



TRANS-CALEDON TUNNEL AUTHORITY

**CONSULTING SERVICES FOR THE MOKOLO CROCODILE
WATER AUGMENTATION PROJECT PHASE 2
(MCWAP-2A)**

CONTRACT № TCTA 20-041

ENVIRONMENTAL MANAGEMENT PROGRAMME

March 2024

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MOKOLO CROCODILE WATER AUGMENTATION PROJECT PHASE 2

(MCWAP-2A)

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MOKOLO CROCODILE WATER AUGMENTATION PROJECT PHASE 2

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ENVIRONMENTAL MANAGEMENT PROGRAMME

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LIST OF ACRONYMS AND ABBREVIATIONS

BPR	Break Pressure Reservoir
BPT	Break Pressure Tank
EMPr	Environmental Management Programme
CI	Conservation Importance
CLO	Community Liaison Officer
CRE	Chief Resident Engineer
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIAr	Environmental Impact Assessment Report
EM	Environmental Monitor
EMC	Environmental Monitoring Committee
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EMS	Environmental Management System
EO	Environmental Officer
EWR	Ecological Water Requirements
FGD	Flue Gas Desulphurisation
GBN-JV	Gibb Bigen Nyeleti Joint Venture
GN	Government Notice
HIA	Heritage Impact Assessment

IDP	Independent Development Plan
IAPs	Interested and Affected Parties
IFC	International Finance Corporation's
ISO	International Organisation for Standardisation
LEDET	Limpopo Department of Economic Development, Environment and Tourism
LEMA	Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003)
LM	Local Municipality
MCWAP	Mokolo and Crocodile River (West) Water Augmentation Project
MCWAP-1	Mokolo and Crocodile River (West) Water Augmentation Project (Phase 1)
MCWAP-2A	Mokolo and Crocodile River (West) Water Augmentation Project (Phase 2A)
MPRDA	Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFA	National Forests Act, 1998 (No. 84 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PIE	Prevention of Illegal Eviction
PDCA	Plan, Do, Check and Act
PGAs	Peak Ground Accelerations
RAP	Resettlement Action Plan
RAL	Roads Agency Limpopo
SDF	Spatial Development Framework
SCC	Species of Conservation Concern
S&EIR	Scoping and Environmental Impact Reporting Process
SAHRA	South African Heritage Resources Agency
SANS	South African National Standard
SAPS	South African Police Services
SDS	Safety Data Sheets
SHEQ	Safety, health, environment and quality
SM	Social Monitor
SO	Social Officer

STD	Sexually Transmitted Diseases
TOPS	Threatened or Protected Species
TCTA	Trans-Caledon Tunnel Authority
ToR	Terms of Reference
WTI	Water Transfer Infrastructure
WUL	Water Use Licence

UNITS OF MEASUREMENT

%	Percentage
°	Degrees
dBA	Decibel (expression of the relative loudness of the A-weighted sound level in air)
G	Grams
Km	Kilometre
km/h	Kilometres per hour
M	Metre
m ²	Square metre
m ³	Cubic metre
m ³ /a	Cubic metre per annum
MI	Megalitre
mm	Millimetre
Mt	Metric ton
PM ₁₀	Particulate matter smaller than 10 µm
Mm	Micrometre

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GLOSSARY

Auditing	A systematic and objective assessment of an organisation's activities and services conducted and documented on a periodic basis.
Construction Area	Immediate site influenced by specific construction activities, as approved by the Engineer.
Construction Domain	Entire footprint required for the construction of the overall project components.
Environment	The environment is defined in terms of the National Environment Management Act, 1998 (Act No. 107 of 1998) (NEMA), as the surroundings within which humans exist and that are made up of the land, water and atmosphere of the earth, micro-organisms, plants and animal life; and any part or combination of the latter and any interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.
Environmental Aspect	Those components of the company's activities, products and services that are likely to interact with the environment.
Environmental Feature	Elements and attributes of the biophysical, economic and social environment.
Environmental Impact	The change to the environment resulting from an environmental aspect, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity. Can be positive or negative.
Environmental Management Programme	A detailed plan of action, prepared to ensure that recommendations for enhancing positive environmental impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.
Environmental Objective	Overall environmental goal pertaining to the management of environmental features.
Environmental Target	Performance requirement that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
Monitoring	A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.

Project Area	The greater area within which the project is executed. Extends beyond the construction domain.
Sensitive environmental features	Environmental features protected by legislation (e.g. heritage resources), or identified during the Environmental Impact Assessment (EIA) as being sensitive through specialists' findings and input received from Interested and Affected Parties (IAPs).
Watercourse	A geomorphological feature characterised by the presence of a streamflow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water. According to the National Water Act, 1998 (Act No. 36 of 1998) (NWA), a watercourse constitutes a river or spring, a natural channel in which water flows regularly or intermittently, 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, and a reference to a watercourse includes, where relevant, its bed and banks.

1 INTRODUCTION

1.1 Background

Major developments are planned for the Waterberg coalfields that are located in the Lephalale area. As a direct result of the aforementioned developments, the demand for water in the Lephalale area is expected to significantly increase in the future.

Due to the limited availability of water in the Lephalale area, the Department of Water and Sanitation (DWS) conducted a feasibility study (completed in 2010) of the Mokolo Crocodile River (West) Water Augmentation Project (MCWAP) to establish how the future water demands could be met. The phases of the proposed project includes the following:

- Mokolo Crocodile River (West) Water Augmentation Project Phase 1 (MCWAP-1): Augment the supply from the Mokolo Dam to supply the growing water use requirement for the interim period, until a transfer pipeline from the Crocodile River West can be implemented. The solution must, over the long term, optimally utilise the full yield from the Mokolo Dam and will be operated as a system together with the Mokolo Crocodile River (West) Water Augmentation Project Phase 2 (MCWAP-2A). Phase 1 has been operational since June 2015; and
- Mokolo Crocodile River (West) Water Augmentation Project: Transfer water from the Crocodile River (West) to the Lephalale area, including the implementation of the River Management System (RMS) in the Crocodile River (West) and its tributaries. Phase 2 (hereafter referred to as MCWAP-2A or the Project) is the focus of this Environmental Management Programme (EMPr).

In essence, water from the Mokolo Dam will primarily be provided to existing consumers such as the Matimba Power Station, Municipal users in the vicinity of Lephalale, as well as the new Medupi Power Station (partly); while the Crocodile River (West) Transfer Scheme will provide water to the new consumers such as Eskom including water requirements linked to flue gas desulphurisation (FGD) (an air pollution abatement measure) for the Medupi- and Matimba Power Stations.

The overall MCWAP-2A consists of the following components:

- Water Transfer Infrastructure (WTI) – Infrastructure required to transfer water from the Crocodile River (West) to Lephalale as described in Section below;
- Borrow Pits – for sourcing of construction material; and
- River Management System – to manage abstractions from, and the river flow in:
 - a) The Crocodile River (West) between the Hartbeespoort Dam and the Vlieëpoort Weir;
 - b) The Moretele River from Klipvoor Dam to the confluence with the Crocodile River (West);
 - c) The stretch of Elands River from Vaalkop Dam to Crocodile River (West) confluence; and
 - d) The required flow past Vlieëpoort Weir.

1.2 Project Overview

MCWAP-1 included the construction of a Pump Station at the Mokolo Dam and 43 km of new water pipeline up to 1.1 m in diameter, delivering approximately 30.52 million m³ water per annum (m³/a) over the long term. The pipeline tied into the existing infrastructure supplying to Exxaro's Grootegeluk

Mine, Eskom's Matimba and Medupi Power Stations and Lephalale Local Municipality (LM). MCWAP-1 is operational.

MCWAP-2A will entail the implementation of a water transfer system between the Crocodile River (West) at Thabazimbi and points of supply in the Lephalale area. It includes abstraction works, pumping stations and pipelines as well as the associated infrastructure and the implementation of measures to mitigate the impact of the Project on both the natural and social environment. The augmentation is required to supply water to coal-fired power stations, including related mining operations and associated developments. The Project site location is depicted below.

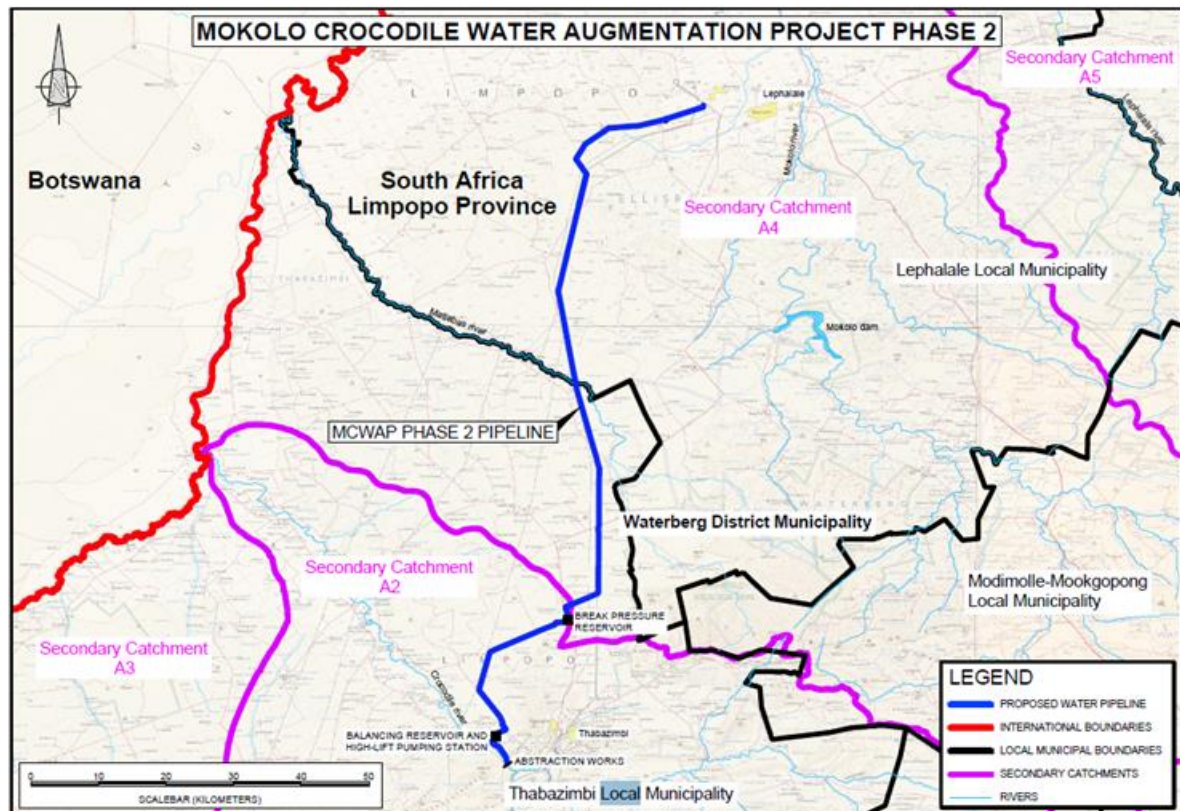


Figure 1: Project Site Location

1.3 MCWAP-2A Infrastructure Components

The infrastructure components of MCWAP-2A are the following:

- The Vlieëpoort Abstraction Works in the Crocodile River (West) on the farm Mooivallei, southwest of Thabazimbi with an abstraction capacity of 125 million m³/a. The Vlieëpoort Abstraction Works includes a diversion weir in the Crocodile River (West), boulder trap, gravel trap and various sand traps. The diversion weir includes a flow measuring section.
- A low-lift pump station at the Vlieëpoort Abstraction Works with an installed capacity of 75 million m³/a that will transfer water via two low-lift rising mains (1000 mm diameter each), approximately 5.9 km long, to the sedimentation works and a 650 mega litre (ML) balancing reservoir.
- A high-lift pump station with an installed capacity of 75 million m³/a at the balancing reservoir will pump water over approximately 27 km through a 1400 mm diameter pipe, to a small break pressure tank.

- From the break pressure tank water will gravitate through a 1400 mm diameter pipe to the 90 MI break pressure reservoir.
- From the break pressure reservoir, water will gravitate over approximately 82.09 km to Off-Take C (future users). The gravity pipeline comprises of 33 km of 1600 mm diameter pipe, 30.5 km of 1500 mm diameter pipe and 18.59 km of 1400 mm diameter pipe.
- From Off-Take C water will gravitate through a 12.9 km of 1100 mm diameter pipeline to Off-Take B (Medupi Power Station).
- From Off-Take B water will gravitate through a 6.3 km of 900 mm diameter pipeline to Off-Take A (Matimba Power Station, Exarro, Grootgeluk and Thabametsi).
- Ancillary works that will comprise of an Operational Control Centre, offices, housing and workshops.

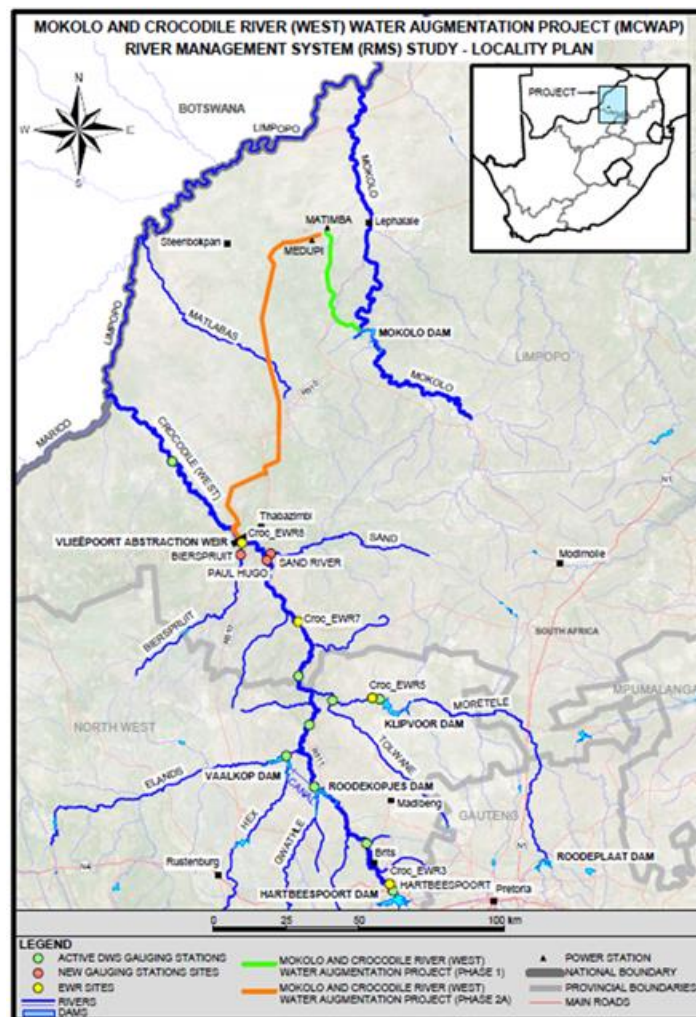


Figure 2: RMS Site Location

The MCWAP-2A will transfer return flows from the Crocodile River (West) which are mainly from Wastewater Treatment Plants (WWTP) within the Crocodile River Catchment, to the Steenbokpan and Lephalale areas. The initial components of the River Management System (RMS) consisted of the following:

- Four (4) existing DWS dams;
- Thirteen (13) existing river gauging stations;

- Smart metering of direct abstraction;
- Smart metering of indirect abstraction (boreholes);
- An Integrated Operational Centre;
- Three 3 new river gauging stations Approved EA (14/12/16/3/3/1/1100);
- Possible River Outlet at Hartbeespoort Dam or Revised Operating Procedures;
- Possible new river outlet at Roodekopjes Dam or revised operating procedures;
- Conveyance capacity in Crocodile River; and
- A Data Communication Network.

The study team for the RMS considered thirteen (13) existing river gauging stations, those sited above during a site visit on 6 and 7 December 2022 with the following objectives:

- Refine the scope of the number of existing weirs to be included for refurbishment;
- Refine the number of new weirs that will be included in the RMS; and
- Appraise the sites of existing weirs to identify rehabilitation and refurbishment requirements.

From this assessment three (3) flow gauging stations were identified where major works will be undertaken, these stations are listed below.

- A2H019 (Beestekraal Weir) on the Crocodile River (West);
- A2H059 (Atlanta Weir) on the Crocodile River (West); and
- A2H116/A2H132 (Paul Hugo Weir) on the Crocodile River (West).

The closest flow gauging weir to the proposed Vlieëpoort Weir Site is the Paul Hugo Weir (A2H132), which is located some 20 km upstream of the proposed Vlieëpoort Weir Site. There are no other functioning flow gauging weirs between the Paul Hugo Weir and the Proposed Vlieëpoort Weir Site. The Paul Hugo Weir, and the weir itself, will need to be upgraded to the same standard as the other DWS Flow Gauging Weirs along the Crocodile River (West) to ensure that data of comparable quantity and quality is available for use in the Proposed RMS. The original purpose of the Paul Hugo Weir is for irrigation and not for flow gauging.

Flow gauge A2H116 was constructed at the foot of the Paul Hugo Weir. It was not meant to augment the accuracy of the Paul Hugo Weir for low flows as it is too close to the main Paul Hugo Weir and becomes drowned when the main weir spills. It was established to measure small amounts of stored water upstream of the Paul Hugo Weir, which is released to the downstream farmers through a small sluice gate when the weir was not spilling. This requirement disappeared many years ago and the sluice gate cannot even be opened anymore.

The primary reason why a new flow gauging weir is proposed downstream of the Paul Hugo Weir, is that the accurate measurement of low flows before the confluence with the Sand River and the Bierspruit is important for management and control of the MCWAP-2. Since the Paul Hugo Weir was not designed as a flow gauging weir, and because it is just a rough broad crested storage weir, the low flows can currently only be estimated at best. Subsequent to this determination, a contactless radar flow monitoring system has been investigated that will be placed on a gantry, as an alternative to the construction of a new weir.

The confluences of the Sandrivier and Bierspruit with the Crocodile River (West) are located downstream of the Paul Hugo Weir and upstream of the Proposed Vlieëpoort Weir Site. This means that the contributions made by the Sandspruit and Bierspruit to the flow in the Crocodile River (West) are currently unknown other than through run-off calculations and cursory visual observations. However, the contributions of these two rivers are considered to be negligible, especially during low flow conditions, and even though Sandspruit and Bierspruit were authorised in the EA (Reference

No. 14/12/16/3/3/2/1100) on 18 March 2019 the recommendation was to not have new weirs constructed in the tributaries of the Crocodile (West) River.

1.4 Scope of this Environmental Management Programme

The Environmental Management Programme (EMPr) approved as part of the EA addressed the Pre-Construction, Construction and Operational Phases. This document incorporates the Pre-Construction and Construction Phase and Operation Phase (as per the approved EMPr).

1.5 Details and Expertise of Environmental Assessment Practitioner

This EMPr report has been compiled by the following person who has the relevant expertise and experience in environmental management.

Project Environmental Lead and Environmental Assessment Practitioner (EAP):	Deon Esterhuizen	Umeshree Naicker	Minenhle Luthuli
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2 ENVIRONMENTAL MANAGEMENT APPROACH AND POLICY

2.1 Environmental Management Approach

The environmental approach of the EMPr is consistent with the approved EMPr. The environmental management approach is based on the Deming Cycle rationale (Figure 3) which is a simplified

continuous improvement model consisting of four main iterative steps, namely: Plan, Do, Check and Act (PDCA). PDCA can be briefly described as follows:

- Plan: Establish the objectives and processes necessary to deliver results in accordance with the applicable organisation’s environmental policy.
- Do: Implement the process.
- Check: Monitor and measure processes against environmental policy objectives, legal and other requirements and report the results.
- Act: Take actions to continually improve environmental performance.

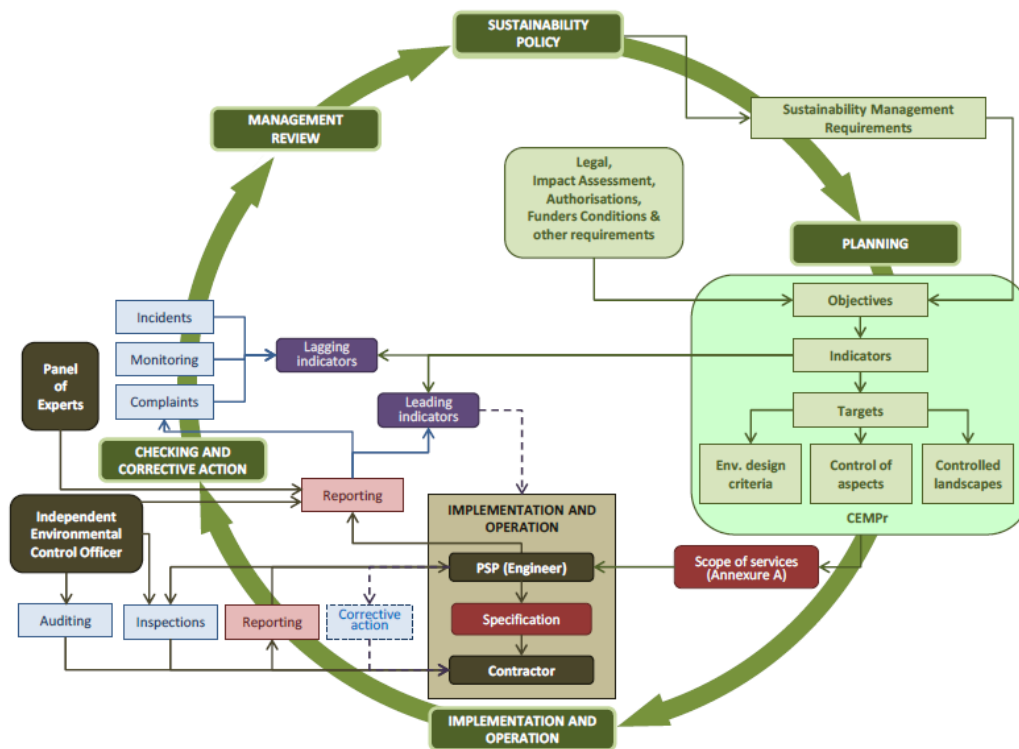


Figure 3: The Specific EMPr rationale based on the Deming Cycle

By basing the Environmental Management approach on the PDCA rationale, the EMPr in essence adopts the approach of the internationally recognised ISO 14001 Environmental Management System (EMS) standard. This standard is also based on the PDCA approach which is adaptive and is based on continual improvement. Continual improvement is achieved by periodic monitoring and review of the EMPr and the subsequent implementation of corrective actions when required. Figure 3 illustrates the various components of the approach and directs the reader to the relevant chapters of the EMPr that addresses each component. This EMPr is therefore a living document which should be continuously updated and possibly improved.

2.1.1 Planning

The “planning” component of an EMS (and therefore this EMPr) involves the identification of environmental aspects, legal and other requirements applicable to the organisation and those applicable to the Project are described in Section 4. Another important requirement of the planning component is the establishment of objectives and targets considering the policy, legal requirements

and the principal objective of continual improvement. These objectives and targets should be specified in an EMPr.

Section 7 of this EMPr is the documented plan in which the objectives are set and the means by which they are to be met. The Project's activities and associated environmental aspects are also identified in Section 7.

2.1.2 Implementation

The “doing” component of an EMS includes the availability of resources, roles and responsibilities to implement, maintain and improve the system. It logically follows in the EMS standard that these resources are appropriately trained. Additional to this, the implementation stage requires that the organisation allow for formal internal and external communication. Operational control and emergency preparedness and response also form part of this stage. All of these components forming part of this EMPr are dealt with between Sections 8–12.

2.1.3 Checking

The “checking” component of an EMS essentially involves monitoring, self-evaluation of compliance, incident reporting and corrective action as well as control of records. These components forming part of this EMPr are dealt with under Section 13.

Checking and corrective action forms the fourth component of the EMPr and serves to ensure that the:

- Required environmental management activities are being implemented; and
- Objectives are being achieved as indicated by meeting the stated targets.

A key underpinning principle for checking action is the concept of leading and lagging indicators. Leading indicators serve to pre-emptively indicate whether the required management actions are in fact being implemented, while lagging indicators present a measure of performance. It is simply inadequate to track only lagging indicators because they will always reflect only what has been achieved (or not).

As such checking and corrective action includes four key lagging indicators. These are:

- Incident recording and review;
- Monitoring selected environmental quality variables as defined in the objectives and targets;
- Monitoring and review of complaints and complaints management; and
- Ongoing inspections of the facilities and activities to identify potential non-compliances.

Leading indicators derive from direct reporting from the Implementer on what has and has not been implemented and is supplemented by an auditing regime that serves to verify the validity of that reporting.

2.1.4 Management Review

The management review component of an EMS is the “Do” stage of the system. For this Project a management review requirement is built into the EMPr requirements and is dealt with under Section 134.

3 DESCRIPTION OF THE AFFECTED AREA

The first baseline studies for MCWAP-2A were conducted in 2018 and were included in the approved EMP. Detailed specialist assessments and baselines were conducted during the 2020 and 2021 periods.

Additional specialist studies were conducted during 2023, specifically for the RMS component, as listed below:

- Aquatic Biodiversity and Sedimentation Report prepared by M2 Environmental Connections (Pty) Ltd (2023);
- Heritage and Palaeontological Impact Assessment by CES - Environmental and Social Advisory Services (2023);
- Environmental Ambient Noise Assessment prepared by Rayten Engineering Solutions (Pty) Ltd (2023);
- Terrestrial Biodiversity Assessment prepared by M2 Environmental Connections (2023);
- Agricultural Impact Assessment prepared by Nsovo Environmental Consulting cc (2023);
- Surface Water by Environmental Assurance (Pty) Ltd (2023);
- Air Quality by Environmental Assurance (Pty) Ltd (2023);
- Civil Aviation Compliance Statement by Delta Built Environment Consultants (2023); and
- Defence Compliance Statement by MDTE (2023).

3.1 Fauna

3.1.1 Bats

The Mooivallei Bat Cave is situated in dolomite of the Malmani Subgroup. The Cave has two entrance holes called “mokondos” (i.e. vertical solution pits in secondary limestone), which have been fenced to prevent livestock from falling in. The mokondos lead to a wide but low, dry chamber, which formed from a collapse in cherty dolostone. The Bat Cave Risk Assessment identified that there are twenty-four (24) bat species occurring in the Mooivallei area. Out of the twenty-four (24) species, the following five (5) are the most conservation important (CI) species:

- Percival's Short-eared Trident Bat (*Cloeotis percivali*): Regionally Red Listed as Endangered;
- Smither's Horseshoe Bat (*Rhinolophus smithersi*) (previously *Rhinolophus hildebrandtii*); Red listed as Near Threatened both regionally;
- Blasius's Horseshoe Bat (*Rhinolophus blasii*): Regionally Red Listed as Near Threatened and experiencing a global population decline;
- Sundevall's Leaf-nosed Bat (*Hipposideros caffer*): Currently not Red Listed but experiencing a global population decline; and
- Natal Long-fingered Bat (*Mastomys Natalensis*) (previously thought to be *Miniopterus schreibersii*): known to roost in large numbers (sometimes hundreds or thousands of individuals) and to migrate hundreds of kilometres.



Figure 4: Cave Fencing and Entrance Hole

3.1.2 Avifauna

The Avifauna Assessment was conducted during 2020. The assessment revealed that a combined total of 177 bird species were recorded during both dry and wet season surveys, along the proposed pipeline route. This includes species detected during both point count (150 spp.) and incidental observations (additional 27 spp.).

The point locality data were separated into four main categories which include:

- Raptor Nests – Threatened Species;
- Raptor Nests – Non-threatened Species;
- Kranskop Cape Vulture Colony; and
- Species of Conservation Concern (SCC) - Point localities of observed SCC individuals.

On the southern half of the pipeline route were the majority of SCC avifauna including threatened raptor species and their nests.

Threatened raptors such as:

- *Gyps coprotheres* (Cape Vulture);
- *Aquila verreauxii* (Verreaux's Eagle);
- *Polemaetus bellicosus* (Martial Eagle);
- *Sagittarius serpentarius* (Secretarybird); and
- Several significant raptor nests belonging to non-threatened species; mainly Wahlberg's Eagle (a breeding migrant present in summer months) but also African Hawk-eagle. The northern half of the pipeline route, in contrast, was more sparsely occupied by SCC but those that do occur are highly threatened i.e. the Critically Endangered White-backed Vulture. SCC species in this area include the Ground Hornbill (on Tarentaalpan) and the Yellow-billed Stork (near the Vlieëpoort Weir in Thabazimbi). Nevertheless, there are also a number of notable observations, the most significant of which include the sighting of the rare and Vulnerable Black Stork along the Matlabas River.

The nest of the Kranskop Cape Vulture colony is also located in the northern half of the pipeline route.



Figure 5: The Critically Endangered White-backed Vulture

3.1.3 Vertebrates and Invertebrates

Areas that were considered to be highly sensitive for vertebrate and invertebrate species include wetlands, rock outcrops and intact vegetation communities that mostly comprise mature trees with a well-developed understory (yet not overgrown and encroached), providing suitable habitat for a diversity of species within the various vegetation strata. These niche habitats within the landscape are considered important as they ensure the ongoing survival of species adapted to, or who select for, these habitat types, with several of these species not being able to survive in other types of habitats. In addition to this, these habitats are often the locus for many vertebrate and invertebrate SCC, many of which have been listed as SCC due to habitat loss.

Vertebrate SCC observed along the pipeline route and within the infrastructure areas, often associated with the high sensitive habitat types:

- *Kinixys lobatsiana* (Lobatse Hingeback Tortoise);
- *Hippotragus niger* (Sable antelope);
- *Crocuta Crocuta* (Spotted Hyaena);
- *Pyxicephalus adspersus* (Giant / Highveld Bullfrog); and
- *Pyxicephalus edulis* (Edible / Lesser Bullfrog).

Invertebrate observed along the pipeline route and within the infrastructure areas, often associated with sensitive habitat types:

- *Harpactirella sp* (Baboon spider);
- *Ceratogyrus sp* burrow (Horned Baboon Spider); and
- *Opisththalmus sp* (Burrowing Scorpion).

3.2 Flora

3.2.1 Ecological Features

The main project area corresponds to five (5) vegetation and landscape features i.e. Subtropical Alluvial Vegetation, Dwaalboom Thornveld, Western Sandy Bushveld, Waterberg Mountain Bushveld and Limpopo Sweet Bushveld.

a) Subtropical Alluvial Vegetation

Flat alluvial riverine terraces supporting an intricate complex of macrophytic vegetation (channel of flowing rivers and river-fed pans), marginal reed belts (in sheltered oxbows and along very slow-flowing watercourses) as well as extensive flooded grasslands, ephemeral herblands and riverine thickets.

b) Dwaalboom Thornveld

Plains with layer of scattered, low to medium high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species, and an almost continuous herbaceous layer dominated by grass species. *Acacia tortilis* and *Acacia nilotica* dominate on the medium clays (at least 21% clay in the upper soil horizon but high in the lower horizons). On particularly heavy clays (>55% clay in all horizons) most other woody plants are excluded and the diminutive *Acacia tenuispina* dominates at a height of less than 1 m above ground. On the sandy clay loam soils (with not more than 35% clay in the upper horizon but high in the lower horizons) *Arisaema erubescens* is the most prominent tree. The alternation of these substrate types creates a mosaic of patches typically 1–5 km across, for example in the unit west of Thabazimbi.

c) Western Sandy Bushveld

Varies from tall open woodland to low woodland, broad-leaved as well as microphyllous tree species prominent. Dominant species include *Acacia Erubescens* on flat areas, *Combretum Apiculatum* on shallow soils of gravelly upland sites and *Terminalia Sericea* on deep sands, occur on slightly undulating plains.

d) Waterberg Mountain Bushveld

Rugged mountains with vegetation grading from *Faurea saligna–Protea caffra* bushveld on higher slopes (in turn grading into the Waterberg-Magaliesberg Summit Sourveld) through broad-leaved deciduous bushveld (dominated by *Diplorhynchus condylocarpon*) on rocky mid- and footslopes to *Burkea africana–Terminalia sericea* savanna in the lower-lying valleys as well as on deeper sands of the plateaus. The grass layer is moderately developed or well developed.

e) Limpopo Sweet Bushveld

Plains, sometimes undulating or irregular, traversed by several tributaries of the Limpopo River. Short open woodland in disturbed areas thickets of *Acacia erubescens*, *Apis mellifera* and *Dichrostachys cinerea* are almost impenetrable.

f) RMS area has the vegetation and landscape features as follows

Site	Bioregion	Vegetation Type	Threat Status
Beestekraal Weir	Central Bushveld	Central Sandy Bushveld	Least Threatened
Atlanta Weir	Central Bushveld	Western Sandy Bushveld	Least Threatened
Paul Hugo Weir	Central Bushveld	Dwaalboom Thornveld	Least Threatened

3.2.2 Protected Species

Several nationally and provincially protected plant species were encountered. These species require permit applications before they can be relocated, destroyed or harvested for reinstatement.

a) National Forest Act (NFA) protected tree species

The following NFA protected tree species were recorded within the footprint of the MCWAP-2A activities:

- *Boscia albitrunca* (Shepherd's tree);
- *Combretum imberbe* (Leadwood);
- *Sclerocarya birrea* subsp. *caffra* (Marula tree);
- *Securidaca longipedunculata* (Violet tree); and
- *Vachellia* (Acacia) *erioloba* (Camel Thorn).

b) Limpopo Environmental Management Act, No. 7 of 2 (LEMA) protected plants.

The *Spirostachys africana* (Tamboti) is a provincially protected flora (Schedule 12 of the LEMA (Section 64)) that was recorded on site.

Members of the *Apocynaceae* family falling in the genera *Huernia*, *Stapelia*, *Orbea*, and *Riocreuxia*. The following protected *Apocynaceae* members are known from the region:

- *Brachystelma brevipedicellatum*;
- *Brachystelma gracile*;
- *Ceropegia ampliata*;
- *Huernia quinta*;
- *Orbea carnososa*;
- *Orbea melanantha*; and
- *Riocreuxia torulosa*.

Sadoxus puniceus is also anticipated to be present within the footprint of the MCWAP-2A activities. *Harpagophytum zeyherii* (Devil's claw) under the NEM:BA TOPS regulations was encountered.

3.3 Wetlands, Rivers, Drainage Lines and Impoundments

Following field verification, this freshwater ecosystem was characterised as a depression wetland (sometimes colloquially referred to as 'pans'). Other depressions, riparian vegetation stream wetland and stream wetland were identified as significant features along the pipeline route. The table below shows description of the significant habitats.

Table 1: Significant Water Features along the pipeline

Farm Name	Significant Habitat / Landscape Feature	CBA categories
Hanover 667 KQ	Crocodile Riparian Vegetation Stream wetland	CBA 1
Donkerpoort 344 KQ Portion 10	Portion of the Riparian Habitat (not in the footprint area but in this farm) Stream wetland	CBA1
Mooivalei 342 KQ Portion 1	Stream wetland	CBA 1 ESA 2
Diepkuil 135 KQ Portion 2	Depression Wetland	CBA 1
Matlabas 94 KQ Portion 2	UCVB Wetland	CBA1
Welgevonden 16 KQ Portion 9	Floodplain	CBA 2
Welgevonden 16 KQ Portion 5	UCVB Wetland	CBA 2
Schoonwater 14 KQ Portion 0	Watercourse / Riparian Vegetation	CBA 2
Inkerman 10 KQ Portion 3	Ephemeral Drainage Line	CBA 2
Rooipan 357 LQ Portion 4	Depression wetland	CBA 1
Rhenosterpan 361 LQ Portion 4	Rock outcrops with specialised habitat Depression Wetland UCVB Wetland	CBA 2

3.4 River Management System

The table below shows description of the significant habitats.

