVIRONMENTAL CONTROL OFFICER	A qualified person nominated by the appointed contractor and/or client who will ensure the day-to-day implementation of the EMP by contractors during Construction and operation of the project.

TERMS	DEFINITION
ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive environmental impacts and limiting or preventing negative environmental impacts are implemented during the life-cycle of the project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.
GENERAL WASTE	Domestic waste, commercial waste, non-hazardous industrial waste and builders rubble e.g. paper, plastics, food, tins, wood, etc.
HAZARDOUS WASTE	It is any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.
HERITAGE RESOURCES	This means any place or object of cultural significance, including all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa
HERITAGE	That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act, 1999 (Act No. 25 of 1999).
IEM	Integrated Environmental Management.
IMPACT	A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.
NEMA	National Environmental Management Act.
REHABILITATION	Rehabilitation is defined as the return of a disturbed area, feature or structure to a state that approximates to the state (where possible) that it was prior disruption, or to an improved state.
PALAEONTOLOGY	Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.
POLLUTION	The National Environmental Management Act, 1998 (Act No. 107 of 1998) defined pollution to mean any change in the environment caused by – substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

TERMS	DEFINITION
PROJECT/SITE MANAGER	A person who represents the client and is responsible for enforcing the technical and contractual requirements of the project.
SAHRA	South African Heritage Resource Agency
SOLID WASTE	All solid waste, including Construction debris, chemical waste, excess cement/concrete, wrapping material, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
TOPSOIL	The layer of soil covering the earth which provides a sustainable environment for the germination of seeds, allows water penetration, and is a source of micro-organisms and plant nutrients.
WASTE	**:** Waste means any substance, whether or not that substance can be reduced, re-used, recycled and recovered • that is surplus, unwanted, rejected, discarded, abandoned or disposed of; • which the generator has no further use of for the purposes of production; • that must be treated or disposed of; or • that is identified as a waste by the relevant Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but— • a by-product is not considered waste; and • any portion of waste, once re-used, recycled and recovered, ceases to be waste.
WASTE DISPOSAL FACILITY	Waste disposal facility means any site or premise used for the accumulation of waste with the purpose of disposing of that waste at that site or on that premises.
WATER POLLUTION	The National Water Act, 1998 (Act No. 36 of 1998 defined water pollution to be the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it – less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful to the welfare, health or safety of human beings; to any aquatic or non-aquatic organisms; to the resource quality; or to property.
WATERCOURSE	A natural channel or depression in which water flows regularly or intermittently in which water flows regularly or intermittently. Or a wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998).
WUL	Water Use License.

ENVIRONMENTAL ASSESSMENT PRACTITIONER

As per the requirements of the NEMA Regulations and in terms of Regulation 14 of Section 24H Registration Authority Regulations, 2016, as amended, the details and expertise levels of the EAP who prepared the report are provided in **Table *1*** below.

Table 1: Environmental Assessment Practitioner details

Contact Details	
Consultant	Abantu Environmental Services (Pty) Ltd
EAP	Sive Mlamla
SACNASP Registration	118495 – Environmental Sciences
EAPASA Registration	2022/5204
Cell	078 207 8278
Postal Address	41 Avon Place Overbaakens Gqeberha, 6070
Fax	086 685 9536
Email	info@abantuenvironmental.co.za
Website	Website: www.abantuenvironmental.co.za

Expertise of the Lead EAP are entailed in **Table *2***.

Table 2: Lead EAP Profile

Environmental Assessment Practitioner:	Mr Sive Mlamla
Expertise:	Sive Mlamla is an environmental scientist with 11 years of experience in scientific research, lecturing and environmental consulting. His key expertise includes environmental impact assessments, environmental compliance auditing, waste planning, proposal & business development, project management, strategic planning, research design & execution, remote sensing & GIS applications for land use/cover change mapping and fluvial geomorphology. **Qualifications** • M.Sc. Geography (Catchment Hydrology) • B.Sc. Honours Environmental Geography • B.Sc. Environmental Sciences (Botany and Geography) **Professional registrations:** • Registered Professional Natural Scientist (Pr.Sci.Nat) - Reg. No. 118495 – SACNASP • Registered Environmental Assessment Practitioner (Reg. EAP (EAPASA)) - Reg. No. 2022/5204

	Training: • Practical Implementation of Environmental Auditing and Monitoring (2025) • WET-Health Tool & WET-EcoServices for Level 1B and Level 2 assessment (2025) • WET-Health Tool for Level 1A assessment (2025) • Environmental Impact Assessments (2025) • Introduction to Synthetic Aperture Radar and Applications (2024) • Earth Observation Data Analysis with Google Earth Engine (2023) • People Management Skills (2017) • Biodiversity spatial data management, acquisition, and analysis (2018) • Water Use Licence Applications via e-WULAAS (2020) • Remote Sensing (land use/cover classification) and SWAT hydrologic modelling (2017) **Registrations and memberships:** • Member of the South African Wetlands Society Reg. No. S9BPP477 • Member of the Southern African Association of Geomorphologists • Institute of Waste Management of Southern Africa (IWMSA) Reg No. 40120001

As per the requirements of the NEMA Regulations and Regulation 14(6) in the S24H Registration Authority Regulations, 2016, as amended, details of the Candidate EAP who assisted in the compilation of the report under the supervision of the EAP are provided in **Table *3*** below.

Table 3: Candidate Environmental Assessment Practitioner details

Candidate Environmental Assessment Practitioner:	Ms Zimkita Dalasile
Expertise:	Junior Environmental Scientist with 4 years' experience in environmental consulting and scientific research. My expertise includes scientific report writing, data analysis, monitoring and conducting environmental compliance audits. **Qualifications** • MSc. Environmental Management with Ecological Water Requirements • Postgraduate Diploma Integrated Water Resource Management • BSc. Environmental and Water Science **Professional registration:** • Candidate Environmental Assessment Practitioner (Cand. EAP (EAPASA)) - Reg. No. 2025/20366 • Candidate Natural Scientist (Cand.Sci.Nat.) - Reg. No. 132501 – SACNASP **Training:** • Introduction Environmental Impact Assessments (2024)

DECLARATION OF INDEPENDENCE

I, **Sive Mlamla**, in my capacity as an Environmental Assessment Practitioner, hereby declare that I –

- Act as an independent consultant
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed
- Have and will not have vested interest in the activity
- Have no, and will not engage in, conflicting interests in the undertaking of the activity
- Undertake to disclose any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan, or document
- Will provide the competent authority with access to all information at my disposal regarding the report, whether such information is favourable to the Client or not
- Based on information provided to me by the Client and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability
- Reserve the right to modify aspects pertaining to the present investigation should additional information become available through on-going research and/or further work in this field
- Undertake to have my work peer reviewed on a regular basis by a competent specialist.

Mr Sive Mlamla (Pr. Sci.Nat, Reg. EAP (EAPASA)
Environmental Assessment Practitioner

1. INTRODUCTION

Abantu Environmental Services (Pty) Ltd has been appointed as the independent Environmental Assessment Practitioners in terms of the National Environmental Management Act (Act No.107 of 1998, NEMA) to facilitate the EIA process and obtain the relevant authorisations The Joe Gqabi District Municipality (JGDM) is proposing the development of a bulk water supply using the eastern and western tributaries of the Blikana river **Figure 1**. The proposed development entails construction of a dam, reservoirs, abstraction points, water treatment works and pipelines to supply water within wards 2, 3, 4, 5 and 6 within Senqu Local Municipality (SLM).

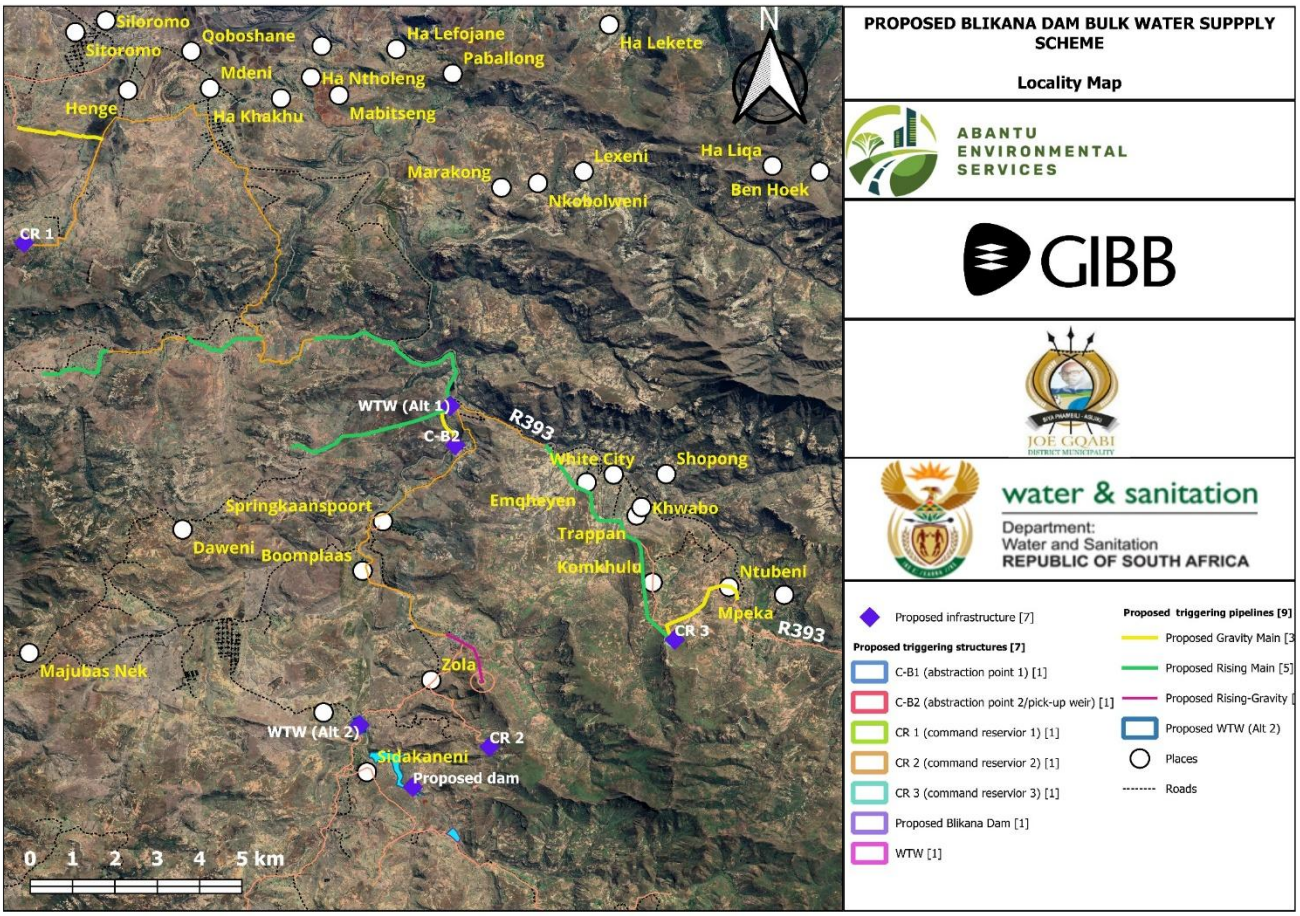

Figure 1. Blikana Dam BWSS locality map

The CEMPr has been compiled to ensure that the development is undertaken in compliance with the requirements set out in Section 28 of the National Environmental Management Act (Act No. 107 of 1998) [NEMA] and other relevant legislation under which the Duty of Care Principal is described.

1.1 LOCATION OF THE ACTIVITY

Property details of the site where the proposed development is located a contained in **Table 4**.

Table 4. Property Information

<table>
<tr><th>PROJECT ASPECT</th><th>DESCRIPTION</th></tr>
<tr><td>District</td><td>Joe Gqabi District Municipality</td></tr>
<tr><td>Local Municipality</td><td>Senqu Local Municipality</td></tr>
<tr><td>Registration Division</td><td>Hershel</td></tr>
<tr><td>Wards</td><td>Ward 2
Ward 3
Ward 4
Ward 5 and
Ward 6</td></tr>
<tr><td>Development footprint size</td><td><u>Pipelines:</u>
• <u>Rising main = 11.59km</u>
• <u>Gravity lines = 113.477km</u>
<u>Dam</u>
<u>Storage capacity of 2.6 Million m³ and a 10m high wall which is greater than 5 m.</u>

<u>Reservoirs:</u>
• <u>CR1- 11.0Mℓ</u>
• <u>CR2- 4.0Mℓ</u>
• <u>SR 1- 3.50 Mℓ</u>
• <u>SR2- 2.50 Mℓ</u>
• <u>SR3- 1.00 Mℓ</u>
• <u>SR4- 0.50 Mℓ</u>
• <u>SR5- 0.50 Mℓ</u>
• <u>SR6- 0.60 Mℓ</u>
• <u>SR7- 0.30 Mℓ</u>
• <u>SR8- 0.30 Mℓ</u>
• <u>SR8- 0.50 Mℓ</u>
• <u>SR10- 0.40 Mℓ</u>
• <u>SR11- 0.70 Mℓ</u>
• <u>SR12- 0.60 Mℓ</u>

<u>Abstraction points & WTW - 7.5Mℓ/d)</u></td></tr>
<tr><td>Farm Name(s)
Farm Number(s)</td><td>
<table>
<tr><th>Farm Name</th><th>Farm Number</th><th>Portion</th></tr>
<tr><td>Thaba Lesoba</td><td>141</td><td>0</td></tr>
<tr><td>Palmietfontein</td><td>290</td><td>0</td></tr>
<tr><td>Lower Telle</td><td>310</td><td>0</td></tr>
<tr><td>Tyinindini</td><td>98</td><td>0</td></tr>
<tr><td>Bhebeza</td><td>316</td><td>0</td></tr>
<tr><td>Blikana</td><td>274</td><td>0</td></tr>
<tr><td>Pelandaba</td><td>244</td><td>0</td></tr>
<tr><td>Rietfontein</td><td>301</td><td>0</td></tr>
<tr><td>Upper Telle</td><td>259</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>Nearest City</td><td>Sterkspruit</td></tr>
</table>

1.2 DEVELOPMENT DESCRIPTION

Blikana Dam

- The Blikana river's eastern and western tributaries will supply water for this development
- A dam will be constructed 300m upstream of the Pelandaba river which is a perennial stream.
- The surface area of the dam and appurtenant structures is 3ha.
- The width of the dam wall will be 25m if concrete gravity dam is selected.
- The proposed dam will have a live storage capacity of 1.62 million m³, with an additional dead storage of 0.9 million m³, resulting in a total storage capacity of 2.52 million m³.
- The bulk of construction material will be sourced locally, and the dam type to be selected to allow as such.
- The quality of water (temperature) will be the same as the temperature of the water in the river.
- The dam has a favourable depth to surface area ratio, 26ha area at 24m deep at full supply level, limiting evaporation losses.
- Abstraction will be directly from the dam through outlet work.
- Water will be abstracted from the dam via a doubled stack dry well intake tower.
- The expected annual evaporation rate is 1500 to 1600 mm/a.

Water Treatment Works

- A water treatment works (WTW) will be constructed downstream of the proposed dam, where water will be treated, stored and pumped to the various reservoirs
- The WTW will produce the required demand of 7.5 Mℓ/d over 20 hours, therefore the design capacity of the WTW will be 9.0 Mℓ/d.
- The WTW will be Class D with the following unit processes:
    - 15 Mℓ raw water storage reservoir
    - Chemical dosing building for coagulation and flocculation
    - Rapid mixing chambers / inline static mixers
    - 2 x Clari flocculators
    - Rapid sand filtration units and backwash recycle system
    - Chlorination dosing building, scrubber and contact tank
    - Sludge Waste Management (Drying beds and recycle system)
    - Clear water storage and pumpstation
    - SCADA system and all necessary pumps, valves, pipes etc.

