

APPENDIX K

ENVIRONMENTAL MANAGEMENT PROGRAMME



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

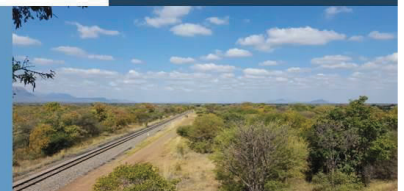
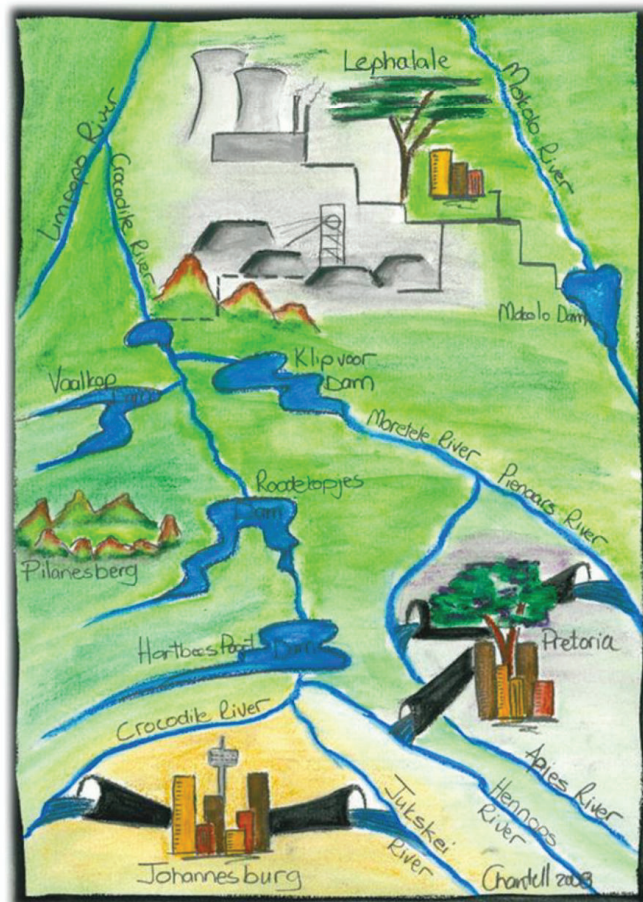
REPORT NO:
P RSA 000/A00/22118/4

PROPOSED MOKOLO AND CROCODILE RIVER (WEST) WATER AUGMENTATION PROJECT (PHASE 2A) (MCWAP-2A): WATER TRANSFER INFRASTRUCTURE

ENVIRONMENTAL MANAGEMENT PROGRAMME

FINAL

November 2018



TITLE AND APPROVAL PAGE

Project Name: *Proposed Mokolo and Crocodile River (West) Water Augmentation Project (Phase 2A) (MCWAP-2A): Water Transfer Infrastructure*

Report Title: *Environmental Management Programme (Final)*

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DEA reference no.:

DWS report reference no.: *P RSA 000/A00/23018/4*

Status of report: *Final*

Date of issue: *December 2018*

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AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
December 2018	Final for Review and Decision-making by DEA	0	

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LIST OF ACRONYMS & ABBREVIATIONS

BPEO	Best Practicable Environmental Option
BPR	Break Pressure Reservoir
CRE	Chief Resident Engineer
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DM	District Municipality
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EM	Environmental Monitor
EMC	Environmental Monitoring Committee
EMPr	Environmental Management Programme
EO	Environmental Officer
EWR	Ecological Water Requirements
GN	Government Notice
IAPs	Interested and Affected Parties
LDEDET	Limpopo Department of Economic Development, Environment and Tourism
LEMA	Limpopo Environmental Management Act (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 (Act No. 28 of 2002)
MSDS	Material Safety Data Sheet
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (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 (Act No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NFA	National Forests Act (No. 84 of 1998)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NWA	National Water Act (Act No. 36 of 1998)
OHS	Occupational Health and Safety
OR	Operational Reservoir
SAHRA	South African Heritage Resources Agency
SANS	South African National Standard

SAPS	South African Police Services
S&EIR	Scoping and Environmental Impact Reporting
SM	Social Monitor
SO	Social Officer
STD	Sexually Transmitted Disease
TCTA	Trans-Caledon Tunnel Authority
WTI	Water Transfer Infrastructure

UNITS OF MEASUREMENT

dB_A	Decibel (expression of the relative loudness of the A-weighted sound level in air)
ha	Hectare
km	Kilometre
km²	Square kilometre
km/h	Kilometres per hour
l	Litres
m	Metre
m³	Cubic metre
m³/a	Cubic metre per annum
m³/s	Cubic metre per second
MVA	Megavolt-ampere
PM₁₀	Particulate matter smaller than 10 µm
t	Tons
%	Percentage