Table 2: Significant Water Features at the three gauging weirs

Site	Theme	Sensitivity	Rationale
Beestekraal Weir	Animal Species	High	Sensitive species
	Plant Species	Low	Low sensitivity
	Terrestrial Biodiversity	Very High	CBA 2 National Protected Area Expansion Strategy (NPAES)
Atlanta Weir	Animal Species	High	Sensitive species

	Plant Species	Low	Low sensitivity
	Terrestrial Biodiversity	Very High	ESA 1
Paul Hugo Weir	Animal Species	High	Sensitive species
	Plant Species	Low	Low sensitivity
	Terrestrial Biodiversity	Very High	Low sensitivity but within Leana Nature Reserve

3.5 Geology

The project area is classified as semi-arid and precipitation occurs mainly in the summer, with the maximum rainfall experienced during November - March. A variation in the geology generally occurs from the south to the north. The geology in the southern regions consists predominantly of dolomites and granites, changing to predominantly Waterberg quartzite, dolomite and granite in the central regions, with Khalahari sands and Waterberg quartzite becoming more prominent towards the north and west.

The large geographical area of the scheme, which extends from the proposed Vlieëpoort Weir site in the south, to the delivery area near Steenbokpan / Lephalale in the north, also has, as a further consequence, an extensive geological coverage. The oldest lithologies are found in the southern portion of the project area, becoming progressively younger towards the north. The oldest lithologies encountered belong to the late Archaean to early Protozoic (i.e. approximately 2 650 to 2 050 million years) Transvaal Supergroup, and comprise the dolomitic rocks and ironstone formations of the Chuniespoort Group, and the slightly younger shales, quartzites and lavas of the Pretoria Group.

The central portion of the project area is underlain by the sandstones of the Waterberg Group which are considered to be between 1 700 and 2 000 million years in age. The northern portion of the project area is underlain by rocks of the Karoo Supergroup which comprises a succession of sandstone, siltstone, shale and mudstone; and are approximately 150 to 270 million years in age. Extensive diabase intrusions are particularly prevalent with the central portion of the project area where they are seen to have intruded the sandstones of the Waterberg Group. Extensive areas, particularly in the north, are covered by Quaternary Age sands which are younger than 1.8 million years.

The structural geology of the project area is similarly highly complex. The older, Transvaal Supergroup rocks in the south of the project area have a moderate to shallow dip of 15° to 30° towards the south-east; reflecting the intrusion of the younger Bushveld Complex, which depressed these underlying strata. These Transvaal Supergroup rocks are extensively faulted. Although faults are generally of limited extent, some major faults, which can be traced for distances in excess of 50 km, can be identified. In the south, the sandstones of the Waterberg Group dip at shallow angles in a northerly direction but become almost horizontal towards the north. Prominent NE-and NW striking lineaments are recognised and likely represent intrusive diabase dykes. The Karoo sedimentary strata are essentially sub-horizontally bedded but are extensively faulted. Some of the faults can be traced for significant distances.

3.6 Heritage and Palaeontology

The Heritage Assessment identified a total of eighteen (18) heritage sites. Of that six (6) have been found to be of high and medium significance. These findings of the 2020 HIA survey are in line with the findings of the 2018 HIA survey that found the areas with significance are as follows:

- Site 1, 3, and 16: These black homesteads fall within the approved corridor;
- Site 2: This grave falls within the proposed construction camp site;
- Site 8: This Stone Age site falls within the proposed development corridor;
- Site 9: This metalworking site associated with the Iron Age lies within the approved pipeline corridor; and
- The actual collection of a sample from the Malamni Subgroup since the Stromatolites were observed during the Phase 1 PIA field visit.

A suitable accredited archaeologist should be present during construction on a watching brief to monitor the above construction activities.

3.7 Socio-economical

a) Population

The population of Limpopo Province increased by 11% between 2007 and 2016 from 5 238 286 in the 2007 CS to 5 799 090 in CS 2016. This drastic increase can be attributed to in-migration related to the development of the Waterberg coalfield, resulting in skills development centres and job opportunities in Lephalale Municipality (LLM). Thabazimbi Local Municipality (TLM) has experienced a 60% increase in its population between 2007 and 2016. Similarly, the sharp rise in population could be attributed to in-migration attracted by the mining sector, just before the closure of ArcelorMittal's Thabazimbi Iron Ore in 2017.

b) Citizenship

In both the Lephalale and Thabazimbi Local Municipalities (LMs) the majority (more than 90%) of the population was born in Limpopo Province. More than 90% of the population in both municipalities are South Africans. The percentage of foreign nationals in Thabazimbi LM is 4% and 8% in Lephalale LM.

c) Community Needs and Services

There was a reduction in access to piped water outside the yard from 2007 to 2016 in the Province, District and in both Local Municipalities. This means that fewer people needed to leave their yards to get water from a communal tap in the street. In that same period, piped water inside the yard has increased, although only a negligible increase in Thabazimbi LM. This means that more households can access water from a tap inside their yards, as opposed to collecting water from a communal tap in the street. This suggests an improvement in access to water. However, according to the Community Census 2016 data, 46.3% and 16.7% of households reported that they did not have access to safe drinking water in Thabazimbi LM and Lephalale LM respectively. Access to electricity has improved for all users, lighting in particular, from 2007 to 2016 in the Province, District and in both Local Municipalities. There has been little change in access to flush toilets between 2007 and 2016, except in Lephalale LM. There was a negligible decrease of 0.5% across the Province and

a small decrease of 3% in Waterberg DM and Thabazimbi LM. There was a substantial increase in access to flush toilets of more than 10% in Lephalale LM.

d) Housing

Rented housing is more prevalent in Thabazimbi (46%) than owned and fully paid off (16%) housing. This suggests a significant presence of transient communities that are not permanently settled. Waterberg DM and Lephalale LM have a lower level of such transience with 22% and 28% of houses rented respectively. Just over half (53%) of Limpopo households live in dwellings they own and are fully paid off.

e) Labour Force

The Waterberg District has very high levels of unemployment as many of its local municipalities are considered to be rural, with limited employment opportunities in relation to the demand for jobs and the available skills levels. Lephalale LM has an unemployment rate of 22% and Thabazimbi's unemployment rate is 20.6% (Stats SA, 2011). These rates are lower than the provincial average, making them better off than the rest of the Province. Higher levels of employment can be attributed to the local developments associated with mining (in particular coal) and power production.

f) Health

According to Stats SA General Household Survey 2016, seven in every ten households went to a public clinic or public hospital as their first point of access when a household member became ill, while only a quarter of households opted to go to a private institution. In Limpopo the Department of Health is allocated about 30 percent of the provincial budget, which is aimed at assisting about 40 hospitals, 454 clinics, 26 community health centres and 123 mobiles.

3.8 Roads and Traffic

The 2021 Roads and Traffic Study assessed the following roads as these roads will be crossed due to the position of the pipeline alignment:

- Road R516; surfaced road between Leeupoort quarry and Thabazimbi and to the project site (for potential concrete aggregate supply).
- Road R511; surfaced road between Leeupoort quarry and Thabazimbi and to the project site (for potential concrete aggregate supply).
- Road R510; surfaced road between Swartklip mine and Thabazimbi and to the project site (for potential concrete aggregate supply).
- Road D1675; surfaced road.
- Road D1925; gravel road.
- Road D175; gravel road.
- Road D2701; surfaced road.
- Road D336; surfaced road.
- Road D769; gravel road.
- Road P16/2; surfaced.
- Road D1649; surfaced road.

4 ADMINISTRATION AND LEGAL FRAMEWORK

The management and mitigation of the environmental impacts conducted during construction is governed by environmental legislation. It is of utmost importance that this project is constructed in compliance with all relevant environmental legislation whether; National, Provincial and/or Local.

The environmental legislative framework and components for South Africa can best be unpacked and summarised as follows:

4.1 The Constitution of South Africa Act (No 108 of 1996)

In accordance with the Constitution, the Government of South Africa has separate national, provincial and local levels that are mutually dependant and interconnected. All three areas of government have legislative and administrative functions and thus have responsibility for the management of the environment.

The Bill of Rights (Chapter 2 of the Constitution) is a fundamental cornerstone of environmental law in South Africa and makes provisions for environmental issues.

Section 24 of the Bill of Rights states that:

“Everyone has the right -

- a. to an environment that is not harmful to their health or well-being; and
- b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -
 - i.) prevent pollution and ecological degradation;
 - ii.) promote conservation; and
 - iii.) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”.

Section 26 (3) of the Constitution, also states:

“No-one may be evicted from their home, or have their home demolished without an order of court made after considering all the relevant circumstances. No legislation may permit arbitrary evictions.”

4.2 International Law

The Limpopo River Basin, of which the Crocodile River (West) is a tributary, is shared by a number of countries, namely, South Africa, Botswana, Zimbabwe and Mozambique. The international obligations in terms of water resource management thus need to be satisfied. This includes the Protocol on Shared Watercourse Systems in the Southern African Development community (SADC) and the SADC Regional Water Policy.

4.3 Common Law

South Africa’s common law is composed of the foundational Roman-Dutch legal principles as modified and interpreted by judicial precedent.

4.4 National Legislation pertaining to this Project

- National Environmental Management Act (No 107 of 1998).
- National Environmental Management: Biodiversity Act (No 10 of 2004).
- National Environmental Management: Waste Act (No 59 of 2008).
- National Veld and Forest Fire Act, Act (No. 101 of 1998).
- National Water Act (No 36 of 1998).
- National Heritage Resources Act (No 25 of 1999).
- National Environment Management: Air Quality Act (No 39 of 2004).
- Mineral and Petroleum Resources Development Act (No 28 of 2002).
- National Road Traffic Act (No 93 of 1996).
- National Environmental Management: Protected Areas Act (No 57 of 2003).
- Occupational Health and Safety Act (No 85 of 1993) and the Construction Regulations of 2014.
- Carbon Tax Act (No 13 of 2019).
- National Forests Act (No 84 of 1998).
- Animals Protection Act (No 71 of 1962).
- Hazardous Substances Act (No 15 of 1973).
- Explosives Act (No 26 of 1956).
- Spatial Planning and Land Use Management Act (No 16 of 2013).
- Promotion of Access to Information Act, (No 2 of 2000).
- Infrastructure Development Act (No 23 of 2014).
- Basic Conditions of Employment Act (No 75 of 1997).
- Promotion of Administrative Justice Act (No 3 of 2000).
- Extension of Security of Tenure Act (No 62 of 1997).
- Water Services Act (No 108 of 1997).
- Prevention of Illegal Eviction and Unlawful Occupation of Land Act (No 19 of 1998).
- Development Facilitation Act (No 67 of 1995).
- Municipal Structures Act (No 117 of 1998).
- Traditional Leadership and Governance Framework Amendment Act (No 23 of 2009).
- Local Government: Municipal Systems Act (No 32 of 2000).
- Legislation Pertaining to Relocation.

4.5 Provincial Legislation pertaining to this Project

- Limpopo Environmental Management Act (No 7 of 2003).
- Limpopo Provincial Heritage Regulations (No 103 of 2003).

4.6 Local By-laws pertaining to this Project

- Lephalale Local Municipality and Thabazimbi Local Municipality.
- Noise Abatement and Prevention of Nuisance Bylaw.
- Refuse Removal Bylaw.
- By-laws relating to water supply.

4.7 National Legislation

4.7.1 National Environmental Management Act (No 107 of 1998)

The NEMA objectives include co-operative environmental governance, sustainable development, environmental justice and the “polluter pays” principle. NEMA Regulations incorporate requirements for environmental impact assessments which are approved or authorised in the form of Environmental Authorisation (EA) reference number 14/12116/3/312/1100 – as was authorised for this Project in 2019.

All project activities must comply with all relevant South African legislation and regulations. All environmental statutory requirements should be included in the Contractors’ Specifications. Some of the pertinent environmental legislation that has bearing on the proposed Project is captured in Table 3, Table 4 and Table 5 below must be adhered to by the Client and Contractor. These conditions therefore form part of the requirements TCTA must comply with as part of this EMPr.

Table 3: General Conditions listed from the EA

General EA Conditions	Reference in EA	Reference in EMPr
A copy of this Environmental Authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying- 60.1. at the site of the authorised activity; 60.2. to anyone on request; and 60.3. where the holder of the Environmental Authorisation has a website, on such publicly accessible website.	60	Section 11

Table 4: Specific Conditions listed from the EA

Selected specific conditions	Reference in EA	Reference in EMPr (where applicable)
A flow gauge must be installed at the Vlieëpoort abstraction weir to inform farmers of the availability of water.	37	Table 13-19
The River Management System must be in place prior to the commissioning of the authorised transfer scheme.	38	Table 12-5
No activities, which require a water use license, must be allowed to encroach into a water resource without a water use authorisation being in place from the Department of Water and Sanitation.	39	Table 12-1
With the exception of the activities and structures required to traverse a watercourse, a recommended buffer zone of 30 m from the edge of the riparian zone, a riverine buffer zone of 32 m from the delineated riparian zones of the Crocodile River (West) and Matlabas Rivers, as well as their tributaries and National Freshwater Ecological Priority Area wetlands identified (pans and floodplains) must be strictly adhered to during the construction phase of the project.	40	Table 13-19

Selected specific conditions	Reference in EA	Reference in EMPr (where applicable)
The location for the construction camp at Rooipan 357 LQ which is adjacent to a pan and within the buffer zone of 15 m must be relocated further east of the present proposal. The final location of the construction camp must be included in the final EMPr.	41	Table 13-7
During the excavation of watercourses, flows should be diverted around active work areas where required. Water diversion must be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion.	42	Table 13-1
A traffic monitoring programme (TMP) must be implemented, and roads maintained. The TMP must form part of the EMPr to be submitted as per condition 13 and 14.	43	Table 13-4
The EMPr must be amended to include a layout plan of the final pipeline route within the corridor.	44	Annexure C
A permit must be obtained from the relevant nature conservation agency for the removal or destruction of indigenous, protected or endangered plant or animal species and a copy of such permit/s must be submitted to the Department for record keeping. Copies of the permit/s must be included in the final EMPr to be submitted to this Department for approval before commencement of construction activities.	45	Table 12-1
No exotic plants may be used for rehabilitation purposes. Only indigenous plants of the area may be utilised.	46	Table 13-23
Vegetation clearing must be kept to an absolute minimum. Mitigation measures as specified in the Specialist Studies / EIAr dated November 2018 must be implemented to reduce the risk of erosion and the invasion of alien species.	47	Table 13-17
A Phase 1 palaeontology assessment must be conducted to assess the value and prominence of fossils along the Central Route.	48	Table 13-20
All heritage sites identified with a significance of medium and high, must be preserved in situ by designing the development footprints in such a way that a buffer area of at least 50 m is maintained from construction activities. In cases where the preservation of such sites and buffer areas are not possible, site-specific mitigation measures must be implemented.	49	Table 13-20
An archaeological and heritage workshop must be conducted with the project ECO before construction commences to allow the ECO to undertake constant monitoring of construction activities.	50	Table 13-20
A determination on the risk to the bat cave (subterranean chambers) in Mooivallei area must be made in consultation with a suitable specialist, and subject to the findings, the necessary mitigation measures must be instituted and included in the amended EMPr.	51	Section 3.1.3 Table 13-18
Construction must include design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	52	Table 13-10

Selected specific conditions	Reference in EA	Reference in EMPr (where applicable)
Affected and neighbouring landowners that will be impacted and affected by construction activities must be given 12 months' notice before commencement of construction activities to enable them to make necessary arrangements.	53	Table 12-3
The holder of EA must comply with Thaba Tholo's (and other landowners, as relevant) biosecurity protocols in relation to the construction and maintenance of the pipeline on the related properties.	54	Table 13-1
A Rehabilitation Management Plan must be developed, and it must include additional measures identified during construction to supplement the reinstatement and rehabilitation provisions included in the EMPr for the construction phase. This plan must be submitted to the DEA for approval before completion of construction activities.	55	Table 13-23
An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Any solid waste must be disposed of at a landfill licensed in terms of Section 20 (b) of the National Environment Management Waste Act, 2008 (Act No.59 of 2008).	56	Table 13-10

4.7.2 Environmental Impact Assessment Regulations, 2014

In order to ensure legal compliance, the EMPr is to comply with the EA conditions (14/12/16/3/3/2/1100) and EIA requirements of the NEMA Section 24 N, together with Appendix 4 of GNR 324 the EIA Regulations, 2017.

Table 5: Content of an EMPr as per the EIA Regulations

No	Requirement	Reference in EMPr
1a	Details of <ul style="list-style-type: none"> i) The EAP who prepared the EMPr; and ii) The expertise of the EAP to prepare an EMPr, including a curriculum vitae; 	Section 1.5 Annexure B
1b	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 6 – Tables 12 to 13
1c	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;	Annexure C

No	Requirement	Reference in EMPr
1d	<p>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:</p> <ul style="list-style-type: none"> i) Planning and design; ii) Pre-construction activities; iii) Construction activities; iv) Rehabilitation of the environment after construction and where applicable post closure; and v) Where relevant, operation activities; 	<p>Section 3 Section 6 – Tables 8 to 11 Section 7 – Table 12 Section 8 – Table 13 Section 8 – Table 13</p>
1e	<p>A description and identification of impact management outcomes required for the aspects contemplated in (d) above;</p>	<p>Section 8 – Table 13</p>
1f	<p>A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph 1d will be achieved and must, where applicable include actions to:</p> <ul style="list-style-type: none"> (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 or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable; 	<p>Section 7 – Table 12 Section 8 – Table 13</p>
1g	<p>The method of monitoring the implementation of the impact management actions contemplated in 1f;</p>	<p>Section 7 – Table 12 Section 8 – Table 13</p>
1h	<p>The frequency of monitoring the implementation of the impact management actions contemplated in 1f;</p>	<p>Section 7 – Table 12 Section 8 – Table 13.</p>
1i	<p>An indication of the persons who will be responsible for the implementation of the impact management actions;</p>	<p>Section 7 – Table 12 Section 8 – Table 13</p>
1j	<p>the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;</p>	<p>Section 7 – Table 12 Section 8 – Table 13</p>
1k	<p>the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);</p>	<p>Section 7– Table 12 Section 8– Table 13</p>
1l	<p>A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations.</p>	<p>Section 8– Table 13 Section 10.1 and 12.1</p>

No	Requirement	Reference in EMPr
1m	An environmental awareness plan describing the manner in which: <ul style="list-style-type: none"> i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment. 	Table 12-4 Section 10.3
1n	Any specific information that may be required by the competent authority.	Table 12-4
2	Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

4.7.3 National Environmental Management: Biodiversity Act (No 10 of 2004)

A section of the infrastructures may or have possible that Red Data Species may occur in these areas. Permit applications must be made to the relevant authority for the removal of any Red Data or Protected Species found in the proposed alignment and construction areas. These permit applications must be made in conjunction with requirements of the Limpopo Environmental Management Act (No 7 of 2003) as well as the National Forests Act (No 84 of 1998). The following plants, as listed in Table 6 will require permits to be removed.

Table 6: Flora requiring Permits before removal.

Species	Co-ordinates		Relevant Authority	Legislation
	Latitude (S)	Longitude (E)		
<i>Spirostachys Africana</i> (<i>Tamboi</i>)	Widespread		Limpopo Provincial Government (LPG)	LEMA
<i>Apocynaceae family</i>	Widespread		Limpopo Provincial Government (LPG)	LEMA
<i>Boscia albitrunca</i> (<i>Shephard's tree</i>)	Scattered individuals		National Government	NFA
<i>Combretum imberbe</i> (<i>Leadwood</i>)	Scattered individuals		National Government	NFA
<i>Sclerocarya birrea</i> <i>subsp.caffra</i> (<i>Marula tree</i>)	Widespread		National Government	NFA
<i>Harpagophytum</i> <i>Zeyherii</i> (<i>Devil's claw</i>)	Scattered individuals		National Government/ Provincial Government	TOPS

Table 7: Fauna requiring Permits before removal

Species	Co-ordinates		Relevant Authority	Legislation
	Latitude (S)	Longitude (E)		
Verreaux's Eagle and Secretarybird	-24.314810°	27.444732	LEDET	NEM:PAA
Martial eagle (<i>Polemaetus bellicosus</i>)	-24.470090°	27.310364	LEDET	NEM:PAA
Wahlberg's eagle (<i>Hieraaetus wahlbergi</i>)	Widespread		LEDET	NEM:PAA

The Biodiversity Act also holds the DWS as authorisation holder ultimately responsible for the eradication of any alien or invasive species which establish on site as a result of the construction activities using methods which are appropriate to the species concerned and the environment in which it occurs. The onus to implement this requirement falls on the Contractor, with TCTA responsible for ensuring all legal requirements are indeed implemented by the Contractor.

4.7.4 National Environmental Management: Waste Act (No 59 of 2008)

All wastes, both general and hazardous, generated during the construction of the pipeline and associated infrastructure must be disposed of at an appropriately licensed waste disposal site such as the waste disposal site. Copies of the permits or licences must be obtained and kept on site before the commencement of construction.

4.7.5 National Water Act (No 36 of 1998)

The following water uses as per section 21 of the Act are triggered by the proposed project activities:

Table 8: Triggered water uses in terms of Section 21 of the NWA

Water Use	Project Activity
Section 21 (a)	Abstraction of water from Taking water from a water resource (water abstraction from the Crocodile River (West) as part of the transfer scheme; taking water for construction purposes);
Section 21 (b)	Storing water (Vlieëpoort abstraction weir);
Section 21 (c)	Impeding or diverting the flow of water in a watercourse (instream works for abstraction works, gauging weirs, access roads' crossings, pipeline crossings, etc.);
Section 21 (f)	Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit (scouring sediment back to the Crocodile River (West));
Section 21 (i)	Alteration of various streams and dongas during pipeline crossing as well as erosion protection measures.
Section 21 (j)	Dewatering of trenches for the safe continuation of activities.

All Water Use Licences must be present on site before construction of the pipeline in these areas may occur.

Table 9: Stream and River Crossings Identified

Crossing name	Co-ordinates	
	Latitude (S)	Longitude (E)
Matlabas	24° 3'5.23"S	27°21'30.80"E
Sandloop River	23°41'35.31"S	27°38'51.43"E
Matlabas River and associated unnamed tributary	24° 0'54.07"S	27°24'20.48"E
Crocodile River	24°35'48.81"S	27°17'10.28"E
Bierspruit River	24°40'39.46"S	27°26'22.44"E
Sandspruit River	24°40'55.01"S	27°19'17.96"E
Medupi Power Station / Marapong	24°13'35.36"S	27°28'44.92"E
Motlhabatsi River	24°13'35.36"S	27°28'44.92"E
Mamba River	24°12'45.51" S	27°30'25.21"E

4.7.6 National Heritage Resources Act (No 25 of 1999)

According to the NHRA archaeological and destruction permits are required for the removal of a structure or element of cultural significance on site.

Results of the phase 1 Heritage Impact Assessment conducted indicate that six (6) archaeological and destruction permits is required for phase 2A. However, should anything of cultural or heritage significance be discovered during construction, the requirements of the legislation must be followed.

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

Section 5(4) prohibits any person from prospecting, mining or undertaking reconnaissance operations or any other activity without an approved EMP, a right permit or permission or without notifying the landowner. Section 38(1)(c) mentions that the holder of the permission / permit / right must manage the environmental impacts according to an EMP and as an ongoing part of the operations.

No person may temporarily or permanently deposit residue on any other site than that demarcated and indicated in the EMP according to Section 42(2).

Permits have been applied for with the Department of Mineral Resources and Energy (DMRE).

4.7.8 National Road Traffic Act (No 93 of 1996)

Relevant provisions of the Road Traffic Act must be complied with pertaining to the diversion of the traffic for the road crossings, the correct licensing for all drivers on site as well as the ensuring that all vehicle and plant is road worthy.

4.7.9 Hazardous Substances Act (No 15 of 1973)

Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which may include the Hazardous Substances Act, the Occupation Health and Safety Act, relevant associated Regulations and applicable SANS and internal standards. The Implementer must ensure that all relevant Material Safety Data Sheets are present on site at all times.

4.7.10 Occupational Health and Safety Act (No 85 of 1993)

All provisions of the Occupational Health and Safety Act must be complied with. The Act must not only provide for the health and safety of the persons connected to the construction but also the persons in the surrounding areas which are affected by the construction.

4.7.11 Explosives Act (No 26 of 1956)

Blasting permits must be present on site before construction can commence. These permits must be acquired from the Department of Mineral Resources in accordance with the Explosives Act (Act No 26 of 1956). Prior to any blasting activities, the blasting contractor is required to submit a comprehensive blasting plan to the Engineer, Environmental Monitor (EM) and Social Monitor (SM) for approval. All affected parties must also be informed of the date and time of blasting.

4.7.12 Basic Conditions of Employment Act (No 75 of 1997)

The Basic Conditions of Employment Act details employment conditions, applies to all workers and employers, and must be obeyed even if other agreements are different. It includes specifications regarding working time, leave, job information and payment, and termination of employment.

The proponent and all its contractors must adhere to the requirements of this Act in the recruitment and employment of labour for construction.

4.7.13 Promotion of Administrative Justice Act (No 3 of 2000)

The Promotion of Administrative Justice Act (PAJA) aims to make Government administration effective and accountable to people for its actions. Section 3 of the Act deals with fair procedures when making decisions affecting the rights of a particular individual. There are five mandatory procedures to be followed:

- Before a decision is made, the individual(s) in question must be given:
 - (1) adequate notice of the nature and purpose of the proposed administrative action, as well as
 - (2) a reasonable opportunity to make representations.
- After a decision is taken, they must receive the following:
 - (3) a clear statement of the administrative action;
 - (4) adequate notice of any right of review or internal appeal; and
 - (5) adequate notice of the right to request reasons.

In terms of this Act, TCTA will give advance notice to all landowners from whom land is to be expropriated for the project.

4.7.14 Extension of Security of Tenure Act (No 62 of 1997)

The Extension of Security of Tenure Act (ESTA) confers certain rights to non-landowning residents of a property based on the period of time the persons have been resident on the land.

As per Section 3 of the Act, a person who has continuously and openly resided on land for a period of one year will be presumed to have consent unless the contrary is proved, while a person living in this manner for a minimum period of three years will be deemed to have done so with the knowledge

of the owner or person in charge. In addition and with regards to farm workers, workers who have lived on a farm for more than ten years and are older than 60 years or unable to work due to a disability, are allowed to remain on the farm for the rest of their lives, unless they breach conditions defined in the Act, or in the agreement in terms of which they stay on the farm. However, if a farm worker's right of occupation on the land is deemed to have been due to their employment on the farm, their resignation from work or dismissal through proper procedures under the Labour Relations Act is grounds for eviction.

In terms of Section 9, the Act requires notice of an intended eviction application to be served on the local municipality and the Department of Rural Development and Land Reform. Under some circumstances, ESTA also requires that alternative accommodation be provided if an eviction takes place.

The Act applies in all rural areas (anywhere outside a proclaimed township), albeit not to any land held by or registered in the name of the State or an institution or functionary exercising powers on behalf of the State. It would therefore apply in the case of any non-landowning residents on land fitting this description (e.g. farm workers on commercial farms) if their houses are in the area to be acquired for the project.

4.7.15 Prevention of Illegal Eviction from and Unlawful Occupation of Land Act (No 19 of 1998)

The Prevention of Illegal Eviction and Unlawful Occupation Act provide procedures for owners to evict illegal occupiers and afford the occupiers some procedural rights in the eviction process.

Section 4 of the Prevention of Illegal Eviction (PIE) from and Unlawful Occupation of Land Act states the following:

- If an unlawful occupier has occupied the land in question for less than six months at the time when the proceedings are initiated, a court may grant an order for eviction if it is of the opinion that it is just and equitable to do so, after considering all the relevant circumstances, including the rights and needs of the elderly, children, disabled persons and households headed by women.
- If an unlawful occupier has occupied the land in question for more than six months at the time when the proceedings are initiated, a court may grant an order for eviction if it is of the opinion that it is just and equitable to do so, after considering all the relevant circumstances, including, except where the land is sold in a sale of execution pursuant to a mortgage, whether land has been made available or can reasonably be made available by a municipality or other organ of state or another landowner for the relocation of the unlawful occupier, and including the rights and needs of the elderly, children, disabled persons and households headed by women.

The provisions of the Act will apply in cases where illegal occupation of land (e.g. informal settlements on State land or farms) has taken place, and where such land is to be acquired for the project and houses in the settlement will be displaced.

4.7.16 Development Facilitation Act (No 67 of 1995)

The Development Facilitation Act (DFA) introduced measures to facilitate and expedite the implementation of reconstruction and development programs and projects in relation to land. It lays down principles governing land development in South Africa and provided for the establishment of a

Development and Planning Commission for the purpose of advising government on policy and land development laws.

This act is relevant to the relocation process that may be undertaken as part of the project. During the resettlement process, alternative land for occupation must be identified and as per best practice guidelines, livelihood restoration programmes are often implemented subsequent to resettlement. The proponent should be aware of the DFA when considering replacement land and in planning its livelihood restoration programmes, as it must be in accordance with the authorities' planning and development objectives.

4.7.17 Spatial Planning and Land Use Management Act (No 16 of 2013)

The Spatial Planning and Land Use Management Act (SPLUMA). The act requires that when developing land, the registration of said land may not be performed unless the municipality certifies that all requirements and conditions for the approval have been complied with.

The Spatial Planning and Land Use Management Act 16 of 2013 aims: to provide a framework for spatial planning and land use management in the Republic; to specify the relationship between the spatial planning and the land use management system and other kinds of planning; to provide for the inclusive, developmental, equitable and efficient spatial planning at the different spheres of government; to provide a framework for the monitoring, coordination and review of the spatial planning and land use management system; to provide a framework for policies, principles, norms and standards for spatial development planning and land use management; to address past spatial and regulatory imbalances; to promote greater consistency and uniformity in the application procedures and decision-making by authorities responsible for land use decisions and development applications; to provide for the establishment, functions and operations of Municipal Planning Tribunals; to provide for the facilitation and enforcement of land use and development measures; and to provide for matters connected therewith.

4.7.18 Municipal Structures Act (No 117 of 1998)

The Municipal Structures Act defines the types and structures of municipalities and requires the municipality to develop a Spatial Development Framework (SDF) as part of its Integrated Development Plan (IDP), which must include the provision of basic guidelines for a land use management system in the municipality. In doing so, the Municipal Councils must annually review the following:

- The needs of the community and its priority to meet those needs;
- The Municipality's processes for involving the community;
- Its organisational and delivery mechanisms for meeting the needs of the community; and
- Its overall performance in achieving its objectives.

The Act also makes provision for the appropriate divisions of powers and electoral systems.

Similar to DFA, this act holds reference for relocation that may take place as part of the project. All resettlement planning, including the design of replacement areas and livelihood restoration programmes must be done in accordance with the affected municipality's IDP and SDF.

4.7.19 Municipal Systems Act (No 32 of 2000)

The Municipal Systems Act defines how local government should operate and allows for various types of partnership arrangements a municipality may enter into to ensure the delivery of services.

The Act requires all municipalities to undertake an IDP process to produce integrated development plans, which, in Section 35 of the Act, is defined as the principle strategic planning instrument, which guides and informs all planning, and development, and all decisions with regard to planning, management and development in the municipality. The IDP legally binds the municipality in the exercise of its executive authority.

In its discussions with the municipality, the proponent and its contractors must be aware that municipalities are governed by this act, and can thus not enter into partnerships without following to correct procedures. In addition, as per the municipality's IDP, some development and infrastructure requirements have been prioritized, and may not necessarily correspond with the needs of the project.

4.7.20 Traditional Leadership and Governance Framework Amendment Act (No 23 of 2009)

This Act amends the Traditional Leadership and Governance Framework Act (Act 41 of 2003). It makes provision for communities to decide for themselves if they want to be regarded as a traditional community in terms of their customs and observe a system of customary law by applying in writing to the Premier.

On receipt of such an application the Premier will consult with the Provincial House of Traditional Leaders, the chief under whose authority the community would fall, and the community themselves before taking a decision on whether to recognize the community concerned as a traditional authority. A community may also, in terms of Section 5(1) of the Act, apply to the Premier for their status of a traditional community to be withdrawn, the Premier must undertake the necessary consultation and accede to the request.

The Act also provides for the establishment and recognition of Traditional Councils, defines the roles and powers of traditional leaders, and provides for dispute resolution and the establishment of a Commission on Traditional Leadership Disputes and Claims.

The authority of the Tribal Authorities in the project area, in terms of acting on behalf of communities in their area of jurisdiction during land acquisition negotiations and granting access for construction work, therefore derives from the provisions of this Act. Phase 2A of the project transverse at least one Tribal Authority area.

4.7.21 Legislation Pertaining to Relocation / Resettlement

National policies or legislation in southern Africa do not explicitly address involuntary resettlement. This policy vacuum is inadequately filled by complicated land tenure, environmental and planning legislation. Consequently, the existing legal frameworks for addressing involuntary resettlement are inadequate and do not aid communities, implementing agents or mining companies.

In view of this gap in national legislation, resettlement processes in South Africa often adopt the guiding principles set out in the International Finance Corporation's (IFC) Performance Standard 5: Land Acquisition and Involuntary Resettlement.

According to the IFC, resettlement is considered involuntary when affected individuals do not have the right to refuse the land acquisition that displaces them. In particular, involuntary resettlement

refers to the physical displacement (relocation or loss of shelter) and to economic displacement (loss of or access to assets that lead to the loss of income sources or means of livelihood) as a result of project-related land acquisition. A Resettlement Action Plan (RAP) is required to set out procedures and actions that will be taken to mitigate adverse project impacts, compensate for any losses, and provide development benefits to those will be resettled and/or displaced as a result of the project.

- Provincial Legislation.
- Limpopo Environmental Management Act (No 7 of 2003).
- Local or Municipal Bylaws (Where applicable the local by-laws listed earlier in the section must be adhered to at all times).

5 IMPLEMENTATION OF THE EMPR

5.1 Roles and Responsibilities

A high-level outline of the institutional arrangements for the implementation of the EMPr during the pre-construction and construction phases of the project, as well as adherence to the conditions of the EA, is provided in Section 5. Key role-players will be the Department of Forestry, Fisheries and the Environment (DFFE), the Department of Water System (DWS), the Environmental Monitoring Committee (EMC), the Trans-Caledon Tunnel Authority (TCTA), the Environmental Control Officer (ECO), Consultants and the Contractors.

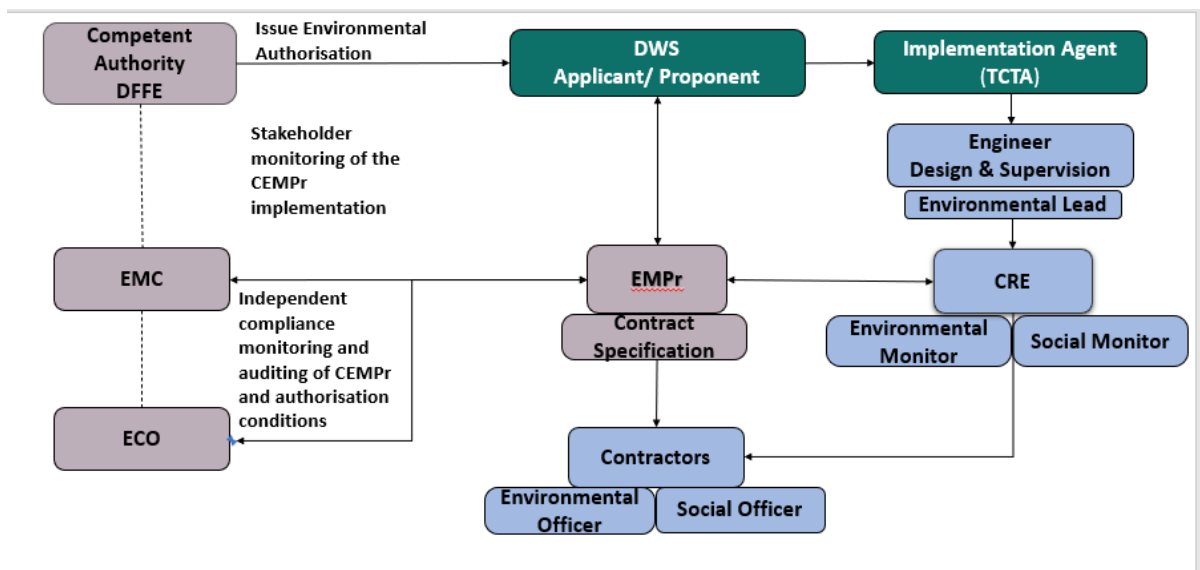


Figure 6: Institutional Arrangements: Roles and Responsibilities

5.1.1 Department of Forestry, Fisheries and the Environment

The DFFE is the mandated authority in terms of NEMA that fulfils a compliance and enforcement role with regards to the authorisation conditions (EA Reference. No. 14/12/16/3/3/2/1100). The DFFE may perform random inspections to check compliance. The DFFE will also serve as an active member of the EMC and will review the monitoring and auditing reports compiled by the ECO.