RESERVOIRS

- Supply reservoirs; SR 1 and SR 2
- Command reservoirs: CR 1 & CR 2

Pipelines for this option include the following:

- Gravity main from Dam to Raw water reservoir
- Rising main from WTW to CR 1
- Gravity main from CR 1 to Booster Pumpstation

- Gravity main from BPS to CR 2
- Rising main from Booster Pumpstation to SR 5
- Gravity main from CR 1 to SR 12
- Gravity main from CR 1 to SR 11
- Gravity main from CR 1 to SR 10
- Gravity main from CR 1 to SR 6
- Gravity main from CR 1 to SR 7
- Gravity main from CR 1 to SR 8
- Gravity main from CR 1 to SR 9
- Gravity main from CR 1 to CR 2
- Gravity main from CR 2 to SR 1
- Gravity main from SR 1/CR 2 to SR 2
- Gravity main from SR 1/CR 2 to SR 3
- Gravity main from SR 1/CR 2 to SR 4

1.3 STRUCTURE OF THE EMPR

For the holistic approach to the management of environmental impacts during the construction of the proposed Blikana dam and associated infrastructure, this EMPr sets out the methods by which proper environmental controls are to be implemented by the Contractor and all other parties involved. The EMPr is divided into four phases of development. Each phase has specific issues unique to that period of the construction and operation. The impacts are identified and given a brief description. The phases of the development are identified below:

Table 5. Development phases and their descriptions

Phases	Description
Planning and Design	This section will provide guidelines on Planning and Design activities such as complying to relevant legal environmental and social authorisations; site establishment and security; public safety; environmental induction and training and awareness; site access and health and safety.
Construction	This section will provide guidelines on the construction methods and considerations. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these.
Rehabilitation	This section of the EMPr provides management principles for the rehabilitation phase of the Development. This will include best practice, procedures and responsibilities as required for various associated activities.

Phases	Description
Operation	This section will provide guideline on the practice and responsibility as required for various activities during operation.

2. RECEIVING ENVIRONMENT

2.1 CLIMATE

The region experiences a temperate climate with distinct seasons, including cold winters and occasional snowfall in higher altitudes (Senqu Local Municipality, 2023). In accordance with the South African National Standard (SANS 204-2), the municipality falls under the Cold Interior climatic region, with some parts of the municipality invading the Temperate Interior climatic region (Conradie, 2012). Temperatures in this municipality vary tremendously, whereby temperatures can reach approximately 42°C in summer and – 16°C in winter (Senqu Local Municipality, 2023). Rainfall ranges from 1000mm to 1400mm in the eastern sections, whilst southern, western, and northern areas experience a reduced amount of rainfall equating to 600mm annually. Rainfall intensity is also directly proportional to the elevation above sea level, high altitudes areas at peaks of mountainous areas experience higher rainfall than low altitude areas such as valleys lands (Senqu Local Municipality, 2023). Snow also occurs sporadically within the region, specifically in the northern areas of the municipality. Snow prevalence occasionally results into a certain environmental and socio-economic impacts such as traffic problems for motorists, livestock and crop agriculture mortalities as well as livelihood impacts for locals.

2.2 TOPOGRAPHY AND HYDROLOGY

The topography of Senqu Local Municipality is very mountainous with the height above sea level increasing from the west to the east. The highest mountain ranges are found in the east and north at elevations ranging between 2000 to 3000 meters above sea level (masl). There is very little development and settlement in the high-lying areas at the east and south-east because of the rugged terrain (Senqu Local Municipality SDF, 2016) and these are the areas where the proposed development is located. Soil erosion is a serious issue in the municipality because the topography of the area exacerbates the rate at which erosion takes place. Although the steeper terrain gradients limit certain developments, such areas may inherently exhibit high propensity for soil erosion.

The Orange River forms the north-eastern boundary of the Study Area, with the Telle River on the eastern boundary and Kromspruit is on the western boundary. The river and streams originate in the south flowing northwards, joining the Orange River (SRK Consulting, 2023). The Telle River catchment at the outlet of interest falls under quaternary catchment (QC) D18K. It makes up for 77% of the quaternary's catchment area. This quaternary catchment constitutes the full Telle River catchment area as its outlet drains at the confluence with the Orange River.

The main physical characteristics of the delineated catchments were extracted from GIS. The main hydrological parameters extracted include the Mean Annual Precipitation (MAP), time of concentration (Tc), lag time (TL), and storm duration (SD). Tc and

TL were calculated following a series of equations that link the physical parameters of the said catchment to its hydrological response time. The storm duration was varied in relation to the computed catchment response times.

A summary of the main physical and hydrological characteristics of Telle River catchment is presented in ***Table 6***.

Table 6. Summary of physical and hydrological characteristics of Telle River catchment (GIBB (Pty) Ltd, 2023).

Catchment Area	L	L_c	S	C_s	MAP	MAR	Lag	T_c
Km^2	km	km	m/m	m/m	m/m	Mm^3/a	hr	hr
Telle River Catchment								
720	44.7	12.1	0.0196	0.3557	770	111	2.2	5.6

Any potential abstraction site will have a catchment area that is a subset of the quaternary catchment D18K. The D18K quaternary catchment area is 98.9 km^2 with a Mean Annual Precipitation (MAP) of 841 mm. The D18K catchment has a Mean Annual Runoff of 15.5 million m^3/annum.

Table 7. Summary of Rainfall-Runoff Parameters for D18K Quaternary Catchment and Telle River sub-catchment (GIBB (Pty) Ltd, 2023).

D18K Catchment											
Catchment area			**MAP**			**MAE**			**MAR**		
Km^2			mm			mm			Mm^3/a		
935			**841**			**1525**			**15.5**		
D18K Catchment Mean Monthly Runoff (Mm^3 per Month)											
Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**
11.07	12.67	12.92	16.17	21.12	25.70	17.42	9.09	4.91	3.73	4.23	5.48
Telle River Catchment											
Catchment area			**MAP**			**MAE**			**MAR**		
Km^2			**mm**			**mm**			**Mm^3/a**		
720			770			1367			111.2		
Telle River Catchment Mean Monthly Runoff (Mm^3 per Month)											
Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**
8.53	9.75	9.95	12.45	16.26	19.79	13.42	7.00	3.78	2.87	3.26	4.22

Comparing the minimum target water volume of (4.4 million m3/a) to the catchment's MAR and to the long-term mean monthly runoff volumes indicates that the required abstraction volumes can be met, even when further deductions related to downstream users, environmental flow requirements, evaporation, etc. are accounted for. It also indicates that as long as the catchment area is big enough, then the type of the abstraction structure can be confined to either a weir or a dam with a maximum wall height of 10 m.

2.3 GEOLOGY

The greater portion of the study area is underlain by the Elliot Formation with the northern parts underlain by the Molteno Formation and the southern area and portions in the centre by the Drakensberg Group. The Elliot Formation consists of red and greenish grey mudstone with subordinate sandstone. The Molteno Formation consists of alternating sandstone (pebbly in places) with olive mudstone and dark grey shale. The Drakensberg group comprise basaltic lava, with minor sandstone, tuff and agglomerate in the lower part of the succession in places. The sedimentary rocks are intruded by multiple dolerite dykes and sills. The strike direction of the dykes vary from northwest-southeast and northeast-southwest. Patches alluvium is mapped along the Orange River and other rivers (SRK Consulting, 2023).

2.3 TERRESTRIAL AND AQUATIC BIODIVERSITY

2.3.1 TERRESTRIAL

According to SANBI (2018), the terrestrial vegetation within the development area is dominated by Senqu Montane Shrubland and Zastron Moist Grassland both falling under the Grassland Biome and listed as Least Concern in terms of conservation status. The Senqu Montane Shrubland is dominated by evergreen shrubs, namely *Rhus erosa, Olea europaea and Diospyros austro-africana*. In a few sheltered inaccessible areas the shrubland turns into thicket with *Kiggelaria africana, Leucosidea sericea* and *Rhamnus prinoides*. The Zastron Moist Grassland comprises a mosaic of moist open sour grassland with affinity to Eastern Free State Sandy Grassland, on elevated areas above sandstone outcrops and Eastern Free State Clay Grassland in low-lying eroded areas as well as mudstone outcrops (Mucina and Rutherford, 2006).

According to the Eastern Cape Biodiversity Conservation Plan (ECBCP, 2019), the project area falls within a range of biodiversity categories, including Ecological Support Areas (ESA 1 and ESA 2), Critical Biodiversity Areas (CBA 2), as well as areas classified as “Other ecosystems”.

In terms of land compatibility with the land use recommendations outlined in the 2019 ECBCP, the proposed development comprises multiple components and land use types, each with distinct activities. The proposed development includes multiple components with varying land use types. According to the 2019 ECBCP, infrastructure such as pipelines, power lines, and substations can be compatible with CBAs and ESAs if designs are informed by specialist studies and strict mitigation measures (e.g., limited vegetation clearing, bird collision avoidance) are implemented.

In this development, the pipelines are compatible with ESA management objectives as hybrid above-ground/below-ground approach is preferred. The dam is located within terrestrial ESA 1 and 2 and aquatic ESA 1 but does not intersect CBA rivers. According to the plan activities involving water damming will affect flow regimes and for this reason, they are not compatible with the management objective for CBA rivers, however ecological impacts within ESAs must be mitigated.

The plan states that water and WWTWs should not be located in CBAs or ESAs. However, the Water Treatment Works (WTW) is predominantly located within other ecosystems, with only a minor section intersecting aquatic ESA 1. Therefore, it can be concluded that the proposed development is compatible with land use recommendations provided that mitigation measures are implemented.

2.3.2 AQUATIC AND STRATEGIC WATER SOURCE AREAS

ESAs are areas that must be maintained in at least fair ecological condition (seminatural/moderately modified state) in order to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species, when it is not possible or not necessary to meet them in natural or near-natural areas (SANBI, 2017).

According to the DFFE screening tool the project area is classified as a Very High aquatic sensitivity. The project area falls within a number of categories, including aquatic Ecological Support Areas (ESA 1 and ESA 2) and areas classified as "Other ecosystems".

According to Le Maitre et al. (2018), Strategic Water Source Areas (SWSAs) are areas of land that either: (a) supply a disproportionate quantity of mean annual surface water runoff in relation to their size and are considered nationally important; or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b). Based on the DFFE screening tool, the project area falls within a Strategic Water Source Area for surface water (Eastern Cape Drakensberg).

2.3.3 FAUNA

The municipality is characterized by a rich and diverse array of fauna, reflective of its unique ecological features. Situated within the greater Drakensberg range, the municipality encompasses a variety of habitats, including grasslands, wetlands, and mountainous areas, each supporting a wide range of animal species. These species are integral to the ecological balance of the region and contribute significantly to its biodiversity. The following subsections comprehensively describe the fauna by dividing them into mammals, reptiles, amphibians, invertebrates, and birds.

The DFFE Screening tool listed the animal species theme for the site as High for most of the infrastructure components with some areas rated as Low and medium. The animal species that have potential to occur on site are listed on ***Table 8*** below.

Table 8. Animal species

Feature(s)	Common name	Conservation status
Aves-Gyps coprotheres	Cape Vulture	Vulnerable
Mammalia-Hydrictis maculicollis	Spotted-necked Otter	Vulnerable
Aves-Aquila verreauxii	Verreaux's eagle	Least concern
Aves-Geronticus calvus	Southern bald ibis	Vulnerable
Sensitive species 29	-	-

2.4 SOCIO-ECONOMIC ATTRIBUTES

2.4.1 POPULATION

The population in the municipality was 147 073 in 2022. The municipality has the highest population in the Joe Gqabi District Municipality compared to Elundini and Walter Sisulu municipalities. The municipality has more females than males, in total there were 78 731 females in 2022 and 68 342 Males. The municipality is mostly dominated by black Africans followed by Whites and then Coloureds (StatsSA, 2022).

2.4.2 EDUCATION

The level of education in the municipality is low but steadily improving. The number of people with higher education was 5 024 (6.2%) in 2022. The total number of people who have been/attended at an educational institution is 42 377, this is high compared to the number of people who have never attended at any educational institution.

2.4.3 HOUSEHOLD LIVING CONDITIONS

Most population reside in formal dwellings, some population still live in traditional dwelling and the minority of the population live in informal dwellings. Most households have piped water inside their houses. The number of households with no access to piped water are significant. Majority of the population use pit toilet and followed by the population who use flush toilets. Most households in the municipality have their refuse removed by the local authority at least once a week, while some people have no rubbish disposal areas. The majority of residents in the municipality use electricity for lighting, same applies for cooking majority use electricity for cooking

2.4.4 ECONOMY

In 2020 the annual growth rate of the municipality was +5.91% which is higher than that of the Eastern Cape Province which is +6.71%. The municipality achieved an annual growth rate of 1.03% from 2010 to 2020 which is a higher Gross Domestic Product (GDP) growth than the Eastern Cape Province (0.41%) and South Africa (0.64%). The municipality was ranked second in the Joe Gqabi District municipality in terms of the total contribution, with a GDP of R4 billion (Senqu Local Municipality IDP, 2022-2027). The municipality's economy is made up of various industries which are agriculture, mining, manufacturing, electricity, construction, trade, transport, finance and community services. Agriculture is the sector that contributes the most in the municipality is the community services at 1.9 billion followed by trade and then finance. Mining is the lowest contributor in the municipality (Senqu Local Municipality IDP, 2022-2027).

3 PURPOSE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMPr forms part of the contractual obligations to which all contractors/employees involved in construction, maintenance, or decommissioning work must be committed. It serves as a guideline and baseline information document for the construction and operations of the proposed project and aims to comply with section 24N of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as well as the Environmental Impact Assessment Regulations, 2014 as amended.

This section outlines the environmental management guideline measures as encompassed in **Appendix 4** of the EIA Regulations as amended that will be undertaken to avoid or minimize impacts on the environment throughout all phases of the proposed development.

The content of the EMPr prepared in terms of the Regulations is outlined in **Table 9** below. The relevant sections of the EMPr in which the requirements are addressed, is also outlined.

Table 9. Alignment to Amended NEMA 2014 EIA Regulations, Appendix 4 of GNR 326 of 2017

Prescribed content of an EMPr	Reference in the EMPr
1. (1) An EMPr must comply with section 24N of the Act and include- (a) details of – (i) the EAP who prepared the EMPr. (ii) the expertise of that EAP to prepare an EMPr, including curriculum vitae.	Before Section 1
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.	Section 1.3
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.	Section 1, Figure 1.
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including- (i) planning and design. (ii) pre-construction activities. (iii) construction activities. (iv) rehabilitation of the environment after construction and where applicable post closure. (v) where relevant, operation activities.	Section 6, 7, 8 & Section 9
(f) A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to – (i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation. (ii) Comply with any prescribed environmental management standards and practices. (iii) Comply with any applicable provisions of the Act regarding closure, where applicable. (iv) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.	Section 6, 7, 8 & Section 9

Prescribed content of an EMPr	Reference in the EMPr
(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Section 6, 7, 8 & Section 9
(h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Section 6, 7, 8 & Section 9
(i) An indication of the persons who will be responsible for the implementation of the impact management actions.	Section 10
(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.	Section 6, 7, 8 & Section 9
(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).	Section 11
(l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations.	Section 11
(m) An environmental awareness plan describing the manner in which – (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work. (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	Section 4.2 & Section 11
(n) Any specific information that may be required by the competent authority.	Not applicable
1. (2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	Not applicable

The main objectives of this EMPr are therefore to:

- Outline environmental management measures related to project activities and provide project contractors with guidelines for carrying out Construction activities in such a way as to minimize environmental impacts;
- Be used as a foundation for the specific environmental management instructions contained in Construction contract documents, where compliance will be a contractual obligation for contractor(s);
- Be used as an educational tool, for orientation and training of project personnel and contractors;
- To outline functions and responsibilities of responsible persons;
- To state standards and guidelines, which are required to be achieved in terms of environmental legislation;
- To outline mitigation measures and environmental specifications which are required to be implemented for all phases of the project in order to minimize the extent of environmental impacts, and to manage environmental impacts associated with the proposed project; and
- To prevent long-term or permanent environmental degradation.