Amendments may be required to the EMPr or the EA, based on adaptive management to the site conditions and the technical requirements of the project. These amendments will need to be approved by the DFFE.

5.1.2 Department of Water and Sanitation

The DWS is the holder of the EA in terms of NEMA. The DWS is also referred to as the project proponent and is ultimately responsible for the development and implementation of the EMPr and ensuring that the conditions in the EA are satisfied. The liability for non-compliance thus ultimately rests with DWS.

5.1.3 Client – TCTA

The TCTA has been appointed as the Implementer of the Project by DWS. As Implementer, part of TCTA's responsibilities is to oversee the overall implementation of the construction of the weir and pipeline for MCWAP-2A as well as the compliance to the applicable legislation, the EA and approved EMPr.

5.1.4 The Engineer

The GIBB Bigen Nyeleti Joint Venture (GBN-JV) is the appointed Engineer responsible for the design of the pipelines and associated infrastructure. The Engineer will be represented on site for the duration of construction by the Chief Resident Engineer (CRE). The Engineer carries a direct responsibility for the effective implementation of the environmental management requirements detailed in this EMPr.

The Engineer is required to have an Environmental Monitor (EM) and Social Monitor (SM) on his team, responsible for daily monitoring of compliance to environmental requirements.

5.1.5 The Chief Resident Engineer

The CRE is a member of the Engineer's staff and responsible for ensuring that the Contractor complies with the construction contract, the design specifications, the EA and the EMPr. The Contractor may only take instructions from the CRE. All decisions affecting programme or costs which are influenced by the specifications, procedures or protocols must be approved by the CRE. The CRE also has the authority to stop any construction activity which is in contravention of the relevant specifications and/or EA and EMPr. The CRE must make the findings of internal audits available to the Implementing Agent and the ECO.

5.1.6 Environmental Monitor

The Environmental Monitor (EM) is employed by the Engineer and is responsible for overseeing the daily implementation of the EMPr and relevant specifications for the duration of the project. The EM should have a clear understanding of the project as well as all the environmental matters pertaining to the project and should have a good knowledge on the applicable environmental legislation and processes.

Responsibilities of the EM include:

- To advise and provide recommendations to the EO on all environmental and related issues based on the requirements of the EMPr;
- To record and forward complaints received from the public to the Engineer and Employer;
- Resolve conflicts;
- Keep detailed and accurate records of the EMPr related activities on site; and
- Report to the ECO on the monitoring of environmental issues.

5.1.7 Social Monitor

The Social Monitor will act on behalf of the Engineer in all social matters pertaining to the project. Responsibilities of the Social Monitor are:

- Resolve conflicts;

- Ensure the implementation of the Social Monitoring Plan as well as social-related requirements in the EMPr;
- Monitor the progress, impact and sustainability of the project; and
- Ensure that all community and landowner complaints are reported to the Engineer and TCTA, recorded and dealt with in a timeous manner.

5.1.8 The Contractor

In order to carry out the requirements of this EMPr, the Contractor must make sure that he has a clear understanding of all environmental matters relating to the project.

The responsibilities of the Contractor will include:

- The implementation of and adherence to the applicable environmental contract specifications in accordance with the requirements of the EMPr;
- The compliance to all national, provincial and local legislation related to the management of environmental aspects, including ensuring all applicable and required site specific permits, authorisations and licenses which are triggered by the Contractor's activities are applied for and obtained timeously. Examples of such permits include the removal of protected plant species and the storage of flammables and hazardous material;
- To ensure all Sub-contractors under his supervision adhere to the applicable environmental contract specifications in accordance with the requirements of the EMPr;
- Report any incident to the Engineer immediately and follow the initial notification with a flash report within 12 hours of the event occurring. The flash report will include details of the incident, which includes the extent, reasons, preventative actions and corrective actions taken;
- To ensure that all employees and Sub-contractors attend Environmental Awareness Training provided by the EO; and
- To conduct any remedial work required in terms of this EMPr as a result of environmental negligence, mismanagement and/or non-compliance.

5.1.9 Environmental Officer

A suitably qualified senior employee of the Contractor stationed full time on site must be responsible for implementing the EMS, environmental monitoring and control. This position must be designated the Environmental Officer (EO). The EO must be responsible for:

- Aiding the Contractor to comply with all the project environmental requirements, objectives and targets;
- Facilitating environmental activities and environmental awareness training of all personnel on site and
- Implementing an internal environmental management system.

5.1.10 Social Officer

A suitably qualified (social sciences degree with at least 3 years working experience) employee of the Contractor who is stationed full time on site, must be responsible for social environmental monitoring and control. This position must be designated the Social Officer (SO).

The duties of the SO will include:

- Aiding of the Contractor with liaison with landowners and other interested and affected parties;
- Facilitating the resolution of potential and actual challenges experienced during construction where these relate to landowners and their special requirements; and
- Aiding the Contractor in keeping accurate records pertaining to issues, complaints and the associated corrective actions.

5.1.11 The Environmental Control Officer

TCTA must appoint a suitably qualified and experienced independent Environmental Control Officer (ECO) who will be responsible for the monthly monitoring of the project compliance to the EA, EMPr and applicable environmental legislation. The contract for the ECO will extend from the commencement of the Construction Phase to the handover of the site by the TCTA to DWS for operation. During this time the ECO will report to and be held accountable by the EMC. The responsibilities of the ECO include but are not limited to:

- Undertaking a due diligence audit at least a month prior to the commencement of construction. The audit will include a site visit and a qualitative survey of the status of the area prior to construction;
- Review and analyse the monitoring data which will include but not be limited to water, dust and noise monitoring, complaints and pollution incidents and non-conformances against the limits that have been set in the environmental specifications and/or the EA;
- Site inspections will be conducted in such a way that all the construction activities are covered in the month. The site inspection will include a physical visit to the construction sites. The ECO will inform the client of the visit and will commence the visit with an opening meeting on site to gather information regarding the level of operations and a closing meeting to provide feedback to the Chief Resident Engineer and TCTA. A report will be compiled to summarise the findings; and
- Every month the ECO will also provide a monitoring report to the DFFE based on the data gathered by the Contractor and evaluate the information against the performance targets set out in the EMPr.

As part of the ECO's contractual responsibilities, an internal six-monthly audit will be undertaken to provide guidance to the project. This will require a compliance audit at 6 monthly intervals. The audit will be a more in-depth compliance audit than the monthly site inspections and will include a review and report of the Contractor's implemented systems / measures to determine effectiveness of implementation of the EMPr and EA. The audit will systematically review and evaluate the progress of the EMPr implementation.

5.1.12 Environmental Monitoring Committee

An environmental Monitoring Committee (EMC) must be established by the holder of the authorisation before commencement of construction activities. The EMC must meet before the commencement of construction activities (to appoint a chairperson discuss terms of reference), from then on the EMC must sit once every two months, special meetings can be convened on special situations. The EMC must comprise of, but not limited to, the following representatives:

- Chairperson;
- National Environmental Department (Observer);

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- National Environmental Department: Chief Directorate: Compliance Monitoring;
 - The holder of the authorisation (DWS);
 - Implementing Agency (TCTA);
 - Provincial Environmental Department;
 - Hartbeespoort Irrigation Board;
 - Makoppa Agriculture;
 - Crocodile River West Irrigation Board;
 - Mooivalei Landowners and or other representative from any other affected Landowner Associations;
 - Provincial Roads Department;
 - Non-Governmental Organisations;
 - Local Government;
 - The Environmental Control Officer; and
 - Community Liaison Officer.

6 DESCRIPTION OF PROJECT RELATED ACTIVITIES AND ASPECTS

In order to oversee the successful construction of the pipeline and associated infrastructure, various construction activities as well as their associated aspects have been identified and listed. From the identified aspects it is possible to determine the associated environmental impacts and therefore set the base to formulate measures to manage and mitigate these environmental impacts on site. This section, along with Sections 5 and Section 7, forms part of the “Plan” component of the Deming Cycle referred to in Section 2 and therefore this EMPr rationale.

6.1 Pre – Construction Activities

Pre – Construction follows on from final project planning tender phase and leads up to the establishment of the appointed Contractor on site. TCTA will be responsible for overseeing the implementation of the project requirements.

The Pre-Construction activities that are going to be conducted involve are consistent with the approved EA and are not limited to:

- Finalise Design Requirements of the pipeline;
- Land Acquisition and access to site;
- The surveying of the alignment;
- Walk down of the alignment with the specialists;
- Acquiring of all relevant permits and licences;
- Identified Cultural Heritage Resources and Graves rescue and relocation;
- Rescue and relocation of identified red data flora;
- Social aspects related to the employment of local labour;
- Development of Method Statements;
- Environmental Awareness Training; and
- Photographic record of areas prior to site establishment and construction.

6.2 Construction Activities

The civil works associated with the installation of the pipeline will comprise the following:

- a) Site and pipeline route clearing and grubbing;
- a) Relocation of existing services;
- b) Temporary fencing of the pipeline servitude;
- c) Removal and stockpiling of topsoil and agricultural soil;
- d) General and trench excavations in existing and new servitudes;
- e) Blasting of hard material;
- f) Opening, management and closing / rehabilitation of designated areas;
- g) Importation of suitable pipeline bedding and backfill material;
- h) Steel pipe manufacture;
- i) Supply, delivery and installation of different diameter coated and lined steel pipelines as specified and shown on the Drawings;
- j) Manufacture, supply, delivery and installation of pipe specials;
- k) Supply, delivery and installation of scour and air valve installations;
- l) Supply, delivery and installation of pipeline ancillaries (such as isolating and control valves and the like);
- m) Supply, delivery and installation of flow meters;

- n) Construction of valve chambers;
- o) Construction of stream / river / wet land crossings;
- p) Construction of pipeline crossings;
- q) Supply, delivery and installation of pipe sleeves (Pipe jacking) under major and minor road crossings and railway line and the installation of carrier pipes through pipe sleeves;
- r) Installation of temporary and permanent cathodic protection;
- s) Trench backfilling and the disposal of unsuitable or surplus excavation materials; and
- t) Provision and installation of corrosion protection and any repair thereof.

The **Construction Phase** will be divided into the following activities:

- Site Establishment and Infrastructure;
- Site Operations and Construction Works; and
- Earthworks.

The activities and associated aspects which have been identified for Site Establishment and Infrastructure are listed in Table 10.

Table 10: Site Establishment and Infrastructure activities and associated aspects

No.	Activity	Aspect	Table Reference to Section 6
1	Clearing and Grubbing	<ul style="list-style-type: none"> • Dust generation • Loss of vegetation, habitat and soil fertility. • Increased level of noise generation 	Table 13 No 16 Table 13 No 14 Table 12 No 16
2	Land Acquisition and Access to Site	<ul style="list-style-type: none"> • Physical and economic displacement of households / individuals 	Table 13 No 6
3	Construction and use of Temporary Access Roads	<ul style="list-style-type: none"> • Dust generation • Loss of Vegetation, Habitat and soil fertility. • Increased potential for erosion. • Increase in vehicle movement in area. • Increased level of noise generation 	Table 13 No 16 Table 13 No 14 Table 13 No 10 Table 13 No 4 Table 13 No 16
4	Installation of parking bays for construction plant and vehicles	<ul style="list-style-type: none"> • Dust generation • Loss of vegetation, habitat and soil fertility • Increased level of noise generation 	Table 13 No 16 Table 13 No 14 Table 13 No 16
5	Installation of warning signage	<ul style="list-style-type: none"> • Decrease in aesthetic quality of the environment • Lack of visibility of signage 	Table 13 No 9 Table 13 No 16
6	Topsoil stripping and stockpiling	<ul style="list-style-type: none"> • Dust generation • Loss of vegetation, habitat and soil fertility. • Increased potential for erosion • Soil contamination • Encroachment and establishment of alien vegetation 	Table 13 No 16 Table 13 No 14 Table 13 No 17 Table 13 No 17 Table 12 No 6
7	Provision of vehicle wash bays	<ul style="list-style-type: none"> • Dust generation • Loss of vegetation, habitat and soil fertility • Increased level of noise generation • Increased potential for erosion. • Soil contamination • Water contamination 	Table 13 No 16 Table 13 No 14 Table 13 No 16 Table 13 No 17 Table 13 No 17 Table 13 No 10

No.	Activity	Aspect	Table Reference to Section 6
8	Provision of sanitation systems	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility Ground water contamination 	Table 13 No 16 Table 13 No 14 Table 13 No 10
9	Bund area for fuel storage	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility Soil contamination 	Table 13 No 16 Table 13 No 14 Table 13 No 17
10	Demarcation, fencing and gates	<ul style="list-style-type: none"> Loss of vegetation and habitat Impede faunal movement Impeded human movement and disrupted daily activities 	Table 13 No 5 Table 13 No 18 Table 13 No 4
11	Provision of maintenance and workshop areas	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility Soil contamination Water Contamination 	Table 13 No 16 Table 13 No 14 Table 13 No 17 Table 13 No 10
12	Provision of oil sump and separators for construction plant wash bays, refuelling and workshop areas.	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility Soil contamination Water Contamination 	Table 13 No 16 Table 13 No 14 Table 13 No 17 Table 13 No 10
13	Batch plants	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility Soil Contamination Water Contamination 	Table 13 No 16 Table 13 No 14 Table 13 No 17 Table 13 No 10
14	Provision of flammable material and other material stores	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility Soil contamination 	Table 13 No 16 Table 13 No 14 Table 13 No 17
15	Crusher Plant	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility 	Table 13 No 16 Table 13 No 14
16	Sand Washing Plant	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility 	Table 13 No 16 Table 13 No 14

The activities and associated aspects which have been identified for Site Operations and Construction Works are listed in Table 11.

Table 11: Site Operations and Construction Work activities and associated aspects

No.	Activity	Aspect	Table Reference to Section 6
1	Blasting of hard material	<ul style="list-style-type: none"> Increased level of noise generation Vibration Dust generation Safety 	Table 13 No 15 Table 13 No 15 Table 13 No 16 Table 13 No 1
2	Refuelling of construction vehicles and plant	<ul style="list-style-type: none"> Soil contamination Water contamination 	Table 13 No 17 Table 13 No 10
3	Demolition activities	<ul style="list-style-type: none"> Dust generation Increased level of noise generation Vibration Increase in waste generation Safety 	Table 13 No 16 Table 13 No 16 Table 13 No 15 Table 13 No 14 Table 13 No 1

No.	Activity	Aspect	Table Reference to Section 6
4	Spoil material generation and management	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility Decline in the aesthetic quality of the environment 	Table 13 No 16 Table 13 No 14 Table 13 No 9
5	Relocation of existing services	<ul style="list-style-type: none"> Disruption in the provision of services 	Table 13 No 6
6	Domestic and Construction waste collection, storage, handling and disposal	<ul style="list-style-type: none"> Unpleasant odours Increase in Waste generation Decline in the aesthetic quality of the environment 	Table 13 No 16 Table 13 No 14 Table 13 No 9
7	Handling, storage, disposal of hazardous waste	<ul style="list-style-type: none"> Unpleasant odours Soil contamination Water contamination 	Table 13 No 16 Table 13 No 17 Table 13 No 10
8	Consultation with affected parties	<ul style="list-style-type: none"> Insufficient consultation 	Table 12 No 3
9	Operation and movement of construction vehicles and plant	<ul style="list-style-type: none"> Dust generation Increase in level of noise generation Soil contamination Safety Vibration Greenhouse gas emissions 	Table 13 No 16 Table 13 No 16 Table 13 No 14 Table 13 No 1 Table 13 No 15 Table 13 No 16
10	Road upgrades	<ul style="list-style-type: none"> Dust generation Increased level of noise generation Soil contamination Safety 	Table 13 No 16 Table 13 No 16 Table 13 No 17 Table 13 No 1
11	Slopes and slope stabilisation	<ul style="list-style-type: none"> Dust generation Increased potential for erosion Water contamination Decline in the aesthetic quality of the environment. Safety 	Table 13 No 16 Table 13 No 4 Table 13 No 10 Table 13 No 9 Table 13 No 1
12	Maintenance of sanitation systems	<ul style="list-style-type: none"> Unpleasant odours Mismanagement of sewerage 	Table 13 No 9 Table 13 No 8
13	Transportation of hazardous waste	<ul style="list-style-type: none"> Potential Spillages of hazardous waste Safety Greenhouse gas emission 	Table 13 No 13 Table 13 No 1 Table 13 No 16
14	Transportation and storage of pipes and associated materials	<ul style="list-style-type: none"> Increase in vehicle movement in area. Impact on the existing road conditions Safety Increase in the level of noise generation. Greenhouse gas emissions 	Table 13 No 4 Table 13 No Table 13 No 1 Table 13 No 16 Table 13 No 16
15	Use of generators	<ul style="list-style-type: none"> Increase in level of noise generation. Soil contamination 	Table 13 No 16 Table 13 No 17

No.	Activity	Aspect	Table Reference to Section 6
16	Water abstraction	<ul style="list-style-type: none"> Decline in water availability of water resource 	Table 13 No 10
17	Protection of archaeological findings	<ul style="list-style-type: none"> Destruction of graves and other sites of archaeological value 	Table 13 No 20
18	Welding	<ul style="list-style-type: none"> Safety Emission of noxious fumes 	Table 13 No 1 Table 13 No 16
19	Cooking of food	<ul style="list-style-type: none"> Fire hazard 	Table 13 No 21 Table 13 No 4
20	Employment of local labour	<ul style="list-style-type: none"> Insufficient employment of local labour Presence of construction workforce Influx of job – seekers Loss of farm labour to construction work 	Table 13 No 6 Table 12 No 6 Table 13 No 6 Table 13 No 6
21	Construction near or under powerlines	<ul style="list-style-type: none"> Damage and inaccessibility to powerlines 	Table 13 No 6
22	Security	<ul style="list-style-type: none"> Trespassing 	Table 13 No 1
23	Fire Control	<ul style="list-style-type: none"> Loss of vegetation, habitat and soil fertility 	Table 13 No 21
25	Water Use and Management	<ul style="list-style-type: none"> Water contamination Misuse of available water 	Table 13 No 10 Table 13 No 11
18	Welding	<ul style="list-style-type: none"> Safety Emission of noxious fumes 	Table 13 No 1 Table 13 No 16

The activities and associated impacts which have been identified for Earthworks are listed in Table 12.

Table 12: Earthwork activities and associated aspects

No.	Activity	Aspect	Table Reference to Section 6
1	Cut and Fill	<ul style="list-style-type: none"> Dust generation Increased potential for erosion 	Table 13 No 16 Table 13 No 14
2	Trenching	<ul style="list-style-type: none"> Dust generation Increased potential for erosion Safety 	Table 13 No 16 Table 13 No 14 Table 13 No 1
3	Importing of suitable bedding and backfill material	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility. Increased potential for erosion 	Table 13 No 16 Table 12 No 14 Table 13 No 14
4	Topsoil stripping and storage	<ul style="list-style-type: none"> Dust generation Loss of vegetation, habitat and soil fertility. Increased potential for erosion Soil contamination Encroachment and establishment of alien vegetation 	Table 13 No 16 Table 13 No 14 Table 13 No 14 Table 13 No 17 Table 12 No 23

No.	Activity	Aspect	Table Reference to Section 6
5	Slopes and slope stabilisation	<ul style="list-style-type: none"> • Dust generation • Increased potential for erosion • Water contamination • Decline in aesthetic quality of the environment • Safety 	Table 13 No 16 Table 12 No 14 Table 13 No 10 Table 13 No 9 Table 13 No 1
6	Crushing of material	<ul style="list-style-type: none"> • Dust generation • Loss of vegetation, habitat and soil fertility 	Table 13 No 16 Table 13 No 14

6.3 Rehabilitation

Rehabilitation will run con-currently with the actual construction of the pipeline and associated infrastructure. Rehabilitation will consist of, but is not limited to, the following rehabilitation measures:

- Removal of structures and infrastructures;
- Removal of Inert Waste and rubble;
- Hazardous waste and pollution control;
- Final Shaping of disturbed areas;
- Topsoil replacement and soil amelioration;
- Ripping and Scarifying;
- Planting;
- Grassing;
- Maintenance; and
- Management of weeds.

Rehabilitation measures mentioned above are dealt with in more detail in Section 7.

7 PRE-CONSTRUCTION PHASE

The planning or pre-construction phase largely entails conducting the necessary specialist baseline studies as indicated in the EA 14/12/16/3/3/2/1100 dated 13/03/2019, determining the site layout and carrying out the requisite environmental processes to obtain authorisations. This phase will also include conducting environmental baseline studies for various parameters which were added to the EMPr for management of impacts and record purposes. This will mainly be carried by both the Engineer and Contractor.

This section also outlines the activities to be completed by the appointed Contractor prior to site establishment. It also includes river management system, environmental and social management measures for the Contractor (and associated sub-contractors) prior to their establishing on site, i.e. activities to be implemented prior to commencement of the construction phase.

- Each management section provides the approved EMPr management and specialist study following details: Activity and objectives – the management objective that applies to each impact.
- Mitigation Measures / Procedure – the strategies, tasks or action program (to nominated operational design standards) that will be implemented to achieve the performance criteria.
- Responsible party for implementing the mitigation measure.
- Implementation timeframe or frequency of the required mitigation measure.
- Monitoring method to determine the success of the required mitigation measure.
- Target – measurable performance criteria (outcomes) for each element.

In order to assist and enhance compliance with the EMPr, the Contractor and Sub Contractor(s) are to implement the activities in alignment with EMS based on the International Organisation for Standardisation (ISO) 14001 or equivalent.

Table 13: Environmental Management and Mitigation Measures that must be implemented during the Pre-Construction Phase

No	Activity	Aspects	Potential Impact	Objectives	Targets and Performance Indicators	Management and Mitigation Measures	Method of monitoring implementation	Monitoring frequency	Applicable Standard or practices	Time period for implementation	Implementation responsibility	Mechanism for monitoring compliance
1.	Applying and/or ensuring permits and licences requirements are in place.	<ul style="list-style-type: none"> Absence of relevant permits (e.g. for protected trees, heritage resources) 	<ul style="list-style-type: none"> Project on standby to acquire permits and licences 	<ul style="list-style-type: none"> Compliance with all applicable legislation to prevent unauthorised activities and negative impacts to protected environmental features.) 	<ul style="list-style-type: none"> All relevant approvals for the activities and protected environmental features are identified and obtained. All sensitive and protected environmental features to be identified in the construction domain (all the components of the project) and inundation area 	<ul style="list-style-type: none"> Seek permit from DAFF in terms of the NFA for protected trees that are to be cut, disturbed, damaged, destroyed or removed. Seek permit from LDEDET in terms of the LEMA for the removal and transportation of endangered fauna and flora (if relevant). Seek permit from SAHRA if heritage resources are to be impacted on (relocated or destroyed), and for the removal of graves. Seek approval from the Department of Mineral Resources (DMR) in terms of the NEMA and the MPRDA for all required borrow pits. Seek all other approvals, permits and licenses required for the project, in accordance with the protocols prescribed by the governing bodies. Approvals are to be in place prior to the potential impacts to the protected environmental features. Adequate financial provision is made for the implementation of the conditions of the Environmental Authorisation and the mitigation measures contained in the EMP. Differentiate between those requirements that relate to the Proponent, Contractor, environmental team and other responsible parties. Document control procedure is to be provided and adhered to. Filing system is to be provided and maintained 	<ul style="list-style-type: none"> Programme Monitoring 	<ul style="list-style-type: none"> As required 	<ul style="list-style-type: none"> National Environment Management Act, 1998 (Act No. 107 of 1998) (NEMA) 	<ul style="list-style-type: none"> Pre-Construction 	<ul style="list-style-type: none"> Engineer and Contractor 	<ul style="list-style-type: none"> Report and Auditing

No	Activity	Aspects	Potential Impact	Objectives	Targets and Performance Indicators	Management and Mitigation Measures	Method of monitoring implementation	Monitoring frequency	Applicable Standard or practices	Time period for implementation	Implementation responsibility	Mechanism for monitoring compliance
2.	Environmental Awareness Creation	<ul style="list-style-type: none"> Inadequate Environmental Awareness 	<ul style="list-style-type: none"> Environmental or social impacts due to lack of environmental/ social awareness Incidence and injuries 	<ul style="list-style-type: none"> Ensure that the Contractor, construction workers and site personnel are aware of the relevant provisions of the EMP, sensitive environmental features and agreements made with the affected landowners and community members. 	<ul style="list-style-type: none"> Identification of all the required site specific and life skills training for employee All construction workers and employees are to have completed appropriate environmental training before being allowed on the construction site. Total number of complaints and corrective actions taken. Approved training material 	<ul style="list-style-type: none"> Environmental Training and Awareness Programme to be developed, which is to be approved by the Engineer. The Contractor must arrange that all of his employees and those of his sub-contractors go through the project specific environmental awareness training courses before the commencement of construction and as and when new staff or sub-contractors are brought on site. These include training: <ul style="list-style-type: none"> On identification of protected flora (booklets to be provided) to assist with marking of such species in the construction footprint or, to demarcate species that must be excluded from vegetation clearing activities. Of a nominated member / representative for each construction team must undergo a snake handling course and be provided with the relevant snake catching and safety equipment. This will ensure that should a snake be located within the trench or contractor sites and is unable to move of by itself, the snake can be safely removed from the area with minimal delay to the construction team. If need be a leaflet / poster should be developed highlighting the various types of species and the most dangerous ones that staff may encounter when on site in order to create better awareness. Of all personnel, prior to the commencement of site work or their duties should be educated about smaller venomous spiders and scorpions which can often be disturbed by earth moving activities and may fall into the excavations whilst foraging at night. These species are to be carefully removed if need be and placed in an undisturbed area nearby. If need be a leaflet / poster should be developed highlighting the various types of species and the most dangerous ones that staff may encounter when on site in order to create better awareness The environmental training is compulsory for all employees and structured in accordance with their relevant rank, level and responsibility, as well as the Environmental Specification as they apply to the works and site. 	<ul style="list-style-type: none"> Keep a record of environmental training undertaken is to be kept on site. 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> NEMA 	<ul style="list-style-type: none"> Throughout the project lifecycle 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Reporting on the Training programmes

No	Activity	Aspects	Potential Impact	Objectives	Targets and Performance Indicators	Management and Mitigation Measures	Method of monitoring implementation	Monitoring frequency	Applicable Standard or practices	Time period for implementation	Implementation responsibility	Mechanism for monitoring compliance
3.	On-going Consultation with Community and Affected Parties	<ul style="list-style-type: none"> Inadequate consultation with landowners / tenants / occupiers of land 	<ul style="list-style-type: none"> Social unrest. Delay in progress of construction. 	<ul style="list-style-type: none"> Establish and maintain a record of all complaints and claims against the project and ensure that these are timeously and effectively verified and responded to. Adhere to agreements made with Local Authorities, Traditional Authorities, individual landowners and community members regarding communication. Surrounding landowners and communities have been consulted with prior to and during construction. 	<ul style="list-style-type: none"> Records of consultation with surrounding landowners and communities are available prior to and during construction. Total number of complaints and corrective actions taken. All complaints and claims are to be acknowledged within 5 working days and are to be responded to within 10 working days of receipt, unless additional information and / or clarification are required. No deviations from agreements made with individual landowners and community members. 	<ul style="list-style-type: none"> Affected and neighbouring landowners that will be impacted and affected by construction activities must be given 12 months' notice before commencement of construction activities to enable them to make necessary arrangements. Establish lines of communications with landowners and community members. Existing communication channels need to be duly respected and adhered to when engaging with the Traditional Authorities. Establish processes and procedures to effectively verify and address complaints and claims received. Complaints or liaison with landowners and community members with regard to environmental aspects, compensation or disturbance to activities or animals, must be recorded, reported to the correct person and a record of the response is to be entered in the complaints register. Provide the relevant contact details to landowners and community members for queries / raising of issues or complaints. Inform the impacted landowners of the construction programme in relation to the affected properties. Agreements made prior to construction with respect to property access, the duration of construction and the impacts on the land should be adhered to by both the landowner and the contractor. Provide all information, especially technical findings, in a language that is understandable to the general public. The dominant local languages are Afrikaans, Sepedi and Setswana. Promptly deal with any raised expectations amongst communities regarding perceived benefits associated with the project, through a process of communication and consultation. Include all relevant community members in decisions affecting them. Notifications to shoreline landowners of Hartbeespoort Dam of completion of the project to allow time for such properties to re-evaluate their security measures. Notifications to dam users of periods of low water/ water level fluctuations (particularly during winter). This would provide owners of vessels time to adjust their mooring facilities prior to these periods of low water. Safety awareness campaign prior to periods of low water to inform users with regards beach conditions. 	<ul style="list-style-type: none"> Public complaints register. Proof of consultation and notifications 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> NEMA 	<ul style="list-style-type: none"> Throughout the project lifecycle 	<ul style="list-style-type: none"> Contractor – Social Officer and Engineer-Social Monitor ECO 	<ul style="list-style-type: none"> Audits of the complaints register

No	Activity	Aspects	Potential Impact	Objectives	Targets and Performance Indicators	Management and Mitigation Measures	Method of monitoring implementation	Monitoring frequency	Applicable Standard or practices	Time period for implementation	Implementation responsibility	Mechanism for monitoring compliance
4.	Construction Site Planning and Layout	<ul style="list-style-type: none"> Poor construction site planning and layout 	<ul style="list-style-type: none"> Damaged sensitive environmental features Infestation of alien vegetation Loss of soil through contamination, wind and water erosion. Loss of biological viability of stockpiled topsoil due to poor handling. Excess material requiring spoiling Disturbance of soil stability or ground cover. Potential silt discharge into streams or wetland. Erosion damage Theft vandalism or unauthorised people simply wandering and exposing themselves to risk or injury Damage to sensitive environment 	<ul style="list-style-type: none"> Proper planning and layout of the construction domain to ensure protection of sensitive environmental features Manage environmental impacts associated with site clearing. Ensure that only areas that are specifically required for the construction purposes are cleared. Prevent impacts to existing services. Adhere to agreements made with owners/custodians of the services. 	<ul style="list-style-type: none"> No impacts to sensitive environmental features because of poor construction site planning and layout. The entire construction footprint is to be included in the pre-construction survey Approved site plan No clearing outside of construction domain. Total number of security complaints and corrective actions taken. All relevant approvals to be obtained prior to working within existing servitudes (including roads, railway line, power lines, telephone lines, etc.) No deviations from agreements made with individual landowners and community members. No damage to sensitive environmental features outside demarcated construction areas during site establishment. Site layout approved by Engineer. No access or encroachment into no-go areas. No justifiable complaints regarding general disturbance and nuisance received from the affected landowners and community members. 	<ul style="list-style-type: none"> The Contractor is to establish site in accordance with the plan approved by the Engineer prior to the establishment of the site, which aims to identify construction activities, facilities and structures in relation to sensitive environmental features. This plan will serve as a spatial tool that facilitates the execution of the construction phase with due consideration of sensitive environmental features (based on specialist studies and findings from walk-down survey). The plan must show the following (as relevant): <ul style="list-style-type: none"> Contractors' camp and lay down areas; Site offices; Site laboratories; Batching plants; Crusher plants; Access / haul routes; Gates and fences; Essential services (permanent and temporary water, electricity and sewage); Solid waste storage and disposal sites; Site toilets and ablutions; Hazardous waste storage and disposal sites; Firebreaks; Excavations and trenches; Cut and fill areas; Topsoil stockpiles; Spoil areas; Construction material stores and laydown areas; Vehicle and equipment stores; Workshops; Wash bays; Fuel stores; Hazardous substance stores; Sensitive environmental features; and Any other activities, facilities and structures deemed relevant. Photographic record as part of the pre-construction survey of areas to be affected by construction activities including crack survey of structures such as houses and private roads. A suitable specialist is to identify protected plants and trees. Any protected plants or trees in proximity to the construction domain that will remain, should be marked clearly (danger tape, fencing, etc.) and must not be disturbed, defaced, destroyed or removed, unless otherwise specified by the Engineer. Acquire the necessary permits under the NFA if avoidance of protected trees is not possible. The details of how site clearing will be executed. Where possible, clearing by hand is recommended in order to create employment opportunities. 	<ul style="list-style-type: none"> Resurvey and site monitor Site Monitoring Site layout approved by Engineer 	<ul style="list-style-type: none"> As required 	<ul style="list-style-type: none"> National Environmental Management : Biodiversity Act (NEMBA) 	<ul style="list-style-type: none"> Preconstruction 	<ul style="list-style-type: none"> Engineer and Contractor 	<ul style="list-style-type: none"> Audits and Reporting

No	Activity	Aspects	Potential Impact	Objectives	Targets and Performance Indicators	Management and Mitigation Measures	Method of monitoring implementation	Monitoring frequency	Applicable Standard or practices	Time period for implementation	Implementation responsibility	Mechanism for monitoring compliance
5.	Establishment and Implementation of River Management System (RMS)	<ul style="list-style-type: none"> Inadequate monitoring and management of abstractions from, and the river flow in, the Crocodile River (West) between Hartbeespoort Dam and Vlieëpoort Weir, the Moretele River from Klipvoor Dam to the confluence with the Crocodile River (West), the stretch of Elands River from Vaalkop Dam to Crocodile confluence, and also the required flow past Vlieëpoort 	<ul style="list-style-type: none"> Non-conformance with the EA Stakeholder resistance towards the project Uncontrolled abstractions along the way the supply to the other users could be jeopardised and also lead to water shortages. 	<ul style="list-style-type: none"> Ensure efficient operation and functioning of the MCWAP-2A to deliver water to its end users. To add significant value in the effective and efficient management of water releases from upstream dams and water supply to the agricultural users. Ensure proper utilisation of water and limitation of spills from the Crocodile River (West) System. Adherence to the Water Resource Class (hereinafter referred to as the "Class"), the Reserve and Resource Quality Objectives (RQOs) as recently gazetted in Government Gazette No. 42775, Government Notice 562 of 2019. 	<ul style="list-style-type: none"> Establish Parameters of the RMS 	<ul style="list-style-type: none"> The River Management System must be in place prior to the commissioning of the authorised transfer scheme. Identify independently which stakeholders should be engaged and evaluate whether the details of the relevant and required stakeholders are available on the available databases. Requirement of a Combined Annual Operating Analysis and System for the Combined Mokolo River and Crocodile River (West) Systems. Detailed operational scenario modelling to establish the MCWAP Operating Rules that includes the lower Ecological Water Requirements (EWR). Current Institutional Arrangements and System Operating Decision-making Processes Established monitoring programmes to measure compliance of the Class and Resource Quality Objectives (RQOs) and a programme to contribute information to this. Formal institutional links between the RMS when in operation and a DWS National Monitoring Programme of RQOs. Vandalism on monitoring and abstraction equipment may pose a significant risk to the proper functioning of equipment and information available for the Decision Support System (DSS). A Review of the Water Use from the Sand Aquifer within and in close proximity to the so-called "red line" to identify challenges for the implementation of the RMS. The design of the RMS needs to accommodate the application of new technological developments. 	<ul style="list-style-type: none"> Programme Monitoring 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> NEMA National Water Act (NWA) and the Classes and Resource Quality Objectives of Water Resources for the Mokolo, Matlabas Croc West and Marico GN of 42775 18 October 2019 Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Pre-construction 	<ul style="list-style-type: none"> RMS Engineer and Contractor 	<ul style="list-style-type: none"> Reporting and Auditing
					<ul style="list-style-type: none"> Conceptual formulation of the Proposed RMS 	<ul style="list-style-type: none"> The DSS to be designed that incorporates data and information management. DSS Formulation (Technology and Software Requirements). Hydraulic DSS – Modelling of the Dynamic Flows and Determination of Release Hydrographs: Determine model. Availability, data requirements, need for channel surveys, obtain field info, populate, test and calibrate model. Water Balancing, Despatching and Short-term Management: Determine the need for modelling or system that accrues the water requirements of all the users and EWRs on daily basis. System and the Mokolo River System, confirm necessity of Water Quality and Financial assessments Integrated / linked DSSs: Establish linkages between the Crocodile River (West) and the Mokolo River systems influencing the RMS. 						

No	Activity	Aspects	Potential Impact	Objectives	Targets and Performance Indicators	Management and Mitigation Measures	Method of monitoring implementation	Monitoring frequency	Applicable Standard or practices	Time period for implementation	Implementation responsibility	Mechanism for monitoring compliance
					<ul style="list-style-type: none"> Proceed with the implementation of the RMS 	<ul style="list-style-type: none"> Determine which delegations, or regulations and agreements, are required (depends on institutional agreement and type of metering etc.) Integrate and evaluate the data captured during the development of the RMS. Prepare Draft Submissions to the DWS and the Minister for Interim Decisions and Final approvals. 						
					<ul style="list-style-type: none"> Implementation of the RMS 	<ul style="list-style-type: none"> Comply with all environmental and other legislated requirements, e.g. the Environmental Authorisation by the Minister of DFFE, must be met. The flows required downstream of the Vlieëpoort Abstraction Weir must be allowed for and must include the Ecological Reserve which has been gazetted as part of the RQOs Silt release management from MCWAP-2A will form part of the operating rules. The RMS must develop operating rules for releases from the upstream dams starting from the Hartbeespoort Dam and cascading down to the other dams in the Crocodile River (West) system. At some of the dams, increased outlet capacities may need to be developed. The RMS must have all the necessary flow gauging and control measures in place. This will potentially include additional flow gauging stations, as well as the metering and control of for example, agricultural abstractions. Additional flow gauging weirs were already identified: <ul style="list-style-type: none"> A2H059 (Atlanta Weir) on the Crocodile River (West); A2H019 (Beestekraal Weir) on the Crocodile River (West); Construct a new weir just downstream of the possibly obsolete A2H116/A2H132 (Paul Hugo Weir) on the Crocodile River (West); and Vlieëpoort flow gauging are integrated with the abstraction weir to be constructed as part of the MCWAP transfer works. Date at which additional outlet capacity would need to be provided at Hartbeespoort and Roodekopjes dams needs to be reviewed for new implementation dates and water requirements. Linked to the System Analysis with the WRPM. Finalise and implement the Communication System connecting the monitoring of releases, and abstractions with servers and a Database making it available for utilisation. Implement the agreed system comparing the actual versus planned releases and abstraction and flows, reporting significant deviations for operational decision-making. Implement Database and programming, utilising the collected data for daily management and compilation of reports. Implement a system to make required information available for feedback to water users and selected I&APs. 						

No	Activity	Aspects	Potential Impact	Objectives	Targets and Performance Indicators	Management and Mitigation Measures	Method of monitoring implementation	Monitoring frequency	Applicable Standard or practices	Time period for implementation	Implementation responsibility	Mechanism for monitoring compliance
					<ul style="list-style-type: none"> Commissioning and Testing of the RMS 	<ul style="list-style-type: none"> Perform trial run and calibrate models, technology and processes with current abstraction prior to the commissioning of the MCWAP-2A) include: <ul style="list-style-type: none"> (i) Execute the RMS Commissioning Plan, including capacitating authorities, operators and irrigators, (ii) Track the Key Performance Indicators and implement remedial measures. Embark on first detailed biophysical monitoring. Test and evaluate the run-time and effectiveness of the Hartbeespoort Dam and other releases. Test, evaluate and record findings. Repeat the above-mentioned actions, but now to prepare for the Vlieëpoort abstractions and transfers (6 months prior to the commissioning of the MCWAP-2A) implementing the findings. Include simulation testing prior to Vlieëpoort Transfers. Perform full scale commissioning in tandem with the testing and commissioning of the Vlieëpoort abstractions and transfers. Include the execution of the RMS Commissioning Plan and performing Adaptive Management Adjustments if and when required. 						
					<ul style="list-style-type: none"> Operate and adjust (Adaptive management) 	<ul style="list-style-type: none"> Include the Adaptive Management Principles in periodic review and operating procedures. Ensure that strategic key spare parts, equipment and emergency services are available at all times. Ensure effective knowledge transfer between personnel, and ensure succession planning. Review and keep technology appropriate, affordable and up to date. 						

8 CONSTRUCTION PHASE

This section includes the environmental and social management measures for the Contractor (and associated sub-contractors) for the construction activities associated with MCWAP-2A which comprises of the proposed construction of the WTI, Contractor's and Engineer's staff accommodation, Contractor's office and associated infrastructure.

Construction activities will include vegetation clearing; earthworks; blasting; construction of temporary construction works and camps; crushing of aggregate; concrete batching; spoiling of waste rock, waste management; water abstraction; etc. All these activities will require a large workforce and will result in increased traffic (light delivery vehicles through to large dump trucks / haul vehicles for the transportation of people and materials to and from site).

Construction activities include all those activities following after site establishment until the end of the defects liability stage and the Contractor's demobilisation from site.

Each management section provides the following details:

- Aspect and objectives – the management objective that applies to each aspect or impact.
- Mitigation Measures / Procedure – the strategies, tasks or action program (to nominated operational design standards) that will be implemented to achieve the performance criteria.
- Responsible party for implementing the mitigation measure.
- Implementation timeframe or frequency of the required mitigation measure.
- Monitoring method to determine the success of the required mitigation measure.
- Target – measurable performance criteria (outcomes) for each element.

The responsibility for implementing the management measures will be the Primary Contractor, unless otherwise specified.

Environmental Method Statements (EMS's) will need to be generated for all of the aspects identified in the following sub-sections (also refer to Section 10 of this EMP). The Contractor must also be audited against their compliance with these method statements.

Table 14: Environmental Management and Mitigation Measures that must be implemented during the Construction Phase

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
1. Management of Safety and Security	• Safety	<ul style="list-style-type: none"> • Injury to site staff from construction, demolition and blasting activities. • Damage to vehicles and building as a result of blasting activities. • Injury or fatal accidents of construction workers during the upgrade of roads. • Potential injury and death to fauna and livestock from falling into open trenches. 	<ul style="list-style-type: none"> • The safety and security of the public and project workforce is of paramount importance and must not be compromised by the activities associated with the construction phase. 	<ul style="list-style-type: none"> • Low incidents of injured on duty (IOD's) on site. • Low incidents of reported pedestrian accidents. • Records kept of health and safety training conducted for all staff on site. • Visible evidence and use of PPE. • Trenches are demarcated. • Approved Contractor's method statement. 	<ul style="list-style-type: none"> • PPE to be provided and well maintained at contractor's camp. • All incidents should be reported to the EM, investigated, documented and kept in the safety file. • All personnel are to undergo Environmental Awareness and Safety Training. A signed register of attendance must be kept for proof. • The Contractor must recognise that the site is situated close to inhabited areas and must therefore take all reasonable measures to ensure the safety of people in the surrounding area. • Where the public could be exposed to danger by any of the Works or Site activities, the Contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans, Sepedi and Sotho, all to the approval of the Project Manager. • All unattended open excavations shall be adequately demarcated (fencing shall consist of a minimum of three strands or wire and made clearly visible). • Storage areas must display the required safety signs depicting "No smoking", "No naked lights" and "Danger". Containers shall be clearly marked to indicate contents as well as safety requirements. • Adequate first aid services must be provided by the contractor at the contractor's camp. • Involve the local Community Policing Forums or other security association. 	<ul style="list-style-type: none"> • Intact fencing along construction servitude. • Public complaints register. • Monitoring reports. 	• Daily	• OHSA and associated Construction Regulations of 2014.	Construction	• Contractor	Part of EM audits.
	• Security	<ul style="list-style-type: none"> • Increasing crime rate 	<ul style="list-style-type: none"> • The safety and security of the public and landowners is of paramount importance and must not be compromised by the activities associated with the project 	<ul style="list-style-type: none"> • Security policy • Total number of security complaints and corrective actions taken. • No crime attributable to the project. 	<ul style="list-style-type: none"> • Ensure compliance with Thaba Tholo's (and other landowners, as relevant) biosecurity protocols in relation to the construction of the pipeline on the related properties. • Work within the parameters of existing landowner security measures that will ensure the safety of landowners, their properties and their assets. • Investigate and consult farmers and local communities on the need to provide suitable access points around the construction sites for people and animals • All Contractor's employees must be subject to police clearance • Ensure suitable management of the labour force to prevent security-related issues or disturbance to landowners and community member. • A security policy must be developed which amongst others requires that permission be obtained prior to entering any property and provisions controlling trespassing by contractor staff. • Only security staff shall be allowed to reside at contractor camps. General labour is expected to reside at approved accommodation or compounds. • The campsites for the project and the non-longitudinal construction sub-site components should be fenced for the duration of construction. • Contractors should establish crime awareness programmes at their site camps. 	<ul style="list-style-type: none"> • Public complaints register 	• Daily	• SAPS	• Construction	• Constructor	• Safety and EMPr audits

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
2. Site Clearing and Establishment	<ul style="list-style-type: none"> Poor construction site planning and layout 	<ul style="list-style-type: none"> Damaged sensitive environmental features Infestation of alien vegetation Loss of soil through contamination, wind and water erosion. Loss of biological viability of stockpiled topsoil due to poor handling. Excess material requiring spoiling Disturbance of soil stability or ground cover. Potential silt discharge into streams or wetland. Erosion damage Theft vandalism or unauthorised people simply wandering and exposing themselves to risk or injury Damage to sensitive environment 	<ul style="list-style-type: none"> Proper planning and layout of the construction domain to ensure protection of sensitive environmental features Manage environmental impacts associated with site clearing. Ensure that only areas that are specifically required for the construction purposes are cleared. Prevent impacts to existing services. Adhere to agreements made with owners/custodians of the services. 	<ul style="list-style-type: none"> A Method Statement is to be developed, which will provide the details of how site clearing will be executed. Where possible, clearing by hand is recommended in order to create employment opportunities. Restrict site clearing activities to the construction area / domain. Clearing of vegetation is to be conducted in a phased manner (where possible), with due consideration of the search and rescue activities. Vegetative cover for sensitive areas such as riparian zones is to remain for as long as possible. Maintain barricading around sensitive environmental features. Avoid any disturbance to demarcated sensitive environmental features. Suitably experienced personnel (relevant to the potentially affected environmental features) are to monitor the clearing activities, with particular focus on heritage resources and graves, as well as protected fauna and flora species. 	<ul style="list-style-type: none"> The Contractor is to produce a site plan for the approval by the Engineer prior to the establishment of the site, which aims to identify construction activities, facilities and structures in relation to sensitive environmental features. This plan will serve as a spatial tool that facilitates the execution of the construction phase with due consideration of sensitive environmental features (based on EIA specialist studies and findings from walk-down survey). Locate construction camps in areas where sensitive environmental features will not be impacted on. Facilities and structures shall be located with due cognisance of the terrain and geographical features of the project site. Positioning of the storage and lay-down areas should aim to minimise visual impacts. Maintain barricading around sensitive environmental features until the cessation of construction works. Control the movement of all vehicles and plant (including suppliers), such that they remain on designated routes and comply with relevant agreements. Ensure noise levels of construction activities and equipment are within their lawfully acceptable limits as per SANS 10103. Minimise public disturbance from lighting of the construction camp and site. For example, proper design of the placing (zones), height, type, direction (inward rather than outward) and intensity of floodlights, without compromising safety. Land required for the construction servitude must be acquired in accordance with prevailing statutory requirements A Method Statement is to be developed, which will provide the details of how site clearing will be executed. Where possible, clearing by hand is recommended in order to create employment opportunities. Restrict site clearing activities to the construction area / domain. Clearing of vegetation is to be conducted in a phased manner (where possible), with due consideration of the search and rescue activities. Vegetative cover for sensitive areas such as riparian zones is to remain for as long as possible. Maintain barricading around sensitive environmental features. Avoid any disturbance to demarcated sensitive environmental features. Suitably experienced personnel (relevant to the potentially affected environmental features) are to monitor the clearing activities, with particular focus on heritage resources and graves, as well as protected fauna and flora species. Search, rescue and relocation activities processes are to be in place ensuring decreased disturbances to such species. The boundaries of all sensitive areas are to be clearly demarcated according to the updated assessment prior to construction using markers The proposed 100 m corridor to be realigned to the north east of the current alignment, such that a 200m buffer to the west and 500m to the east from the boundary of the Bat Cave to be maintained during construction activities. Restrict site clearing activities to the approved construction footprint. Ensure no footprint creep into any wetlands or watercourses or other sensitive areas takes place. No vegetation clearing is to take place outside of the demarcated zones or within the appropriate buffers of demarcated sensitive habitats. 	<ul style="list-style-type: none"> Resurvey and site monitor Site Monitoring Site layout approved by Engineer 	<ul style="list-style-type: none"> As required 	<ul style="list-style-type: none"> National Environmental Management: Biodiversity Act (NEMBA) 	<ul style="list-style-type: none"> Preconstruction 	<ul style="list-style-type: none"> Engineer and Contractor 	<ul style="list-style-type: none"> Audits and Reporting

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
3. Management of Existing Services and Infrastructure	<ul style="list-style-type: none"> Inadequate management of existing infrastructure 	<ul style="list-style-type: none"> Destroying the existing infrastructure 	<ul style="list-style-type: none"> Prevent impacts to existing services. Adhere to agreements made with owners/custodians of the services. 	<ul style="list-style-type: none"> No unwarranted complaints regarding adverse impacts to existing services and infrastructure. No adverse impacts to existing services and infrastructure. All relevant approvals to be obtained prior to working within existing servitudes (including roads, railway line, power lines, telephone lines, etc.). 	<ul style="list-style-type: none"> Identify and record all existing services. Conform to requirements of relevant service providers. Agreements to be in place prior to construction in affected areas. Ensure access to infrastructure is available to service providers at all times. Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site. Notify landowners of any disruptions to essential services. Relocate landowners' existing services (e.g. reticulation, irrigation lines, power lines), where possible, to accommodate construction activities. Land acquisition and compensation to adhere to prevailing legal framework and international guiding principles. Liaise with property owners to ensure that existing infrastructure is recorded and any damage repaired satisfactorily or compensated for. Adequate reinstatement and rehabilitation of affected environment. If there is a risk of damage taking place on a property as a result of construction, a condition survey should be undertaken prior to construction and record maintained. The contractor is to make good and acknowledge any damage that occurs on any property as a result of construction work. Where crops and agricultural machinery are damaged, compensation is to be paid to the farmer for the loss of these crops, subject to evaluation of the claim and approval per se. The farmer should be compensated for any loss of income experienced at the account of the contractor and this is subject to evaluation of the claim and approval. Provide a channel through which communities can route grievances or concerns regarding service disruption as a result of the project. Regularly monitor the effect that the project has had on existing infrastructure facilities and social services within the host community. 	<ul style="list-style-type: none"> Public complaints register. Contractor's method statement. Agreements with owners of services. 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> National Environmental Management: Biodiversity Act (NEMBA) 	<ul style="list-style-type: none"> Throughout the duration of the construction period. 	<ul style="list-style-type: none"> Engineer and Contractor 	<ul style="list-style-type: none"> Audits and Reporting

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
4. Management of Access and Traffic	<ul style="list-style-type: none"> Increase in vehicle movement in the area 	<ul style="list-style-type: none"> Nuisance. Increase in potential vehicle accidents. Potential increase in pedestrian and livestock accidents. Decrease in the surface quality of roads. The development of potholes. Damage to vehicles 	<ul style="list-style-type: none"> Accidents are kept to a minimum. The surface quality of the road is not negatively impacted on by the construction activities. The presence of construction activities and vehicles is continually clearly indicated thereby minimising the potential for accidents. Sections of existing road surfaces which have been impacted on by the construction activities are remediated. 	<ul style="list-style-type: none"> No incidents of reported vehicle, pedestrian and livestock accidents. Condition of road surface maintained. Total number of complaints from surrounding landowners or road users and action taken Clear visibility of warning signage. Existing road surfaces are utilised and maintained within the baseline levels 	<ul style="list-style-type: none"> Reduce the speed limit for construction vehicles to 40 km/hr through town areas (on the R510 around Thabazimbi and Nelson Mandela Drive in Lephalale) Undertake negotiations and confirm arrangements with the private landowners regarding the use of private roads and associated traffic arrangements. Selective upgrade of the relevant access roads to ensure that they can accommodate the type of vehicles and/or mechanical plant using these roads. Obtain the necessary approvals from the Roads Agency Limpopo (RAL) and any other Roads Authority, as required. The responsibility for obtaining wayleaves prior to construction within the road reserve shall rest with the contractor. Use existing access roads where present. Temporary access roads constructed are to be suitably rehabilitated. Ensure temporary accommodation of traffic where any public or private roads are to be affected by construction activities. Make provision for community members to access their properties safely. Strict adherence to speed limits by construction vehicles on the public and private access roads. Appropriate speed limits need to be posted on all access roads (especially on gravel roads where typically no speed signs are posted) according to the geometric design and limitations of heavy vehicles. Movement of vehicles at night is to be restricted to limit the risk of collisions with faunal species. Such movement restriction will also help mitigate the increased risk of poaching at night as vehicles moving along the roads will be more noticeable. The access roads need to provide sufficient width for heavy vehicles to navigate around curves in the road but also to prevent vehicles from driving off road and unnecessarily damaging adjacent habitat. This applies in particular to the district roads, which should be cleared of encroaching vegetation and a minimum 8m cross-sectional width maintained throughout the contract. Ensure appropriate traffic safety measures are implemented to make provision for blind rises and sharp bends on relevant roads to be used by construction vehicles in the construction domain. A traffic control Method Statement is required in this regard. Traffic accommodation to South-African Road Traffic Signs Manual standards where any construction affects an existing Clearly mark pedestrian-safe access routes within the construction areas. This applies in particular to roads that have schools adjacent to them (e.g., D769). If scholar patrols are not operational in the area, the necessary arrangements should be made prior to the construction work commencing. Areas such as Thabazimbi have high pedestrian and public transport activity alongside the road (R510). Construction vehicles should be restricted from travelling through these areas at night unless there is sufficient street lighting or additional lighting is provided. Signage relating to construction activity and the presence of pedestrians should be provided. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> South African Road Traffic Act National Road Traffic Regulations (2000) 	<ul style="list-style-type: none"> Pre-construction surveys and construction monitoring. Rehabilitation phase will deal with rehabilitation of damages to utilised roads. 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Part of EM audits

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
					<p>Suitable erosion protective measures are to be implemented for access roads during the construction phase.</p> <ul style="list-style-type: none"> • Clearly demarcate all construction access roads. • Consult with property owners, local authorities and communities to ensure that all affected parties are informed of the timing and extent of any disruptions • Ensure that the local roads used by the contractor are left in the same or better condition than they were prior to the start of construction. • When selecting haul routes, those roads with sufficient overtaking opportunities should be preferred, to prevent driver frustration (especially from the local community who use these roads on a daily basis) when driving behind slow-moving. • Certain gravel roads (e.g. D1925) are within a flood plain and it can be expected that these roads will deteriorate as and when there is heavy rainfall in the area. This should be highlighted in the contractor's specification. • Temporary turning lanes should be considered at intersections where there is a large speed differential between the main road and the side road, e.g., R-routes • During maintenance related activities, damage to access gates, access roads, fencing and/or private property, will be restored Restrict operation and maintenance activities to the pipeline servitude and Government Waterworks. Where this is not possible, the landowners need to be notified and adequate arrangements made in advance. • Landowners should be notified that routine pipeline and servitude maintenance inspections will be undertaken, at least 10 working days prior to undertaking the inspection. Affected landowners should be notified in advance or operation and maintenance activities. • Strict adherence to speed limits by operation and maintenance vehicles. On private farm roads, maintenance vehicles may not exceed a speed of 40 km/h. • All roads and tracks used for maintenance inspections and maintenance works should be maintained and repaired where necessary to its original condition • Trucks should not be overloaded, and wheel/axle loading should be in accordance with legislation (TMH 3). 						

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
5. Management of Fencing Arrangements	Poor fencing arrangements	<ul style="list-style-type: none"> Environmental or social impacts due to lack of environmental/social awareness Incidence and injuries 	<ul style="list-style-type: none"> Protect and maintain existing fences. Fencing arrangements to adequately protect livestock/game animals from construction activities. Adhere to agreements made with individual landowners and/or land users regarding fencing. <p>Minimise disturbance to animals.</p>	<ul style="list-style-type: none"> No deviations from agreements made with individual landowners and/or land users regarding fencing. No direct harm to livestock/game animals due to inadequate fencing arrangements. Disturbed or damaged fencing to be reinstated / replaced to meet pre-existing conditions. 	<ul style="list-style-type: none"> Any damaged fencing is to be replaced to meet pre-existing conditions. All fences erected for construction purposes (e.g. fences around camp sites, fencing around trenches, fence along construction servitude, etc.) should be inspected on a daily basis to detect whether any damage has occurred. Damaged fences / barricading are to be repaired immediately. On farms or in areas where livestock / game occur, erect fences according to appropriate specifications (depending on the type on animals that occur on the farms) for the construction camps and construction servitude to protect animals from construction-related activities. Fences on game farms should be constructed to meet the following requirements: <ul style="list-style-type: none"> The fence should be straight and vertical; All the straining posts should be firmly and vertically anchored; All the posts should extend to the same height above ground level by corresponding to the terrain form; The straining posts and droppers should not be too far apart – the closer they are, the firmer the fence; Each wire strand should be firmly attached to the standards or line posts at a specific height above ground level and should be a certain distance apart from each other; The droppers should be neatly and evenly spaced between the standards. The wire strands should be firmly attached to maintain the proper space between the strands and to prevent vertical movement; Fences should never be constructed of inferior quality material. Therefore, fencing material with the SABS mark should be used; Fences on game farms should be erected according to appropriate specifications depending on the type of animals that occur on the property. Comply with all regulatory requirements. Fences to be constructed over dongas or streams should meet specific requirements as fences over such features can become insecure and lead to the escape of valuable animal or provide access to predators. Where necessary, game screens should be erected to minimise construction-related impacts (e.g. noise) to animals on game farms. Fence failure and escape of wildlife into the construction corridor during the construction phase must be reported to the relevant rancher/farmer immediately. Fence failures during the construction phase must be fixed immediately. To reduce visual intrusion, fences must be of a robust mesh type. Shiny galvanized or white coloured fencing must be avoided for permanent security fencing around infrastructure areas. Where practically feasible the security fence must be offset between any roads or farmstead boundary and a green buffer zone must be kept in place to shield receptors from both the infrastructure and the security fencing 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> NEMA 	<ul style="list-style-type: none"> Throughout the duration of the construction period. 	<ul style="list-style-type: none"> Engineer and ECO - to monitor compliance. Contractor to implement management actions 	<ul style="list-style-type: none"> Audits of the complaints register

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
6. Management of Labours	<ul style="list-style-type: none"> Reduced productivity of subsistence farmland 	<ul style="list-style-type: none"> Increased socio-economic vulnerability. Reduction in food security. 	<ul style="list-style-type: none"> The impact of the project on the productivity of subsistence farmland is kept to a minimum. 	<ul style="list-style-type: none"> Implementation of measures to minimise impact on soil productivity. Where loss of soil productivity is inevitable, evidence of measures to compensate for its impact on households / communities is available 	<ul style="list-style-type: none"> Management measures to limit impact of disturbance on soil fertility. The Implementer must make provision for post-relocation support for a predefined time period to ensure restoration of livelihoods. Possible provision must be provided for agricultural extension services and treatment of disturbed soil with basal fertiliser 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received 	<ul style="list-style-type: none"> Daily monitoring and monthly auditing 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Pre-construction and Construction phase 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Monthly auditing
	<ul style="list-style-type: none"> Damage and inaccessibility to powerlines 	<ul style="list-style-type: none"> Disruption of the provision of electricity supply to the surrounding areas. Impeding the maintenance of the powerlines. Potential injury and death of site staff. 	<ul style="list-style-type: none"> Damage is prevented and allowance is made for easy accessibility for Eskom to powerlines and servitudes at all times. 	<ul style="list-style-type: none"> No recorded damage to power lines. Total number of complaints received from Eskom and action taken No visible impediment of servitudes observed. 	<ul style="list-style-type: none"> A formal application must be submitted to Eskom stating exactly what construction procedures will be used near the Eskom power lines. A locality and layout plan of the pipeline must be provided indicating how the Eskom services will be affected. Any cost and claims due to interruptions or interference to Eskom Services causing power supply loss or loss of income, due to this application will be borne by the Implementer. No mechanical equipment, including mechanical excavators, may be used under or in close proximity to Eskom services without the prior approval of Eskom's authorised representatives. The consent is further subject to the landowner's permission for the proposed works. A copy of the permission must be filed with Eskom seven days before any work is carried out in the servitude. Blasting may only occur under the strict supervision of Eskom's authorised representative and after at least three days notification to Eskom. Should any of Eskom's services be damaged during commencement of any work, the incident must be immediately reported to Eskom's 24-hour fault number 0860 037 566 Statutory ground or structure to conductor clearances is to be always maintained. 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Damage and inaccessibility to powerlines 	<ul style="list-style-type: none"> Disruption of the provision of electricity supply to the surrounding areas. Impeding the maintenance of the powerlines. Potential injury and death of site staff. 	<ul style="list-style-type: none"> Damage is prevented and allowance is made for easy accessibility for Eskom to powerlines and servitudes at all times.
	<ul style="list-style-type: none"> Influx of jobseekers 	<ul style="list-style-type: none"> Loitering at construction site. Increase in crime and social pathologies. Pressure on existing services/ infrastructure. Development of informal settlements. 	<ul style="list-style-type: none"> The influx of job-seekers is minimised and the risk of their presence leading to negative social impacts is reduced. 	<ul style="list-style-type: none"> Records of resident status of temporary workers. Existence of labour desk. Total number of complaints from local residents regarding population influx and action taken 	<ul style="list-style-type: none"> Employ people from local communities as far as possible, with adequate verification of applicants' local resident status. Clear communication of preference for local labour to surrounding communities. Establishment of labour desk away from site for recruitment; alternatively, working through office of the local Department of Labour. Strict control of access to construction site. Labourers associated with the contractor must be easily recognisable (i.e. the Contractor must issue overalls with company name / logo etc.), and no non-labourer will be allowed within the construction camp at any time. The Implementer in consultation with the local SAPS / community policing forum must set up an adequate response plan to criminal incidents. 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received 	<ul style="list-style-type: none"> Daily monitoring and monthly auditing 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Pre-construction and Construction phase 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Monthly auditing

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
	<ul style="list-style-type: none"> Loss of farm labour to construction work 	<ul style="list-style-type: none"> Landowner resistance to the project. Increased unemployment after construction ends. 	<ul style="list-style-type: none"> Local people are encouraged not to leave current employment for temporary work on the project. 	<ul style="list-style-type: none"> Total number of complaints from local landowners regarding loss of farm labour and action taken 	<ul style="list-style-type: none"> During community engagement / information dissemination, emphasis must be placed on the temporary nature of construction employment. Strict adherence to Labour legislation (in terms of employment of minors, etc.) must at all times be made 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received 	<ul style="list-style-type: none"> Daily monitoring and monthly auditing 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Loss of farm labour to construction work 	<ul style="list-style-type: none"> Landowner resistance to the project. Increased unemployment after construction ends. 	<ul style="list-style-type: none"> Local people are encouraged not to leave current employment for temporary work on the project.
	<ul style="list-style-type: none"> Increased prevalence of HIV/AIDS 	<ul style="list-style-type: none"> Opportunities for the transmission of HIV between field workers 	<ul style="list-style-type: none"> Record of implementation of HIV/AIDS Plan 	<ul style="list-style-type: none"> All the necessary precautions against the spreading of disease 	<ul style="list-style-type: none"> Implement a Sexually Transmitted Diseases (STD) and HIV/AIDS awareness and prevention programme amongst labourers. The contractor should provide an adequate supply of free condoms to all workers. Condoms should be located in the bathrooms and other communal areas on the construction site and at the construction camps. If viable, a voluntary counselling and testing programme should be introduced. 	<ul style="list-style-type: none"> Free testing 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Construction phase 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Monthly auditing 	<ul style="list-style-type: none"> Increased prevalence of HIV/AIDS
	<ul style="list-style-type: none"> Increased prevalence of COVID-19 	<ul style="list-style-type: none"> Opportunities for the transmission of COVID-19 between field workers 	<ul style="list-style-type: none"> Record of implementation of COVID 19 Plan Records of screening all traffic on site 	<ul style="list-style-type: none"> All the necessary precautions against the spreading of disease, especially COVID-19. Keeping anti-venom onsite. Measures for screening, physical distancing, masks, cleaning, disinfecting and personal protective equipment (PP) 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received 	<ul style="list-style-type: none"> Daily testing and monthly auditing 	<ul style="list-style-type: none"> Amendment of directions issued in terms of Regulation 4(8) of the Regulations made under Section 27(2) of the Disaster Management Act, 2002 (act no. 57 of 2002): measures to prevent and combat the Spread of COVID -19 	<ul style="list-style-type: none"> Construction phase 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Monthly auditing 	<ul style="list-style-type: none"> Increased prevalence of COVID-19
	<ul style="list-style-type: none"> Trespassing on construction site and private properties 	<ul style="list-style-type: none"> Theft. Vandalism. Safety to site staff jeopardised. Injury to trespassers resulting in possible lawsuits. 	<ul style="list-style-type: none"> The construction site is fully secured with adequate access control. 	<ul style="list-style-type: none"> Secure and adequate fencing and access control. 24-hour security evident on site. 	<ul style="list-style-type: none"> Labourers associated with the contractor must be easily recognizable (i.e. company issued overalls with company name / logo etc.), and no non-labourer will be allowed within the construction camp at any time. The Contractor shall take all necessary precautions against trespassing on private properties. The contractor will be responsible for his own security arrangements and comply with all site security instructions. Gates shall be installed where necessary. All gates must be fitted with locks and be kept locked at all times during the construction phase. Gates must only be left open on request of the Landowner. Protect and maintain existing private property, fences and gates. Respect the open or closed status of gates for the duration of the construction period. Prevent loitering within the vicinity of the construction camp as well as construction sites. 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> Trespassing on construction site and private properties 	<ul style="list-style-type: none"> Theft. Vandalism. Safety to site staff jeopardised. Injury to trespassers resulting in possible lawsuits. 	<ul style="list-style-type: none"> The construction site is fully secured with adequate access control. 	<ul style="list-style-type: none"> Secure and adequate fencing and access control. 24-hour security evident on site.

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	<ul style="list-style-type: none"> Insufficient employment of local labour 	<ul style="list-style-type: none"> Social unrest. Potential delays in construction programme. Limiting growth in local economy. 	<ul style="list-style-type: none"> Local labour where applicable have been employed as far as possible. Development of unskilled, semi-skilled and skilled personnel recruited from the Project Area, and wider Limpopo Province respectively 	<ul style="list-style-type: none"> Evidence of staff employment record. Total number of complaints received from local community and action taken Training of females, expenditure on learner ships and expenditure on internships 	<ul style="list-style-type: none"> Workers should be provided with identity cards and should wear identifiable clothing. Creating nuisances and disturbances in or near communities shall be prohibited. Machine / vehicle operators must receive clear instructions to remain within demarcated access routes and construction areas. Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly. Designated smoking areas should be provided, with special bins for discarding of cigarette butts. Establish a 'labour and employment desk' in consultation with local authorities, which is not to be situated at the site. Sensitise staff in respect of gender sensitive issues that are pertinent to the workplace. Ensure gender inclusivity and equity with respect to all compensation. Prioritise gender inclusivity and equity in access to resources, goods, services and decision making with the aim of empowering women. Prioritise and articulate gender inclusivity and equity in the project documents by including specific strategies and guidelines for implementation. The project documents should also include clear mechanisms through which the actual implementation of the activities and the impact on the ground can be monitored and evaluated. Promote equal job opportunities for women and men during the construction and operational processes. Develop a grievance procedure to specifically address gender matters. Factors such as culture should be considered when planning for gender activities since they play a great role in influencing gender relations. Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment. A procurement policy promoting the use of local business where possible, should be put in place and applied throughout the construction and operational phases of the project. Prioritise and articulate gender inclusivity and equity in the project documents by including specific strategies and guidelines for implementation. Where possible use labour-intensive methods of construction. Use local labour as far as possible (e.g. unskilled labour). Implement applicable training of labour to benefit individuals beyond completion of the project. Communicate the limitation of opportunities created by the project through the Ward Councillors. Draw up a recruitment policy in conjunction with the Ward Councillors of the area and ensure compliance with this policy. Liaise with the appropriate local authorities to ensure that they are aware of the increase of population 	<ul style="list-style-type: none"> Site monitoring and regular follow-ups on complaints received. 	<ul style="list-style-type: none"> Monthly Reporting 	<ul style="list-style-type: none"> Contract specification 	<ul style="list-style-type: none"> Pre-construction and throughout the construction phase. 	<ul style="list-style-type: none"> Contractor, Engineer and Project Implementer. 	<ul style="list-style-type: none"> Audits on Contractor's appointments.