3.1 ENVIRONMENTAL CODE OF CONDUCT

One of the objectives of the EMPr is to ensure that all the workforce, contractors, sub-contractors, and construction staff understand environmental issues and potential impacts on-site activities. This environmental code of conduct provides the basic rules that must be strictly adhered to.

It is the responsibility of the Site Environmental Officer, the Environmental Officer and ECO (as appointed) to ensure that each contractor, sub-contractor, and workforce understand and adhere to the Code of Conduct.

All persons are obliged to keep to the rules of this code of conduct. Ignorance, negligence, recklessness, or a general lack of commitment resulting in environmental degradation or pollution must not be tolerated.

Environmental Rules

- Do not waste electricity, water, or consumables;
- Only use authorised accesses;
- Do not litter;
- Dispose solid waste to the correct waste containers provided;
- Prevent pollution;
- Use the toilet facilities provided;
- Do not dispose contaminated wastewater to the storm water or the environment;
- Immediately report any spillage from containers, plant, or vehicles;
- Do not burn or bury any waste in the sand;
- Do not trespass onto private properties;
- Strictly leave all animals alone. Never tease, catch, or set devices to trap or kill any animal;
- Never damage or remove any trees, shrubs, or branches unless it forms part of working instructions;
- Do not deface, draw, or cut lettering or any other markings on trees, rocks or buildings in the area;
- Know the firefighting procedure and locations of firefighting equipment; and know the environmental incident procedures.

3.2 CONTRACTUAL OBLIGATION

This EMPr must be included in all tender and contract documentation associated with the development. Note that notwithstanding the Companies Act, 2008 (Act No. 71 of 2008), or the Close Corporations Act, 1984 (Act No. 69 of 1984), the directors of a company or members of a close corporation are jointly and severally liable for any negative impact on the environment, whether advertently or inadvertently caused by the company or close corporation which they represent, including damage, degradation or pollution.

4 MANAGEMENT AND MONITORING PROCEDURE

4.1 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITY

This section indicates the party responsible for implementing the environmental measures and action plans laid out in this EMPr. Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Proponent, Project Manager, Site Manager/Engineer, Contractor/Operator and Environmental Control Officer are as detailed below.

Project Developer shall:

- Be fully acquainted with the EMPr for the project;
- Ensure that the Project Engineer and the Contractor/Operator are aware of all specifications, legal constraints, standards, and procedures pertaining to the project specifically with regard to the environment;
- Ensure that all stipulations within the EMPr are communicated and adhered to by the Project Engineer and the Contractor/Operator;
- Monitor the implementation of the EMPr throughout the project by means of regular site visits and meetings; and
- Order the removal of any person(s) and/or equipment in contravention of the specifications of the EMPr.

The Project Manager (Engineer) shall:

- Be fully conversant with the EMPr;
- Ensure compliance with the EMPr;
- Have overall responsibility for the implementation of the EMPr;
- Liaise with the Project Manager and Contractor/Operator on matters concerning the environment;
- Prevent actions that will harm or may cause harm to the environment, and take steps to prevent pollution of the site;
- Implement remedial measures in the event of pollution incidents or environmental impacts;
- Monitor and verify that environmental impacts are kept to a minimum;
- Review and approve construction methods where necessary; and
- Order the removal of any person(s) and/or equipment in contravention of the specifications of the EMPr.

The Contractor shall:

- Be fully conversant with the EMPr;
- Ensure compliance with the EMPr;
- Ensure that all the environmental specifications contained within this EMPr are adhered to at the site;
- Regularly liaise with the Site Manager on matters relating to the environment; and
- Confine activities to the demarcated construction site.

The above responsibilities listed for the Contractor will also apply to any appointed sub-consultants.

The Environmental Control Officer (ECO) shall:

- Be fully conversant with the EMPr;
- Be fully conversant with all environmental legislation and ensure compliance;
- Ensure that all the environmental specifications contained within this EMPr are adhered to at the site;
- Regularly liaise with the Site Manager on matters relating to the environment; and
- Compile monthly reports as to the progress of the construction phases and report to all parties involved (Site Manager, Project Proponent).

4.2 ENVIRONMENTAL AWARENESS TRAINING

Training and environmental awareness is an integral part of a complete EMPr. The overall aim of the training will be to ensure that all site staff is informed of their relevant requirements and obligations pertaining to the relevant authorizations, licences, permits and the approved EMPr and protection of the environment. Environmental awareness training courses should be run for all personnel on site. Two types of courses should be run, one for the Contractor's and Subcontractor's management and one for all site staff and labourers. Courses shall be run in the morning during normal working hours at a suitable venue provided by the Contractor. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the ECO.

- The size of each session shall be limited to 30 people. The Contractor shall allow for sufficient sessions to train all personnel. Subsequent sessions shall be run for any new personnel coming onto site. A Method Statement with respect to the organization of these courses shall be submitted.
- Notwithstanding the specific provisions of this clause, it is incumbent upon the Contractor to convey the sentiments of the EMPr to all personnel and Subcontractors involved with the Works.

3.2.1 Training Course for Management and Foremen

- The environmental awareness training course for management shall include all management staff and foremen. The course, which will be presented by the ECO, will be of approximately one-hour duration.
- The initial course shall be undertaken not less than 7 days prior to commencement of work on site. Subsequent courses shall be held as and when required.

3.2.2 Training Course for Site Staff and Labour

- The environmental awareness training course for site staff and labour shall be presented by the Contractor's SHE Officer from material provided by the ECO unless otherwise required by the Project Specification. The course will be approximately one-hour long.
- The course shall be run not more than 7 days after commencement of work on site with sufficient sessions to accommodate all available personnel. Subsequent courses shall be held as and when required.

3.2.3 Construction Personnel Information Posters

- The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with the EMPr. Construction personnel information posters shall be laminated and erected in all eating areas, workshops, and site offices. The Contractor shall ensure that the construction personnel information posters are not damaged in any way and shall replace them if any part becomes illegible.
- Examples of these posters will be supplied to the Contractor by the ECO in electronic format.

3.2.4 The Environmental Awareness Training Programme

The environmental awareness training programme should include:

- The induction of all construction and operation staff;
- Signing by all persons, an acknowledgement of receiving and understanding the induction;
- Identification of environmental risks and job specific training on addressing these risks; and training on the implementation of emergency procedures (where necessary).

3.2.5 Topics Covered by the Environmental Awareness Programme

Various topics to be entailed by environmental awareness programmes include by not limited to:

- What is meant by “Environment”?
- Why does the environment need to be protected and conserved?
- How can construction activities impact on the environment?
- What can be done to mitigate against such impacts?
- Awareness of emergency and spills response provisions.

5 LEGISLATIONS AND GUIDELINES

All the applicable environmental standards contained within the environmental legislation will be adhered to. Below are applicable legislations and guidelines for the proposed development and have been identified as applicable:

Legislation/ guidelines	Summary	Legal requirement for this project
NATIONAL		
The Constitution of South Africa, 1996 (Act No.108 of 1996)	The Constitution is the highest and the supreme law in South Africa. The Bill of Rights in chapter 2 section 24 of the Constitution of South Africa Act (Act 108 of 1996) makes provisions for environmental issues and declares 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 c) generations, through reasonable legislative and other measures that: i. prevent pollution and ecological degradation; ii. promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".	The applicant has an obligation to ensure that the project is undertaken in a manner that respects and protects the constitutional rights of all interested and affected parties. The applicant must ensure that the project environment is not harmful and that measures are implemented to prevent pollution so that future generations can enjoy the social and ecological benefits.
National Environmental Management Act, 1998 (Act No.107 of 1998) as amended	The National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) is a 'principles based Act' and is an overarching statute regulating various aspects of natural resources use, integrated environmental management and pollution control. The Act provides for the right to an environment that is not harmful to the health and wellbeing of the South African people; sustainable development, environmental protection, equitable distribution of natural resources; and the formulation of environmental management frameworks. Its definition of the environment includes the land and water of the earth, microorganisms, plant and animal	The applicant must ensure that construction and operation of activities must be conducted according to the generally accepted principles of sustainable development, integrating social, economic, and environmental factors.

Legislation/ guidelines	Summary	Legal requirement for this project
	life or a combination of those things, and the inter relationships among them. The Act aims to provide for cooperative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance, and procedures for coordinating environmental functions exercised by organs of state. Section 24 Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.	An application for Environmental Authorisation is being submitted on behalf of the client in line with the requirements of NEMA since the proposed project will trigger listed activities which require authorization prior to commencement. As part of the EIA process, mitigation measures will be proposed to ensure that the significance of the predicted impacts is reduced thus protecting the environment from degradation.
Environmental Impact Assessment Regulation, 2014 as Amended	The Environmental Impact Assessment (EIA) Regulations promulgated under NEMA in 2014 provide a list of activities which are subject to an Environmental Authorisation (EA) process prior to construction or implementation. In accordance with the 2014 EIA Regulations, (as amended) an EIA process is required owing to the applicability of the activities listed in *Error! Reference source not found.*. According to the NEMA Regulations these activities may not commence without environmental authorization from the competent authority which requires the investigation, assessment and statement of potential impact of activities and must follow the procedure as described in the EIA Regulations. A Basic Assessment (BA) process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in Listing Notices 1 and/or 3 and a Scoping and Environmental Impact Assessment (S&EIA) process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in Listing Notice 2. As the Proposed Project includes activities listed in Listing Notice 2 it is necessary that a S&EIA process is undertaken in order for the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) to consider the application in terms of NEMA.	An application for Environmental Authorisation is being submitted on behalf of the client in line with the requirements of NEMA EIA Regulations since the proposed project will trigger listed activities which require authorization prior to commencement
National Environmental Management Biodiversity Act (Act No. 10 of 2004)	The National Environmental Management: Biodiversity Act (NEM:BA) makes provisions for achieving the objectives of the United Nations Convention on Biological Diversity, to which South Africa is a signatory.	The proposed infrastructure routes may impact CBA areas. The applicant through the EIA process ensures that areas that remain natural within the CBA are kept as intact as possible. The applicant

Legislation/ guidelines	Summary	Legal requirement for this project
	The Bill promotes management, conservation and sustainable use of indigenous biological resources, and provides for: ● the management and conservation of biological diversity; ● the use of indigenous biological resources in a sustainable manner; and ● the fair and equitable sharing of benefits arising from the commercialization through bio-prospecting of traditional uses and knowledge of generic resources. The Bill gives effect to international agreements relating to biodiversity which are binding on the Republic and provides for co-operative governance in biodiversity management and conservation and provides for a National Biodiversity Institute to assist in achieving the above objectives. The Act gives wide powers to the National Biodiversity Institute to inter alia protect flora and fauna in appropriate enclosures, the collection of information, undertaking and promotion of research on indigenous biodiversity and the sustainable use of indigenous biological resources, the prevention, control or eradication of listed invasive species, biodiversity planning and other functions. This act lists all critically endangered, vulnerable and protected species. The potential occurrence of any such species will be investigated in the BA process.	and its appointed contractor has the responsibility to prevent the establishment of alien vegetation within the site and where it has established, ensure that alien plants are eradicated promptly.
National Water Act, 1998 (Act No.36 of 1998)	In terms of chapter 3 section 12-20, water resources are to be protected, used, developed, conserved, managed and controlled. This Act recognizes that water is a scarce resource; it is a natural resource that belongs to all of South Africa's people. The National Department of Water and Sanitation is responsible for the nation's water resource and also the Minister of Department of Water and Sanitation ensures that the water resource is "protected, used, developed, conserved, managed and controlled" through the implementation of this Act (National Water Act 36 of 1998).	The proposed project is located in, within 100m of a river. Additionally, the proposed development involves taking water from a water resource as well as storing water. Thus Section 21 a, b, c and i of the National Water Act will be triggered, an application must be submitted to DWS.

Legislation/ guidelines	Summary	Legal requirement for this project
	This Act makes provisions for the protection of surface water and groundwater resources and their sustainable management for the prevention and remediation of the effects of pollution, and for the control of emergency occurrences. Section 21 of the National Water Act (NWA) lists water uses for which a Water Use Licence will be required.	
National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004)	The objective of the Act is to protect the environment by providing reasonable measures for the protection and enhancement of air quality and to prevent air pollution. The Act makes provision for measures to control dust, and offensive odours. Section 32 of The National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) deals with dust control measures regarding dust control. The Minister or MEC may prescribe measures for the control of dust in specified places or areas, either in general or by specified machinery or in specified instances, the steps to be taken to prevent nuisance or other measures aimed at controlling dust. The National Dust Control Regulations (2013) provides for the management and monitoring of dust.	The EMPr which will be compiled during the EIA phase must include measures for control of dust during the construction phase, If there are any exceedances observed in terms of the National Dust Regulations then a dust monitoring programme must be submitted to the Competent Authority.
Conservation of Agricultural Resources Act, 1983 (No. 43 of 1983)	This Act provides for the control over the utilisation of the natural agricultural resources of the country in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants. Section 5 of the Act prohibits the spread of weeds through the prohibition of their sale. GN R1084 (published under CARA) provides categories for the classification of the various weeds and invader plants, and restrictions where these species may occur. Regulation 15E of GN R1084 provides methods to be implemented for the control of weeds and invader species.	CARA finds application throughout the project lifecycle of the Proposed Project. As a result, soil conservation and erosion prevention management and mitigation measures need to be implemented. Furthermore, an Alien Invasives Species Control and Management Plan must be developed and implemented for the duration of the project life cycle of the Proposed Project
Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970), as amended	The Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970), as amended provides for the subdivision of all agricultural land within the Republic thereby prohibiting certain activities from being undertaken without consent from relevant authority, the Minister of the Department of Agriculture, Land Reform and Rural Development.	This Act could be relevant to the Proposed Project if any portion of land is zoned for agriculture and will need to be leased for a period exceeding 10 years is regulated by the Act
Occupational Health and Safety Act, 1993 (Act No.85 of 1993)	The Occupational Health and Safety Act makes provisions in regulations Section 8 for the general duties of employers to their employees. The act provides for the health and safety of people at work utilising machinery and	The applicant must ensure that a safe working environment is provided for its employees during construction and operational phases of the project. This includes obtaining the relevant work permits, providing PPE and ensuring all required facilities

Legislation/ guidelines	Summary	Legal requirement for this project
	the protection of others against health and safety risks associated with activities on site/work. General Administrative Regulations (2003) describe the administration of the various OHS Regulations, including the designation of health and safety committees, the reporting and recording of incidents and occupational diseases. This Act is applicable to all contractors during the planning, construction and operational phases of the project. To provide 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.	are available for a working environment that is conducive. All stalls must have adequate training for their various duties and the applicant must ensure that compliance with the OHSA and Construction Regulations is monitored on a regular basis.
Hazardous Substance Act (No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitizing or inflammable nature of the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products about the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. • Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive, etc., nature or because it generates pressure through decomposition, heat, or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance • Group IV: any electronic product; and • Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force. It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored, or handled. If applicable, a license is required to be obtained from the	Relevant permits must be obtained for the storage of hazardous substances if any will be stored on site during construction. The contractor must ensure that hazardous substances are stored in a safe manner and MSDS are retained on file for all hazardous substances on site.
National Environmental Management: Waste Act, 2008 (Act No.59 of 2008)	During construction waste will be produced, in either liquid, solid and/or hazardous state, and this waste will be required to be adequately and appropriately disposed of. There are several Regulations or Acts that are	No authorization is required in terms of NEMWA, however, the applicant must make sure that waste is managed appropriately on site. This includes separation of waste, routine cleanup of the site and spillages as well as disposal at appropriately

Legislation/ guidelines	Summary	Legal requirement for this project
	applicable to the proposed development in terms of waste management. To reform 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 licensing 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.	licensed waste landfills. Where possible, waste should be recycled to minimizes volumes of waste disposed to landfills
National Heritage Resources Act (Act No. 25 of 1999)	The protection of archaeological and paleontological resources is the responsibility of a provincial heritage resources authority and all archaeological objects, paleontological material and meteorites are the property of the State. "Any person who discovers archaeological or paleontological objects or material or a meteorite in the course of development must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority". According to Section 34 of NHRA, No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority. Section 38 Listed Activities: (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;	.According to the Heritage Report contemporary and historical formal and informal graves were identified during the field survey. However, no archaeological heritage resources were identified during the survey, therefore, considered as having a low archaeological heritage significance, by surface observation. In terms of paleontological resources no fossils were identified. However, the underlying geology indicates a moderate to high probability of fossil material being unearthed during excavation activities. Therefore, it is strongly recommended that a Fossil Chance Find Protocol be incorporated into the EMPr.

Legislation/ guidelines	Summary	Legal requirement for this project
	(b) the construction of a bridge or similar structure exceeding 50 m in length; (c) any development or other activity which will change the character of a site— (i) exceeding 5 000 m^2 in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; (d) the re-zoning of a site exceeding 10 000 m2 in extent; or (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,	
The Spatial Planning and Land Use Management Act, 2013 (No. 6 of 2013) (SPLUMA)	The Spatial Planning and Land Use Management Act, 2013 (Act No. 6 of 2013) aims to confirm and regulate the role of municipalities in land use planning and management.	Objectives of the Act relevant to the Proposed Project ensure that the system of spatial planning and land use management promotes social and economic inclusion and to provide for the sustainable and efficient use of land.
Mineral and Petroleum Resource Development Act 28 of 2002	The Mineral and Petroleum Resources Development Act 28 of 2002 intends to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources; and to provide for matters connected therewith.	If borrow pits or quarries are required for sourcing construction material for the dam, the applicant must obtain the necessary authorisations and approvals under the Act. An approved environmental management plan must be implemented for extraction activities, ensuring minimal disturbance, compliance with sustainable resource use principles, and full site rehabilitation

Legislation/ guidelines	Summary	Legal requirement for this project
		after use. Community consultation and equitable access requirements must also be met.
Climate Change Act 22 0f 2024	The act seeks to enable the development of an effective climate change response and long-term, just transition to a low-carbon and climate-resilient economy and society for South Africa in the context of sustainable development; and to provide for matters connected therewith.	The applicant must undertake a climate change risk and vulnerability assessment for the dam and associated infrastructure. The project design must integrate adaptation measures to withstand droughts, floods, and temperature extremes. Measures to reduce greenhouse gas emissions during construction and operation must be implemented, and climate reliance reporting must align with national and provincial requirements. Local economic opportunities must be promoted in line with just transition principles.
Integrated Environmental Management Information Guidelines Series:	This series of guidelines was published by the Department of Environmental Affairs (DEA) and refers to various environmental aspects. Applicable guidelines in the series for the proposed project include: ● Guideline 5: Companion to NEMA EIA Regulations, 2010; ● Guideline 7: Public participation; and ● Guideline 9: Need and desirability. Additional guidelines published in terms of the NEMA EIA Regulations, 2014 (as amended), in particular: ● Guideline 3: General Guide to EIA Regulations, 2006; ● Guideline 4: Public Participation in support of the EIA Regulations, 2006; and Guideline 5: Assessment of alternatives and impacts in support of the EIA Regulations, 2006.	These guidelines have been consulted in the compilation of this report as well as the public participation process that will be undertaken.
Municipal Systems Act (Act 32 of 2000)	The Municipal Systems Act provides for the core principles, mechanisms and processes that are necessary to enable municipalities to provide for community participation and for the integration of all activities for the overall	The Senqu Local Municipality has been included as an I&AP for this project and the municipal IDP has been consulted in compilation of this report.

Legislation/ guidelines	Summary	Legal requirement for this project
	social and economic upliftment of communities in harmony with their local natural environment. It also states that a fundamental aspect of the new local government system is the active engagement of communities in the affairs of municipalities of which they are an integral part. The Act requires the implementation and monitoring of Integrated Development Plans, the setting of targets and key performance indicators, including environmental targets, as well as the preparation of by-laws and policies that deal with environmental issues.	
PROVINCIAL LEGISLATION AND POLICY FRAMEWORK		

Eastern Cape Environmental Management Bill (Notice 205 of 2019)	The goals of the Eastern Cape Environmental Management Bill are as follow:
	• To supplement national legislation in the Province where necessary to protect the environment by providing reasonable measures for –
	  ○ The management, protection and conservation of certain areas of ecological or environmental importance;
	  ○ The promotion of the sustainable utilisation of the areas of ecological or environmental importance;
	  ○ The management, protection and conservation of biological diversity and of the components of such biodiversity; and
	  ○ The use of indigenous biological resources in a sustainable manner;
	• To provide for sound environmental management, enhancing and encouraging sustainable use of resources;
	• To encourage conservation, a risk averse approach;
	• To set provincial requirements, norms and standards for provincial environmental management according to best practices; and
	• To provide for compliance with the measures set out in paragraph (a); and
	• Generally, to give effect to section 24 of the Constitution within the Province.
		The applicant must ensure that the project design, construction, and operation apply a precautionary, risk-averse approach, prioritise biodiversity protection, and demonstrate sustainable use of natural resources. The project must comply with any provincial environmental norms and standards and secure necessary provincial inputs/approvals in addition to national authorisations.

Eastern Cape Biodiversity	The primary intention of NEMBA Chapter 3 is to facilitate conservation and management of biodiversity in “biodiversity priority areas” or priority areas	The applicant must screen all project components (dam, WTW, pipelines, servitudes, access roads,

Legislation/ guidelines	Summary	Legal requirement for this project
Conservation Plan (BCP) (2019)	for conservation, outside of the Protected Area network, at a landscape level. The BCP may be used as a precursor for further refined mapping in Bioregional or Biodiversity Sector Plans undertaken at more localised scales (e.g. District or Local Municipalities). Therefore, the purpose of the BCP is to provide a map of these important biodiversity areas and develop associated land use management guidelines to inform:	spoil sites) against CBAs/ESAs and avoid development in no-go biodiversity areas. Where avoidance is not feasible, impacts must be minimized and offset according to BCP guidelines. Rehabilitation and restoration plans must be implemented to maintain ecological connectivity.
JOE GQABI DISTRICT MUNICIPALITY		
Joe Gqabi Integrated Development Plan 2023/24	The Joe Gqabi Integrated Development Plan is a super plan for the district that gives an overall framework for development. It aims to co-ordinate the work of local and other spheres of government in a coherent plan to improve the quality of life for all the people living in an area. It should take into account the existing conditions and problems and resources available for development. It is a process through which the district municipality prepares a strategic development plan which extends over a 5-year period. In terms of the Municipal Systems Act, Act 32 of 2000 all municipalities have to undertake an IDP process to produce IDP's.	The applicant must ensure that the project supports IDP priorities for bulk water provision, equitable service access, and sustainable development. Project planning and phasing must align with municipal budgeting cycles, and performance indicators (such as water reliability and job creation) must be reported to the municipality.
Joe Gqabi Spatial Development Framework (2009)	One of the development goals of the Municipality is Environmental Management, which is identified as a key spatial issue. The objectives of the municipality are to adhere to sound environmental practices in line with the legislation and to also protect environmentally sensitive areas. The strategy the municipality proposes to achieve these is to implement the principles of Integrated Environment Management.	The applicant must demonstrate spatial alignment with SDF by locating infrastructure within identified nodes/corridors, avoiding prime agricultural land, and preventing urban sprawl. Visual impacts, biodiversity corridor protection, and watercourse setbacks must be incorporated into the design. Waste and sanitation systems must be self-sufficient for works outside urban areas.
Joe Gqabi DM Municipal Environmental Profile	This District Municipal Profile provides an overview of the current environmental status quo and current challenges within Joe Gqabi District Municipality. The intention of the profile is to deepen awareness of environmental aspects within the District to highlight key considerations for future development planning. The District Municipal Profile is based on existing information made available by the Department of Environmental Affairs (DEA) in respect of the following thematic areas: Environmental Management Governance; Environmental Programmes; Biodiversity; Waste Management; Air Quality; Climate Risk and Vulnerability; and Climate Change Mitigation.	The applicant must address environmental challenges identified in the profile by incorporating biodiversity protection, air quality management, waste minimisation, and climate resilience measures into the Environmental Management Programme (EMPr). Environmental monitoring must be aligned with district reporting indicators.

Legislation/ guidelines	Summary	Legal requirement for this project
JGDM Climate Change Response Strategy	The strategy prioritises adaptation actions for vulnerable sectors and communities, with the aim of reducing risks and enhancing resilience. Proposed interventions include supporting small-scale farmers, rehabilitating wetlands, upgrading informal housing, developing climate-resilient infrastructure, and improving public health responses. The strategy aligns with national and international climate policy frameworks, including South Africa's National Climate Change Response Policy and the Paris Agreement. In the context of environmental authorisation processes, this response strategy should be considered an important guiding document. It highlights climate risks and adaptation needs specific to the district and should inform the planning, design, and mitigation measures of proposed developments to ensure alignment with local climate resilience objectives.	The applicant must conduct a climate risk assessment for the dam and associated infrastructure, integrate adaptation measures for droughts, floods, and extreme weather, and adopt energy-efficient technologies to reduce greenhouse gas emissions. Implementation must align with the district's climate response objectives.
Local Economic Development Strategy (2015)	The intention is not to re-create a strategy, so much as to revise the existing strategy and ensure that the assumptions and outcomes are embedded in a thorough understanding of the local context and the parameters within which the District Municipality currently operates.	The applicant must maximise local job creation, skills transfer, and procurement during construction and operation. Opportunities for SMMEs and vulnerable groups must be prioritised, and local supply chains must be utilised where feasible.
Water Services Development Plan (2022/23 – 2026/27)	**Purpose:** An improved quality of life for all residents.	The applicant must ensure the project aligns with water service coverage, demand projections, and sustainability targets in the WSDP. Operational plans must address water quality compliance, non-revenue water reduction, and emergency drought and incident responses.
Municipal Health Services By-Laws	**Purpose:** The Municipality being aware of the constitutional rights of every person to an environment that is not harmful to his or her health or well – being, and the principles that underlines the National Health Act, 2003 (Act 61 of 2003) as amended and the National Environmental Management Act, 1998 (Act 107 of 1998) as amended, adopts this By-laws with the purpose that these By-laws will enable the Municipality to set minimum environmental health standards to prevent diseases, prolong life, protect	The applicant must comply with municipal health standards for construction camps, sanitation, food handling, and waste management. Public health risks such as dust, noise, and stagnant water must be mitigated, and municipal inspections facilitated.

Legislation/ guidelines	Summary	Legal requirement for this project
	and promote the long term health and well- being of people in the Municipal area	
Water and Sanitation By-Laws	Joe Gqabi Water and Sanitation by-laws play a vital role in regulating various aspects of community life and are important for both businesses and residents regarding the handling of water and sanitation. These by-laws are designed to maintain order, ensure equal and fair water use, and create harmonious living environments.	The applicant must comply with all municipal requirements for water abstraction, storage, distribution, and discharge. Effluent quality limits must be maintained, water losses minimised, and backflow prevention systems installed. Emergency shut-off and reporting procedures must be in place.
SENQU LOCAL MUNICIPALITY		
Senqu Local Municipality Integrated Development Plan 2022-2027 (2023-2024 Review)	The municipality's strategic goal is to ensure protection of natural assets through the implementation and drafting of an Environmental Management framework. The drafting of the EMF is part of the 5-year target of the municipality.	The applicant must align the project with municipal environmental priorities, integrate with EMF development objectives, and support sustainable water supply. Municipal participation and feedback must be incorporated into project planning and performance reporting.
Senqu Local Municipality Environmental Management Plan 2025-2030	EMP for the municipality is a Strategic Document that guides development in the jurisdiction of Senqu Local Municipality together with Provincial and National Environmental Legislations, forms basic strategic document for the development of Municipal by-laws that regulate the municipal environment Protection competency and gives effect of environment sustainable as per MSA definition of "environment sustainable	The applicant must implement EMP measures during site selection, construction, and operation, including buffer zones, erosion control, spill response, and rehabilitation. Environmental awareness training staff and monitoring of rehabilitation targets must be conducted in line with municipal EMP requirements

6 PLANNING AND DESIGN PHASE

This section of the EMPr provides management principles and mitigation measures for the pre-construction phase of the project. The environmental actions, procedures and responsibilities as required during the pre-construction phase are specified below.

Table 10. Impacts and Mitigation Measures in Planning and Design Phase

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
1.	Legal and social compliance	• Ensure approvals, permits and licenses are obtained for the development. These include: o Environmental Authorisation (EA) o Water Use License (WUL) o Relocation or removal permit (if required) for graves or heritage resources should be obtained from ECPHRA. • Environmental Control Officer (ECO) to be appointed to monitor compliance with permits conditions.	• Commence development with all permits and authorisations in place.	• JGDM • Project Engineer	Once-off
2.	Consultation with affected landowners/ community members	• Affected and neighbouring landowners that will be impacted and affected by construction activities must be given notice before commencement of construction activities. • Establish lines of communications with landowners and community members. • Complaints or liaison with community members must be recorded in the complaints register, which should be always kept on site. • Provide the relevant contact details to landowners and community members for queries / raising of issues or complaints	• To ensure no complaints are received from landowners/ community members.	• JGDM • Project Engineer • Contractor	Once-off
3.	Site establishment	• Prior to the establishment of the site area, the Contractor must produce a site layout plan showing the positions of all site structures and infrastructure for approval. • The location for construction infrastructure should take into account environmentally sensitive areas (no-go areas) and local residents.	• To ensure all areas demarcated as no go areas remain undisturbed and the site camp and construction infrastructure are not sited on sensitive areas.	• Contractor •	Once-off As required

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• The construction camp must be sited in an area already disturbed.			
4.	Dam structural design	• Fishway should be incorporated into the dam design to allow migratory freedom of fish. • Design structures to maintain minimum downstream flows to protect aquatic ecosystems. • Design dam to be deeper rather than having a large surface area, as the rate of evaporation increases with surface area.	• Maintain ecological connectivity and allow for natural fish migration. • Protect downstream aquatic ecosystems by ensuring sufficient environmental flow.	• JGDM • Project Engineer	Once-off
5.	Visual and Landscape	• Refine the final footprint and layout so that structures, roads and disturbed areas are located as low in the landscape as practicable and do not unnecessarily break skylines or prominent landform edges. • Minimise cut-and-fill, especially on exposed upper slopes, valley sides and plateau margins. • Keep the WTW layout compact and avoid the scattered placement of visually unrelated structures. • Use muted, recessive and non-reflective colours and finishes that respond to the dominant local palette of rock, grassland, and earth tones. • Design all lighting as low-intensity, fully shielded and directed downward, and limit lighting to operationally necessary locations. • Limit signage to essential safety and identification purposes only and avoid visually intrusive branding or oversized signboards.	• Reduced visual contrast and improved landscape fit. • Lower local visual intrusion and improved integration.	• JGDM • Project Engineer	Once-off

7 CONSTRUCTION PHASE

This section of the EMPr provides management principles and mitigation measures for the construction phase of the project. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Project Manager and Environmental Control Officer.