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					<ul style="list-style-type: none"> Alert local businesses to the fact that with the arrival of construction workers the population of the area will increase and they are likely to be faced with a higher demand and will need to prepare for this. A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction. Sensitise construction workers from outside the area to the traditions and practices of local communities. Include a section in the induction programme for incoming construction workers that cover local traditions and practices. Ensure the infrastructure and social facilities within the host communities will not be compromised with the arrival of additional people into the area. All employment of locally sourced labour should be controlled on a contractual basis. If possible, and if the relevant Ward Councillors deem it necessary, the employment process should include the affected Ward Councillors. People in search of work may move into the area, however, the project will create a limited number of job opportunities. Locally based people should be given opportunities and preferences over others. No staff accommodation should be allowed on site (except for security personnel). Spaza/informal trader shops may open next to the site as a consequence of construction. These should be controlled by the contractor to limit their footprint and to ensure that the local Municipalities – Informal Trading By-laws are complied with. 						
	<ul style="list-style-type: none"> Disruption in the provision of services 	<ul style="list-style-type: none"> Disruption of the availability of water, electricity and telecommunications to surrounding landowners. Negative effects on the well-being of the local inhabitants as well as the potential outbreak of disease. Decline in the micro-economic output of the surrounding area 	<ul style="list-style-type: none"> Disruption of all major services to the affected area is prevented. 	<ul style="list-style-type: none"> No disruptions to daily activities of local communities and land users Total number of complaints received from local communities and land users and action taken 	<ul style="list-style-type: none"> Where pipelines are found along the route, the depth of the pipes under the surface must be determined to ensure that proper protection is afforded to such structures. Any damage to pipelines must be repaired immediately. All existing private access roads used for construction purposes, must be maintained at all times to ensure that the local people have free access to and from their properties. Care must be taken not to damage irrigation equipment, lines, channels and crops. 	<ul style="list-style-type: none"> Site monitoring and regular follow-ups on complaints received 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> EM audits
	<ul style="list-style-type: none"> Physical and economic displacement of households/ individuals 	<ul style="list-style-type: none"> Loss of assets. Increased socio-economic vulnerability. Fragmentation of communities. 	<ul style="list-style-type: none"> All households physically relocated and displaced by the project have been compensated for or all lost assets have been replaced. 	<ul style="list-style-type: none"> Existence of Relocation Action Plan, including record of consultation with affected households / communities. Record of implementation of RAP. 	<ul style="list-style-type: none"> Selective narrowing of construction servitude to minimise the need for relocation must be undertaken. Development of Relocation Action Plan (RAP) document which includes the extent of displacement and appropriate compensation / relocation measures. Where displacement is unavoidable, provision of adequate compensation must be made by the Implementer for all loss of assets / land uses, whether loss is temporary or permanent. Where feasible, compensation should be made in similar kind rather than in cash. 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received. 	<ul style="list-style-type: none"> Daily monitoring and monthly auditing 	<ul style="list-style-type: none"> Physical and economic displacement of households/ individuals 	<ul style="list-style-type: none"> Loss of assets. Increased socio-economic vulnerability. Fragmentation of communities. 	<ul style="list-style-type: none"> All households physically relocated and displaced by the project have been compensated for or all lost assets have been replaced. 	<ul style="list-style-type: none"> Existence of Relocation Action Plan, including record of consultation with affected households / communities. Record of implementation of RAP.

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7. Management of Construction Camps	<ul style="list-style-type: none"> Inadequate management of construction camp 	<ul style="list-style-type: none"> Environmental or social impacts due to lack of environmental/ social awareness Incidence and injuries 	<ul style="list-style-type: none"> Minimise environmental impacts associated with construction camp and eating areas 	<ul style="list-style-type: none"> No environmental contamination associated with construction camp and eating areas. Minimise visual impact associated with construction camp and eating areas. Prevent socio-economic impacts associated with the construction camp. 	<ul style="list-style-type: none"> The final location for the construction camp at Rooipan 357 LQ which is adjacent to a pan has a minimum buffer of 32m. Erect suitable fencing around the construction camp. The construction camp may not be situated within 100 meters of any water body or within the 1:100 year flood line. Provide essential services (including showers, appropriate sanitation and drinking water facilities) at the construction camp. Maintain essential services in a functional state. Provide safe potable water for food preparation, drinking and bathing. Provide adequate parking for site staff and visitors. Open uncontrolled fires will be forbidden at the site camp. Rather, 'contained' cooking mechanisms will be used (e.g. gas stoves or an enclosed braai facility). The cooking area should be positioned such that no vegetation is in close proximity thereto, including overhanging trees. An area around the cooking area will be cleared such that any escaping embers will not start an uncontrolled fire. Eating areas will be designated and demarcated. The feeding, or leaving of food for animals, is strictly prohibited. Allow areas for social interaction. Sufficient vermin / weatherproof bins will be present in this area for all waste material. Dish washing facilities will be provided. Ensure that wastewater is appropriately disposed of. Locate all storage areas and material laydown sites within predetermined zones as per the approved site plan. Keep the camp and all its storage and laydown areas secure and neat at all times. Manage storm water from construction camp to avoid environmental contamination and erosion. Failure to comply with the general code of conduct, or the rules and procedures implemented at the construction camp will result in disciplinary actions. Prohibit the felling of trees for firewood. Provide medical and first aid facilities at the camp area. Prepare de-establishment plan for construction camp for approval by the Engineer. Provide firefighting equipment at the camp area. 	<ul style="list-style-type: none"> Public complaints register. Contractor's method statement. Disposal certificates. Service agreements with Waterberg District Municipality, Thabazimbi and Lephalale Local Municipalities, and other relevant service providers 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> National Environmental Management Act 	<ul style="list-style-type: none"> Period from when the construction camp is created up to de-establishment 	<ul style="list-style-type: none"> Engineer and ECO - to monitor compliance. Contractor to implement management actions. 	<ul style="list-style-type: none"> Audits of the complaints register

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8. Management of Ablution Facilities	<ul style="list-style-type: none"> Absence of ablution facilities 	<ul style="list-style-type: none"> Environmental or social impacts due to lack of environmental/ social awareness Incidence and injuries 	Minimise environmental impacts associated with ablution facilities.	<ul style="list-style-type: none"> No environmental contamination associated with ablution facilities. Minimise visual impact associated with ablution facilities 	<ul style="list-style-type: none"> No pit latrines, french drain systems or soak away systems must be allowed. Install and maintain conservancy tanks for any site offices. The location of conservancy tanks is to be approved by the Engineer. Toilets may not be situated within 50 meters of any water body. A sufficient number of toilets must be provided to accommodate the number of personnel working in any given area. Toilets may not be further than 100 m from any working area. Toilet facilities supplied by the Contractor for the workers must occur at a maximum ratio of 1 toilet per 15 workers. All temporary / portable / mobile toilets must be secured to the ground to prevent them from toppling over due to wind or any other cause. Ensure the proper utilisation, maintenance and management of toilet, wash and waste facilities. The entrances to the toilets must be adequately screened from public view. These facilities will be maintained in a hygienic state and serviced regularly. Toilet paper must be provided. The Contractor must ensure that no spillage occurs when the toilets are cleaned or emptied and that a licensed service provider removes the contents from site. Disposal of such waste is only acceptable at a licensed waste disposal facility (proof of disposal to be provided). Should shower facilities be provided for use by staff on site, the following controls must be imposed: <ul style="list-style-type: none"> Proper positioning of the shower, and specifically its discharge point, must be carried out to ensure that erosion and build-up of detergents does not occur; All discharge from the shower and other washing facilities must be managed to prevent environmental contamination; Use of the shower facilities must be limited to staff or authorised persons only. 	<ul style="list-style-type: none"> Public complaints register. Maintenance register for ablution facilities. Waste disposal certificates. Contractor's method statement.	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> National Environmental Management Act 	<ul style="list-style-type: none"> Period from when the construction camp is created up to de-establishment 	<ul style="list-style-type: none"> Engineer and ECO - to monitor compliance. Contractor to implement management actions 	<ul style="list-style-type: none"> Audits of the complaints register

Environmental Management Programme

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
9.Management of Visual	<ul style="list-style-type: none"> Changing the aesthetic quality of the environment 	<ul style="list-style-type: none"> Scarring of landscape. Infestation of alien invasive species because of ecological disturbances. Spread of litter. Light pollution Negative effect on sense of place of the surrounding area. 	<ul style="list-style-type: none"> The disruption of the natural and existing landscape characteristics is limited. 	<ul style="list-style-type: none"> Total number of complaints and action taken Low level lighting/limited mounting height of lights Colouring and avoidance of smooth concrete surface in specific locations. Main Infrastructure such as rip rap stones, access roads, rock cutting, edges of BPT, steel roofs needs to blend in with existing environment 	<ul style="list-style-type: none"> Protect all areas susceptible to erosion resultant from O&M activities. In general, slopes steeper than 1(V):3(H) or slopes where the soils are by nature dispersive or sandy, must be stabilised. Should maintenance or repair work be required on site, the landowner should be notified well in advanced. Maintenance work should be undertaken as per the provisions of the EMP for the pre-construction and construction phases, as relevant. Monitoring to be conducted to detect erosion (e.g. steep sections along access roads and pipeline, crossing of drainage lines, tie-ins at river banks, etc.). Relevant members of the operational team to attend the Community Security Meetings, as required Positioning of the storage and lay-down areas should aim to minimise visual impacts Prohibit artificial lighting within Mooivallei Bat Cave The site scouring will be shielded / screened through maintaining the natural vegetation to minimise the visual impact, where practicable On-going housekeeping to maintain a tidy construction area. Temporary construction signs and barricading must be removed as soon as the particular activity or set of activities are complete and in accordance with health and safety requirements. Camouflage netting to be draped over stockpile areas and temporarily secured with pegs where stockpiles are situated next to main roads or close to homesteads and within view of tourist accommodation. All temporary buildings or office containers must fit into the surroundings through the appropriate use of colour such as shades of dark olive, khaki brown or a grey, brown colour. Advertising and lighting will be in accordance with relevant standards. Lighting must not constitute an eyesore / hazard to users of the road and the surrounding community. Lighting will be sufficient to ensure security but will not constitute 'light pollution' to the surrounding areas. The site will be shielded /screened to minimise the visual impact, where practicable On-going housekeeping to maintain a tidy construction area. After the construction phase, the areas disturbed that are not earmarked for operational purposes (part of infrastructure footprint) must be suitably rehabilitated. The use of highly reflective material should be avoided, and any metal surface should be painted to fit into the surrounding environment in a colour that blends in effectively with the background. White structures to be avoided as these will form a significant contrast with the natural surroundings Construction activities should be restricted to daylight hours as far as possible, to limit the need to bright floodlighting and the potential for sky glow The Contractor must not deface, paint, damage or mark any natural feature (e.g. rocks, etc.) situated on or around the site for survey or any other purposes unless agreed beforehand with the stakeholders. Any features affected by the Contractor in contravention to the above must be rehabilitated / restored to the satisfaction of the stakeholder Telemetry towers must be placed on the lower section of a ridge line. This allows the tower in totality (or parts thereof) to be viewed against a dark backdrop. 	<ul style="list-style-type: none"> Site monitoring and regular follow-ups on complaints received. Total number of complaints and agreed timelines Telemetry Towers must be a darker charcoal like colour, that will recede into a vegetation or mountain backdrop. Darker colours tend to recede into the landscape and lighter colours tend to stand out. 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> EM audits

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					<ul style="list-style-type: none"> • Prior to construction the position and type of lighting will be planned to ensure unnecessary light pollution will be eliminated. • All lighting installed on site must not lead to unacceptable light pollution to the surrounding community and natural environment (e.g. use of down-lighters). • Smaller concrete ancillary structures such as scour and air valves which are visible from main roads, farmsteads, and tourist accommodation, must be coloured by means of the most appropriate or most practical concrete colouring techniques. The colour must be slightly darker than the adjacent surface material. Smooth concrete surfaces must, where possible and where practically feasible, be avoided in the areas of higher visibility. • Stone used for rip rap areas must blend into the adjacent natural environment, specific attention must be given to colour, shape, and size. • Vehicle mounted lights or portable lights are preferred over mounted lighting for nighttime maintenance activities. • All painted surfaces on buildings must be maintained on a regular basis to ensure deterioration of the infrastructure does not occur, in turn affecting the aesthetics of the area. • An exposed aggregate finish using natural quartzite stone from the area must be used, (where practically feasible) in blending retaining walls and other in situ concrete works into the surrounding area to soften the appearance. • Where revegetation occurs trees and shrubs must be planted in clumps, (mimicking natural vegetation openings) and not in rows or other geometric shapes. • Where cutting into rock occur, exposed rock faces must be colour treated and, if required, texturized to match those of the adjacent rock surface. Sample colour and texture must be approved by the Engineer. • Where surfaces on buildings are painted it should be darker colours such as khaki brown, grey brown or olive green. • Trees must be planted in parking areas at the workshop and offices located at the Balancing Reservoir. • Steel roof sheets must be a dark colour such as khaki brown, grey brown or olive green, bright and light colours like red, blue and orange must be avoided. 						

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10. Management of Water	<ul style="list-style-type: none"> Water contamination 	<ul style="list-style-type: none"> Impact on the wellbeing and reproduction potential of the aquatic biota. Potential decrease in surface- and ground water quality. Potential decline in the use of water for activities on site. 	<ul style="list-style-type: none"> No pollutants are being released to the aquatic environments. Wastewater is appropriately managed. Erosion is prevented. Sedimentation is prevented. 	<ul style="list-style-type: none"> The quality of the water from upstream of construction and downstream of construction will not differ with more than 10%. No evidence of pollutants released into streams and rivers. 	<ul style="list-style-type: none"> The Contractor must identify sources of process water and quantify quantities for approval and monitoring by the Engineer. The Contractor must supply a wastewater management system that will comply with legal requirements and be approved by the Engineer. Wash bays, service areas and fuel storage areas may not be located within the 1:100 year flood line or horizontal distance of 100 m (whichever is greater) of a watercourse or drainage line. No detergents may be used. Workshops, refuelling depots and washing areas must be operated in such a way as to prevent contaminated water to run-off the site, polluting nearby streams or water bodies. Water from wash bays, service areas and fuel storage areas must be discharged into oil separators and sumps. Oils collected in this manner should be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites. Contain oil or fuel spills in water using an approved oil absorbent fibre. Grey water not deemed suitable for dust suppression by the Engineer must be stored in sealable marked containers and disposed of with other wastewater. Wastewater as well as spilled fuel collected within bunded areas and refuelling areas must be disposed of as hazardous waste. During construction through a drainage line, the majority of the flow must be allowed to pass down the stream. In stream diversions should be used rather than the construction of new channels. Erosion from the construction activities must be mitigated. Measures to control erosion include: <ul style="list-style-type: none"> Minimising removal of vegetation; The Contractor must inform all site staff of the use of supplied ablution facilities and under no circumstances must indiscriminate excretion and urinating be allowed other than in supplied facilities. Concrete trucks must not be washed on site outside of designated concrete washbays. Such washbays must be constructed in such a manner to ensure adequate settlement of concrete from water and cleaning of such settled concrete from the washbay. The washbay must be bunded to prevent water from leaving the washbay and contaminating surrounding soil and/or waterbodies. The batching plant area must be operated in such a way as to prevent contaminated water to run-off the site, polluting nearby streams or water bodies. To this effect diversion berms can be installed to direct all wastewater to a catchment area. Alternatively, these areas must be bunded to contain contaminated water. Contain the contaminated run-off emanating from within the batch, crusher and sand washing plants within a sludge dam for later disposal in the appropriate manner. Do not locate any site toilet, sanitary convenience, septic tank or French drain within the 1:100 year flood line, or within a horizontal distance of 100 m (whichever is greater) of stream or rivers 	<ul style="list-style-type: none"> Site monitoring and water sampling and testing 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> General limits listed in the National Water Act (NWA) and the Classes and Resource Quality Objectives of Water Resources for the Mokolo, Matlabas Croc West and Marico GN of 42775 18 October 2019 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing.

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					<ul style="list-style-type: none"> Do not allow the use of any watercourse for swimming, bathing, or the cleaning of clothing, tools and equipment by any persons associated with the project. Prevent the discharge of water containing polluting matter or visible suspended materials directly into drainage lines or streams. Deflect any unpolluted water / runoff away from any dirty area. Where necessary, turbid water pumped from excavations within rivers must be passed through a sand filter or settling pond before being releases back into the river. Ensure that no storm water is allowed to enter any drainage installation for the reception, conveyance, storage and or treatment of sewage. Before any water is permitted to enter natural drainage lines, the quality of the water must comply with the standards contained within the General Authorisations of the DWS which has been authorised by DWS. Ensure that water passing through vehicle wash bays and workshops pass through oil separators before passing into the conservancy tank. Existing drifts and bridges may be used if the Landowner gives his consent. Such structures must them be thoroughly examined for strength and durability before they are used. A licence must be acquired from DWS for all water use crossings before construction starts. No drainage from fuel storage areas must be permitted. Never hose oil or fuel spills into storm water drain or sewer, or into the surrounding natural environment. Any contaminated storm water and other run-off from the site must be contained and cleaned. Any spill which may contaminate water must be treated according to the approved spill management method statement the Contractor compiled. 						
	<ul style="list-style-type: none"> Decline Water availability of water resource. 	<ul style="list-style-type: none"> The decrease in the habitat for aquatic biota and riparian vegetation. Negative effect on the wellbeing of terrestrial fauna. Decrease in the effective functioning of the aquatic biota. Decrease availability of water for downstream users of the watercourse. 	<ul style="list-style-type: none"> Full compliance to the limits provided by DWA for abstraction volumes from a watercourse. 	<ul style="list-style-type: none"> Volume of water abstracted from the watercourse on an annual basis not to exceed the DWA Water Use License provisions by more than 5% on an annual basis. 	<ul style="list-style-type: none"> Water may only be abstracted from a watercourse for use during construction once all grey water from batch, crusher and sand washing plants has been utilised on site for dust suppression. The volume of water abstracted from a watercourse may not exceed the limits stipulated by DWS by more than 5 % on an annual basis. Boreholes selected for water supply need to be aquifer tested for a sustainable yield to which abstraction rates must comply. Groundwater levels from abstraction boreholes must be monitored on a monthly basis to ensure water levels don't drop below the pump position (damaging equipment). Do not drain, fill or alter in any way, any drainage line, including the riverbanks unless this forms part of the construction Works, or upon specific instruction by the Engineer and as authorised by the water use license. Monitor groundwater levels and quality in boreholes surrounding the development on a monthly basis during construction in the dolomite aquifers. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> General limits listed in the National Water Act (NWA) and the Classes and Resource Quality Objectives of Water Resources for the Mokolo, Matlabas Croc West and Marico GN of 42775 18 October 2019 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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	<ul style="list-style-type: none"> Groundwater contamination 	<ul style="list-style-type: none"> Decrease in groundwater quality. Decrease in the populations of aquatic micro-organisms. Decrease in floral reproductively. 	<ul style="list-style-type: none"> No contamination of groundwater. 	<ul style="list-style-type: none"> No evidence of pollutants being released into groundwater. Prevention of water contaminated through storm water attenuation works discharging into any storm water drain, river or stream. Water quality and levels to remain within baseline ranges. Report all hydrocarbon spillages. 	<ul style="list-style-type: none"> No residue or substance which causes or is likely to cause pollution of a water resource may be placed in the workings of any underground or opencast excavation. Monitor water supply sources for inorganic and microbiological quality components and implement treatment options if required. Continue quarterly monitoring of strategic groundwater boreholes for groundwater levels and quality to assess impacts of the construction phase on the baseline groundwater quantity and quality of the area. Investigate any changes in groundwater monitoring levels or quality from the baseline results and implement any corrective measures recommended as an outcome of the investigation. Investigate claims or complaints from surrounding landowners on changes in groundwater levels or quality and implement any corrective or compensation measures recommended as an outcome of the investigation. Prevent leakages from pipes or taps. Water extraction sites should take note of the location of burial sites to prevent water contamination. Establish a dedicated vehicle maintenance area and wash-bay, where suitable storm water management measures are in place to prevent pollution. Water abstraction from boreholes or the river (by framers and for the project) and the construction of weirs in the river must not impact on ground water levels near or cause flooding to the Mooivallei Bat Cave. This could result in cave instability and collapse Manage storm water from construction site to avoid environmental contamination and erosion. Specific attention to be paid to erosion of in-situ burial sites. Storm water runoff from workshops, vehicle maintenance area, wash-bay and other potential pollution sources must be collected and treated in hydrocarbon separation pits / tanks before proper disposal. Drip trays must be cleaned regularly and the contents disposed of in accordance with the requirements for dealing with the particular waste. Drip trays shall be seen as a temporary environmental protection measure, and shall not be a permanent solution to oil leaks etc. that should be repaired appropriately. All wastewater discharges to comply with legal requirements associated with the NWA, including the General Authorisation that specifically deals with S21 (f) and (g) water uses. Wastewater discharges to form part of water monitoring programme. Water samples are to be analysed on a monthly basis in order to determine compliance to the aforementioned regulation. Keep disturbance footprint to a minimum in areas underlain by sensitive aquifers. Prevent hydrocarbon spills by maintain vehicles and the use of metal drip trays. Any hydrocarbon spills which do occur need to be cleaned up immediately and the contaminated material disposed of according to the hazardous waste management plan. If there is a hydrocarbon spill, nearby boreholes must be sampled immediately for the full range of organic parameters. Sampling of organic parameters must continue on a monthly basis thereafter until the results are undetectable. If organic parameters remain undetectable after the spill, sampling must continue for a year to confirm no negative impacts where caused to the borehole. If a complaint or issue is raised thereafter sampling for organic parameters will need to resume until the results are undetectable. Assess the risk for the development of karstic features in the dolomites underlying the project area. If there is a potential risk, it is recommended that a geotechnical / stability investigation for the infrastructure footprints be undertaken to identify any mitigation requirements to prevent damage to the project infrastructure and negative impacts to the dolomite aquifer. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> General limits listed in the National Water Act (NWA) and the Classes and Resource Quality Objectives of Water Resources for the Mokolo, Matlabas Croc West and Marico GN of 42775 18 October 2019 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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	<ul style="list-style-type: none"> Misuse of available water on site 	<ul style="list-style-type: none"> Unsustainable utilisation of available wastewater resulting in increased abstracted volume of water from natural watercourses. The decrease in the habitat for aquatic biota and riparian vegetation. Decrease availability of water for downstream users of the watercourse. Ensure leaks are detected and repaired. 	<ul style="list-style-type: none"> Wastewater generated from construction activities is as far as possible recycled for reuse. 	<ul style="list-style-type: none"> Abstraction from natural watercourses is kept to a minimum and does not exceed the DWA Water Use License provisions by more than 5% on an annual basis. Implementation, management and monitoring of storm water attenuation works, resulting in effective management of inter alia flooding and erosion. 	<ul style="list-style-type: none"> Filtered water from the sludge dams may be released into the environments should they conform to the sediment load requirements of DWS. Monitor water use and ensure that areas of waste are identified and minimised. Repair identified leaks and address issues of water wastage as soon as these are identified. Where possible, reuse water on the construction site for dust suppression on roads. Create awareness of water conservation in toolbox talks. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> National Water Act (NWA) 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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11. Management of Topsoil	<ul style="list-style-type: none"> Erosion from areas where topsoil has been reinstated 	<ul style="list-style-type: none"> Non-recovery of topsoil from disturbed areas 	<ul style="list-style-type: none"> Ensure suitable removal, storage, and transportation of topsoil for re-use during rehabilitation. 	<ul style="list-style-type: none"> At least 95% of recovered topsoil from disturbed areas is to be stored for future use. No visual evidence of erosion from topsoil stockpiles. No visual evidence of erosion from areas where topsoil has been reinstated 	<ul style="list-style-type: none"> Determine the average depth of the topsoil prior to excavations. Identify suitable areas to store topsoil. Remove topsoil from areas to be affected by construction activities. Establish and demarcate topsoil stockpiling areas, in order to prevent the mixing of topsoil with subsoil and spoil material. Topsoil is to be adequately protected from contamination from construction activities and material. Protect stored topsoil from compaction. Wind and water erosion-control measures are to be implemented to prevent loss of topsoil. Following the construction phase, the topsoil should be placed as the final soil layer prior to seeding. Topsoil should be stored in such a way that does not compromise its plant-support capacity. Topsoil from the construction activities should be stored for post-construction rehabilitation work and should not be disturbed more than is absolutely necessary. Protect topsoil in order to avoid erosion loss on steep slopes. Protect topsoil from contamination by aggregate, cement, concrete, fuels, litter, oils, domestic and wastes. An ecologically-sound storm water management plan must be implemented during construction and appropriate water diversion systems put in place. In instances where the Contractor has to handle topsoil more than twice, a specific request must be submitted to the Engineer justifying the reason for the activity and may only continue if the Engineer agrees. 	<ul style="list-style-type: none"> Condition of topsoil stockpiles. Dust monitoring. Rehabilitated areas. Contractor's method statement 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> National Water Act (NWA) 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing
12. Management of Excavations			<ul style="list-style-type: none"> Minimise environmental impacts associated with excavations. 	<ul style="list-style-type: none"> No damage to sensitive environmental features outside construction area during excavations. No harm to people or animals as a result of excavations. 	<ul style="list-style-type: none"> Construction activities to remain within the designated construction servitude. Subsoil and overburden should be stockpiled separately to be returned for backfilling in the correct soil horizon order. Suitable barricading to be erected around open excavations / trenches, as per the Construction Regulations (2014) or the prevailing legislation. Provide signage as a warning of open excavations. Divert runoff away from excavations, where necessary. Trench lengths will be kept as short as practically possible. Trench walls are to be stabilised using battering, shoring and bracing or similar techniques depending on the stability of the trench sides. Inspect open trenches at least daily to ensure that animals have not become trapped. Such animals will be safely removed and released, where possible. Special equipment for handling of venomous snakes should be available on site to ensure safe removal. Make adequate provision for subsidence 	<ul style="list-style-type: none"> Barricading of excavations. Excavation register. Contractor's method statement. 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> National Water Act (NWA) 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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13. Management of Hazardous substances	<ul style="list-style-type: none"> Spillages of hazardous waste Contamination of soil and/or water resources 	<ul style="list-style-type: none"> Potential negative effects to the wellbeing of fauna and flora. 	<ul style="list-style-type: none"> Hazardous spills are prevented and no incidents to human health and the environmental 	<ul style="list-style-type: none"> Immediate removal and remediation of all spills. All staff trained. All hazardous substances are documented. 	<ul style="list-style-type: none"> Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (Act No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards. Storage and use of hazardous materials will be strictly controlled to prevent environmental contamination and must adhere to the requirements stipulated on the MSDS. Appropriate signage to be displayed at storage areas for hazardous substances. Where flammable liquids are being used, applied or stored the workplace must be effectively ventilated. No person may smoke in any place in which flammable liquid is used or stored. Install an adequate number of fire-fighting equipment in suitable locations around the flammable liquids store. Where flammable liquids are decanted, the metal containers must be are bonded or earthed. No flammable material (e.g. paper, cleaning rags or similar material) may be stored together with flammable liquids. Staff that will be handling hazardous materials must be trained to do so. Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor. Suitable ventilation to be provided. All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material. MSDSs, which contain the necessary information pertaining to a specific hazardous substance, must be present for all hazardous materials stored on the site. Spill kits must be available for the cleanup of hazardous material spillages. Provide secondary containment where a risk of spillage exists. Drip trays to be placed under parked heavy vehicles, equipment and other receptacles of hazardous material to prevent spillages. During refuelling of Equipment suitable drip trays shall also be utilised, and spill clean-up materials shall be available in the immediate vicinity of the refuelling work In the event of spillages of hazardous substances the appropriate clean up and disposal measures are to be implemented. Spill reporting procedures to be displayed at all locations where hazardous substances are being stored. Hazardous materials will be disposed of at registered sites or handed to registered hazardous waste disposal facilities for disposal / recycling. Proof of adequate disposal required. <ul style="list-style-type: none"> Proper and timeous notification of any pollution incidents associated with hazardous materials 	<ul style="list-style-type: none"> Site monitoring Approved Emergency Response Plan. Training and awareness creation records. Signage displayed. Contractor's method statement. Incident Register and Report 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> Substances Act (Act No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards. 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Inspections of site conditions, waste management facilities and hazardous chemical storage facilities

<p>15. Blasting</p>	<ul style="list-style-type: none"> • Vibration 	<ul style="list-style-type: none"> • Change in habitats of subterranean fauna. • Change in the breeding potential of subterranean fauna. • Nuisance to surrounding landowners and communities. • Formation of cracks and deterioration of existing buildings. 	<ul style="list-style-type: none"> • Identified subterranean habits prior to blasting and compaction activities are considered. • The effects of blasting and compaction activities are limited. • Minimise environmental impacts associated with blasting 	<ul style="list-style-type: none"> • Evidence of consultation with surrounding landowners and communities. • Visible warning signs. • Measures in place for controlled blasting. • Compliance with blasting-related legislation and standards. • No blasting-related impacts to private property, livestock, wildlife or human health • Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. 	<ul style="list-style-type: none"> • The Contractor must take preventative measures (e.g. timing, pre-notification of affected parties, calculation of charge size, overseeing of correct stemming of blast holes) to minimise complaints regarding noise and vibration nuisance from sources. • The Contractor will be held responsible for the damage to structures as result of blasting. • Blasting Plan to be approved by the Engineer. • The Contractor must do a crack survey and prepare a photographic record of each structure, especially houses, buildings, ruins, etc., of the local communities within 250 m of any Works, whether on the surface or underground, prior to any blasting taking place. • In populated areas, a representative sample of the closest dwellings must be surveyed, and experienced building consultants employed if necessary. • The Contractor must also obtain a census of all boreholes within 250m and a yield test of water boreholes within 50m of a blast. A copy of the record, approved by the owner, must be provided to the Engineer prior to any blasting taking place. • Prohibit blasting (use non-explosive rock-breaking methods instead) to avoid impacting the bat cave's stability and avifauna nests. • Prior to commencing with blasting activities, the blasting Contractor should submit a Method • The Contractor must employ industry standard methods to control the impact of blasting and limit the risk of damage to buildings and structures by reducing blast vibrations induced in the rock mass, eliminating fly rock and limiting air-blast and noise to acceptable levels. • Blast mats should be used wherever fly-rock may result in damage to any infrastructure or where it could result in death or injury of animals, livestock, game, or where damage could be caused to sensitive environmental features. • Blasting operations should be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. • All explosives must be transported, stored and handled in accordance with applicable laws and good design engineering and constructions practices. • Communicate blasting and after-hours construction work on farms where tourism and hunting takes place. • Statement which should comply with the Explosives Regulations (2003) and all relevant SANS standards and health and safety standards for mitigating blasting.. 	<ul style="list-style-type: none"> • Site monitoring. • Complaints from surrounding landowners or users of the site. 	<ul style="list-style-type: none"> • Weekly 	<ul style="list-style-type: none"> • Explosives Regulations (2003) and all relevant SANS • standards and health and safety standards • USBM RI 8507 standard. • Chapter 10 of the Federal Railroad Administration (FRA), 2012. 	<ul style="list-style-type: none"> • Construction 	<ul style="list-style-type: none"> • Engineer and ECO - to monitor compliance 	<ul style="list-style-type: none"> • Contractor
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14.Management of Waste	• Increase in waste generation.	<ul style="list-style-type: none"> • Unpleasant odours • Potential outbreak of disease • Infringement on human rights • Spillages which could result in increase in microbiological pollutants to watercourses and soil. 	<ul style="list-style-type: none"> • The required number of latrines are provided and emptied on a regular basis. 	<ul style="list-style-type: none"> • The required number of chemical toilets • Record of sewage waste disposal certificates. • Water quality of streams and rivers are maintained within baseline levels. 	<ul style="list-style-type: none"> • Toilets must be provided in the working area within 100 m from worker activity. • Separate toilets must be provided for males and females. • Chemical toilets must be emptied / serviced on a regular basis to prevent them overflowing. Proof of this must be provided to the EM. • The Contractor must inform all site staff to the use of supplied ablution facilities and under no circumstances must indiscriminate excretion and urinating be allowed other than in supplied facilities. • The storage of general or hazardous waste in a waste storage facility must comply with the norms and standards in GN No. R. 926 of 29 November 2013. • Vermin / weatherproof bins must be provided in sufficient numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overflowing and other associated nuisances. • Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes). • Establish and monitor recycling targets. • Provide waste skips at the construction areas. These skips should be sufficient in number, the skip storage area should be kept clean, and skips should be emptied and replaced before overflowing or spillage occurs. Ensure suitable housekeeping. • The Contractor must ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs. All waste will be disposed of at suitable licensed disposal sites, based on the waste type (general versus hazardous). • Ensure that waste is transported so as to avoid waste spills en-route. 	<ul style="list-style-type: none"> • Site monitoring 	<ul style="list-style-type: none"> • Daily 	<ul style="list-style-type: none"> • National Environmental Management Act (NEMWA). • National Water Act (NWA) 	<ul style="list-style-type: none"> • Construction 	<ul style="list-style-type: none"> • Contractor and Engineer 	<ul style="list-style-type: none"> • Auditing of sewage related aspects on site.
		<ul style="list-style-type: none"> • Illegal dumping resulting in soil and water resources contamination. • Over supply and wastage of materials on site through excessive ordering practices. • Potential for spillages of liquid chemical wastes in temporary storage. • Nuisance factor (litter, odours and aesthetics) • Decrease in the aesthetic quality of the environment. • Unpleasant odours. • Potential disease and injury to site staff and local inhabitants. • Land surface pollution. 	<ul style="list-style-type: none"> • Re-use and recycling of waste is promoted where prevention thereof is not possible. • The disposal of waste to local waste disposal sites is limited. 	<ul style="list-style-type: none"> • No visible waste from construction activities observed on site. • No unpleasant odours. • Marked and sealable bins observed. • Evidence of waste disposal certificates. • Quantities of recycled material and disposed 	<ul style="list-style-type: none"> • The Contractor must ensure that the site is kept clean and free of rubbish that could potentially attract animal pests and that rubbish bins are scavenger proof. • The Contractor must dispose of all domestic refuse generated by the staff and sub-contractors at a registered waste disposal facility. Proof of this must be provided by the Contractor to the Engineer. • The Contractor will be responsible for the removal and transportation of all construction waste material off site to a registered waste disposal facility. Proof of this must be provided by the Contractor to the Engineer. Maintain a waste register for materials removed from the site, indicating type, quantity, date, haulage contractor, delivery point and safe disposal certificate. • The storage of general or hazardous waste in a waste storage facility must comply with the norms and standards in GN No. R. 926 of 29 November 2013. • Vermin / weatherproof bins must be provided in sufficient numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overflowing and other associated nuisances. • Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes). • Establish and monitor recycling targets. • Ensure suitable housekeeping 	<ul style="list-style-type: none"> • Public complaints register. • Waste register. • Recycling targets. • Disposal certificates. • Monitoring records 	<ul style="list-style-type: none"> • Weekly and Monthly 	<ul style="list-style-type: none"> • NEM:WA. Classification of types of waste must be referred to GN 634 of 2013 	<ul style="list-style-type: none"> • Construction 	<ul style="list-style-type: none"> • Throughout the duration of the construction period. 	<ul style="list-style-type: none"> • Engineer and ECO - to monitor compliance. • Contractor to implement management actions.

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					<ul style="list-style-type: none"> • The Contractor must ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs. All waste will be disposed of at suitable licensed disposal sites, based on the waste type (general versus hazardous). • Separate disposal sites for hazardous waste. This must be on a bunded area compliant to hazardous waste disposal regulations. • During transportation of waste, the Contractor must comply with the codes of practice and guidelines for licensing of waste transport vehicles and the regulation and monitoring of transport operations. • Collect waste, concrete and cement sludge off the side of the batch plant on a regular basis and dispose of according to the Contractor's approved method statement. • Do not dump waste of any nature, or any foreign material into any drainage line or stream. • Characterise and quantify all waste streams across the project in terms of quantity, hazard, generation frequency and recyclability and define and implement disposal options approved by the Engineer. • As part of the characterisation define opportunities for source reduction, as well as reuse and recycling as opposed to simply disposing of waste. • Ensure segregation of hazardous wastes from non-hazardous. • Collect waste, concrete and cement sludge off the side of the batch plant on a regular basis and dispose of according to the Contractor's approved method statement. • Do not dump waste of any nature, or any foreign material into any drainage line or stream. • Clearly marked waste bins are to be provided for the separation of waste. • Recyclable waste, including glass, paper and plastic must be separated at the construction camp, stored and recycled where possible, for example waste oil should be recycled. • The Contractor must do site clean-ups on a daily basis and dispose in the designated refuse bins provided. • The Contractor must dispose of all domestic refuse generated by the staff and sub-contractors on a weekly basis at a registered waste disposal facility. Proof of this must be provided by the Contractor to the Engineer. • Ensure that solid waste is transported so as to avoid waste spills en route. • Sealable waste drums should be provided at least every 100m along the construction of the pipeline. • Litter bins must be emptied on a weekly basis (or as required before they reach capacity). 						