Table 11. Impact and Mitigation Measures in Construction Phase

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
DAM					
1.	Landscape visual impact	• Compile a pre-construction photographic baseline for the key viewpoints and receptor locations identified in the LVIA. • Confirm final colours, finishes, lighting specifications and signage details prior to construction. • Undertake routine construction-phase visual compliance inspections to verify footprint control, housekeeping, rehabilitation progress and lighting management. • Clearly demarcate the approved disturbance footprint and prevent unnecessary spread of construction activity into surrounding undisturbed areas. • Locate laydown areas, stockpiles, parking and temporary facilities within the least visible and already disturbed portions of the site where possible. • Strip, stockpile and replace topsoil appropriately and implement progressive rehabilitation as soon as areas become available. • Stabilise exposed slopes and disturbed surfaces promptly to avoid long-lived erosion scars and prominent raw soil exposure. • Maintain good housekeeping and ensure that temporary materials, waste and redundant equipment do not remain unnecessarily visible.	• Reduced short-term visual disturbance and recovery faster.	• Contractor	• As required • Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Use temporary lighting only where operationally required and ensure all lights are hooded and down-directed.			
2.	Direct loss of indigenous vegetation and SCC	• Minimise natural vegetation clearance: Limit the footprint of disturbance by maximising the use of existing tracks, roads, and infrastructure corridors wherever possible. • Environmental supervision: Appoint a competent Environmental Control Officer (ECO) for the construction phase to ensure all recommendations in this report are implemented. • Restrict access: Limit all construction and maintenance access to demarcated areas to prevent disturbance to vegetation outside the development footprint. • Protect natural resources: Prohibit collection of plants, wood, or other natural resources outside the approved development footprint. • Laydown areas: Restrict laydown, storage, and temporary work areas to sites of low ecological sensitivity to reduce unnecessary habitat loss. • Selective clearing: Only clear vegetation that is essential for construction, such as for stringing pipelines or removing bushclumps, to minimise habitat loss. • Topsoil management: Remove and stockpile topsoil carefully during construction for use in the rehabilitation of disturbed areas. • Rehabilitation timing: Undertake rehabilitation immediately after construction activities cease in a given area to reduce erosion and promote ecosystem recovery. • Rehabilitation methods: Allow mostly passive regeneration of vegetation, supplemented initially	• To minimise unnecessary clearing and impact on indigenous vegetation.	• Contractor • JGDM	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		with indigenous grass mixes to stabilise soils and accelerate recovery. • Protected species management: Apply for relevant permits prior to removing any protected species, and ensure removal is conducted in accordance with legal requirements. • Long-term management: Develop an alien invasive plan prior to operations, including monitoring and control of alien invasive species, ongoing vegetation management. • Demarcate the minimum construction footprint and all aquatic no-go areas prior to clearing. • Maintain the recommended 50 m buffer around the Blikana River wherever feasible. • Restrict stockpiling, laydown areas, parking and construction camp activities to designated areas outside sensitive aquatic zones. • Strip and stockpile topsoil separately for use in rehabilitation. • Minimise clearing within the buffer and at river crossings to the minimum extent required. • Rehabilitate all temporary disturbed areas progressively during construction. • Avoid unnecessary disturbance of riparian vegetation and drainage line margins. • Use the preferred WTW site rather than Alternative 1 from an aquatic perspective, as it is not associated with drainage lines or dongas.			
3	Direct loss of terrestrial plant SCCs and their habitat	• Micro-siting / avoidance where possible: Finalise the layout to avoid highrisk SCC microhabitats where feasible (riparian margins/drainage lines/seeps; rocky ledges/boulder screes/shaded cliff niches; intact grassland patches).	• To minimise impact on Plant SCCs.	• Contractor • ECO	Once-off Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Targeted pre-construction walkdown: Specialist + ECO walkdown before clearing/trenching at all cliff/rock sections, riparian crossings/near-water works, and intact habitat patches to confirm microhabitats and refine no-go areas/buffers. • Demarcation and footprint discipline: Peg/tape the approved corridor and work areas; prohibit widening, parallel tracks and off-road driving; keep laydowns/stockpiles and refuelling in approved disturbed areas only. • Stop-work trigger: If any suspected SCC (or unknown plant matching SCC traits) is encountered, stop work, demarcate, and obtain specialist confirmation and buffer instructions before continuing. • Riparian + erosion control: Maintain riparian management buffers where feasible; minimise and tightly control crossings; implement erosion/sediment controls (staged clearing, stabilisation, silt measures) and rehabilitate banks/slopes immediately after works. • Rehabilitation + alien control + monitoring: Progressive rehabilitation with correct topsoil handling where applicable, plus alien invasive plant control along disturbed edges and access routes; ECO to monitor compliance and keep an SCC encounter log (including GPS/photo records and database submission if SCC are confirmed).			
4	Disturbance of the surface resulting in increased risk of AIPs	• Minimise disturbance and keep to demarcated footprint: Strict footprint demarcation, no parallel tracks, and minimal vegetation clearing reduce new disturbed “recruitment zones” for AIPs. • Topsoil and spoil management: Strip and store topsoil separately (where applicable), avoid mixing topsoil with subsoil/spoil, and prevent moving	• To prevent unnecessary destruction and fragmentation of the ecosystem function.	• Contractor • ECO	Regularly As required

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		contaminated soil from invaded areas into clean areas. • Active AIP control during construction: Implement immediate control/removal of AIPs encountered within the footprint and along access routes (method appropriate to species—mechanical removal, targeted herbicide by a qualified operator, and safe disposal). Prevent dumping of cut material in the veld. • Rehabilitation and follow-up monitoring: Rehabilitate progressively to re-establish indigenous groundcover quickly and implement follow-up AIP monitoring and control for at least one growing season (longer in riparian and high-risk disturbed areas), with ECO inspections and corrective actions.			
5	Disturbance and degradation of cliff habitat	• Micro-site off cliff faces/ledges where feasible; minimise footprint at cliff sections • Daylight-only works; no lighting toward cliffs • Strict access/footprint demarcation; avoid new tracks along cliff edges • Pre-construction cliff scan and stop-work trigger if nesting/roosting indicators recorded • Waste/carcass control to avoid attracting scavengers	• Minimise the establishment and spread of alien invasive plant species.	• Contractor • ECO	Regularly As required
6.	Riparian disturbance and water quality degradation	• Maintain riparian management buffer (min. 50 m where feasible) • Minimise crossings; select narrow stable points; rehabilitate banks immediately • Erosion/sediment controls (staged clearing, silt fences, berms, stabilisation) • Spill prevention and response readiness; no refuelling/storage near watercourses	• Minimise disturbance to sensitive cliff habitats and associated fauna.	• Contractor	Regularly
7.	Disturbance to the riverbed and banks	• Disturbances within the riverbed need to be minimised as far as possible. • Limit instream works during low-flow season.	• Protect riparian habitats from disturbance.	• Contractor	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
8.	Sediment disturbance and water quality	• Ensure that all stockpiles are well managed and have measures such as berms and sediment traps implemented to prevent erosion and sedimentation. • Undertake water quality monitoring and biomonitoring in the affected watercourses. • All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area. • Ensure proper storage of material that could cause water pollution.	• To prevent contamination of water resources. • To ensure that the quality of the water resource is not impacted.	• Contractor	Regularly
9.	Changes in flow regime	• Maintain base flows in the river at all times during dam construction. • Any disruption to natural flows should be minimized, and where impacts are unavoidable, should be limited to a short period as possible. • Construction works should preferably be done during low flow season. • Minimise construction footprint to where the construction activities take place in-stream. • A natural flow and sedimentation regime must be promoted as far as practically possible. • Construction activities not to adversely interfere with downstream water users to be minimised as far as possible. • To reduce in-stream work durations and potential flow disruptions, the use of precast materials is recommended wherever practicable, preference to in-situ casting of structures.	• To minimsie disruption on the flow of the watercourse.	• Contractor	Regularly
10.	Negative impact on aquatic biota	• Care must be taken during construction activities to prevent loss of benthic biota. • During construction baseflows in the river must be maintained at all times and the duration of impacts on flows should be limited to a short period as possible.	• To minimise stress on aquatic communities when working in the river.	• Contractor	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Ongoing biomonitoring must take place throughout construction and operation to determine trends in ecology.			
11.	Riparian disturbance and water quality degradation	• Maintain riparian management buffer (min. 50 m where feasible) • Minimise crossings; select narrow stable points; rehabilitate banks immediately • Erosion/sediment controls (staged clearing, silt fences, berms, stabilisation) • Spill prevention and response readiness; no refuelling/storage near watercourses	• Protect riparian habitats from disturbance.	• Contractor	Regularly
		WTW			
12.	Landscape visual impact	• Compile a pre-construction photographic baseline for the key viewpoints and receptor locations identified in the LVIA. • Confirm final colours, finishes, lighting specifications and signage details prior to construction. • Undertake routine construction-phase visual compliance inspections to verify footprint control, housekeeping, rehabilitation progress and lighting management. • Clearly demarcate the approved disturbance footprint and prevent unnecessary spread of construction activity into surrounding undisturbed areas. • Locate laydown areas, stockpiles, parking and temporary facilities within the least visible and already disturbed portions of the site where possible. • Strip, stockpile and replace topsoil appropriately and implement progressive rehabilitation as soon as areas become available. • Stabilise exposed slopes and disturbed surfaces promptly to avoid long-lived erosion scars and prominent raw soil exposure.	• Reduced short-term visual disturbance and recovery faster.	• Contractor	• As required Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Maintain good housekeeping and ensure that temporary materials, waste and redundant equipment do not remain unnecessarily visible. • Use temporary lighting only where operationally required and ensure all lights are hooded and down-directed.			
13.	Direct loss of indigenous vegetation and SCC	• Minimise natural vegetation clearance: Limit the footprint of disturbance by maximising the use of existing tracks, roads, and infrastructure corridors wherever possible. • Environmental supervision: Appoint a competent Environmental Control Officer (ECO) for the construction phase to ensure all recommendations in this report are implemented. • Restrict access: Limit all construction and maintenance access to demarcated areas to prevent disturbance to vegetation outside the development footprint. • Protect natural resources: Prohibit collection of plants, wood, or other natural resources outside the approved development footprint. • Laydown areas: Restrict laydown, storage, and temporary work areas to sites of low ecological sensitivity to reduce unnecessary habitat loss. • Selective clearing: Only clear vegetation that is essential for construction, such as for stringing pipelines or removing bushclumps, to minimise habitat loss. • Topsoil management: Remove and stockpile topsoil carefully during construction for use in the rehabilitation of disturbed areas. • Rehabilitation timing: Undertake rehabilitation immediately after construction activities cease in a	• To minimise unnecessary clearing and impact on indigenous vegetation.	• Contractor • ECO	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		given area to reduce erosion and promote ecosystem recovery. • Rehabilitation methods: Allow mostly passive regeneration of vegetation, supplemented initially with indigenous grass mixes to stabilise soils and accelerate recovery. • Protected species management: Apply for relevant permits prior to removing any protected species, and ensure removal is conducted in accordance with legal requirements. • Long-term management: Develop an alien invasive plan prior to operations, including monitoring and control of alien invasive species, ongoing vegetation management. • Demarcate the minimum construction footprint and all aquatic no-go areas prior to clearing. • Maintain the recommended 50 m buffer around the Blikana River wherever feasible. • Restrict stockpiling, laydown areas, parking and construction camp activities to designated areas outside sensitive aquatic zones. • Strip and stockpile topsoil separately for use in rehabilitation. • Minimise clearing within the buffer and at river crossings to the minimum extent required. • Rehabilitate all temporary disturbed areas progressively during construction. • Avoid unnecessary disturbance of riparian vegetation and drainage line margins. • Use the preferred WTW site rather than Alternative 1 from an aquatic perspective, as it is not associated with drainage lines or dongas.			
14.	Direct loss of terrestrial plant	• Micro-siting / avoidance where possible: Finalise the layout to avoid highrisk SCC microhabitats where	• To minimise impact on Plant SCCs.	• Contractor • ECO	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
	SCCs and their habitat	feasible (riparian margins/drainage lines/seeps; rocky ledges/boulder screes/shaded cliff niches; intact grassland patches). • Targeted pre-construction walkdown: Specialist + ECO walkdown before clearing/trenching at all cliff/rock sections, riparian crossings/near-water works, and intact habitat patches to confirm microhabitats and refine no-go areas/buffers. • Demarcation and footprint discipline: Peg/tape the approved corridor and work areas; prohibit widening, parallel tracks and off-road driving; keep laydowns/stockpiles and refuelling in approved disturbed areas only. • Stop-work trigger: If any suspected SCC (or unknown plant matching SCC traits) is encountered, stop work, demarcate, and obtain specialist confirmation and buffer instructions before continuing. • Riparian + erosion control: Maintain riparian management buffers where feasible; minimise and tightly control crossings; implement erosion/sediment controls (staged clearing, stabilisation, silt measures) and rehabilitate banks/slopes immediately after works. • Rehabilitation + alien control + monitoring: Progressive rehabilitation with correct topsoil handling where applicable, plus alien invasive plant control along disturbed edges and access routes; ECO to monitor compliance and keep an SCC encounter log (including GPS/photo records and database submission if SCC are confirmed).			
15.	Loss of Ecosystem function and connectivity	• Protect key ecological processes and corridors (avoidance/micro-siting): Micro-site the footprint to avoid or minimise disturbance in riparian corridors, drainage lines, wet areas, and connectivity pinch	• To prevent unnecessary destruction and fragmentation of the ecosystem function.	• Contractor • ECO	Regularly as required

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		points (valley bottoms, narrow passes, ridgelines) that maintain landscape function. • Maintain habitat connectivity (footprint discipline): Keep all disturbance within a single, clearly demarcated corridor; avoid parallel tracks; reinstate/close temporary access routes after construction to prevent longterm fragmentation and edge effects. • Erosion, stormwater and sediment control (process protection): Implement robust erosion and stormwater controls on slopes and at crossings (staged clearing, diversions/berms, silt measures, rapid stabilisation). Prevent sediment delivery to riparian systems to protect downstream functioning. • Topsoil and rehabilitation to restore function: Strip, store and re-spread topsoil (where applicable) to reinstate soil seedbank and microbial function; rehabilitate progressively; stabilise disturbed ground and re-vegetate to restore groundcover, infiltration and productivity. • Alien invasive species prevention and control: Apply hygiene measures and active invasive control along disturbed edges and access routes to prevent replacement of indigenous communities and long-term functional decline.			
16.	Disturbance of the surface resulting in increased risk of AIPs	• Minimise disturbance and keep to demarcated footprint: Strict footprint demarcation, no parallel tracks, and minimal vegetation clearing reduce new disturbed “recruitment zones” for AIPs. • Topsoil and spoil management: Strip and store topsoil separately (where applicable), avoid mixing topsoil with subsoil/spoil, and prevent moving contaminated soil from invaded areas into clean areas.	• Minimise the establishment and spread of alien invasive plant species.	• Contractor • ECO	Regularly As required