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16. Management of Pollution Generation Potential	<ul style="list-style-type: none"> Increased level of noise generation 	<ul style="list-style-type: none"> Hearing loss through exposure to extended and or high noise levels. Disruption of sense of place due to noise nuisance. Disruption of daily activities due to noise disturbances. Noise nuisance to sensitive receptors 	<ul style="list-style-type: none"> Level of noise generation kept to a minimum. 	<ul style="list-style-type: none"> 1-hour LAeq noise levels at selected key receptor Threshold levels determined from detailed baseline monitoring. a. LAeq (equivalent continuous sound level) during daytime hours (07:00 to 22:00) = 55 dBA; b. LAeq during night-time hours (22:00 to 07:00) = 45 dBA; c. Comply with SANS 10103:2008. Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. 	<ul style="list-style-type: none"> The remote nature of the construction domain needs to be factored in to the mitigation of noise-related aspects. The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents. Noise must be monitored at the nearest sensitive receptor and where the noise is generated following a complaint (receptor within 100m). Install a noise meter near the entrance of Mooivallei Cave to monitor, manage and mitigate noise levels in the vicinity of this sensitive environment. Noise levels at this location should never exceed SANS 10103 limits. Construction work should take place during working hours – defined as dawn to dusk on weekdays and dawn to 15:00 on Saturdays. Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place. No amplified music will be allowed on the site. The use of radios, tape recorders, compact disc players, television sets etc. will not be permitted unless at a level that does not serve as an intrusion to adjacent land-owners. The Contractor will take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools. Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events. Where possible material stockpiles should be placed so as to protect site boundaries from noise from individual operations. If a stockpile is constructed, it should be at a position and of such a height as to effectively act as a barrier to site noise at any sensitive area, if line of sight calculations show this to be practicable. Environmental noise monitoring should be carried out at intervals for the construction phase in order regularly to detect deviations from pre noise levels and enable corrective measures to be taken where warranted. Potentially sensitive receptors must be notified when night-time construction activities is to be undertaken within 500m. Include a component covering environmental noise in the Health and Safety Induction to sensitize all employees and contractors about this subject. The Contractor must take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisance from sources. 	<ul style="list-style-type: none"> Site monitoring. Complaints from surrounding landowners or users of the site 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> National Noise Control Regulations SANS 10103:2008 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Engineer and ECO - to monitor compliance. 	<ul style="list-style-type: none"> Contractor to implement management actions. Contractor to conduct environmental monitoring for noise

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	<ul style="list-style-type: none"> Cement and Concrete Batching 	<ul style="list-style-type: none"> Nuisance to surrounding landowners and communities. Formation of cracks and deterioration of existing buildings 	<ul style="list-style-type: none"> No verified complaints regarding pollution. No measurable signs of pollution 	<ul style="list-style-type: none"> No verified complaints regarding pollution. 	<ul style="list-style-type: none"> Cement mixing to take place on an impervious surface (e.g. cement mixing pit). Batching operations to take place in a designated area, which will be kept clean at all times. Location of batching plant to be approved by the Engineer, with due consideration of the relevant management measures contained in the EMPr (see EMPr sections on Site Clearing, Site Establishment, Management of Water, Management of Waste, etc.) Ensure separation of clean and dirty water from batching plant 	<ul style="list-style-type: none"> Site monitoring. Complaints from surrounding landowners or users of the site. 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> Explosives Regulations (2003) and all relevant SANS standards and health and safety standards 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Engineer and ECO - to monitor compliance 	<ul style="list-style-type: none"> Contractor
	<ul style="list-style-type: none"> Dust Generation 	<ul style="list-style-type: none"> Negative effects on floral photosynthetic functioning. Potential increase in breathing ailments of site staff, surrounding landowners, communities and fauna. Decreased visibility. Nuisance. 	<ul style="list-style-type: none"> Dust emissions are kept to a minimum. Dust does not disturb the economic or social activities in the vicinity of the construction site. 	<ul style="list-style-type: none"> Threshold levels determined from detailed baseline monitoring. a. Fence line sites = Industrial Band (600 to 1200 mg/m²/day); b. Community sites = Residential Band (< 600 mg/m²/day); c. Comply with ASTM D1739; SANS 1929, SANS 69. Particulate matter (PM10) – 24 hr = 120 µg/m³ (more than four times a year); Annual = 50 µg/m³; Comply with the National Ambient Air Quality Standards 	<ul style="list-style-type: none"> Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area, access roads, site yard, etc. Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of construction activities to sensitive receptors. The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, and pre-notification of affected parties). Concentrated flows from dust suppression must be avoided and remediated from entering natural watercourses. Operators will be trained on best techniques (induction and toolbox talks) to handle materials in a manner that reduces dust generation such as reducing drop heights. Material transporting vehicles will not be overloaded. Ensure minimum travel distance between working areas and stockpiles, where possible. Maintain access roads in order to limit exposed dust generating areas. <p>All exposed surfaces must be minimised in terms of duration of exposure to wind through implementing concurrent rehabilitation.</p>	<ul style="list-style-type: none"> ASTM D1739 reference method (dust fallout) and Continuous particulate monitoring PM10. 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> National Environmental Management: Air Quality Act (NEMAQA) National Dust Control Regulations (GNR 827) 	<ul style="list-style-type: none"> Pre-construction, Construction and Rehabilitation 	<ul style="list-style-type: none"> Engineer and EM, Contractor 	<ul style="list-style-type: none"> Monthly air quality reporting will highlight any monitoring locations that exceed acceptable limits and suggest appropriate mitigation corrective measures.
	<ul style="list-style-type: none"> Unpleasant odours 	<ul style="list-style-type: none"> Nuisance to local communities and land users in close proximity to construction area 	<ul style="list-style-type: none"> No unpleasant odours are experienced on site 	<ul style="list-style-type: none"> All toilets are services. All putrescible waste removed and disposed of off-site. 	<ul style="list-style-type: none"> Putrescible waste must be handled, stored and disposed of before the probability of it generating odours. Chemical toilets must be emptied / serviced at a frequency as agreed between the Engineer and the Contractor and in accordance with health and safety standards. Proof of this must be provided to the Engineer. Sewage tanks must be emptied at a frequency as agreed between the Engineer and the Contractor. Proof of this must be provided to the Engineer. Scouring of water from pipelines with unpleasant odour to be undertaken in consultation and agreement with the Engineer. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> As per the OHS and safety standards 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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	<ul style="list-style-type: none"> Greenhouse gas emissions 	<ul style="list-style-type: none"> Contributing influence to global warming 	<ul style="list-style-type: none"> The level of greenhouse gas emissions emanating from plant and vehicles on site is kept to a minimum 	<ul style="list-style-type: none"> All vehicles, plant and equipment serviced as per manufacturer's maintenance schedules. Evidence available of service records kept for all vehicles, plant and equipment. No evidence of plant, equipment or vehicles in bad condition. 	<ul style="list-style-type: none"> Plant and equipment to function at an optimal level. All vehicles and equipment must be maintained and serviced according to manufacturer's specifications. Implementing disaster management policies and onsite employee training specifically for extreme weather event (including heavy rain occurrences, and lightning strikes) risk management protocols. Ensure environmental hazard procedures and protocols are in place onsite. Install lightning rods and have a lightning sensor to provide early warning when lightning is still a safe distance away. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily monitoring of condition of vehicles. Quarterly feedback on the project's carbon footprint at the Environmental Management Review sessions. 	<ul style="list-style-type: none"> National Environmental Management: Air Quality Act (NEMAQA) 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing
	<ul style="list-style-type: none"> Emission of noxious fumes from welding 	<ul style="list-style-type: none"> Development of Respiratory problems. Irritation to eyes. 	<ul style="list-style-type: none"> Damage caused to lungs and eyes is prevented. 	<ul style="list-style-type: none"> Use or appropriate / required PPE including welding mask, gloves and overall. Medical test results prior to construction not be exceeded. 	<ul style="list-style-type: none"> Required PPE must be worn at all times. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> As per the OHS and safety standards 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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17. Management of Flora	<ul style="list-style-type: none"> Loss of Vegetation, Habitat and Soil Fertility 	<ul style="list-style-type: none"> Decrease in faunal diversity and density. Decrease in floral diversity. Increased potential for erosion and soil loss. Increase in dust emissions. Potential decrease in soil organisms. 	<ul style="list-style-type: none"> To minimise the extent of the contactors camp, construction footprint borrows pit and spoil storage footprint, as well as remain outside of sensitive areas. 	<ul style="list-style-type: none"> Contractor's camp and construction works kept within confines of demarcated footprint. All the sensitive or protected flora identified to be rescued and relocated from site. No accommodation on site. 	<ul style="list-style-type: none"> Search, rescue and relocation of red data, protected and endangered flora species affected by construction. Seasonality must conform to activity period of animal with reference to herpetofauna. Larger exotic species that are not included in the Category 1b (compulsory control required) or Category 2 (which requires permitting) list of invasive species could also be allowed to remain outside the pipeline servitude for aesthetic purposes. During the monitoring of the pipeline servitude, any non-listed alien vegetation must be checked to ensure they do not become problematic. The planning and design for the construction camp and construction site must ensure that there is a minimum impact on the environment. These areas must be kept to a minimum footprint size. The working servitude must be reduced in sensitive environments such as pristine or valuable vegetation as well as sensitive social environments. A nursery must be established at the Construction Camp. Protected flora species must be removed and kept in the nursery during construction to be used for the rehabilitation of the disturbed areas. Comply with the requirements of NEM:BA, NFA, National Veld and Forest Fire Act (No. 101 of 1998) and LEMA. Include mitigation measures identified as part of environmental sensitivity walk down survey. Ongoing identification of protected plants and trees. Any protected plants or trees in proximity to construction domain that will remain, should be clearly marked and must not be disturbed, defaced, destroyed or removed, unless permitted and otherwise specified by the Engineer. Acquire the necessary permits under the NFA or LEMA (as relevant) if avoidance of protected trees is not possible. Clearly demarcate the construction servitude prior to construction. Retain vegetation within the construction domain, wherever possible. Vegetation clearing to be undertaken with brushcutters as opposed to earth-moving equipment, where practicable and economical. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> National Environmental Management: Biodiversity Act (NEMBA) National Forest Authority, National Veld and Forest Fire Act, No. 101 of 1998 and LEMA. Conservation of Agricultural Resources Act, No. 43 of 1983 and GN No. R. 598 (Alien and Invasive Species Regulations, 2014) 	<ul style="list-style-type: none"> Pre-construction (for search and rescue of protected species), construction, rehabilitation and demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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					<ul style="list-style-type: none"> • Control of alien invasive species and noxious weeds for disturbed areas, in accordance with the requirements of the Conservation of Agricultural Resources Act (No. 43 of 1983) and GN No. R. 598 (Alien and Invasive Species Regulations, 2014) in terms of NEM:BA. • A compensation ratio of 1:3 should apply for every conservation-worthy indigenous tree removed. Suitable sites for the planting of the trees will need to be identified. This may include planting within the edge of the construction servitude or outside of the permanent servitude. • Where feasible, felled timber to be made available to the local community free of charge only after ensuring that material for mulching for rehabilitation is secured. • Where possible, transplant plant material to designated areas. Avoid translocating topsoil to sensitive areas in order to prevent translocating soil seed banks of alien species. • The establishment of pioneer species should be considered with the natural cycle of rehabilitation of disturbed areas, which assists with erosion control, dust and establishment of more permanent species. This can be controlled during construction phase and thereafter more stringent measures should be implemented during the rehabilitation and post rehabilitation. • Larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain outside the pipeline servitude for aesthetic purposes. • No storage of any construction material on sensitive areas. • Limit clearing for fencing to the removal of trees and shrubs within 1 m of the fence line. No removal of the grass cover or topsoil is to occur within this width. • Site demarcations must remain in position until the completion of construction. • All grass and other vegetation should be left on the topsoil stockpiles so that they colonise the area after construction. Plants outside of the construction area are not to be disturbed, destroyed or removed • The Contractor will be held liable for the replacement of any plant or feature under the protection of local by-laws, provincial ordinances or national legislation that is removed or damaged by the Contractors negligence or mismanagement. The Engineer is to indicate the plants or features to be avoided. • The Contractor with the assistance of a qualified botanist should familiarise themselves with the protected, orange listed, range restricted or endemic species. • A management plan must be compiled for nursery operations to ensure the persistence of "rescued" plant specimens • All protected species not removed must be clearly marked for the duration of the construction works. • A certified horticulturist should be employed to supervise the transplantation process and to oversee the nursery • Access roads should be kept to existing roads, where possible, to reduce fragmentation of existing natural habitat. • The footprint area of all proposed infrastructure should be limited to what is necessary. Disturbance to the surrounding natural habitat should be kept to a minimal 						

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					<ul style="list-style-type: none"> The EM should keep a database (approximate number, identity and geographic position) of all of the protected and endangered plant species lost during the construction phase. The number of endemic and/or protected individuals removed during the construction phase should be replaced during rehabilitation. All endemic or protected species will be rescued from the construction site and maintained in the onsite nursery. Alternatively seeds of the species should be harvested in a 5 km radius prior to construction and then cultivated in the onsite nursery. Endemic or protected species which are commercially available should be sourced from nurseries within a 50km radius. Should any 'remarkable trees' be relocated, a tree surgeon must be appointed. The removal of harvesting of plant species for medicinal or cultural use by an employee is strictly prohibited. The width and depth of the trench, as well as the working place (footprint) adjacent to the trench must be specified in the form of a method statement that will have been approved by the Engineer. Planning of access routes must be done in conjunction between the Contractor, Engineer, ECO, TCTA and the relevant landowners. Slight deviations of the access road alignments are permitted, so as to avoid significant vegetation specimens and communities, natural features and sites of cultural and historical significance. Any additional routes and turning areas required by the Contractor must be approved by the Engineer. No vegetation clearing in the form of de-stumping, scalping or uprooting must be allowed on river- and stream banks, unless authorised by the Engineer. Do not disturb, deface, destroy or remove plants or natural features outside of the construction area, whether fenced or not, for the duration of the Contractors presence on site, unless otherwise specified. Do not establish any Site Works besides those specified and allowed for in the successful tender. Do not paint or mark any natural feature. Marking for surveying and other purposes must be done using pegs, beacons, rope or droppers. It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, is placed outside of sensitive habitat units (i.e., rocky outcrops and watercourses with associated zones of regulation as described within the Freshwater Ecological Assessment and Management Plan - SAS 220114, 2021). It is recommended that prior to the commencement of construction activities that the entire construction servitude, including lay down areas and stockpile areas etc., be fenced off and clearly demarcated. All areas of increased ecological sensitivity outside of the authorised footprint must be designated as "No-Go" areas and be off limits to all unauthorised construction vehicles and personnel 						

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	<ul style="list-style-type: none"> Illegal wood harvesting for creation of fires 	<ul style="list-style-type: none"> Loss of indigenous woody vegetation. Decrease in habitat for fauna and avifauna. Increased potential for erosion. Possible loss of protected species. 	<ul style="list-style-type: none"> Unnecessary harvesting of wood from the surrounding area is prevented. 	<ul style="list-style-type: none"> No visual evidence of wood harvesting. No change to vegetation baseline. 	<ul style="list-style-type: none"> After consultation with the community, woody material removed during construction must be placed in a designated area for collection by the local community. No vegetative matter, besides the woody material mentioned above, may be removed for firewood. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> NEMBA 	<ul style="list-style-type: none"> Pre-construction, construction, rehabilitation and rehabilitation phase 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing
	<ul style="list-style-type: none"> Soil contamination 	<ul style="list-style-type: none"> Decline in soil organisms. Potential sterilisation in the carrying capacity of the soil. 	<ul style="list-style-type: none"> Adequate protection of soil and soil remediation measures in case of spills is ensured. 	<ul style="list-style-type: none"> No evidence of hydrocarbon and hazardous spills. No release of contaminated water into the natural environment. Immediate removal and remediation of all spills. 	<ul style="list-style-type: none"> Fuel must be stored in above ground storage tanks or sealed containers – both such vessels being contained within a bunded area with sump drainage. No drainage from fuel storage areas must be permitted. Appropriate response plans must be prepared by Contractors to ensure the fastest possible reaction to spills or accidents. These plans must include rehabilitation procedures. All spills (minor and major) must be cleaned and remediated to the satisfaction of the EM within 24 hours of occurrence. Any spillage on site will be excavated to the visible depth of impact and disposed of for removal to a registered hazardous waste disposal site. Excavated areas are to be refilled with suitable material. Alternative in-situ remediation techniques could be used if approved by the Engineer and EM. The contractor must ensure that there is a supply of absorbent material and clean-up materials readily available to absorb, breakdown and, where possible, encapsulate minor material spillages. Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area. Should emergency repairs be necessary, metal drip trays or tarpaulins must be utilised to ensure the collection of the oil. The area for emergency repairs should be identified between the Contractor and Engineer. Suitable, sturdy, leak-proof, metal drip trays, with turned up sides, to be placed under all vehicles and equipment on site where any permitted maintenance/repairs and/or emergency repairs are affected outside the controlled workshop areas; and Suitable storage and disposal of hydraulic fluids and other vehicle oils (see section on Management of Storage and Handling of Hazardous Material). Site establishment must take place in orderly manner and all amenities must be installed at the camp sites before the main workforce move onto site. Storage areas and material laydown sites must be located within a pre-determined zone and should be indicated on the site plan. Additional laydown and storage areas required must be approved by the Engineer. Temporary structures must be placed in a predetermined area and be founded on a platform, of either subsoil or screed slab. Vehicles, plant and equipment may only be washed in designated areas. Cement must be delivered in sound and properly secured bags or in approved bulk containers. Cement products in bags must be stored in storage containers to be provided at the construction camp and should only be opened when needed. Limit cement and concrete mixing to single sites where possible. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> NEMBA 	<ul style="list-style-type: none"> Pre-construction, construction, rehabilitation and rehabilitation phase 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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					<ul style="list-style-type: none"> Repair all erosion damage as soon as possible and not later than a target specified by the Engineer. Slopes steeper than 1(V):3(H) or slopes where the soils are by nature dispersive or erodible must be stabilised. Dust and erosion of topsoil from runoff must be minimised through watering or similar dust control measures. Placing of topsoil in areas exposed to high wind or excessively rainy conditions must be avoided. Wherever possible, access routes should not traverse drainage lines and riparian zones. Drainage lines are not to be altered and these areas should be level with the surrounding land once subsidence has occurred. Construction must include design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off Runoff from roads must be managed to avoid erosion and pollution problems. Minimise the flow of any surface water or floodwater into borrow areas. Deflect clean surface runoff away from excavations. 						
	<ul style="list-style-type: none"> Encroachment and establishment of weeds 	<ul style="list-style-type: none"> Decrease in indigenous floral habitat availability. Decrease in floral populations and diversity. Spread of weeds to other environments. 	<ul style="list-style-type: none"> Alien plants / seeds are prevented from being introduced on site and spreading to surrounding areas. Alien plants are eradicated and removed from site. 	<ul style="list-style-type: none"> No visible presence of weeds on site. 	<ul style="list-style-type: none"> Weeds growing on topsoil stockpiles must be removed. All sites disturbed by construction activities must be monitored for exotic or invasive plant species and weeds. Herbicides and pesticides may only be used during vegetation clearance and the eradication of alien plant species with the prior approval of the ECO. If necessary, a method statement must be submitted for approval. Chemical removal must be used in accordance with manufacturer's specification for weeds where mechanical eradication / control is no longer effective. Those exotic / invasive plant or weed which cannot be eradicated by means of herbicides, need to be manually removed from site. The herbicide consultant must have a Pest Control Operators license. The Contractor must consult a flora specialist or the herbicide consultant in developing a brochure for those eradicating weeds which identifies declared weeds and alien species that can be totally eradicated. Control the type of material imported to site to ensure that soil contamination, in terms of weed and alien invasive plants, does not occur. 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> NEMBA Conservation of Agricultural Resources Act, No. 43 of 1983 and GN No. R. 598 (Alien and Invasive Species Regulations, 2014) 	<ul style="list-style-type: none"> Preconstruction construction, rehabilitation phase 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

Environmental Management Programme

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18. Management of Fauna	<ul style="list-style-type: none"> Decrease in faunal diversity. Decrease in faunal diversity. Obstruction to faunal migratory patterns. Potential decrease in faunal populations. Potential injury and death to fauna. 	<ul style="list-style-type: none"> Ensure the protection of animals (including wildlife and livestock). Adhere to agreements made with landowners and community members regarding animals. 	<ul style="list-style-type: none"> Total number of incidences of violation involving indigenous fauna and action taken Unpermitted disturbance to protected flora species. No direct / indirect harm to animals from construction activities No visible impediment of faunal corridors. Trenches are not left open for long distances at a time. All fences removed at completion of construction work. No illegal hunting or poaching of fauna. 	<ul style="list-style-type: none"> Loss of Fauna Habitat 	<ul style="list-style-type: none"> Search, rescue and relocation of red data, protected and endangered faunal species affected by construction. Stringent and dedicated control of poaching. All wildlife must be protected, with snaring or hunting strictly prohibited with stated consequences and penalties enforced. Unauthorized use of natural resources from adjacent properties must be avoided and strictly enforced. No fishing allowed. No wilful harm to any animals, unless a direct threat is posed to a worker's health or safety. Captured animals to be safely released to a similar habitat in the surrounding area but outside of disturbance footprint. Prepare emergency response procedure for dealing with snake bites, as venomous species may occur in the area. Photographs of protected and sensitive fauna species must be displayed in the construction camp to heighten awareness. If any herpetological species (including the Southern African Python, Giant Bullfrog and African Bullfrog) are encountered or exposed during the construction phase, they should be removed and relocated to suitable natural areas. This remedial action requires the employment of a herpetologist and or ecologist to oversee the removal of any herpetofauna. Aestivating Bullfrogs need to be carefully reburied in a suitable location and substrate similar to that of where they were removed so as to maximise the rate of survivability. If any arachnid species are encountered, especially burrowing species or species which are often found living under rocks and fallen tree / logs, they are to be safely removed from the disturbance footprint and released in suitable similar habitat in the surrounding area. Use of pesticides / insecticides is prohibited Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily. The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase. No trapping or any other method of catching of any animal or bird may be performed on site. No dogs or other domestic pets should be allowed at the site. Comply with the requirements of the NEM:BA, LEMA and Animal Protection Act, No. 71 of 1962. Include mitigation measures identified as part of environmental sensitivity walk down survey. Unauthorized use of natural resources from adjacent properties must be avoided and strictly enforced. Fauna (mammals and reptiles) that become trapped in any excavation or in any construction or operational related activity may not be harmed and must be rescued and relocated by an experienced person. Illegal hunting is prohibited. Make provision for wildlife movement and migration, where possible. Safe translocation of high value wildlife species encountered to areas of protection. Preserve high value wildlife species in situ where possible and protect unique wildlife habitats. Creating an alternative habitat with high productive potential during rehabilitation procedures by planting pipeline servitude with suitable indigenous grass species that will improve biodiversity 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> National Environmental Management: Biodiversity Act (NEMBA) National Forest Authority, National Veld and Forest Fire Act, No. 101 of 1998 and LEMA. Conservation of Agricultural Resources Act, No. 43 of 1983 and GN No. R. 598 (Alien and Invasive Species Regulations, 2014) 	<ul style="list-style-type: none"> Pre-construction (for search and rescue of protected species), construction, rehabilitation and demobilisation by the contractor 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing

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					<ul style="list-style-type: none"> • Devise and implement a monitoring policy to determine noise impacts on wildlife. • Implement measures to prevent the use of unauthorised security firearms on the construction site. • Prohibit the transport of live plants or other animals into natural areas. • All wildlife must have sufficient space to move away from construction disturbances. • Rare and expensive wildlife breeding stock should be relocated to alternative camps where noise and disturbance from construction is a matter of concern. • Planned blasting activities must be communicated to all affected IAPs. Communication. • Methods should be amplified in the method statement. • Design and Implement standard operating procedures for unexpected cases of emergency and support to ranchers/farmers i.e. unplanned veld fires, fence breaks and wildlife escapes. <p><u>Bat Cave</u></p> <ul style="list-style-type: none"> • Measures to safeguard the bat cave in the Mooivalei area: • No damage to the bat caves in the Mooivalei area due to construction activities; • Shift the low pressure pipeline within the 100m corridor that was assessed as part of the • EIA to avoid the bat cave as much as possible (as required); • Bat species residing within the Mooivalei area (cave) must not be unnecessarily disturbed. • Construction activities must not hinder their access to the cave; • Caution should be taken to ensure construction footprints are kept to an absolute minimum, including storage of materials, stockpiling etc.; • Toolbox talks should be provided to contractors regarding disturbance to bats. • A 50m buffer from Bat Roosting Areas • A low-intensity bat monitoring programme is recommended for during and after construction of the pipeline and associated infrastructure. <p><u>Nests – Avoidance Feasible - Spatial Measures:</u></p> <ul style="list-style-type: none"> • Implement prescribed buffers that were based on best practice and/or specialist expertise: • Red-listed spp.: Minimum Core – 1 km; Preferred Outer 2.5 km • Non-red-listed spp.: Minimum Core – 200 m; Preferred Outer 1km • Known sites identified during winter survey include: • Cape Vulture (Kranskop Colony, Marakele National Park) • Martial Eagle (Karoobult 126 LQ) • Verreaux's Eagle (Karoobult 126 LQ) • Secretarybird (Ruigtevley 97 KQ, Ptn. 5) • Wahlberg's Eagle (various locations along route) • African Hawk-Eagle (various locations along route) • Nests – Avoidance Feasible - Temporal Measures 						

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					<ul style="list-style-type: none"> In addition to proactive seasonal avoidance measures initiated from the planning phase, construction will need to include an adaptive / dynamic management approach which includes reactive temporal measures to safeguard breeding by SCC avifauna. If an active nest of an SCC avifaunal species is found within development corridor / footprint either by the specialist or the contractors, construction should be halted for the duration of the nestling period. <p><u>Nests – Avoidance Not-Feasible:</u></p> <ul style="list-style-type: none"> Limiting sensory disturbance to avifauna Avoid high intensity impacts e.g. blasting wherever possible within the buffer zones applied to nests and sensitive habitats Minimise dust, noise and light pollution and excessive human activity in areas of high avifaunal sensitivity. Do not place temporary construction camps, laydown areas or toilets in or within the buffers on areas of high avifaunal sensitivity. Move construction as quickly and quietly as possible through these areas. Avoid disruption of functional wildlife enterprises (including game farming operations, hunting and ecotourism activities). Plan pipeline construction phases to select sections with cattle and wildlife farming enterprises during the winter months (May to September), with wildlife eco-tourism and hunting enterprises targeted for construction during the summer months (October to April) if possible and feasible within the constraints of the construction schedule and economy. Where this is not possible affected farmers / ranchers must be informed in writing of the proposed construction schedule to ensure pre-emptive action in mitigating impacts by cancellation of bookings or re-scheduling of planned land use activities 						
	<p>Impede faunal movement and disrupt livelihood</p>	<ul style="list-style-type: none"> Decrease in faunal diversity. Obstruction to faunal migratory patterns. Potential decrease in faunal populations. Potential injury and death to fauna. 	<ul style="list-style-type: none"> All possible impacts on faunal movement are kept to a minimum. Consideration is given to faunal movements before demarcation of areas and trenching. 	<ul style="list-style-type: none"> No visible impediment of faunal corridors. Trenches are not left open for long distances at a time. All f removed at completion of construction work. No hunting or poaching of fauna. 	<ul style="list-style-type: none"> All excavations must be demarcated using danger tape with steel droppers or other methods approved by the EM. The contractor must ensure that domesticated animals belonging to the local community are kept away from the construction site. The footprint of disturbance should be kept to a minimum. Trenches must be checked on a daily basis for any signs of fauna which may have fallen in. Access roads should be planned so that only minimum linear distances are developed Maintain animal movement corridors as far as possible. Ensure that domesticated animals belonging to the local community are kept away and are safe from any unprotected Works. Do not make use of any pesticides, unless approved by the EM. Fences must be aligned to avoid the significant impact on animal movement corridors. The Contractor must communicate the benefits of the ecological conservation being practiced by the project and encourage active participation by all employees 	<ul style="list-style-type: none"> Site monitoring 	<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> NEMBA 	<ul style="list-style-type: none"> Pre-construction, construction, rehabilitation and rehabilitation phase 	<ul style="list-style-type: none"> Engineer and contractor 	<ul style="list-style-type: none"> Reporting and auditing.

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19. Management of Watercourses	<ul style="list-style-type: none"> Change in Aquatic health 	<ul style="list-style-type: none"> Deterioration of the watercourses because of construction activities. Reductions in diversity or populations of aquatic life. 	<ul style="list-style-type: none"> Ensure that the watercourses (including the Crocodile River (West) and Matlabas River and their tributaries, natural channels, drainage lines, wetlands) are protected and incur minimal negative impact to their resource quality (i.e. flow water quality, riparian habitat, morphology and aquatic biota). 	<ul style="list-style-type: none"> Existing Lawful Water Uses in accordance with NWA is not affected. DWR (Ecological Water Requirements) in accordance with NWA for the Crocodile River (West) and Matlabas River to be satisfied during the construction period. Contractor's method statement. During the construction phase, no activity such as temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment or waste disposal may be permitted within any wetland, riparian ecosystem or any other sensitive site Wetlands, riparian ecosystems (within the 1:100 year flood line) and any sensitive areas outside the construction site must be indicated as no-go areas. These areas may not be accessed by people or vehicles without authorisation 	<p>General –</p> <ul style="list-style-type: none"> During the construction phase monthly sampling of biological aspects are required to facilitate trajectory of change and to prevent long term detrimental degradation of the system. Use of early warning systems to detect and prevent stochastic events in the aquatic ecosystem. These are systems upstream of the construction sites to alert construction crews of flooding events or detrimental events. The construction of the pipeline will need to ensure that the impact to the river system is mitigated, and the condition does not degrade with impacts. Avoid creating a structure that has a high maintenance requirement in terms of clearing of flotsam and destructive valve maintenance. Disturbances within the riverbed / active channel need to be minimised as far as possible. As such, it is recommended that precast materials be used wherever possible in place of in-situ casting of structures. Any structures should be implemented in such a way as to minimise the creation of turbulent flow and a subsequent risk of erosion. Any structures should be located as far above the water level in the active channel as possible to reduce the potential for impeding and diverting flow The narrowest points in the watercourses should be identified and potentially used as the crossing points. During the excavation of watercourses, flows should be diverted around active work areas where required. Water diversion must be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion 	<ul style="list-style-type: none"> Review periodic results from water quality monitoring and biomonitoring. Erosion monitoring. Conditions of WUL. Monitoring reports. Technical memorandums should be prepared to evaluate the data to date 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> General limits listed in the National Water Act (NWA) and the Classes and Resource Quality Objectives of Water Resources for the Mokolo, Matlabas, Crocodile West and Marico GN of 562 18 October 2019 	<ul style="list-style-type: none"> Construction until demobilisation by the contractor 	<ul style="list-style-type: none"> Measures pertaining to the general protection of water resources – throughout the duration of the construction period. 	<ul style="list-style-type: none"> Specialist or Aquatic ECO appointed for these sections. Engineer and ECO to monitor compliance. Contractor to implement management actions.

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					<ul style="list-style-type: none"> With the exception of the activities and structures required to traverse a watercourse, a recommended buffer zone of 30m from the edge of the riparian zone, a riverine buffer zone of 32m from the delineated riparian zones of the Crocodile River (West) and Matlabas Rivers, as well as their tributaries and National Freshwater Ecological Priority Area wetlands identified (pans and floodplains) must be strictly adhered to during the construction phase of the project The crossing points should avoid areas where the watercourse active channel makes sharp bends directly upstream of the identified crossing point, increasing the risk of turbulent flow and subsequent erosion. The design must ensure that no upstream ponding and no downstream erosion and scouring occur and there should be no hindrance to the movement of terrestrial, wetland and aquatic fauna. The design should ensure that maximum hydrological connectivity is retained at all times as far as possible. Inspection of accumulating debris / blockage or maintenance requirements should be conducted at the crossings on a regular basis. Screening of material required before replacement. Finer materials must be placed first, building to larger material on top. Due to commercially grown wetland plants not being available, any hydrophytes found (with exception of alien vegetation) must be replanted in a temporary holding area Storm water channels and preferential flow paths must be monitored. If increased erosion / flows are observed flow dissipation measures must be included to slow flows and limiting erosion 						
				<ul style="list-style-type: none"> Unaltered river morphology affected by construction activities 	<p>River morphology –</p> <ul style="list-style-type: none"> Reinstate (shaping) and rehabilitate (riparian vegetation) affected areas in riparian zone and watercourse channel. Structure and function to be returned to pre-construction state. Reincorporate existing hydrological controls (bedrock) post construction to ensure alluvial materials process are maintained. Install suitable buttressing to prevent future erosion, if required. No illegal crossing of watercourses with construction plant. Suitable temporary river crossing to be built. Select most appropriate crossing point based on geotechnical conditions, sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilisation) and instream habitat, depending on technical feasibility. Crossing points to be approved by ECO and Engineer. No construction facilities (including storage areas, containers, chemical toilets, etc.) to be located within natural drainage lines. A buffer zone of 30 m from the edge of the delineated riparian zone is recommended for construction activities such as mixing areas, stockpiles and laydown yards. Use of early warning systems to detect and prevent stochastic events in the aquatic ecosystem. These are systems upstream of the construction sites to alert construction crews of flooding events or detrimental events. 						

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				<ul style="list-style-type: none"> Unaltered downstream flow regime for watercourses affected by construction activities 	<p>Flow –</p> <ul style="list-style-type: none"> Construction activities must not influence the EWR in accordance with NWA for the Crocodile River (West) and Matlabas River. During the excavation within watercourses, flows should be diverted around active work areas where required. Water diversion must be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion. These excavations must be done during the dry months with emphasis on the Matlabas River system. Due to the perennial nature of the system, construction should preferably commence during the dry months in the Matlabas River, Bier and Sandspruit systems Any releases from impeding devices must not cause concentrated flows in the system. Run-off from compacted surfaces will be slowed down with strategic placement of berms to limit gully formation. Minimise construction footprint where the construction activities take place in-stream or in close proximity to watercourses. A natural flow and sedimentation regime must be promoted as far as practically possible. Prevent erosion on steep slopes or in areas where vegetation has been lost as a result of the construction activities, which in turn have the potential to result in sedimentation of the watercourses and ultimately impact flow. Minimise influence on downstream flow regime when diverting and impeding flow for cofferdams, temporary river crossings or for any other purposes. A flow gauge must be installed at the Vlieëpoort abstraction weir to inform farmers of the availability of water Do not hinder flow in natural drainage lines. Construction activities not to adversely interfere with downstream water users to be minimised as far as possible. As such, it is recommended that precast materials be used wherever possible in place of in-situ casting of structures. The proliferation of alien and/or invasive species must be prevented, which has the potential to affect water quantity and flow and invade the marginal zones and eventually the active channel. Edge effects (impacts on areas beyond the construction footprint due to ineffective care and management) during construction need to be strictly controlled through ensuring good housekeeping and strict management of activities near the watercourses of their associated buffer zones. Following completion of construction, re-profiling of the banks of disturbed areas must take place and must be revegetated with indigenous graminoid species. A suitable mix should be confirmed by a suitable qualified wetland specialist following the updated wetland specialist assessment. Any bypass or diversion channels that are necessary to accommodate the construction process should fit the profile as indicated in .4.276 above to ensure fish can retain freedom of movement passed the construction area. This is applicable throughout all phase of the construction activities. The fishway should be one of the first components of the permanent infrastructure to be established so that migratory freedom of fish can be prioritised during the remainder of the construction phase. This should be confirmed with the engineer for feasibility. If not regarded as being feasible, then the diversion / bypass channel should be allowed to remain functional 						

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				<ul style="list-style-type: none"> Downstream water quality to remain within acceptable ranges, as determined through baseline monitoring. Water quality variables measured downstream of construction activities may not have deteriorated by more than a class. 	<p>Water quality –</p> <ul style="list-style-type: none"> Undertake water quality monitoring and biomonitoring in the affected watercourses. During activities in watercourses weekly water quality monitoring must be completed All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area. Storage area and ablution facilities not to be located closer than 30m from edge of riparian habitat Storage area and ablution facilities not to be located closer than 100 meters of any water body, within the 1:100 year flood line and or delineated aquatic ecosystems and associated buffers must be included. Where necessary, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be inspected, maintained and serviced on a regular basis. The style of silt trap will depend on materials used and the water movement patterns. If silt traps are not deemed feasible, other suitable measures need to be taken to limit high sediment volumes in the watercourses. Implement suitable storm water measures during construction to manage ingress of runoff into watercourses. No wastewater to be released to natural drainage lines. Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand. Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. straw bales) bag system. These are to be serviced regularly and removed when no longer in use. Materials can be re-used. Wastewater from batching operations to be disposed in accordance with the EMP section on Management of Water. Contaminated water will not be discharged to the environment. Prevent overflow from contaminated wastewater storage area. Waste concrete and cement sludge to be removed on a regular basis (to prevent overflowing) and to be disposed of at a suitable facility. Unused cement bags will be stored in an area not exposed to the weather and packed neatly to prevent hardening or leakage of cement. Used cement bags will be stored so as to prevent windblown dust and potential water contamination. Used bags will be disposed of adequately at a licenced waste disposal facility. Concrete transportation will not result in spillage. Cleaning of equipment and flushing of mixers will not result in pollution, with all contaminated wash water entering the wastewater collection system. To prevent spillage onto roads, ready mix trucks will rinse off the delivery shoot into a suitable sump prior to leaving the site. Suitable screening and containment will be in place to prevent windblown contamination from cement storage, mixing, loading and batching operations. All contaminated water and fines from exposed aggregate finishes will be collected and stored in sumps and will be adequately disposed of. All visible remains of excess concrete will be physically removed on completion of the plastering or concrete pouring and disposed of in an acceptable manner. 						

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				<ul style="list-style-type: none"> Water sources affected by withdrawal of water. No erosion caused by construction activities. No sedimentation caused by construction activities 	<p>Sediment -</p> <ul style="list-style-type: none"> The left bank floodplain erosion protection measures where unnatural erosion in extreme floods, at the left bank side of the weir and downstream of the weir at the existing left bank road. Riprap (dumped rock) could be designed on suitable filter layers to be stable during extreme floods to protect the riverbank against erosion. Note that the erosive stream power on the riverbanks is much less than at the weir. The right bank floodplain downstream of the weir will experience deep unnatural scour during extreme floods and it is proposed that all existing and planned infrastructure on the floodplain are relocated / located above the Q100cc or the Q200cc floodlines. Riprap protected flood levees could be designed to protect the existing farm buildings and infrastructure. The levees should however be able to drain during the floods. The safe minimum river discharge recommended for flushing of the boulder trap, the gravel traps and the pump canal traps is 50 m³/s. To ensure that sediment concentrations are low during flushing to limit the ecological impact, flushing should not be done when the river flow is low but during floods. The flushing duration for one boulder trap, one gravel trap and one pump canal trap should be limited to 20 minutes, 20 minutes and 15 minutes, respectively, which is in line with the WRC Design Guidelines for River Abstractions / Diversion Works (2020). Positioning of the downstream entrance of the fishway not to be affected by sedimentation. Monitoring of the river before and after the construction of the new proposed abstraction works in order to identify any potential negative impacts and to allow the necessary interventions in a time critical manner. The Vlieëpoort abstraction site river main channel to the top of the riverbanks should be surveyed from 300 m upstream to 420 m downstream of the abstraction site prior to the start of construction. The river should also be surveyed underwater. The survey data should be plotted as 0.5 m contour data in AutoCAD. Cross sections should be surveyed at the abstraction works site and sedimentation works discharge site of the river at the locations that were surveyed during the baseline study prior to the start of construction of the river. Regular monthly section surveys should be carried out during construction to evaluate possible sediment deposition and erosion cause by the construction activities. Daily suspended sediment grab sampling of the Crocodile River should be carried out as during the baseline study (at the site downstream of the abstraction works, which is approximately 780m along the river from the weir (but could be moved closer to the weir: 300 m to 420 m from the weir). The concentrations should be correlated against continuous recording permanently installed real time turbidity meter. The baseline data will be used to identify critically high sediment concentrations which could be caused by the construction activities. 						

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					<ul style="list-style-type: none"> • A turbidity probe and logger should also be installed downstream (100m to 200m) of the sedimentations works flushing point of discharge to monitor construction activities. • The turbidity meter readings should be supplemented with flow measurement to be able to calculate the sediment loads. Stable river sections should be selected to calculate a theoretical stage-discharge relationship based on a primary hydraulic control, which can be calibrated by a number of flow measurements at different river discharges. A real time pressure transducer and logger should be installed to record water levels. • Bed sediment grab samples (3 at each section in the main channel) should be collected at the baseline survey sections on the river (the upstream site at the abstraction works site should be moved out of the backwater effect of the weir), on a monthly basis for grading analysis: sieve and hydrometer. This is to evaluate possible excessive deposition of silt and clay on the river bed caused by the construction. • Monthly georeferenced photographs should be captured at all baseline river transects in 4 directions when samples are taken. Videos by drone should also record the river to cover all the baseline study sites. Possible river channel changes from the photographs such as bank erosion can be evaluated. • Near the completion of the construction phase, the affected river banks and river bed (including floodplains) upstream and downstream of the weir site and sedimentation works discharge point should be restored to the condition prior to construction by the contractor. This includes the complete removal of coffer dams in the river and floodplains. • The use of cement lined channels must be avoided at all costs and lining must be done with Loffel stones (or Amourflex stones) or similar products • Riprap (dumped rock) should be designed on suitable filter layers to be stable during extreme floods to protect the riverbank against erosion. Note that the erosive stream power on the riverbanks are much less than at the weir • Construction activities must commence from upstream, proceeding downstream with proper sedimentation barriers in place to prevent sediments and pollution moving downstream from the site. This is of relevance to the non-perennial systems of the Matlabas River, Bier and Sandspruit systems • Abstraction works sediment trap flushing operation manual to specify minimum river discharges, sequence of flushing, frequency of flushing, etc. • Sedimentation works sediment flushing operational manual to specify minimum river discharge, flushing duration, etc. • Sediment management requires monitoring of the river before and after the construction of the new proposed abstraction works in order to identify any potential negative impacts and to allow the necessary interventions in a time critical manner. 						

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20. Management of Heritage Features	<ul style="list-style-type: none"> • Destruction of graves and other sites of archaeological value • Destruction of the palaeontology 	<ul style="list-style-type: none"> • Loss of archaeological and palaeontological valuable artefacts. • Loss of cultural and heritage value to society. • Social unrest 	<ul style="list-style-type: none"> • Preserve sites and artefacts of archaeological and palaeontological interest, unearthed during construction as well as ensure that the correct protocols for grave relocation are adhered to. 	<ul style="list-style-type: none"> • Sites demarcated prior and during construction. • Evidence of records should further discoveries be identified during construction. • Full compliance to all mitigation measures required. 	<ul style="list-style-type: none"> • Search, rescue and relocation of heritage sites affected by construction. • An archaeological and heritage workshop must be conducted with the project ECO before construction commences to allow the ECO to undertake constant monitoring of construction activities • Phase 2 Palaeontological survey and upgrading of chance find protocol (CFP). For any chance finds, all work will cease in the area affected and the Contractor will immediately inform the Engineer. A registered heritage specialist must be called to site for inspection. The relevant heritage resource agency (SAHRA) must be informed about the finding. Works in the area may only proceed once all the requirements have been met to the satisfaction of the Engineer in consultation with the heritage specialist. • Permits to be obtained in terms of the NHRA if heritage resources are to be impacted on and for the removal of graves. • Exhumation and relocation of graves once families and affected communities have been consulted and permission received for relocation. All cultural practices in terms of removal of graves as requested by family / community to be complied with. • Should any remains be found on site that is potentially human remains apply the change find procedure as described above. The South African Police Service should also be contacted. • Whenever possible, all heritage sites identified during this study with a significance of Medium and higher, must be preserved in situ by designing the development footprints in such a way that a buffer area of at least 50m is kept clear between any development footprints and construction activities and these heritage sites. This buffer zone should be demarcated with barrier tape before construction commences and machinery operators should be made aware of the reason for these demarcations. • Areas along the banks of the Crocodile River is known to contain Middle to Late Stone Age deposits and operators in these areas should be made aware of what to look out for in terms of such sites. • The site-specific mitigation measures are required when the preservation of the identified heritage sites with a significance of Medium and higher, as well as their associated buffer areas, is not possible. This second phase mitigation work should be contracted out to a suitably qualified heritage management company. • All heritage sites identified with a significance of medium and high, must be preserved in situ by designing the development footprints in such a way that a buffer area of at least 50m is maintained from construction activities. In cases where the preservation of such sites and buffer areas are not possible, site-specific mitigation measures must be implemented 	<ul style="list-style-type: none"> • Site monitoring 	<ul style="list-style-type: none"> • As part of the daily site monitoring. 	<ul style="list-style-type: none"> • National Heritage Resources Act 	<ul style="list-style-type: none"> • Pre-construction and construction 	<ul style="list-style-type: none"> • Contractor and Engineer 	<ul style="list-style-type: none"> • Audits by the EM.

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
21. Management of Emergency Procedures	<ul style="list-style-type: none"> Fire Hazards 	<ul style="list-style-type: none"> Potential injury or death of fauna, avifauna species, and humans. Fire damage to equipment, plant, vehicles and construction materials. 	<ul style="list-style-type: none"> Minimise environmental impacts associated with emergency procedures No uncontrolled fires were started. 	<ul style="list-style-type: none"> Approved emergency response procedures, where relevant. No site fires to be caused by construction activities and workers. 	<ul style="list-style-type: none"> Comply with the National Veld and Forest Fire Act (No. 101 of 1998) and National Veld and Forest Fire Bill (B122B of 1998). Work closely with the local Fire Protection Association. Determine requirements and add to list of emergency telephone numbers. Keep a fire danger index displayed on site and comply with requirements. Fire breaks are to be agreed with neighbours and the local Fire Protection Association. Proper emergency response procedure to be in place for dealing with fires. Burning of waste is not permitted. Suitable precautions will be taken (e.g. suitable fire extinguishers, water bowsers, welding curtains) when working with welding or grinding equipment. All fire control mechanisms (fire-fighting equipment) will be routinely inspected by a qualified investigator for efficacy thereof and be approved by local fire services. All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire. No fires are allowed on site. Firebreaks to be made for construction areas, as required. Dedicated smoking areas to be provided. 	<ul style="list-style-type: none"> Approved Emergency Response Plan. Training and awareness creation records. Signage displayed. Contractor's method statement. Incident Register and Report 	<ul style="list-style-type: none"> Weekly 	<ul style="list-style-type: none"> Construction Regulation 27 of the OHS Act (appointment of fire coordinators and equipment inspectors / wardens). 	<ul style="list-style-type: none"> Pre-construction, construction and rehabilitation 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Auditing by environmental and safety spheres.
	<ul style="list-style-type: none"> Accidental Leaks and Spillages 				<ul style="list-style-type: none"> Proper emergency response procedure to be in place for dealing with spills and leaks. Ensure that the necessary materials and equipment for dealing with spills and leaks are available on site, where practicable. Remediation of the spill areas will be undertaken to the satisfaction of the Engineer. In the event of a hydrocarbon spill, the source of the spillage will be isolated and contained. The area will be cordoned off and secured. The Contractor will ensure that there is always a supply of an appropriate absorbent material readily available to absorb, breakdown and where possible, encapsulate a minor hydrocarbon spillage. All staff on site will be made aware of actions to be taken in case of a spillage. Provide contact details of person to be notified in a case of spillages – signage to be displayed at strategic points within the construction domain (e.g. workshop, fuel storage area, hazardous material containers). All Major Incidents (i.e. uncontrolled release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant harm to the environment, human life or property) to be reported to DEA and/or other relevant authorities. 						

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
22. Management of Health and Safety	<ul style="list-style-type: none"> Health and safety 	<ul style="list-style-type: none"> Failure to comply with health, safety and environmental specifications 	<ul style="list-style-type: none"> Provide a safe working environment to construction workers and the public. 	<ul style="list-style-type: none"> Approved Health and Safety Plan. No major incidents. Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993), Construction Regulations (2014) and other relevant regulations. 	<ul style="list-style-type: none"> Contractor to submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work. These requirements are aligned with the Construction Regulations (2014). Fencing and barriers will be in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993). Applicable notice boards and hazard warning notices will be put in place and secured. Night hazards will be indicated suitably (e.g. reflectors, lighting and traffic signage). Emergency contact details will be prominently displayed. Two-Way Radio Systems should be used where cell phone coverage is poor. All construction personal must be clearly identifiable. All employees must also be issued with employee cards for identification purposes. All workers will be supplied with the required Personal Protective Equipment as per the Occupational Health and Safety Act (Act No. 85 of 1993). Maintain access control to prevent access of the public to the construction areas, as far as practicable. Use approved communication channels to inform the community of Occupational Health and Safety measures to prevent incidents involving community members. Account should be taken of the safety impacts on the local community when carrying out the longitudinal aspects of the project, such as the pipelines. Put in place a monitoring system to monitor health risks throughout the life of the projects 	<ul style="list-style-type: none"> Site monitoring and evaluation of complaints received 	<ul style="list-style-type: none"> Daily monitoring and monthly auditing 	<ul style="list-style-type: none"> Occupational Health and Safety system Construction Regulations (2014). 	<ul style="list-style-type: none"> Pre-construction and Construction phase 	<ul style="list-style-type: none"> Safety Agent 	<ul style="list-style-type: none"> Monthly auditing

Environmental Management Programme

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
23. Management of reinstatement and rehabilitation	<ul style="list-style-type: none"> Restoration and rehabilitation of affected environment 	<ul style="list-style-type: none"> Erosion and loss of productive topsoil due to ineffective rehabilitation. Infestation by alien invasive plant species. Environmental degradation due to stockpiles, spoil and other construction materials being abandoned on site instead of removed. Dust generation due to exposed surfaces. Reduction in species diversity along the servitude after rehabilitation has been completed. Reduction in soil productivity 	<ul style="list-style-type: none"> Adequate reinstatement and rehabilitation of construction areas. Conduct concurrent or progressive rehabilitation of areas affected by construction activities 	<ul style="list-style-type: none"> Complete site clean-up. Reinstate and rehabilitate areas disturbed by construction activities. Habitats restored. Contractor's Method Statement. Appropriate rehabilitation measures required for each land portion must be ascertained, authorised and implemented for the duration of the project. The seed mix for use in rehabilitation must be an approved mix of indigenous grass species common to the area. All vegetative matter removed during the search and rescue operation must be replanted in the area that they were rescued from. 	<ul style="list-style-type: none"> No exotic plants may be used for rehabilitation purposes. Only indigenous plants of the area may be utilised EMPrEnsure that rehabilitation is in line with the surrounding natural environment and preconstruction state of the affected area. Alien vegetation control to form part of the rehabilitation measures Cordon off areas that are under rehabilitation as no-go areas. <p><u>Removal of structures and infrastructure –</u></p> <ul style="list-style-type: none"> Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, and fixtures. Ensure that all temporary access roads utilised during construction and which are not earmarked for use during the operational phase, are returned to a usable state and/or a state no worse than prior to construction. <p><u>Inert waste and rubble –</u></p> <ul style="list-style-type: none"> Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates. After the material has been removed, the site must be reinstated and rehabilitated. Load and haul excess spoil and inert rubble to fill in dongas or to dump sites indicated / approved by the Engineer. All remaining combustible biomass from bush clearing operations must be removed from the area unless it is to be used in rehabilitation measures. <p><u>Domestic waste –</u></p> <ul style="list-style-type: none"> Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site. <p><u>Hazardous waste and pollution control -</u></p> <ul style="list-style-type: none"> Remove from site all pollution containment structures. Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner. <p><u>Instream habitat restoration and reinstatement of flows</u></p> <ul style="list-style-type: none"> Functionality of the fishway (if found to be applicable) must be evaluated post construction prior to construction teams and equipment leaving the site, although it is envisioned that only minor changes could be implemented at this stage. Instream habitat must be reinstated to ensure that not hindrances to reach the fishway by fish are encountered (e.g., area downstream of fishway entrance (outflow) is inaccessible due to poor streambed reinstatement). The entrance area (outflow) of the fishway is purposely located along the peripheral zones of a highly-turbulent area as fish will navigate along the outer edges of the turbulence to seek upstream passage. They should not be hindered by steps or terraces that form part of the foundation apron or other infrastructure. This mixture of vertical and laminar flows reduces the overall flow velocity of the water within this zone. The flow velocity should not exceed 2.5 m/s within this zone, however, bearing in mind that there will be reduced flow velocities along the edges of the main flow. 	<ul style="list-style-type: none"> Monitoring reports. Post-construction Audit 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> NEMA 	<ul style="list-style-type: none"> Rehabilitation Phase 	<ul style="list-style-type: none"> Contractor and Engineer 	<ul style="list-style-type: none"> Monthly auditing

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				<ul style="list-style-type: none"> Care must be taken in replanting of vegetation in wetland to ensure the highest level of success in rehabilitation. Vegetated cover of rehabilitated areas must correlate with the cover of the surrounding natural vegetation. 	<p><u>Final shaping –</u></p> <ul style="list-style-type: none"> Due to variance in the geological topography it is advised that trench breakers be installed for all linear excavations in, near and leading to aquatic ecosystems. This is to prevent water in the soils moving along the newly installed pipeline, rather than through the soils. The use of impermeable sandbags or clay plugs is advised and should be keyed into the sides of the trench to prevent compromising the trench breakers. In general, no slopes steeper than 1(V):3(H) are permitted in cut-and-fill areas, unless otherwise specified by the Engineer. Steeper slopes require protection. New slopes must mimic the natural slopes and topography, where possible. Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results. Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material. Shape all disturbed areas to blend in with the surrounding landscape, where possible. Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is landscaped to blend in with the surrounding landscape <p><u>Topsoil replacement and soil amelioration –</u></p> <ul style="list-style-type: none"> Execute top soiling activity prior to the rainy season or any expected wet weather conditions. Execute topsoil placement only after all construction work has ceased. Prior to replacement of topsoil, any possible alien vegetation must be removed Execute top soiling activity prior to the rainy season or any expected wet weather conditions. Execute topsoil placement only after all construction work has ceased. Contractor to test top 15 cm soil at predetermined distances for fertilizer requirements. All testing to occur at a SANS 17025 approved laboratory. Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes. Replace topsoil to the original depth. Once the site has been cleared of vegetation (i.e. trees and shrubs), the topsoil including the existing grass cover shall be stripped as directed by the Engineer. The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage Do not use topsoil suspected to be contaminated with the seed of alien vegetation. Alternatively, the soil is to be appropriately treated and monitored for alien vegetation re-establishment Ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it. After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area Topsoil shall be stripped over the entire width of the temporary pipeline construction servitude and borrow pit areas, except for the topsoil storage area, and to a maximum depth of 250 mm within cultivated land or 150 mm in all other areas. 						

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
					<p><u>Seeds and seedlings -</u></p> <ul style="list-style-type: none"> • All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment. • Tree seedling material should be fresh and of local origin. Resist using plants from far afield as they may not be best suited to local climatic or soil conditions. Ideally make use of species representative of the vegetation types • Small seedlings are likely to transplant more successfully than will large ones. These should be potted and kept under nursery conditions until they are large enough to plant out. • Establish further specifications for seeds and seedlings. <p><u>Transplanted plants -</u></p> <ul style="list-style-type: none"> • All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment. • Transplanting entails the removal of plant material and replanting the same plants in another designated position. • Transplant trees and shrubs into designated positions. • Establish further specifications for transplanted plants. <p><u>Nursery plants –</u></p> <ul style="list-style-type: none"> • All appropriate permits must be in place • All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment. • Plant all trees, shrubs and individual plants in designated positions. • Planting should preferably be done at the start of spring during the rainy season. • After planting, each plant must be well watered, adding more soil upon settlement if necessary. • Arboreal species planting must include dedicated fertiliser applications • Establish further specifications for nursery plants. • Ensure no pathogens or exotic invertebrates (e.g. earthworms) from nurseries are introduced during rehabilitation . <p><u>Grassing -</u></p> <ul style="list-style-type: none"> • Suitably trained personnel must undertake grassing by making use of the appropriate equipment and grass species as specified by the terrestrial ecologist. • Sodding may be done at any time of the year, but seeding must be done by sowing appropriate seed mixtures only between 1 October and 31 January. • Hydroseeding with a winter mix will only be specified where regrassing is urgent, and cannot wait for the summer. • Establish further specifications for sods, runners and hand seeding. <p>Comply with relevant provisions under the following EMP section</p> <ul style="list-style-type: none"> • –Management of Storage and Handling of Hazardous Material; • – Management of Water; • – Management of Waste; and • – Management of Pollution Generation Potential. 						

9 OPERATIONAL PHASE

This section includes the environmental and social management measures for the Contractor (and associated sub-contractors) for the construction activities associated with MCWAP-2A which comprises of the proposed construction of the WTI, Contractor's and Engineer's staff accommodation, Contractor's office and associated infrastructure.

Operational activities include all those activities following after construction

Each management section provides the following details:

- Aspect and objectives – the management objective that applies to each aspect or impact.
- Mitigation Measures / Procedure – the strategies, tasks or action program (to nominated operational design standards) that will be implemented to achieve the performance criteria.
- Responsible party for implementing the mitigation measure.
- Implementation timeframe or frequency of the required mitigation measure.
- Monitoring method to determine the success of the required mitigation measure.
- Target – measurable performance criteria (outcomes) for each element.

The responsibility for implementing the management measures will be the applicant or operator, unless otherwise specified.

The Applicant will also be audited against their compliance with these method statements.

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
1. Management of Access, Routine Maintenance Inspections and Maintenance Works	<ul style="list-style-type: none"> Increase in road damage 	<ul style="list-style-type: none"> Potential increase in pedestrian and livestock accidents. Decrease in the surface quality of roads. The development of potholes. Damage to vehicles 	<ul style="list-style-type: none"> Manage environment impacts associated with operation and maintenance activities. Restrict operation and maintenance activities to permanent pipeline servitude and areas acquired for the Government Waterworks. Safeguarding of sensitive environmental features and existing services. Ensure proper access control. Adhere to agreements made with individual landowners and community members regarding access 	<ul style="list-style-type: none"> No damage to be caused to sensitive environmental features (including heritage resources, protected flora and fauna, watercourses, cultivated areas, existing structures and infrastructure, etc.) outside of the Government Waterworks. Prior notification of affected landowners of operation and maintenance activities. No reports of operation and maintenance vehicles using unauthorised access points and routes. No verified complaints regarding poor practices during operation and maintenance 	<ul style="list-style-type: none"> During maintenance related activities, damage to access gates, access roads, fencing and/or private property, will be restored to its original condition. Maintain access control to the permanent servitude and Government Waterworks. All access gates should be closed and locked as per the instruction of the landowner. All roads and tracks used for maintenance inspections and maintenance works should be maintained and repaired where necessary. 	<ul style="list-style-type: none"> Public complaints. Unauthorised access to private property. Verified damage to private property. Evidence of erosion. 	<ul style="list-style-type: none"> Daily monitoring and monthly auditing 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Operational phase 	<ul style="list-style-type: none"> Applicant / Operator - to monitor compliance and implement management actions. 	<ul style="list-style-type: none"> Monthly auditing
2. Management of Leaks	<ul style="list-style-type: none"> Wastage of water 	<ul style="list-style-type: none"> Unaccountable water Landowners 	<ul style="list-style-type: none"> Ensure leaks are detected and repaired. 	<ul style="list-style-type: none"> Timeous detection and repairing of leaks. 	<ul style="list-style-type: none"> Routine inspection to include detection and timeous repairs of leaks. 	<ul style="list-style-type: none"> Leak detections 	<ul style="list-style-type: none"> As required 	<ul style="list-style-type: none"> National Water Act 	<ul style="list-style-type: none"> Operational Phase 	<ul style="list-style-type: none"> Applicant / Operator - to monitor compliance and implement management actions. 	<ul style="list-style-type: none"> Monthly auditing
3. Management of Pipeline Scouring	<ul style="list-style-type: none"> Improper scouring 	<ul style="list-style-type: none"> Erosion and loss of productive topsoil due to ineffective rehabilitation 	<ul style="list-style-type: none"> Prevent environmental impacts associated with scouring. 	<ul style="list-style-type: none"> No visible signs of erosion channels caused by scouring. No de-stabilisation of river morphology due to scouring. 	<ul style="list-style-type: none"> Suitable erosion protection measures to be implemented to prevent erosion due to scouring. Manage impacts to water quality (e.g. sedimentation) of receiving watercourses due to scouring. Implement appropriate measures to manage impacts to the ecological status of the Matlabas River during scoring, as determined during the high-flow period, prior to construction Monitoring of the sediment levels in the Crocodile River (West) before and after flushing (scouring from desilting works), as necessary, to determine impacts 	<ul style="list-style-type: none"> Evidence of erosion. Water quality and aquatic health of Matlabas River (prior to and after scouring events). 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> National Water Act 	<ul style="list-style-type: none"> Operations Phase 	<ul style="list-style-type: none"> Applicant / Operator - to monitor compliance and implement management actions. 	<ul style="list-style-type: none"> Monthly Reporting

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4. Management of Watercourses	<ul style="list-style-type: none"> Change in Aquatic health 	<ul style="list-style-type: none"> Deterioration of the watercourses. Reductions in diversity or populations of aquatic life. 	<ul style="list-style-type: none"> Ensure that the watercourses (including the Crocodile River (West) and Matlabas River and their tributaries, natural channels, drainage lines, wetlands) are protected and incur minimal negative impact to their resource quality (i.e. flow water quality, riparian habitat, morphology and aquatic biota). 	<ul style="list-style-type: none"> . EWR for the Crocodile River (West) and Matlabas River to be satisfied during the operational phase. 	<ul style="list-style-type: none"> Monitoring of the ground- and surface water levels, as well as chemistry, to be done to confirm the link between surface and groundwater. Appropriate measures to be identified to address disturbances, as necessary. Implement the River Management System to monitor, control and manage the releases into the river, the flows in the river and abstractions from the river. This will also allow for the monitoring of the flow downstream, thereby allowing verification that the lawful downstream water uses are met. Periodic monitoring of chemical characteristics of sediment to confirm storage requirements at desilting works and that scouring is suitable. Establish boreholes upstream and downstream of the abstraction weir site to define a groundwater level baseline prior to the construction of the weir. Monitor the actual situation regarding sediment conveyance against the established baseline for sediment in suspension downstream of the proposed weir. Monitor the boreholes within the redline for abstraction of authorised volumes. 	<ul style="list-style-type: none"> Monitoring programme (water quality, aquatic health, sediment, ground- and surface water interaction). 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> General limits listed in the National Water Act (NWA) and the Classes and Resource Quality Objectives of Water Resources for the Mokolo, Matlabas, Crocodile West and Marico GN of 562 18 October 2019 	<ul style="list-style-type: none"> Operational phase 	<ul style="list-style-type: none"> Applicant / Operator - to monitor compliance and implement management actions. 	<ul style="list-style-type: none"> Monthly Reporting
5. Management of Flora and Fauna	<ul style="list-style-type: none"> Loss of flora and fauna 	<ul style="list-style-type: none"> Decrease in floral and faunal diversity and density. 	<ul style="list-style-type: none"> Control alien invasive plant species within the areas acquired for the Government Waterworks. Ensure the protection of animals (including wildlife and livestock). 	<ul style="list-style-type: none"> No direct / indirect harm to animals from operation and maintenance activities. No deviations from agreements made with individual landowners and community members regarding animals. 	<ul style="list-style-type: none"> Rehabilitation Management Plan to be developed, which will include additional measures identified during and following construction to supplement the reinstatement and rehabilitation provisions included in the EMPr. Targets to be specified for maintaining vegetative cover. Control of alien invasive species and noxious within the areas acquired for the Government Waterworks, in accordance with the requirements of the prevailing environmental regulatory framework. Ensure that all construction personnel have the appropriate level of environmental awareness and competence. Comply with regulatory framework pertaining to protected fauna and flora species, as required (e.g. cutting of protected trees growing in permanent servitude). Revegetation must match the vegetation type, which previously existed, unless otherwise indicated by a suitable specialist. Take appropriate remedial action where vegetation establishment has not been successful or erosion is evident. 	<ul style="list-style-type: none"> Encroachment of alien invasive plants and noxious weeds into the areas acquired for the Government Waterworks. Successful rehabilitation. Evidence of erosion. 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> NEMA 	<ul style="list-style-type: none"> Operational phase 	<ul style="list-style-type: none"> Applicant / Operator - to monitor compliance and implement management actions 	<ul style="list-style-type: none"> Monthly auditing

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
6. Management of Sediment Discharge	<ul style="list-style-type: none"> Sediment Flow Alterations 	<ul style="list-style-type: none"> Deterioration of the water quality 	<ul style="list-style-type: none"> Ensure that the watercourses are protected and incur minimal negative impact to their resource quality (i.e. flow water quality, riparian habitat, morphology and aquatic biota) 	<ul style="list-style-type: none"> EWR for the Crocodile River (West) River to be satisfied during the operational phase 	<ul style="list-style-type: none"> Installing flow regulation mechanisms, such as adjustable gates or flow control structures, can help manage and maintain desired flow conditions within the weir systems. Undertaking habitat restoration initiatives, such as the creation of artificial habitats, the reintroduction of native vegetation, and the establishment of riparian buffers, can help offset the potential negative impacts of flow alterations. Implementing effective sediment management strategies, such as regular sediment removal and erosion control measures, can help mitigate the potential impacts of sedimentation caused by flow alterations within weir systems. Revegetate River banks with endemic aquatic vegetation to improve riverbank erosion Construct erosion protective structures where River banks are vulnerable Erosion or bank collapse to be carefully avoided and managed, care should be taken with heavy machinery along verges Protective barriers and strategically partial impoundments should be put in place in order to minimise sediment deposition zones. Stormwater management systems should be utilised effectively, proper stream velocity management could reduce erosion and sedimentation downstream. Implementing effective sediment management strategies, such as regular sediment removal and erosion control measures, can help mitigate the potential impacts of sedimentation caused by flow alterations within weir systems. Suitable erosion protective measures to be implemented for access roads, weir structures and stabilisation of river banks once vegetation has been removed Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site-specific conditions. Monitoring to be conducted to detect erosion (e.g on steep slopes). Exposed areas to be rehabilitated as soon as possible to prevent erosion. Implement an ecologically-sound storm water management plan during construction. The man-made structure at the weir should also be removed to allow free stream distribution of sediment once sediment is being discharged at the site. Integrating constructed wetlands near weirs can significantly improve phosphate and nitrate assimilation. They can effectively reduce nutrient levels in stormwater run-off before it enters downstream water bodies. Establishing and maintaining riparian buffers along the banks of water bodies can help enhance nutrient assimilation at weirs. Implementing permeable reactive barriers, such as permeable reactive interlocking blocks or permeable reactive gates, can effectively reduce phosphate and nitrate levels at weirs. Implementing nutrient management practices, such as reducing fertilizer use and implementing sustainable agricultural practices in upstream areas Consider the use of side channels or bypass channels to divert flows during critical periods and minimise the impact of the main channel. 	<ul style="list-style-type: none"> Monitoring programme (water quality, aquatic health, sediment, ground- and surface water interaction). 	<ul style="list-style-type: none"> Monthly 	<ul style="list-style-type: none"> General limits listed in the National Water Act (NWA) and the Classes and Resource Quality Objectives of Water Resources for the Mokolo, Matlabas, Crocodile West and Marico GN of 562 18 October 2019 	<ul style="list-style-type: none"> Operational phase 	<ul style="list-style-type: none"> Applicant / Operator - to monitor compliance and implement management actions. 	<ul style="list-style-type: none"> Monthly Reporting

ID	Aspect	Potential Risk and Impact	Objectives	Performance Indicators and Targets	Mitigation measure / Procedure	Monitoring Methods	Monitoring Frequency	Applicable Standards or practices	Time period for implementation	Implementation Responsibility	Mechanism for Monitoring Compliance
					<ul style="list-style-type: none"> • Implement an adaptive management strategy making adjustments based on monitoring results to address any unforeseen issues or environmental changes. • River diversion headwork should be properly constructed at the head of the canal to divert the river water towards the canal, so as to ensure a regulated continuous supply of silt-free water. • Protecting and preserving natural riparian vegetation along the banks of water bodies can help regulate water temperature and maintain water quality. • Implementing effective water flow management strategies at weirs can help regulate water temperatures and maintain water quality. • Implementing comprehensive stormwater run-off treatment systems, such as constructed wetlands, biofiltration systems, and sedimentation basins, can help reduce the influx of pollutants and contaminants that can contribute to changes in water quality and temperature. 						

10 MONITORING AND MEASUREMENT

The Implementer, TCTA is required to ensure that the key characteristics of the Project's construction operations, that can have a significant environmental impact, are monitored and measured on a regular basis. The baseline levels of environmental components have been established prior to the start of construction which will provide the prevailing conditions and environmental health of the environment which could be affected by the construction of MCWAP-2A. During the construction of the Project, the Implementer is required to ensure that regular monitoring and measurement of the environmental components be conducted in order to determine whether or not the Project is causing a negative impact to its immediate and surrounding environment. This provides for quantitative data to be used to manage the construction activities to minimise negative influence to the environment. The Section below, together with the following Section 8, is the "Checking" component of the Deming Cycle and therefore this EMP.

The following environmental components are required to be monitored and measured:

10.1 Air Quality

Air quality monitoring must focus on areas where construction activities could impact negatively on ambient air quality. Planned sources of air pollution from the pipeline construction included as a minimum, infrastructure and equipment use:

- Tracked machinery and equipment;
- Heavy mobile vehicles;
- Dump trucks;
- Haul trucks;
- Light motor vehicles; and
- Access roads.

a) Dust deposition

Dust buckets of a standard size and shape are to be prepared and set up at locations on the borders of the property, relating to the main compass points (wind directions), so that dust can settle for periods of 30 (± 2) days. The dust buckets are collected and sealed on site and sent to a SANAS accredited laboratory for analysis. The masses of the water-soluble and insoluble components of the material collected are then determined and results are reported as $\text{mg/m}^2/\text{day}$. This methodology is described according to South African National Standards 1929:2011 and the American Society for Testing and Materials (ASTM) Designation: D 1739-98 (2017) standards. The results for this method of testing are obtained by gravimetric weighing. The apparatus required for this type of monitoring include open-top buckets / containers no less than 150 mm in diameter with a height of no less than twice its diameter. The buckets must be placed on a stand at a height of 2 (± 0.2) m above the ground.

Results obtained is evaluated against the four-band scale for dust deposition (SANS 1929:2011) and the National Dust Control Regulation limits (GN827).

Table 15: Four-band scale evaluation criteria for dust deposition (SANS 1929: 2011)

Band Number	Band Description level	Classification	Dust fallout rate (D) (mg/m ² /day, 30-day average)	Comment
1	Residential	Ideal	D > 600	Permissible for residential and light commercial.
2	Industrial	Acceptable	600 < D < 1200	Permissible for heavy commercial and industrial.
3	Action	Tolerable	1200 < D < 2400	Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.
4	Alert	Unacceptable	2440 < D	Immediate action and remediation required followed the first incidence of dust fallout rate being exceeded. Incidents report is submitted to the relevant authority.