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Active AIP control during construction: Implement immediate control/removal of AIPs encountered within the footprint and along access routes (method appropriate to species—mechanical removal, targeted herbicide by a qualified operator, and safe disposal). Prevent dumping of cut material in the veld. • Rehabilitation and follow-up monitoring: Rehabilitate progressively to re-establish indigenous groundcover quickly and implement follow-up AIP monitoring and control for at least one growing season (longer in riparian and high-risk disturbed areas), with ECO inspections and corrective actions.			
17.	Disturbance and degradation of cliff habitat	• Micro-site off cliff faces/ledges where feasible; minimise footprint at cliff sections • Daylight-only works; no lighting toward cliffs • Strict access/footprint demarcation; avoid new tracks along cliff edges • Pre-construction cliff scan and stop-work trigger if nesting/roosting indicators recorded • Waste/carcass control to avoid attracting scavengers	• Minimise disturbance to sensitive cliff habitats and associated fauna.	• Contractor	Regularly
18.	Riparian disturbance and water quality degradation	• Maintain riparian management buffer (min. 50 m where feasible) • Minimise crossings; select narrow stable points; rehabilitate banks immediately • Erosion/sediment controls (staged clearing, silt fences, berms, stabilisation) • Spill prevention and response readiness; no refuelling/storage near watercourses	• Protect riparian habitats from disturbance.	• Contractor	Regularly
19.	Loss/fragmentation of grassland/open habitat	• Strict footprint demarcation; keep corridor as narrow as practicable • No parallel tracks; progressive rehabilitation; erosion control • Alien invasive plant control on disturbed verges • ECO monitoring and corrective action	• Maintain ecological integrity and connectivity within the affected area.	• Contractor	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
20.	Faunal injury/mortality during construction	• Speed limits; restrict driving to demarcated routes • Daily trench checks; escape ramps; cover open excavations where feasible • Fauna encounter/rescue procedure under ECO oversight • Limit works to daylight hours where practical. • Keep footprint as small as possible • Prohibit unnecessary vegetation clearing. • Enforce no-hunting/no-harassment and site speed limits.	• Prevent the loss of the faunal community	• Contractor	Regularly
21.	Changes in water quality due to foreign materials	• No stockpiling is to occur within 32 m of watercourses. • Watercourses must be demarcated and marked as no-go. • Storm water flows into the river must be controlled.	• Prevent contamination of watercourses by foreign materials. • Reduce the risk of polluted runoff entering rivers during construction.	• Contractor	Regularly
22.	Soil erosion and sedimentation	• Implement erosion control measures such as silt fences, sediment basins, and sediment traps to prevent soil erosion and minimise sedimentation in water bodies. • All exposed soils must be protected for the duration of the construction phase in order to prevent erosion and sedimentation of the river. • Ensure that construction activities are conducted in a manner that minimises soil disturbance and runoff.	• Prevent or reduce soil erosion during construction. • Minimise sedimentation and contamination of water resources.	• Contractor	Regularly
		RESERVOIRS			
23.	Direct loss of indigenous vegetation and SCC	• Vegetation clearance must be limited to the footprint of the site and only areas to be used for construction should be cleared. • Topsoil should be separated from the subsoil to preserve the indigenous vegetation seedbanks of the area. • Minimise natural vegetation clearance: Limit the footprint of disturbance by maximising the use of	• To minimise unnecessary clearing and impact on indigenous vegetation.	• Contractor • ECO	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		existing tracks, roads, and infrastructure corridors wherever possible. • Environmental supervision: Appoint a competent Environmental Control Officer (ECO) for the construction phase to ensure all recommendations in this report are implemented. • Restrict access: Limit all construction and maintenance access to demarcated areas to prevent disturbance to vegetation outside the development footprint. • Protect natural resources: Prohibit collection of plants, wood, or other natural resources outside the approved development footprint. • Laydown areas: Restrict laydown, storage, and temporary work areas to sites of low ecological sensitivity to reduce unnecessary habitat loss. • Selective clearing: Only clear vegetation that is essential for construction, such as for stringing pipelines or removing bushclumps, to minimise habitat loss. • Topsoil management: Remove and stockpile topsoil carefully during construction for use in the rehabilitation of disturbed areas. • Rehabilitation timing: Undertake rehabilitation immediately after construction activities cease in a given area to reduce erosion and promote ecosystem recovery. • Rehabilitation methods: Allow mostly passive regeneration of vegetation, supplemented initially with indigenous grass mixes to stabilise soils and accelerate recovery. • Protected species management: Apply for relevant permits prior to removing any protected species, and			

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		ensure removal is conducted in accordance with legal requirements. • Long-term management: Develop an alien invasive plan prior to operations, including monitoring and control of alien invasive species, ongoing vegetation management.			
24.	Direct loss of terrestrial plant SCCs and their habitat	• Micro-siting / avoidance where possible: Finalise the layout to avoid highrisk SCC microhabitats where feasible (riparian margins/drainage lines/seeps; rocky ledges/boulder screes/shaded cliff niches; intact grassland patches). • Targeted pre-construction walkdown: Specialist + ECO walkdown before clearing/trenching at all cliff/rock sections, riparian crossings/near-water works, and intact habitat patches to confirm microhabitats and refine no-go areas/buffers. • Demarcation and footprint discipline: Peg/tape the approved corridor and work areas; prohibit widening, parallel tracks and off-road driving; keep laydowns/stockpiles and refuelling in approved disturbed areas only. • Stop-work trigger: If any suspected SCC (or unknown plant matching SCC traits) is encountered, stop work, demarcate, and obtain specialist confirmation and buffer instructions before continuing. • Riparian + erosion control: Maintain riparian management buffers where feasible; minimise and tightly control crossings; implement erosion/sediment controls (staged clearing, stabilisation, silt measures) and rehabilitate banks/slopes immediately after works. • Rehabilitation + alien control + monitoring: Progressive rehabilitation with correct topsoil handling where applicable, plus alien invasive plant	• To minimise impact on Plant SCCs.	• Contractor • ECO	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		control along disturbed edges and access routes; ECO to monitor compliance and keep an SCC encounter log (including GPS/photo records and database submission if SCC are confirmed).			
25.	Loss of Ecosystem function and connectivity	• Protect key ecological processes and corridors (avoidance/micro-siting): Micro-site the footprint to avoid or minimise disturbance in riparian corridors, drainage lines, wet areas, and connectivity pinch points (valley bottoms, narrow passes, ridgelines) that maintain landscape function. • Maintain habitat connectivity (footprint discipline): Keep all disturbance within a single, clearly demarcated corridor; avoid parallel tracks; reinstate/close temporary access routes after construction to prevent longterm fragmentation and edge effects. • Erosion, stormwater and sediment control (process protection): Implement robust erosion and stormwater controls on slopes and at crossings (staged clearing, diversions/berms, silt measures, rapid stabilisation). Prevent sediment delivery to riparian systems to protect downstream functioning. • Topsoil and rehabilitation to restore function: Strip, store and re-spread topsoil (where applicable) to reinstate soil seedbank and microbial function; rehabilitate progressively; stabilise disturbed ground and re-vegetate to restore groundcover, infiltration and productivity. • Alien invasive species prevention and control: Apply hygiene measures and active invasive control along disturbed edges and access routes to prevent replacement of indigenous communities and long-term functional decline.	• To prevent unnecessary destruction and fragmentation of the ecosystem function.	• Contractor • ECO	Once-off

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
26.	Disturbance of the surface resulting in increased risk of AIPs	• Minimise disturbance and keep to demarcated footprint: Strict footprint demarcation, no parallel tracks, and minimal vegetation clearing reduce new disturbed "recruitment zones" for AIPs. • Topsoil and spoil management: Strip and store topsoil separately (where applicable), avoid mixing topsoil with subsoil/spoil, and prevent moving contaminated soil from invaded areas into clean areas. • Active AIP control during construction: Implement immediate control/removal of AIPs encountered within the footprint and along access routes (method appropriate to species—mechanical removal, targeted herbicide by a qualified operator, and safe disposal). Prevent dumping of cut material in the veld. • Rehabilitation and follow-up monitoring: Rehabilitate progressively to re-establish indigenous groundcover quickly and implement follow-up AIP monitoring and control for at least one growing season (longer in riparian and high-risk disturbed areas), with ECO inspections and corrective actions.	• Minimise the establishment and spread of alien invasive plant species.	• Contractor • ECO	Once-off
27.	Disturbance and degradation of cliff habitat	• Micro-site off cliff faces/ledges where feasible; minimise footprint at cliff sections • Daylight-only works; no lighting toward cliffs • Strict access/footprint demarcation; avoid new tracks along cliff edges • Pre-construction cliff scan and stop-work trigger if nesting/roosting indicators recorded • Waste/carcass control to avoid attracting scavengers	• Minimise disturbance to sensitive cliff habitats and associated fauna.	• Contractor	As required
28.	Loss/fragmentation of grassland/open habitat	• Strict footprint demarcation; keep corridor as narrow as practicable • No parallel tracks; progressive rehabilitation; erosion control • Alien invasive plant control on disturbed verges	• Protect riparian habitats from disturbance.	• Contractor	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• ECO monitoring and corrective action			
29.	Faunal injury/mortality during construction	• Speed limits; restrict driving to demarcated routes • Daily trench checks; escape ramps; cover open excavations where feasible • Fauna encounter/rescue procedure under ECO oversight	• Maintain ecological integrity and connectivity within the affected area.	• Contractor	Regularly
30.	Disturbance of fauna and loss of habitats.	• Temporary laydown and site office areas to be established in disturbed or low sensitivity areas. • Vegetation clearance must be limited to the footprint of the site and only areas to be used for construction should be cleared. • No trapping or hunting of any animals should be done on site.	• Prevent the loss of the faunal community	• Contractor	Regularly
31.	Soil erosion	• Implement erosion control measures. • Rehabilitate disturbed areas immediately after construction.	• Landscape protection from erosion induced degradation	• Contractor	Regularly
32.	Slope instabilities	• Immediately rehabilitate disturbed areas and revegetate to reduce erosion.	• Maintain slope stability and limit erosion in disturbed areas.	• Contractor	Regularly
GRAVITY AND RISING MAINS					
33.	Direct loss of indigenous vegetation and SCC	• Topsoil from excavation pipeline trench must be kept and reused for rehabilitation. • Minimise natural vegetation clearance: Limit the footprint of disturbance by maximising the use of existing tracks, roads, and infrastructure corridors wherever possible. • Environmental supervision: Appoint a competent Environmental Control Officer (ECO) for the construction phase to ensure all recommendations in this report are implemented. • Restrict access: Limit all construction and maintenance access to demarcated areas to prevent disturbance to vegetation outside the development footprint.	• To minimise unnecessary clearing and impact on indigenous vegetation.	• Contractor • ECO	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Protect natural resources: Prohibit collection of plants, wood, or other natural resources outside the approved development footprint. • Laydown areas: Restrict laydown, storage, and temporary work areas to sites of low ecological sensitivity to reduce unnecessary habitat loss. • Selective clearing: Only clear vegetation that is essential for construction, such as for stringing pipelines or removing bushclumps, to minimise habitat loss. • Topsoil management: Remove and stockpile topsoil carefully during construction for use in the rehabilitation of disturbed areas. • Rehabilitation timing: Undertake rehabilitation immediately after construction activities cease in a given area to reduce erosion and promote ecosystem recovery. • Rehabilitation methods: Allow mostly passive regeneration of vegetation, supplemented initially with indigenous grass mixes to stabilise soils and accelerate recovery. • Protected species management: Apply for relevant permits prior to removing any protected species, and ensure removal is conducted in accordance with legal requirements. • Long-term management: Develop an alien invasive plan prior to operations, including monitoring and control of alien invasive species, ongoing vegetation management.			
34.	Direct loss of terrestrial plant SCCs and their habitat	• Micro-siting / avoidance where possible: Finalise the layout to avoid highrisk SCC microhabitats where feasible (riparian margins/drainage lines/seeps; rocky ledges/boulder screes/shaded cliff niches; intact grassland patches).	• To minimise impact on Plant SCCs and conserve biodiversity	• Contractor • ECO	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Targeted pre-construction walkdown: Specialist + ECO walkdown before clearing/trenching at all cliff/rock sections, riparian crossings/near-water works, and intact habitat patches to confirm microhabitats and refine no-go areas/buffers. • Demarcation and footprint discipline: Peg/tape the approved corridor and work areas; prohibit widening, parallel tracks and off-road driving; keep laydowns/stockpiles and refuelling in approved disturbed areas only. • Stop-work trigger: If any suspected SCC (or unknown plant matching SCC traits) is encountered, stop work, demarcate, and obtain specialist confirmation and buffer instructions before continuing. • Riparian + erosion control: Maintain riparian management buffers where feasible; minimise and tightly control crossings; implement erosion/sediment controls (staged clearing, stabilisation, silt measures) and rehabilitate banks/slopes immediately after works. • Rehabilitation + alien control + monitoring: Progressive rehabilitation with correct topsoil handling where applicable, plus alien invasive plant control along disturbed edges and access routes; ECO to monitor compliance and keep an SCC encounter log (including GPS/photo records and database submission if SCC are confirmed).			
35.	Loss of Ecosystem function and connectivity	• Protect key ecological processes and corridors (avoidance/micro-siting): Micro-site the footprint to avoid or minimise disturbance in riparian corridors, drainage lines, wet areas, and connectivity pinch points (valley bottoms, narrow passes, ridgelines) that maintain landscape function.	• To prevent unnecessary destruction and fragmentation of the ecosystem function.	• Contractor	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Maintain habitat connectivity (footprint discipline): Keep all disturbance within a single, clearly demarcated corridor; avoid parallel tracks; reinstate/close temporary access routes after construction to prevent longterm fragmentation and edge effects. • Erosion, stormwater and sediment control (process protection): Implement robust erosion and stormwater controls on slopes and at crossings (staged clearing, diversions/berms, silt measures, rapid stabilisation). Prevent sediment delivery to riparian systems to protect downstream functioning. • Topsoil and rehabilitation to restore function: Strip, store and re-spread topsoil (where applicable) to reinstate soil seedbank and microbial function; rehabilitate progressively; stabilise disturbed ground and re-vegetate to restore groundcover, infiltration and productivity. • Alien invasive species prevention and control: Apply hygiene measures and active invasive control along disturbed edges and access routes to prevent replacement of indigenous communities and long-term functional decline.			
36.	Disturbance of the surface resulting in increased risk of AIPs	• Minimise disturbance and keep to demarcated footprint: Strict footprint demarcation, no parallel tracks, and minimal vegetation clearing reduce new disturbed “recruitment zones” for AIPs. • Topsoil and spoil management: Strip and store topsoil separately (where applicable), avoid mixing topsoil with subsoil/spoil, and prevent moving contaminated soil from invaded areas into clean areas. • Active AIP control during construction: Implement immediate control/removal of AIPs encountered	• Minimise the establishment and spread of alien invasive plant species.	• Contractor • ECO	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		within the footprint and along access routes (method appropriate to species—mechanical removal, targeted herbicide by a qualified operator, and safe disposal). Prevent dumping of cut material in the veld. • Rehabilitation and follow-up monitoring: Rehabilitate progressively to re-establish indigenous groundcover quickly and implement follow-up AIP monitoring and control for at least one growing season (longer in riparian and high-risk disturbed areas), with ECO inspections and corrective actions.			
37.	Disturbance and degradation of cliff habitat	• Micro-site off cliff faces/ledges where feasible; minimise footprint at cliff sections • Daylight-only works; no lighting toward cliffs • Strict access/footprint demarcation; avoid new tracks along cliff edges • Pre-construction cliff scan and stop-work trigger if nesting/roosting indicators recorded Waste/carcass control to avoid attracting scavengers	• Minimise disturbance to sensitive cliff habitats and associated fauna.	• Contractor	Regularly
38.	Riparian disturbance and water quality degradation	• Maintain riparian management buffer (min. 50 m where feasible) • Minimise crossings; select narrow stable points; rehabilitate banks immediately • Erosion/sediment controls (staged clearing, silt fences, berms, stabilisation) • Spill prevention and response readiness; no refuelling/storage near watercourses	• Protect riparian habitats from disturbance.	• Contractor	Regularly
39.	Loss/fragmentation of grassland/open habitat	• Strict footprint demarcation; keep corridor as narrow as practicable • No parallel tracks; progressive rehabilitation; erosion control • Alien invasive plant control on disturbed verges • ECO monitoring and corrective action	• Maintain ecological integrity and connectivity within the affected area.	• Contractor	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
40.	Faunal injury/mortality during construction	• Speed limits; restrict driving to demarcated routes • Daily trench checks; escape ramps; cover open excavations where feasible • Fauna encounter/rescue procedure under ECO oversight	• Prevent the loss of the faunal community	• Contractor	Regularly
41.	Direct and indirect disturbances to and mortalities of animal species	• Vegetation clearance must be limited to the footprint of the site. • No trapping or hunting of any animals must be done on site.	• Minimise mortality and injury to animal species during construction activities.	• Contractor	Regularly
42.	Soil erosion and Slope instabilities	• Implement erosion control measures. • Rehabilitate disturbed areas immediately after construction. • Trenching must be limited to the development footprint to minimize disturbance. • Immediately backfill and compact trenches after pipeline installation. Stabilize exposed soils by revegetating to prevent erosion. • Benching of slopes along the pipeline route using a cut-and-fill method is recommended to enhance slope stability and reduce the risk of erosion, gullying, and landslides.	• Maintain slope stability and limit erosion in disturbed areas.	• Contractor	Regularly
43.	Impact on cultural or heritage resources	• All graves or stone packed structures identified along the routes of the proposed pipelines should be avoided as per the Phase 1 Archaeological and Cultural Impact Assessment. • The proposed pipeline must avoid all graves (formal and informal) and stone packed structures whether contemporary or as ruins situated within and around the residential homesteads. • If it is necessary for graves to be relocated the corrects procedures must be followed. The costs and process would be on the onus of the developer. The proper procedures and a rigorous public participation	• Ensure that artefacts of heritage value are identified and protected. • Ensure graves and burial sites are avoided.	• Contractor	Regularly

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		process would have to be followed before the graves may be exhumed, relocated and reburied. • There should be no impacts on initiation schools. The seasons for the process should be noted during the construction process. The initiation schools occur during the winter season, June / July and the summer season November / December. • Local Tribal authorities and associated members, members of the community who will be directly affected by the construction of the pipeline, and well as members of the community who will not be directly affected, who reside in the villages surrounding the project area, must be consulted and included as part of the public participation process. Residents who do not reside within the project area may still have a spiritual connection to the project area. • If concentrations of pre-colonial archaeological and/or historical heritage material (such as below surface dense artefacts accumulations and associated material) and/or human remains (including graves and burials) are uncovered during construction, all work must cease immediately and be reported to the Eastern Cape Provincial Heritage Resources Agency (ECPHRA) (043 745 0888) and/or the author the report, so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the archaeological / heritage site may then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities continue. • A person or persons must be trained as a site monitor/s to report any archaeological sites found			

	Aspect	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		during the development. Construction managers/foremen and/or the Environmental Control Officer (ECO) should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites. • A Chance Finds Protocol must be compiled and made readily available for all staff working during the construction phase of the project.			