If the above regulations are exceeded, it must be noted that the dust fallout monitoring report must be submitted to the local authorities. Within three months after submission of the report, the Client must develop and submit a dust management plan to the local air quality officer for approval. Such a plan must:

- Identify all possible sources of dust within the affected site;
- Detail the best practical measures to be undertaken to mitigate dust emissions;
- Detail an implementation schedule;
- Identify the line management responsible for implementation;
- Incorporate the dust fallout monitoring plan; and
- Establish a register for recording all complaints received.

b) Particulate Matter

The Met One Instruments, Inc. model E-Sampler is a type of nephelometer which automatically measures and records real-time airborne PM10, PM2.5, or TSP particulate concentration levels using the principle of forward laser light scatter. In addition, the E-Sampler has a built-in 47 mm filter sampler which can optionally be used to collect the particulate for subsequent gravimetric mass or laboratory evaluation.

Where communities or concentrations of homesteads are located in the proximity of the pipeline alignment, the monitoring of PM10 dust particles must also be conducted in order to determine the potential health impact of the fine dust on the receptors in accordance with SANS1929:2011: Ed2.00 standard.

c) Sampling Frequency

Dust fallout should be conducted on a monthly basis while PM10 monitoring should be conducted continuously.

10.2 Surface Water Quality

Construction will include activities that could directly or indirectly affect the quality of water in the area's rivers and streams. Construction activities must be managed so as to prevent any further degradation of the area's already stressed watercourses. Over and above the requirements of this EMP, any additional requirements mentioned in the Water Use Licence must be adhered to.

Instream water quality monitoring must be undertaken whenever there is a disturbance to any Watercourse or Waterbody caused by construction within or adjacent to the said Watercourse or Waterbody. Sampling and monitoring must take place 50 m upstream and 50 m downstream of the area where disturbance to the Watercourse or Waterbody has occurred and must comprise a composite water sample collected from 4 points equidistant across the Watercourse or Waterbody at each location.

Results received from monitoring must be compared to the baseline levels established from the baseline studies as well as any further requirements of the Water Use Licence (WUL) issued by the Department of Water and Sanitation. In cases where baseline levels and WUL requirements differ, the more stringent of the two must be adhered to. Bio monitoring should be on the wet / dry season.

10.2.1 Variables

The variables and parameters listed below in Table 16 must be monitored for the duration of the construction phase to determine whether construction activities are having an impact on water sources. In cases where a difference in values of water quality variables exists, the difference may not be exceeded by more than 10%. When the downstream measured value exceeds the upstream value by more than this, the reason for the exceedance should be investigated and corrective action taken immediately. The site activities at the stream crossing in question may need to be temporarily ceased at the discretion of the Engineer.

Table 16: Water quality variables to be tested every second month

Variables
Calcium (mg/l)
Chloride (mg/l)
Total Dissolved Salts (mg/l)
Electrical Conductivity (mS/m @ 25 °C)
Potassium (mg/l)
Sodium (mg/l)
pH (pH Units @ 25 °C)
Suspended Solids (mg/l)
Total Alkalinity as CaCO ₃ (mg/l)
Colour (Cobalt-Platinum Units)

Variables
Dissolved Oxygen (mg/l O ₂)
Faecal Coli (CFU/100ml)
Temperature (°C)
Chemical Oxygen Demand (mg/l)
Soap, oil, grease (mg/l)
Residual chlorine (mg/l) Cl
Free and saline ammonia (mg/l) N
Orthophosphate (mg/l) PO ₄
Nitrate (Nitrogen) (mg/l) NO ₃
Chromium (Cr) (mg/l)
Chrome (VI) (Cr ⁶⁺) (mg/l)
Copper (Cu) (mg/l)
Iron (Fe) (mg/l)
Zinc (Zn) (mg/l)
Antimony
<i>Escherichia coli</i> (<i>E.coli</i>) (CFU/100ml)
Faecal Coliforms (CFU/100ml)

The variables listed in Table 16 should be tested once during the wet season and once in the dry season for the duration of the construction in the identified area. When the measured value exceeds the baseline, then the reason for the exceedance should be investigated and corrective action taken.

The following physio-chemical parameters must be measured in situ using a multi-parameter water test instrument. The following measurements should be taken in the flowing part of the stream:

- pH (pH units);
- Temperature (°C);
- Electrical conductivity (EC) (mS/m); and
- Dissolved Oxygen (mg/l and % saturation).

Results received from monitoring must be compared to the baseline levels established from the baseline studies as well as any further requirements of the Water Use Licence (WUL) issued by the Department of Water and Sanitation. In cases where baseline levels and WUL requirements differ, the more stringent of the two must be adhered to.

10.2.2 Releases / Effluent Discharges and Dewatering of Trenches

During construction the bulk supply pipelines need to be tested and emptied. In order to empty the pipeline, a section of pipeline is isolated and the water within the isolated section is released at installed drain points (scour points). These drain points (scour points) consist of scour valve assemblies housed in a reinforced concrete chamber and are located at predetermined positions along the length of the pipeline, usually where the pipeline vertical alignment has low points. Scour water is then released into nearby watercourses. Water is also released from pump shafts. These discharges are not necessarily wastewater as no additions and or changes occurred from the source

to the eventual discharge via the scour valve. Notwithstanding this, it is proposed that these discharges be monitored during the discharge activity to confirm that the quality complies with the General Limit as per Table 17, and that excessive / high velocity discharges that may cause river / stream bank erosion be avoided.

Due to the sensitive nature of the Matlabas River, discharge of scour water is not allowed. The MCWAP-2A Project would prefer to scour into an Evaporation Pond instead. This Evaporation Pond could also be used during construction as a settling pond. The Evaporation Pond will be located on an "Approved" Borrow Pit Footprint. The Evaporation Pond will become the Borrow pit's final void and will be shaped to follow the natural topography of the surrounding area.

Table 17: Water quality parameters for discharge and dewatering

Substance / Parameter	General Limit
Faecal Coliforms (per 100 ml)	1 000
Chemical Oxygen Demand (mg/l)	75*
pH	5,5-9,5
Ammonia (ionised and un-ionised) as Nitrogen (mg/l)	3
Nitrate/Nitrite as Nitrogen (mg/l)	15
Chlorine as Free Chlorine (mg/l)	0,25
Suspended Solids (mg/l)	25
Electrical Conductivity (mS/m)	70 mS/m above intake to a maximum of 150 mS/m
Ortho-Phosphate as phosphorous (mg/l)	10
Fluoride (mg/l)	1
Soap, oil or grease (mg/l)	2,5
Dissolved Arsenic (mg/l)	0,02
Dissolved Cadmium(mg/l)	0,005
Dissolved Chromium (VI) (mg/l)	0,05
Dissolved Copper (mg/l)	0,01
Dissolved Cyanide (mg/l)	0,02
Dissolved Iron (mg/l)	0,3
Dissolved Lead (mg/l)	0,01
Dissolved Manganese (mg/l)	0,1
Mercury and its compounds (mg/l)	0,005
Dissolved Selenium (mg/l)	0,02
Dissolved Zinc (mg/l)	0,1
Boron (mg/l)	1

One grab sample at the start of the release, during the release and at the end of the release will be taken for compliance measurement.

10.3 Noise

For consistency, sites used for baseline monitoring should continue to be used during construction. Additional monitoring points must be added to these, if necessary.

Monitoring should take place at both noise point source and noise sensitive receptors.

Daytime monitoring should take place as standard operating practice, while additional night-time monitoring should be conducted in areas where construction takes place at night.

10.3.1 Monitoring Sites

As mentioned above, the sites to be monitored during the construction phase of the project are the same as those of the baseline studies and their position are as follows:

Table 18: Noise Baseline Studies Location

Farm	Latitude	Longitude
Buffelsjacht	23°43'34.34"S	27°24'16.74"E
Welgevonden 16 KQ Portion 2	24° 5'44.11"S	27°25'16.58"E
Haarlem Oost 51 KQ Portion 15	24°10'31.32"S	27°26'25.11"E
Ruigtevley 97 KQ Remainder	24°18'17.58"S	27°27'15.23"E
Diepkuil 135 KQ Portion 2	24°24'6.81"S	27°25'22.14"E
Kesarona Primary School	24°34'22.54"S	27°18'36.01"E
Community housing behind school	24° 34.245"S	27° 18.575"E
Paarl 124 KQ Portion 7	24°30'38.07"S	27°16'56.54"E
Mooivalei 342 KQ Portion 1	24°35'38.27"S	27°17'43.04"E
Mooivalei 342 KQ Portion 2	24°36'1.17"S	27°17'34.63"E
Mooivalei 342 KQ Rem Portion 5	24°36'37.14"S	27°18'4.85"E
Mooivalei 342 KQ Rem Portion 4	24°36'51.73"S	27°18'26.03"E
Mooivalei 342 KQ Rem Portion 7	24°36'50.01"S	27°18'19.35"E
Mooivalei 342 KQ Rem Portion 8	24°37'14.13"S	27°18'48.5"E
Mooivalei 342 KQ Rem Portion 9	24°37'14.13"S	27°18'48.50"E
Mooivalei 342 KQ Rem Portion 10	24°37'29.67"S	27°18'44.61"E

The sites to be monitored during RMS are as follows:

Table 19: Noise Baseline Studies Location

Weir	ID	Latitude	Longitude	Description	Distance (m)
Beestekraal	Sensitive Receptor BK 1	25.397843°	27.574044°	Shongololo Camping Site	630 m
Beestekraal	Sensitive Receptor BK 2	25.407603°	27.566436°	Thaba lodge	970 m

Beestekraal	Sensitive Receptor BK 3	25.407523°	27.569801°	Residential Houses (informal)	680 m
Atlanta	Sensitive Receptor AT 1	25.206677°	27.559716°	Residential Farmhouse	220 m
Atlanta	Sensitive Receptor AT 2	25.207234°	27.566377°	Residential Houses and Offices	860 m
Atlanta	Sensitive Receptor AT 3	25.210931°	27.543096°	Residential Farmhouse	1550 m
Paul Hugo	Sensitive Receptor PH 1	24.693229°	27.400652°	White Silo Guesthouse	830 m
Paul Hugo	Sensitive Receptor PH 2	24.698166°	24.698166°	Residential Farmhouse	850 m
Paul Hugo	Sensitive Receptor PH 3	24.693425°	27.395564°	Residential Houses (informal)	1360 m
Paul Hugo	Sensitive Receptor PH 4	24.694591°	27.389419°	Residential Farmhouse and storage facility	2000 m

10.3.2 Variables

For each measurement the following data is to be recorded:

- Description of the site.
- Date, time and duration of measurement.
- GPS coordinates and altitude.
- Meteorological data (wind speed and direction, ambient temperature, cloud cover, humidity, barometric pressure).
- Sound pressure level data:
 - a) Equivalent continuous sound pressure level.
 - b) Maximum sound pressure level during measurement period.
 - c) Minimum sound pressure level during measurement period.
- Notes on incidents influencing the noise measurement during the measurement period.
- Reference to photographs taken (at least one photograph of each site is to be taken).

10.3.3 Frequency

The frequency of monitoring measurements is dependent on the construction operations, but as a general guideline, measurements should be taken at least once weekly in areas where construction is taking place.

10.4 Groundwater

The variables and parameters listed below in Table 18 and Table 19 must be monitored for the duration of the construction phase to determine monitor construction activities are having an impact on water sources.

Table 20: Full Range of SANS (241: 2015) Water Quality Parameters

pH (Value at 25°C)	Sulphate as SO ₄ (mg/l)	Chloroform as CHCl ₃ (ug/l)	Sodium as Na (mg/l)	Total Chromium as Cr (ug/l)
Electrical Conductivity (mS/m at 25°C)	Fluoride as F (mg/l)	Bromoform as CHBr ₃ (ug/l)	Potassium as K (mg/l)	Copper as Cu (ug/l)
Total Dissolved Solids (mg/l at 180°C)	Nitrate as N (mg/l)	Dibromochloromethane as CHBr ₂ Cl (ug/l)	Calcium as Ca (mg/l)	Iron as Fe (ug/l)
Colour (PtCo Units)	Nitrite as N (mg/l)	Bromodichloromethane as CHBrCl ₂ (ug/l)	Magnesium as Mg (mg/l)	Lead as Pb (ug/l)
Turbidity (N.T.U)	Combined Nitrate & Nitrite (mg/l)	Combined Trihalomethanes (mg/l)	Aluminium as Al (ug/l)	Manganese as Mn (ug/l)
Free Residual Chlorine as Cl ₂ (mg/l)	Silica as SiO ₂ (Mg/l)	Total Coliform Bacteria (count / 100 ml)	Antimony as Sb (ug/l)	Mercury as Hg (ug/l)
Monochloramine (mg/l)	Total Organic Carbon as C (mg/l)	E. coli (count / 100 ml)	Arsenic as As (ug/l)	Nickel as Ni (ug/l)
Total Alkalinity as CaCO ₃ (mg CaCO ₃ /l)	Free Cyanide as CN (ug/l)	Heterotrophic Plate Count (count / 1 ml)	Barium as Ba (ug/l)	Selenium as Se (ug/l)
Langelier Index (at 25°C)	Phenols (ug/l)	Somatic Coliphages (count / 10 ml)	Boron as B (ug/l)	Uranium as U (ug/l)
Chloride as Cl (mg/l)	Microcystin as LR (ug/l)	Free and Saline Ammonia as N (mg/l)	Cadmium as Cd (ug/l)	Zinc as Zn (mg/l)

Table 21: Reduced Range of SANS (241: 2015) Water Quality Parameters

Ph (value at 25°C)	Total organic carbon as c (mg/l)	Boron as b (ug/l)
Electrical conductivity (ms/m at 25°C)	Oil & grease (mg/l)	Cadmium as cd (ug/l)
Total dissolved solids (mg/l at 180°C)	Free and saline ammonia as n (mg/l)	Total chromium as cr (ug/l)
Colour (ptco units)	Sodium as na (mg/l)	Copper as cu (ug/l)
Turbidity (n.t.u)	Potassium as k (mg/l)	Lead as pb (ug/l)
Total alkalinity as CaCO_3 (mg CaCO_3 /l)	Calcium as ca (mg/l)	Manganese as mn (ug/l)
Langelier index (at 25°C)	Magnesium as mg (mg/l)	Mercury as hg (ug/l)
Chloride as cl (mg/l)	Aluminium as al (ug/l)	Nickel as ni (ug/l)
Sulphate as SO_4 (mg/l)	Antimony as sb (ug/l)	Selenium as se (ug/l)
Fluoride as f (mg/l)	Arsenic as as (ug/l)	Uranium as u (ug/l)

10.5 Assets and Infrastructure

A photographic record must be recorded and retained of fixed-point monitoring to compare the state of assets and infrastructure before and after project activities.

10.5.1 Variables

The following must be recorded for each identified asset and infrastructure:

- The GPS coordinates (accurate to the within 5 metres) of the point from which the photograph was taken;
- The date and time of day on which the photograph was taken;
- The direction in which the photograph was taken;
- The height of the camera / tripod from which the photograph was taken; and
- Weather conditions at the time the photograph was taken, where these must be appropriately classified (e.g. sunny, partly cloudy, overcast, etc.).

The procedure for taking photographs must furthermore conform to the following specifications:

- Selection of points for taking photographs. Prior to commencing fieldwork, the contractor must select an appropriate number and spacing of points from available aerial or satellite imagery to ensure that all relevant assets and infrastructure are captured photographically. During fieldwork, more points may be selected as necessary; and
- Number of photographs per point. At each selected point, a sufficient number of photographs must be taken to cover a 360-degree panorama. Adjoining photographs must overlap sufficiently to ensure that the entire panorama is covered.

10.5.2 Pre-construction (walk-down) Survey

- A pre-construction survey needs to be conducted for all areas that are to be affected by construction activities. The survey needs to include the following:
 - a) Site investigations by appropriate members of the project team and specialists (as relevant);
 - b) Generate records from survey which include site details, photographs, explanatory notes, etc. (as required);
 - c) Compare baseline of water quality records to enable a comparable pre-impact objective for post construction goals;

- d) Record the condition of existing structures and infrastructure on the site; and
 - e) Identify site-specific mitigation measures.
- The records from the pre-construction survey must be used to establish and inform the reinstatement and rehabilitation requirements for the affected areas.

11 EMERGENCY PREPAREDNESS

11.1 Contingency Planning

The Contractor will be required to provide contingency plans for situations where the failure of a component of the EMS could result in significant pollution problems. It is preferable to have planned for contingency beforehand, rather than to wait for the failure and a pollution incident to occur.

The Contractor will be required to have available equipment and materials to be able to deal rapidly with the more serious pollution incidents, in particular:

- Fuel or chemical spillage;
- Watercourse pollution (e.g. by oil); and
- Fire.

11.2 Reporting

Environmental incidents and accidents are unforeseen / unplanned events that may lead to the loss of life, injury and/or property damage, with incidents considered to be preventable while accidents are not.

An initial report of an environmental incident / accident must be submitted to the Engineer and TCTA within 24 hours of occurrence and an investigation report must be submitted to the Engineer, TCTA and the authorities in line with legislation (S30 of NEMA and S20 of NWA) within 48 hours of occurrence in a format agreed upon with the Engineer. Each environmental incident report must contain as a minimum, a description of the incident, a statement on the severity and significance of the impact, and actions taken to remediate the resultant damage. A similar approach is required by the Contractor when reporting on an accident.

Environmental incidents and accidents constitute all those activities and events that may have a negative impact on the surrounding natural and social environment. An incident is an unplanned, undesired event that hinders completion of a task and may cause injury, illness, or property damage or some combination of all three in varying degrees from minor to catastrophic. It is generally preventable and an event that can be planned for. While the definition of an accident is like that of an incident, it is an event that could not be planned for.

11.3 Environmental training and awareness creation

Training aims to create an understanding of environmental management obligations and prescriptive measures governing the execution of the project. It is generally geared towards project team members that require a higher-level of appreciation of the environmental management context and implementation framework for the project. Awareness creation strives to foster a general attentiveness amongst the construction workforce to sensitive environmental features and an understanding of implementing environmental best practices.

- The various means of creating environmental awareness during the pre-construction and construction phases of the project may include:
 - a) Induction course for all workers before commencing work on site.
 - b) Visitors' induction for all visitors to site.
 - c) Refresher courses (as and when required).
 - d) Daily toolbox talks, focusing on particular environmental issues (task- and area specific).
- Courses must be provided by suitably qualified persons and in a language and medium understood by the workers. It is noted that Sepedi and Setswana are the dominant languages in the area.
- Erect signage and barricading (where necessary) at appropriate points in the construction domain, highlighting sensitive environmental features (e.g. grave sites, protected trees).
- Place posters containing environmental information at areas frequented by the construction workers (e.g. eating facilities).
- Training and awareness creation will be tailored to the audience, based on their designated roles and responsibilities. Records will be kept of the type of training and awareness creation provided, as well as containing the details of the attendees.
- The Contractor must compile a project-specific Environmental Training and Awareness Programme, taking into consideration the abovementioned factors, to be approved by the Engineer.

12 RECORD KEEPING

The EO will be responsible for maintaining all records in relation to the EMPr requirements on site. Such records will be made available to the Engineer's representatives on request during any audits, as well as at any time as requested by officials of the DFFE and/or the Client. Typically, these records will include:

- Daily Environmental Management Reports / Checklists.
- Monthly summaries of daily reports.
- Incident and non-conformance reports as well as an Incidents register.
- Environmental awareness training records.
- Waste management records.
- Monitoring schedule.
- Monitoring databases (e.g. noise, dust, water quality).
- Internal and external audits.
- Spill clear up records.
- Register of hazardous substances.
- Water use records – construction water.
- Waste transfer notes (including hazardous waste).
- List of "toolbox talks" topics.

Record keeping must be undertaken in an orderly fashion with the intent of ensuring easy reference. Records includes Registers (e.g. training register or a complaints register).

The Contractor filing system or structure would typically include the following documents:

- All environmental authorisations.
- Environmental Policy.
- Environmental Management Programme (this document).
- Environmental Specifications (based on this document and included in the contractual documentation).
- Environmental Method Statements.
- Procedures.
- Work Instructions.
- Registers.
- Photographs.
- Checklists.

The EO will contribute to / participate in the following:

- Weekly environmental toolbox talks.
- Weekly reports and monthly reports to be submitted to the Engineer.
- Environmental monitoring.
- Inspections after stochastic events such as large rainfall events.
- Weekly report to EM.
- Attend monthly SHEQ committee meetings with ECO, SHEQ Auditor, etc.
- Review all avifaunal monitoring reports and action recommendations made.

The EM (Engineer's representative) will contribute to / participate in the following:

- Compilation of a monthly report to the Engineer detailing environmental compliance, audit summaries and incidents for all Contracts being managed by the Engineer.

- Attend monthly SHEQ committee meetings with ECO, Resident Engineer SHEQ Auditor, etc.
- Consolidate info for monthly reports to TCTA.
- Attend monthly meetings with Contractor and TCTA.

A copy of the Environmental Authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying -

- At the site of the authorised activity;
- To anyone on request; and
- Where the holder of the Environmental Authorisation has a website, on such publicly accessible website.

12.1 Contractor's Method Statements

The Contractor will submit proposals regarding methods of working, and the Engineer is required to respond to these submissions. The proposals will not only be vetted by the engineering staff but also by the EM in terms of compliance with the environmental specifications, issues noted in the EMPr, etc.

These method statements will include a risk assessment identifying all environmental hazards associate with the activity. The method statements should include a commentary on environmental control measures required to prevent problems (or at least limit their effects). Method statements are the key to successful environmental management.

The method statements must be project- and site specific and should explain in detail the following:

- The manner in which the work is to be undertaken.
- The estimated schedule for the works (timing).
- The area where the works will be executed (location).
- The materials and plant / equipment needed for the works.
- The necessary mitigation measures that need to be implemented to adequately safeguard the environment, construction workers and the public (where applicable).
- Training of employees.
- Roles and responsibilities.
- Monitoring and reporting requirements.

The list of method statements required to assist in the implementation of this EMPr includes at least the following:

- Method Statement for site clearing.
- Method Statement for establishing the construction camp(s).
- Method Statement with regard to waste and wastewater management.
- Method Statement to show procedures for dealing with possible emergencies that can occur, such as fire and accidental leaks and spillage of carbon fuels and oils.
- Method Statement for dust control.
- Method Statement for the storage and handling of hazardous substances.
- Method Statement for management of concrete and batching plants.
- Method Statement for sourcing, transport and storage of materials.
- Method Statement for river diversions.

- Method Statement for controlling alien invasive species and noxious weeds. Method Statement for the decommissioning of the construction works area.
- Method Statement for the rehabilitation of the construction footprint.

Note that the method statements are contractual requirements between the Implementing Agent and the Contractor and therefore not subject to approval by the Department of Forestry, Fisheries and the Environment (DFFE).

12.2 Communication

Principally all communication with external parties regarding environmental management will be via TCTA. However, the Contractor will be required to develop a grievance mechanism / procedure in alignment with TCTA's Grievance Resolution Procedure to deal with complaints raised by external parties. The Contractor must keep a register of all complaints received together with the following records:

- Date and time of complaint.
- The method by which the complaint was made, e.g. telephone, letter, meeting, etc.
- Name, town, contact telephone number of complainants. If no such details were provided, a note to that effect should be provided.
- Details of complaint.
- Action taken in response including follow up contact with the complainant.
- Any monitoring to confirm that the complaint has been satisfactorily resolved.
- If no action was taken, the reasons why no action was taken.

The Grievance Procedure will indicate the process of escalating grievances from the Contractor to the EM and Engineer to TCTA, and the way these are reported in the monthly progress reports.

Feedback on how grievances have been addressed must be provided to the party reporting the grievance.

13 NON-CONFORMITY, CORRECTIVE ACTION AND PREVENTIVE ACTION

Failure to comply with all of the relevant legislation, conditions of the EA and EMPr may result in one of the following measures being taken by DFFE:

- The withdrawing of the authorisation;
- The issuing of directives to either address the non-compliances identified, including an order to cease the activity; and
- The instituting of criminal and/or civil proceedings to enforce compliance.

13.1 Non-conformance Reporting

It is thus important that all non-conformances be reported and recorded in order for them to formally be addressed and closed-out. Non-conformances will be recorded on a standard Non-conformance Record (NCR) developed by the Engineer's EM. NCR's may be submitted by any employee on site. NCR's are submitted to the Contractor's EO after which he/she will investigate the cause for the incident and ensure that the incident is appropriately closed-out and prevented in future.

13.2 Penalties

The penalty system as contained in the Specifications for phase 2A must be implemented. This penalty system is combined with a penalty system to both motivate and compel the Contractor to adhere to the Environmental Specifications and EMPr for the duration of his contract.

The Contractor must not have the misimpression that adherence to the Environmental Specifications or EMPr is optional (i.e. persistent non-compliance will not only result in the Contractor forfeiting the retention amount, but he will also be penalised).

All such penalty and retention funds must be used to improve environmental conditions on the site (or others) under development, either during or post-construction, and may not be used to recoup losses incurred as a result of overspent construction items.

13.3 Retention System

For this system, a cost estimate will be determined by the Engineer. This system will entail calculating the total value of the outstanding penalties, as per the bill of quantities (BOQ), the project specification and the penalty system. If the value exceeds 10% of the environmental items BOQ, the project retention value of 10% will be retained until the performance certificate has been issued and all the matters have been resolved.

The value of each non-compliance and penalty (according to the bill of quantities and the penalty system) will be added together. Once all the penalties and non-compliances have been paid or closed out (in physical remediation, project director man hours or a monetary contribution) the value of the retention will be released to be paid out once the performance certificate has been issued at the completion of the contracts defects and liability phase. If the environmental monitoring process reveals persistent and/or wilful non-compliance with any aspect of the Environmental Specifications and EMPr, then the retention associated with that particular item will be withheld permanently from the payment certificate.

The Engineer may then utilise these retained funds to rectify the problem on site making use of other resources at his disposal. The remainder of the retention funds will then be paid out to the Contractor

(pending approval by the Engineer's Environmental Representatives and the Environmental Control Officer, confirming compliance with the relevant specifications and EMPr).

13.4 Penalty System

The penalty system will be based on two procedures, a stipulated community service task (calculated as project director man hours or days) or a monetary liquidation liability. Should the environmental monitoring process reveal acts of persistent and/or wilful non-compliance with the Environmental Specifications or EMPr, then the Contractor will be penalised according to the specified value of that item (see Table 22).

A stipulated community service task is any task in the local region that will improve the environment or prevent further environmental degradation identified by the Engineers Environmental Representative and the ECO. Examples could include repairing erosion dongas, implementing an alien invasive plants eradication program, grading rural school access roads, planting indigenous trees in the community, establishing food gardens at the local schools, planting non-invasive fruit trees in the community, installing rain water systems at the local schools, set up a recycling system in the community (where the community benefits from the program), establish waste infrastructure in the community, etc.

Should the local authorities in conjunction with the Engineers-Social and Environmental Representatives and the ECO, identify any practical tasks available at any point during the contract, this task will form part of the penalty system. These allocated tasks will then take precedence over the monetary liquidation liability system. Non-compliance to the Environmental Specifications and/or EMPr will accumulate project directors man hours and/or days of community service work. The final completion certificate will only be issued once the Contractor has completed these tasks to a satisfaction of the Engineer.

Should practical tasks not be available, the monetary system will apply. Time and monetary values will be, but are not necessarily limited to the following:

Table 22: Breakdown of Environmental Penalties

Non-compliance	First time offence (community service task (hours) or monetary liquidation liability (R))	Subsequent offences (community service task (hours) or monetary liquidation liability (R))
Access into designated no-go areas	4 hours; or R10 000	16 hours per subsequent offence; or R20 000 per subsequent offence
Vehicles, plant, equipment or material outside of the demarcated site	2 - 8 hours; or R10 000	16 hours per subsequent offence; or R10 000 per subsequent offence
Persistent un-repaired machinery leaks	hours; or R1 500	hours per subsequent offence; or R2 000 per subsequent offence
Litter on site	1 hour; or R500	2 hour per subsequent offence; or R800 per subsequent offence
Lighting of fires outside of designated areas	6 hours; or R2 500	8 hours per subsequent offence; or R3 500 per subsequent offence

Non-compliance	First time offence (community service task (hours) or monetary liquidation liability (R))	Subsequent offences (community service task (hours) or monetary liquidation liability (R))
Eating meals outside of designated areas	2 hours; or R500	2 hours per subsequent offence; or R500 per subsequent offence
Individual not making use of site ablution facilities	2 hours; or R1 000	3 hours per subsequent offence; or R1 500 per subsequent offence
Persons, vehicles, items or plant causing a public nuisance	4 hours; or R1 000	4 hours per subsequent offence; or R1 000 per subsequent offence
Erosion	Cost to repair / rehabilitate	Cost to repair / rehabilitate plus 20% per subsequent offence
Oil spills	Cost to clean plus 4 hours; or Cost to clean plus 20%	Cost to clean plus 4 hours per subsequent offence; or Cost to clean plus 20% per subsequent offence.
Unauthorised damage to the environment	Cost to rehabilitate	Cost to rehabilitate plus 20% per subsequent offence
Unauthorised damage to cultural historical sites and/or artefacts of archaeological significance	To a maximum of R120 000	R200 000.
Unauthorised damage or deformation of small trees (smaller than 75 mm girth diameter @ a height of 1 m)	2 hours; or R2 000 per tree, if the tree is indigenous, an additional 8 hours or R6000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act	The permits will be obtained, if needed and 3 hours per subsequent offence; or R3 000 per subsequent offence. If the tree is indigenous, an additional 10 hours or R8000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act
Unauthorised damage or deformation of medium trees (75 – 200 mm girth diameter @ height of 1 m)	4 hours ; or R3 500 per tree, if the tree is indigenous, an additional 10 hours or R8000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act	6 hours per subsequent offence; or R4 500 per subsequent offence. If the tree is indigenous, an additional 12 hours or R10 000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act
Unauthorised damage or deformation of large trees (larger than 200 mm girth diameter @ a height of 1 m)	2 days; or R10 000 per tree, if the tree is indigenous, an additional 12 hours or R10 000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act	3 days per subsequent offence ; or R20 000 per subsequent offence If the tree is indigenous, an additional 14 hours or R14 000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act

Non-compliance	First time offence (community service task (hours) or monetary liquidation liability (R))	Subsequent offences (community service task (hours) or monetary liquidation liability (R))
Pick, cut, uproot, break, damage or destroy indigenous plants	4 hours per plant; or R1 500 per plant If the plant is protected the relevant authority is to be notified of this act	6 hours per subsequent offence; or R5 000 per subsequent offence to a maximum of R2 500 If the plant is protected the relevant authority is to be notified of this act
Pick, cut, uproot, break, damager, destroy or have in possession (and unable to give a satisfactory account of such possession) a protected plant	5 hours per plant; or R2 000 per plant	5 hours per subsequent offence; or R2 500 per subsequent offence
Kill, capture or disturb an animal or take or destroy any egg, larva or nest	2 days; or R5 000	3 days per subsequent offence; or R6 000 per subsequent offence
Setting a snare / trap or hunting / capturing any animal by means of a trap, snare or poison, or with the aid of a light, or by means of a veld fire, or from a vehicle	2 days; or R5 000	3 days per subsequent offence; or R6 000 per subsequent offence
Crossing a river, stream wetland without a method statement	The cost to rehabilitate	The cost to rehabilitate plus an additional 20%
No action or no action within 7 working days on ECO / EM findings	Cost of the corrective action plus R2000 per non-compliance or 4 hours	4 hours for every subsequent event and Cost of the corrective action plus R4000 per subsequent offence or 4 hours
No action within delequidation liability period on NCRs issued	8 hours or R4000	16 hours per subsequent offence; or R6000 per subsequent
No storm water control measures	2 hours or R1000 per silt fence / turbidity curtains	4 hours per subsequent offence or R2000 per silt fence / turbidity curtains per subsequent offence.
Exceeding water quality discharge standards, air quality, noise standards, etc.	16 hours / R6000 per offence	22 hours / R10 000 per subsequent office.
Spotting any alien plant with seeds on the servitude	4 hours / R1000 per 100 m ²	8 hours or R2000 per 100 m ² Per-subsequent offence.
Mixing topsoil and subsoil	Value to replace the contaminated topsoil	Value to replace the contaminated topsoil plus 20%per subsequent offence

Non-compliance	First time offence (community service task (hours) or monetary liquidation liability (R))	Subsequent offences (community service task (hours) or monetary liquidation liability (R))
Mismanagement of topsoil	Value to replace the contaminated topsoil	Value to replace the contaminated topsoil plus 20% per subsequent offence
Mismanagement of toilets, breeding vectors or nauseous smell	4 hours / R1000 per toilet	6 hours / R2000 per toilet and subsequent offences
Spill kits un-stocked	2 hours / R500 per 5 kits	4 hours / R1000 per 5 kits for subsequent offences
Mixing of waste	2 hours /R500 per 5 bins	4 hours / R1000 per 5 bins per subsequent offences
Overflowing of waste skips	2 hours / R500 per skip	4 hours / R1000 per skip per subsequent offences
Dust clouds	If exceedances are evident in the monitoring report it will be addressed accordingly	If exceedances are evident in the monitoring report it will be addressed accordingly plus 20% for subsequent offences
Securing the servitude	2 hours / R500 per 50 m	4 hours / R1000 per 50 m per subsequent offences
Water structures such as settlement ponds leaking, or causing damage to the environment	Cost to rectify	Cost to rectify plus 20% of the cost for subsequent offences
blocking drainage lines / pooling of water on the servitude or in trenches or excavations	Cost to rectify	Cost to rectify plus 20% of the cost for subsequent offences
Sedimentation of watercourses and abstraction from an un authorised water body	Cost to rectify	Cost to rectify plus 20% of the cost for subsequent offences
Undertaking rehabilitation out of sequence and using unauthorised materials / fertilisers / seeds / composts	Cost to rectify	Cost to rectify plus 20% of the cost for subsequent offences

14 MANAGEMENT REVIEW

Management Review is the “Act” component of the Deming Cycle and therefore this EMP rationale. Management Reviews by the TCTA must be held at planned intervals to ensure the EMP’s continuing suitability, adequacy and effectiveness. Reviews must include assessing opportunities for improvement and the need for changes to the EMPr, including the Environmental Policy and Objectives. Records of these Management Reviews must be retained.

14.1 Management Reviews

The Management Reviews must be held on an annual basis and must include:

- Results of audits of the Project which would include Contractor’s internal audits by the EO and EM, external audits by the ECO and the TCTA;
- Communication from external interested and affected parties which would include any possible complaints;
- The environmental performance of the Contractor;
- The extent to which Objectives have been met;
- Status of corrective and preventive actions;
- Follow-up actions from previous management reviews (where applicable);
- Changing circumstances, including developments in legal and other requirements related to its Environmental Aspects; and
- Recommendations for improvement.

The outputs from Management Reviews must include any decisions and actions related to possible changes to Environmental Policy, Objectives and other elements of the EMPr, consistent with the commitment to continual improvement.

14.2 Environmental Management Programme Review

Due to its dynamic nature, the EMPr for MCWAP-2A WTI will be reviewed and revised when necessary to ensure continued environmental improvement.

Following detailed design and planning, the EMPr may need to be revised to render the management actions more explicit and accurate to the final project specifications. Changes to the EMPr must also be required where the existing system:

- Does not make adequate provision for protecting the environment against the preconstruction, construction and/or operational activities.
- Needs to be modified to meet conditions of statutory approval.
- It is not achieving acceptable environmental performance.
- Requires changes due to the outcome of a monitoring or auditing event or management review.
- Provides redundant, impracticable or ineffective management measures.
- Based on provisions in Regulation 34 of GN No. R 982, as amended.

The amendment of the EMPr will be undertaken in terms of Regulation 34 – 37 of GN No. R 982, as amended (7 December 2017), as applicable. For minor amendments, an EMPr Amendment Register should be maintained in discussion with the Environmental Control Officer (ECO) and Environmental Monitoring Committee (EMC), however significant changes will require formal approval from DFFE.