8 REHABILITATION PHASE

Post construction obligations, also application during works, of the project are outlined in the subsequent table to ensure that contractor leaves site in an acceptable condition with minimal environmental impacts.

Table 12. Impact and Mitigation Measures in Operational Phase

	Activity/Impact	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
1.	Site de-establishment	• All structures should be removed and the site must be clean with no waste, rubble or construction material.	• Ensure the site is left clean, safe, and free of construction-related waste and materials.	• Contractor	Once-off
2.	Revegetation	• Rehabilitation of vegetation on the site must be done as described in the Rehabilitation Plan.	• Ensure the site is rehabilitated.	• Contractor	Regularly

9 OPERATIONAL PHASE

This section of the EMPr provides management principles for the operational phase of the project. Environmental actions, procedures and responsibilities as required during the operational phase are specified.

Table 13. Impact and Mitigation Measures in Operational Phase

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
1.	Environmental compliance	• All post construction requirements of the environmental permits should be fully adhered to.	• Environmentally compliant and sustainable operations of BWSS infrastructure	• JGDM	Ongoing
DAM					
2.	Dam safety	• Ensure compliance with Chapter 12 of the National Water Act (Act 36 of 1998) and the Dam Safety Regulations ("the Regulations", Government Notice R.139 of February 2012) published in terms of the Act.	• Safe operations, maintenance and utilisation of the dam to public and owners' staff	• JGDM	Once-off

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Install and maintain adequate fencing, gates or barriers especially around high-risk zones. • Install clear warning signage to prevent entry and accidental drowning. • Educate the local community about dam risks and safe behavior near the dam.			
3.	Reduced flows and aquatic biota impacts	• Implement environmental flow releases to maintain ecological integrity. • Ensure fishway is maintained to allow for upstream and downstream fish migration.	• Maintained longitudinal hydrological and ecological connectivity	• JGDM	Ongoing As required
4.	Downstream scouring and undercutting	• Implement environmental flow releases to reduce erosion downstream and maintain ecological integrity. • Ensure sediments are released from upstream to maintain downstream channel stability.	• Avoided channel and associated infrastructure degradation due to severe incision	• JGDM	Ongoing As required
2.	Reduced sediment transport on instream habitat and aquatic biota	• Monitor sediment accumulation and conduct dredging when required. • Restore sediment continuity, move sediment around or through the dam via sediment bypass, sluicing, and flushing.	• Improve water quality and biota habitat	• JGDM	Ongoing As required
3.	Sediment trapping	• Reduce sediment yield to dams by erosion control in the upstream river basin.	• Improved water quality, in particular turbidity and related parameters	• JGDM	Ongoing As required
4.	Entrainment and impingement of aquatic biota at the dam abstraction works	• Position the intake in an area with low fish density and away from critical habitats like spawning grounds or migratory paths. • Utilizing submerged intakes or abstracting water from the riverbank or sand formations (sand abstraction systems) can reduce direct interaction with aquatic life in the main water channel. • Tower intakes allow for drawing water from specific depths, which can help avoid areas where fish are concentrated.	• Aquatic biota conservation	• JGDM	Ongoing As required

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Screens with very fine slots or mesh (as small as 0.5 mm to 2.54 mm, depending on the target species) are used to physically block fish and even larval stages from passing through. • The water velocity perpendicular to the screen face (approach velocity) must be low enough to allow fish to swim away or avoid the screen. Guidelines often recommend specific maximum approach velocities (e.g., 0.5 feet per second). • Self-cleaning screens, such as travelling band screens or multi-disc screens, use internal water jets or mechanical brushes to dislodge debris and organisms, preventing impingement and maintaining low approach velocities. • Special systems, often incorporating "fish buckets" or troughs with a continuous water flow, are integrated into screening mechanisms to gently collect impinged or entrained fish and safely return them to their original water source away from the intake area. • Designing the abstraction system to meet demand but minimize overall disturbance is crucial. This can involve limiting high abstraction rates during sensitive periods of the day or year (e.g., during fish migration). • Intakes and screens must be inspected and well-maintained regularly to ensure they are functioning correctly and that screens are not clogged, which could increase approach velocities.			
5.	Evaporation and potential of drought	• The municipality must develop a Drought Management Plan. • Promote water conservation and awareness campaigns within the serviced communities to reduce non-essential water use.	• Strategic readiness for extreme dry events to ensure continued water supply	• JGDM	Ongoing As required

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Optimise operational releases and abstraction to balance supply reliability with long-term resource sustainability.			
6.	Increased thermal stratification and water temperature	• Multilevel intake to release water from different depths, ensuring cooler water is released and thermal stratification is minimized.	• Conserved water storage and minimised losses	• JGDM	Ongoing As required
7.	Dissolved oxygen decline and anoxic deep water	• Multilevel intake to release water from oxygen-rich layers. • Monitor dissolved oxygen levels in the dam.	• Improved water quality of the dam	• JGDM	Ongoing As required
8.	Increased sediment inflow during storm events	• Implement upstream erosion control measures and sediment traps. • Revegetate any area that has been disturbed due to erosion.	• Early detection and mitigation of erosion	• JGDM	Ongoing As required
9.	Accelerated reservoir sedimentation and storage loss	• Conduct desilting activities to remove accumulated sediments from the dam to maintain storage capacity and water quality.	• Early detection and mitigation of erosion	• JGDM	
10.	Alien Invasion	• The proliferation of alien and/or invasive species (such as water hyacinth) must be prevented, which has the potential to affect water quantity and flow. • Develop an Alien Invasive Management Plan to mitigate the establishment of alien plant species.	• Effective control and elimination of invasive plant species for improved ecological integrity	• JGDM	Ongoing As required
11.	Floods and property damages	• An Emergency Preparedness and Response Plan and maintenance plan must be developed. • Conduct inspections to ensure that spillways and outlets are functioning properly. • Educate local community members about flood risks.	• Flood mitigation and preparedness readiness	• JGDM	Ongoing As required
12.	Water quality / riparian degradation from	• Spill kits, bunding, maintenance Standard Operating Procedures (SOPs); no storage/refuelling near watercourses; routine inspection of erosion controls; rapid incident response.	• Improved water quality of the dam	• JGDM	Ongoing As required

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
	operational incidents				

13	Maintenance of infrastructure	• An Emergency Preparedness and Response Plan and maintenance plan must be developed.
		• Routine inspection of the dam must be undertaken to ensure if the dam is performing optimally.
		• Maintenance activities must include:
		  ○ Vegetation control
		  ○ Repairs
		  ○ Sediment management
			• Eliminated environmental impacts due to operations	• JGDM	Ongoing
					As required

14	Visual landscape impact	• Undertake periodic operational visual audits of the dam to assess maintenance, lighting, screening and any new visually intrusive additions. • Maintain complaints register for visual and lighting issues raised by stakeholders and address verified issues through adaptive management. • Maintain all rehabilitated areas until stable vegetative cover has been achieved and re-establish failed areas promptly. • Ensure that buildings, tanks, walls, fencing and ancillary elements retain muted, recessive finishes and do not weather into highly reflective or visually discordant surfaces. • Keep all external lighting to the minimum required for safety and operation and maintain shielded fittings to prevent glare and light spill. • Maintain good housekeeping within the dam-related operational areas so that litter, staining, corrosion, exposed stored materials and neglected infrastructure do not increase visual clutter. • Maintain any approved visual screening or landscape planting where ecologically appropriate and avoid the introduction of alien invasive species.	• Residual impact reduced but not eliminated; permanent change becomes more visually assimilated over time.	• JGDM	Ongoing As required

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Review any future additions, expansions or signage against the visual objectives of this LVIA before implementation.			
WTW					
15.	High energy consumption	• Renewable energy options and/or alternative energy sources be used.	• Reduced carbon footprint from energy use	• JGDM	Once-off
16.	Sludge contamination	• Sludge management area must be lined with an impermeable geosynthetic lining to prevent seepage. • Sludge must be disposed of at a licensed landfill site or reused as a fertilizer on agricultural lands.	• Contamination and pollution prevent and containment	• JGDM	Ongoing
17.	Increased raw water turbidity and treatment load	• Implement pre-treatment sedimentation by directing raw water through sedimentation basins or clarifiers to allow suspended solids and larger particles to settle before entering the main treatment process, thereby reducing turbidity.	• Improved water quality	• JGDM	Ongoing
18.	Water quality deterioration associated with WTW operation	• Operate and maintain the WTW so that all treatment and associated operational systems function efficiently and reliably. • Ensure that all chemicals, sludge, process waste, wash water and other waste streams are properly contained, handled and disposed of. • Prevent leaks, spillages, uncontrolled discharges and contaminated runoff from entering drainage lines or the Blikana River. • Implement routine compliance and operational monitoring, including inspection of drainage systems, bunded areas, sludge handling areas and stormwater controls. • Establish trigger levels, incident reporting procedures and corrective actions for pollution events. • Ensure operator training, preventive maintenance and rapid response to operational failures.	• Eliminated environmental impacts due to operations	• JGDM	Ongoing

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Separate clean and dirty water systems where relevant and maintain effective stormwater management around the WTW site.			
19.	Lack of maintenance of the infrastructure	• An Emergency Preparedness and Response Plan must be developed. • Ongoing routine monitoring and reporting for any spillage leaking from the treatment plant. • Spill kits and disposal containers must be available for employees to handle spillages.	• Prevent environmental operational impacts	• JGDM	Ongoing
20.	Malfunctioning or poorly operated water treatment infrastructure	• Ensure efficient operation and preventative maintenance of all WTW systems. • Provide backup power where required to reduce risk of failure-related incidents. • Install appropriate telemetry, alarms and operational monitoring systems. • Provide adequate containment and bunding for chemicals, sludge/process waste and wash water. • Implement routine inspections, maintenance and housekeeping of drainage and containment systems. • Maintain an incident response protocol for spillages, leaks or treatment failures. • Prevent contaminated runoff from leaving the site uncontrolled. • Train operators in pollution prevention, emergency response and environmental compliance.	• Prevent environmental operational impacts	• JGDM	Ongoing
21.	Stormwater/ Soil erosion	• Regular maintenance of stormwater drainage systems to ensure runoff is effectively directed away from soil and nearby water resources. • Design and implement an appropriate stormwater management system for the WTW. • Separate clean and dirty water systems where relevant.	• Early detection and mitigation of erosion	• JGDM	Ongoing

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		• Install attenuation measures and ensure controlled discharge of runoff. • Protect outlets and discharge points using energy dissipators, erosion protection and stabilisation measures. • Prevent direct discharge of concentrated runoff into the Blikana River, tributaries or drainage lines. • Inspect and maintain stormwater infrastructure regularly during operation. • Monitor and repair erosion features promptly. • Maintain vegetative cover on exposed areas and rehabilitate disturbed ground where required.			
22.	Ongoing disturbance at cliff-associated infrastructure	• Restrict maintenance access; no lighting toward cliffs; schedule visits to minimise disturbance; apply stop-work trigger if nesting/roosting indicators found.	• Avoidance of mass wasting from geological falls	• JGDM	Ongoing
23.	Water quality / riparian degradation from operational incidents	• Spill kits, bunding, maintenance Standard Operating Procedures (SOPs); no storage/refuelling near watercourses; routine inspection of erosion controls; rapid incident response.	• Improved water quality of the system	• JGDM	Ongoing
24.	Long-term fragmentation / access-mediated disturbance along the corridor	• Decommission temporary tracks; maintain single controlled access; rehabilitate and monitor; alien control.	• Restored ecological integrity of the environment	• JGDM	Ongoing
25.	Faunal injury/mortality from operational traffic	• Speed limits; restrict driving to daylight and defined routes; awareness induction.	• Protected faunal species from accidents and mortality	• JGDM	Ongoing

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
26	Visual landscape impact	• Undertake periodic operational visual audits of the dam to assess maintenance, lighting, screening and any new visually intrusive additions. • Maintain complaints register for visual and lighting issues raised by stakeholders and address verified issues through adaptive management. • Maintain all rehabilitated areas until stable vegetative cover has been achieved and re-establish failed areas promptly. • Ensure that buildings, tanks, walls, fencing and ancillary elements retain muted, recessive finishes and do not weather into highly reflective or visually discordant surfaces. • Keep all external lighting to the minimum required for safety and operation and maintain shielded fittings to prevent glare and light spill. • Maintain good housekeeping within the WTW related operational areas so that litter, staining, corrosion, exposed stored materials and neglected infrastructure do not increase visual clutter. • Maintain any approved visual screening or landscape planting where ecologically appropriate and avoid the introduction of alien invasive species. • Review any future additions, expansions or signage against the visual objectives of this LVIA before implementation.	• Low residual visual impact where mitigation is sustained.	• JGDM	Ongoing
RESERVOIRS & GRAVITY AND RISING MAINS					
27.	Alien invasion	• Rehabilitate or revegetate disturbed areas. • Develop an Alien Invasive Management Plan to mitigate the establishment of alien plant species. • Implement measures such as manual or mechanical removal, herbicide application, to control and eradicate invasive vegetation.	• Effective control and elimination of invasive plant species for improved ecological integrity	• JGDM	Ongoing

	ASPECT	RECOMMENDED MITIGATION MEASURES/ MANAGEMENT ACTIONS	MANAGEMENT OUTCOMES	RESPONSIBLE PARTY	FREQUENCY OF ACTION
28.	Maintenance of infrastructure	• Ongoing routine monitoring.	• Prevent environmental operational impacts	• JGDM	Ongoing
29.	Soil erosion	• Regularly inspect pipelines for leaks and ensure that any detected leaks are repaired immediately to prevent soil erosion.	• Early detection and mitigation of erosion	• JGDM	Ongoing
30.	Increased erosion and scour risk along pipeline routes	• Conduct regular inspections of pipeline routes to identify areas of erosion or scour and implement corrective measures.	• Early detection and mitigation of erosion	• JGDM	Ongoing
31	Ongoing disturbance at cliff-associated infrastructure	• Restrict maintenance access; no lighting toward cliffs; schedule visits to minimise disturbance; apply stop-work trigger if nesting/roosting indicators found.	• Avoidance of mass wasting from geological falls	• JGDM	Ongoing
32.	Water quality / riparian degradation from operational incidents	• Spill kits, bunding, maintenance Standard Operating Procedures (SOPs); no storage/refuelling near watercourses; routine inspection of erosion controls; rapid incident response.	• Improved water quality of the system	• JGDM	Ongoing
33.	Long-term fragmentation / access-mediated disturbance along the corridor	• Decommission temporary tracks; maintain single controlled access; rehabilitate and monitor; alien control.	• Restored ecological integrity of the environment	• JGDM	Ongoing
34.	Faunal injury/mortality from operational traffic	• Speed limits; restrict driving to daylight and defined routes; awareness induction.	• Protected faunal species from accidents and mortality	• JGDM	Ongoing

10 ROLES AND RESPONSIBILITIES

10.1 PROJECT MANAGER

The Project Manager is responsible for overall management of the project and the implementation of the EMPr. The following tasks fall within his / her responsibilities:

- Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures;
- Monitor site activities on a daily basis for compliance;
- Conduct internal audits of the construction site against the EMPr;
- Confine the construction site to the demarcated areas; and
- Rectify transgressions through the implementation of corrective action

10.2ENVIRONMENTAL CONTROL OFFICER

The Developer must appoint a suitable qualified Environmental Control Officer that will be responsible for ensuring compliance to the EMPr. The Environmental Control Officer on site will conduct regular site visits to ensure the success of the EMPr.

The Environmental Control Officer will:

- Do regular site visit to be able to compile site inspection reports for the inclusion in the EMPr as an addendum if necessary.
- Report compliance and non-compliance to the competent authority.
- Know the contents and implications of the environmental report and monitor the implementation of the findings using the EMPr.
- Act as a guide, advisor and consultant to the contractor and client on environment issues during construction. This will be achieved by continuous auditing of the project, identification of problem areas and provisioning of action plans to avoid costly stoppages and /or environmental damage.
- Ensure that people can report incidents and recommend corrective action when required for aspects of non-compliance within the EMPr
- Upgrade the EMPr as necessary and inform the relevant parties of the changes.

10.3 CONTRACTOR

The construction contractor is responsible for submitting reports on implementation of the environmental plan as described by the project proponent and authorities. The contractor must always ensure compliance with the EMPr

during construction activities and maintain an environmental register which keeps a record of all environmental incidents that occur such as

- Public involvement / complaints;
- Health and safety incidents;
- Incidents involving Hazardous materials stored on site; and
- Non-compliance incidents.

11 IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PROGRAMME

A copy of the EMPr must be kept on site at all times during the construction period. The EMPr will be binding on all contractors operating on the site and must be included within the Contractual Clauses. The monitoring programme must be implemented for the duration of the construction and operation of the erosion control structures. This programme should include:

- Establishing a baseline of pre-construction site conditions validated with photographic evidence.
- Monthly audits will be conducted by an independent ECO for the construction phase to ensure compliance with the conditions stipulated in this EMPr and, where necessary, make recommendations for corrective action. These audits can be conducted randomly and do not require prior arrangement with the Project Coordinator.
- Compilation of an audit report with a rating of compliance with the EMPr. The ECO must keep a photographic record of the demarcated site and construction area. The Contractor must be held liable for all unnecessary damage to the environment. A register must be kept of all complaints from the community. All complaints must be handled immediately to ensure timeous rectification by the responsible party.

11.1 ENVIRONMENTAL AUDITS AND MONITORING

The construction contractor will submit reports on implementation of the environmental plan as described by the project proponent and authorities. An environmental audit will be conducted prior to the development and construction activities. This environmental audit will ensure that:

- Mitigation measures are implemented as prescribed in the Environmental Management Programme;
- The relevant authorities are kept informed about progress with the project and that they are given assurance that the project is implemented and managed as prescribed in the EMPr.
- Periodic inspections and/or audits are performed.
- Compliance to the conditions of the EMPr is adhered to and a report compiled.
- Reviews of conformance against policies and procedures stated in this document are performed.
- Supervisors in all work areas will conduct performance and compliance reviews, using the EMPr as guideline to ensure compliance.

- Inspections will occur monthly (or as required).

11.2 RECORD KEEPING

Documents to be maintained by the designated representative/ site agent are to include:

- Training records.
- Inspection records.
- Records of non-compliance and corrective action.
- Records of all complaints, concerns or issues and corrective action.
- Environmental Management Programme.
- All incidents reports.

All records will be kept for up to a year after the completion of the project or in accordance with other legal requirements as they apply.

11.3 EMPR UPDATES

The EMPr will be subject to on-going review throughout the course of the project to ensure its continued suitability, adequacy, and effectiveness. This review may include but will not be limited to monitoring and measuring information, performance data, assessment and audit results and other relevant information and data.

11.4 NON-COMPLIANCE

The contractors must act immediately when notice of non-compliance is received and take corrective action. Complaints received regarding activities on the construction site pertaining to the environment must be recorded in a dedicated register and the response(s) noted with the date and action taken. The ECO should be made aware of any complaints.

Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define how the environment is managed. Failure to redress the cause must be reported to the competent authority for them to deal with the transgression, as it deems fit. The Contractor is deemed not to have complied with the EMPr if, inter alia:

- There is evidence of contravention of the EMPr specifications within the boundaries of the construction site and site extensions;
- There is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site;
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or
- The Contractor fails to comply with corrective or other instructions issued within a specific time.

It is recommended that the Contractors institute penalties for the following less serious violations and any others determined during work, as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or unrepaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven more than designated speed limits.
- Removal and/or damage to fauna, flora, cultural or heritage objects on site.
- Urination and defecation anywhere except at designated facilities.

11.5 INCIDENT REPORTING AND REMEDY

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident. The following information must be provided:

- the location;
- the nature of the load;
- the extent of the impact; and
- the status at the site of the accident itself (i.e., whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes to prevent similar future occurrences.

11.6 PENALTIES

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the Developer and/or the Contractor will be liable. The following violations, and any others determined during work, should be penalised:

- Hazardous chemical/oil spill and/or dumping in non-approved sites.
- Damage to sensitive environments.
- Damage to cultural and historical sites
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.

- Uncontrolled/unmanaged erosion.
- Unauthorised blasting activities (if applicable).
- Pollution of water sources.
- Unnecessary removal or damage to trees.

12 SUMMARY OF RECOMMENDATIONS AND CONCLUSION

The proposed development will have minimal environmental impacts which are manageable through good engineering practices and following all environmental recommendations prescribed. Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be considered as a day-to-day management document. The EMPr thus sets out the environmental standards that are required to minimize the negative impacts and maximize the positive benefits of the local communities. An EMPr is a “live document” and its continuous review and correct management will definitely result to the successful construction of the proposed development.

The contractor is to be made aware of the potential cost and timing implications needed to fulfill the implementation of the EMPr, thus adequately costing for these.

Annexure 1: Rehabilitation Schedule and Guideline

Where applicable, the rehabilitation schedule and procedure to be adhered to is as follows (this methodology should be updated during the construction phase):

Table 14. Rehabilitation schedule and guideline

Step	Method	Equipment
1	Remove all construction material from the area where construction has been completed	To be undertaken by hand.
2	The ground should be sloped so as to attain a natural slope and to attain a natural water flow, if it has been altered during construction (the natural slope should be altered as little as possible during construction).	To be undertaken by hand.
3	Topsoil that has been stockpiled during construction must be applied to the area to undergo rehabilitation. The depth of the topsoil layer to be applied depends on the natural depth of topsoil in the area, and the amount of topsoil that may have been lost during construction.	Topsoil must be applied from the topsoil stockpiled during construction
4	The area should be mulched to improve water retention, and brushwood applied to act as a soil stabiliser. Mulch and brushwood must be applied more heavily in areas which are presently well-wooded (or as directed by the ECO).	The mulch used should be woodchip, obtained commercially or from trees removed during site clearance. The brushwood is obtained from the bushes and trees removed during site clearance.
5	The planting of locally indigenous species should be undertaken, with local species endemic to the area.	The plant species to be used during the rehabilitation process should be endemic to the area surrounding the substation installation.
6	The species which has been planted should be regularly watered after planting. Watering should ensure that no erosion of the topsoil takes place.	A hosepipe must be available on site.
7	Plant species which are not well established after a period of 2 months after planting should be re-planted. If necessary, another dressing of topsoil should be applied prior to planting.	As above
8	Slope stabilisation measures may be necessary in areas where vegetation has not been able to establish and there is an erosion risk. The measures implemented depend on the situation, and can be varied as necessary. The ECO will direct the Contractor as required.	Various slope stabilisation measures are available and vary in effectiveness according to the situation including • Onion bags • Soil saver (jute/hessian) blankets • Logs/bark held in place with pegs

Annexure 2: Proposed Fines and Penalty Structure

Table 15. Proposed fines and penalty structure

Typical incidents incurring penalties	Value
Failure to secure construction site from public access	R5,000
Failure to demarcate working areas and servitudes and/or maintain fences and/or demarcation tape.	R1,000
Failure to stockpile topsoil correctly (per incident)	R2,000
Failure to stockpile materials in designated areas (per incident)	R500
Discharging effluent and/or polluted storm water onto the ground or into surface water (per incident)	R2,000
Failure to provide adequate sanitation, waste disposal facilities or services (per incident)	R1,000
Failure to demarcate construction area boundaries before commencing construction clearance and other activities (per incident)	R5,000
Venturing into or undertaking construction related activities within no-go areas, without formal written approval from the ECO (per incident)	R5,000
No induction regarding environmental matters and site housekeeping practices (per employee)	R2,000
Stockpile of soils and materials outside demarcated areas (per incident)	R1,000
Inappropriate mixing of cement/concrete and poor management of concrete slurry (per incident)	R2,000
Burning of waste on site (including cement bags) (per incident)	R 2,000
Untidiness and litter at camp (per incident)	R200
Unauthorised removal of indigenous trees, medicinal or other plants (per incident)	R2,000
Damaging/killing animals/birds (per incident)	R 1,500
Failure to erect temporary fences as required (per incident)	R2,000
Failure to reinstate disturbed areas within the specified timeframe (per incident)	R2,000
Fire – costs of runaway fires will be borne by the Contractor, should he/she be proven responsible for such fires (per incident)	R25,000
Failure to provide adequate equipment for emergency situations (per incident)	R5,000
Defacing, painting or damaging natural or heritage features (per incident) – mandatory removal of employee from site	R5,000
Damaging cultural, historical and/or archaeological sites of importance (per incident) – mandatory removal of employee from site	R5,000
Failure to maintain basic safety measures on site	R1,000
Failure to carry out required community liaison, damage to property etc., without prior negotiation and/or compensation and other social infringements (per incident)	R1,000
Persistent and un-repaired oil leaks from machinery. The use of inappropriate methods of refuelling (per incident)	R2,000
Failure to provide drip trays and/or empty them frequently (per incident)	R500
Inappropriate use of bins and poor waste management on site (per incident)	R500
Inappropriate off-site disposal of waste from site (per incident)	R10,000
Deliberate lighting of illegal fires on site (per incident)	R1,000
The eating of meals on site outside the defined eating area. Individual not making use of the site ablution facilities (per incident)	R200
Inappropriate use of adjacent watercourses and water bodies – such as for unapproved water abstraction, washing of vehicles, wastewater disposal and use by employees for washing (per incident)	R1000
Any person, vehicle, item of plant, or anything related to the Contractor's operations causing a public nuisance (per incident)	R500
Construction vehicles not adhering to speed limits (per incident)	R200
Failure to maintain and register incidents in the incident register (per incident)	R1,000
Failure to remove all temporary features and leftovers from the construction site and works areas upon completion of the works (per incident)	R50,000
Any contravention with a Method Statement (per incident)	R5,000
Repeated contravention of the specifications or failure to comply with instructions (per incident)	R5,000

Annexure 3: Issues to be addressed by and where appropriate shown on the Environmental Management Site Plan

Table 16. Issues addressed on the EMP Site Plan

Issue	Nature / Description
Sequence of events	Description of the nature of the process required. Briefly describe the sequence of events that will take place from the time that the contractor moves onto site to the time when the site is handed over to the Project Proponent
Health and safety	Potential risks and hazards and precautions that will be taken Cooking area, hazardous materials site, first aid kit, fuel store, security issues, fire management, and public safety.
On site toilets	How many required for the particular development? Are there existing ablution facilities that can be used? If not, how many toilets need to be brought to site and how long are the toilets required on site? Location of toilets (Site Plan)
Workforce	Number of onsite workers Training of workforce in terms of environmental awareness Management of workforce, particularly sub-contractors
Transport and traffic	Transport required for site workers Routes to be used by construction vehicles Demarcate location of traffic turning circle and parking areas (Site Plan)
Infrastructure and associated equipment	Nature and extent of infrastructure needed for construction Indicate on site plan
Material storage (e.g. sand needed to build wall)	Approximation of quantity to be excavated Where to be stockpiled (Site Plan) How long to be stockpiled Area required for stockpile
Earthworks/cleaning	Volume of material to be excavated/cleaned Duration of operations Where stocks to be kept on site (Site Plan) How long to be kept on site Where, when and how to be disposed of Recycling and/or re-use of materials
Equipment needed for construction activities	Area required for material and equipment storage Duration of works Nature of equipment and necessary materials
Drinking water	Quantity required Duration of period in which required Source of water Location of potable water (Site Plan)
Cooking and rest areas	Area required Equipment required e.g. gas stoves, matches etc. Shelter Location – indicate on site plan
Existing structures	Indication of location of any structures that need to be removed and/or protected
Life of project	Working hours Time frame Phasing of work areas

Issue	Nature / Description
Construction site	Work area required Location of construction site and work area (Site Plan) Demarcation of no-go areas
Environmentally sensitive areas and possible environmental risks associated with construction activities	A plan of environmentally sensitive areas must be drawn up and made available to contractors. This will include the riverine corridor and pan demarcated in the field survey. A training programme on possible environmental risks that may result from construction activities and how to deal with these (including a reporting structure) must be made available prior to construction commencing.
Waste management	Litter drums - number, type, size, location (Site Plan) Closest registered waste disposal site (Location map) Waste management plan Recycling / material re-use options

Annexure 4: General Code of Conduct for Contractors

Contractors shall ensure that all sub-contractors, employees, suppliers, agents, etc., are fully aware of the environmental issues detailed in the Construction Environmental Management Programme.

Contractors must Investigate and comply with all existing regulations and laws/ bylaws unless the Relevant Authority grants specific written authority waiving compliance with any legislation.

Contractor's, *inter alia*¸ commit to the following code of conduct:

- Implementing, documenting, reviewing and complying with environmental specifications, permits and management plans as well as relevant environmental legislation, regulations and standards.
- Ensuring the communication and training of all personnel through induction and appropriate environmental training.
- Reducing and, where possible, eliminating and preventing any harmful effects to the environment and societal milieu
- Liaising openly with, and reporting publicly to, all interested and affected parties on environmental matters.

Annexure 5: Environmental Incident Register

Table 17. Environmental incident register

ENVIRONMENTAL INCIDENT REGISTER				
Date	**Environmental incident**	**Comments** *(Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)*	**Corrective Action Taken** (*Give details and attach documentation as far as possible)*	**Signature**

Annexure 6: Environmental Complaints Register

Table 18. Environmental complaints register

ENVIRONMENTAL COMPLAINTS REGISTER				
Date	**Environmental Complaint**	**Name of Compliance** (*Name of complained and method which complaint was received)*	**Corrective Action Taken** (*Give details and attach documentation as far as possible)*	**Signature**