DEFINITION OF KEY TERMS

Auditing	<i>A systematic and objective assessment of an organisation's activities and services conducted and documented on a periodic basis.</i>
Construction Area	<i>Immediate site influenced by specific construction activities, as approved by the Engineer.</i>
Construction Domain	<i>Entire footprint required for the construction of the overall project components.</i>
Environment	<p><i>The surroundings in which humans exist and which comprise:</i></p> <ul style="list-style-type: none"> <i>• The land, water and atmosphere of the earth.</i> <i>• Micro-organisms, plant and animal life.</i> <i>• Any part or combination of a) and b) and the interrelationships among and between them.</i> <i>• The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that can influence human health and well-being.</i>
Environmental Aspect	<i>Those components of the company's activities, products and services that are likely to interact with the environment.</i>
Environmental Feature	<i>Elements and attributes of the biophysical, economic and social environment.</i>
Environmental Impact	<i>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.</i>
Environmental Management Programme (EMPr)	<i>A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.</i>
Environmental Objective	<i>Overall environmental goal pertaining to the management of environmental features.</i>
Environmental Target	<i>Performance requirement that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.</i>
Monitoring	<i>A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.</i>
Project Area	<i>The greater area within which the project is executed. Extends beyond the construction domain.</i>
Sensitive environmental features	<i>Environmental features protected by legislation (e.g. heritage resources), or identified during the EIA as sensitive through specialists' findings and input received from Interested and Affected Parties.</i>
Watercourse	<i>A geomorphological feature characterized 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 (Act 36 of 1998), 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.</i>

1 PURPOSE OF THE DOCUMENT

Water demand will increase in the Lephalale area due to various planned and anticipated developments associated with the Waterberg coalfields. The Department of Water and Sanitation (DWS) commissioned the Proposed Mokolo and Crocodile River (West) Water Augmentation Project (MCWAP) Feasibility Study to investigate the options for meeting the aforementioned water requirements.

Nemai Consulting was appointed by DWS and the Trans-Caledon Tunnel Authority (TCTA) (implementing agent) to conduct the Environmental Impact Assessment (EIA) for MCWAP (Phase 2A) (MCWAP-2A) in terms of Government Notice (GN) No. R. 982 of 4 December 2014 (as amended). This document serves as the **Final Environmental Management Programme (EMPr)** for the proposed MCWAP-2A Water Transfer Infrastructure (WTI), which consists of the following:

- ❖ Weir and abstraction infrastructure, including a balancing dam, desilting works, and a high-lift pumping station at Vlieëpoort (near Thabazimbi);
- ❖ Transfer system (approximately 100 km);
- ❖ Break Pressure Reservoir (BPR);
- ❖ Operational Reservoir (OR);
- ❖ Delivery system, consisting of a gravity pipeline (approximately 30 km) running from the Operational Reservoir to the terminal point near Steenbokpan; and
- ❖ Gauging weirs.

This EMPr provides performance criteria required to address potential environmental impacts during the pre-construction, construction and operational phases of MCWAP-2A. This report must be read in conjunction with the MCWAP-2A WTI EIA Report.

The scope of the EMPr is as follows:

- ❖ Establish management objectives during the pre-construction, construction and operational phases in order to enhance benefits and manage (i.e. prevent, reduce, rehabilitate and/or compensate) adverse environmental impacts;
- ❖ Provide targets for management objectives, in terms of desired performance;
- ❖ Describe actions required to achieve management objectives;
- ❖ Outline institutional structures and roles required to implement the EMPr; and
- ❖ Provide the legislative framework.

2 DOCUMENT ROADMAP

As a minimum, the EMPr aims to satisfy the requirements stipulated in Appendix 3 of Government Notice (GN) No. R 982 of 4 December 2014 (as amended). **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: Document Roadmap

Chapter	Title	Correlation with Appendix 4 of G.N. No. R982	
1	Purpose of the Document	N/A	
2	Document Roadmap	N/A	
3	Project Overview	N/A	
4	Environmental Assessment Practitioner	1(a)	Details of – (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including curriculum vitae.
5	Legislation and Guidelines Considered	N/A	
6	Roles & Responsibilities	1(i)	An indication of the persons who will be responsible for the implementation of the impact management actions.
7	Monitoring	1(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).
		1(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).
		1(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).
		1(l)	A programme for reporting on compliance, taking into account the requirements as prescribed by the Regulations.
8	Environmental Training & Awareness Creation	1(m)	An environmental awareness plan describing the manner in which - (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.
9	EMPr Review	N/A	
10	Environmental Activities, Aspects and Impacts	1(b)	A detailed description of the aspects of the activity that are covered by the final environmental management plan.
11	Sensitive Environmental Features	1(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.
12	Impact Management	1(d)	A description of impact management outcomes, including

Chapter	Title	Correlation with Appendix 4 of G.N. No. R982	
			management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including – (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities.
		1(f)	A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to - (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards 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 provisions for rehabilitation, where applicable.
		1(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.
		1(l)	A programme for reporting on compliance, taking into account the requirements as prescribed by the Regulations.
N/A		1(n)	Any specific information that may be required by the competent authority
N/A		2	Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.

3 PROJECT OVERVIEW

3.1 Project 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 into the future.

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

- ❖ Mokolo Crocodile River (West) Water Augmentation Project Phase 1: Augment the supply from Mokolo Dam to supply in 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 Mokolo Dam and will be operated as a system together with Mokolo Crocodile River (West) Water Augmentation Project Phase 2A. Phase 1 is operational since June 2015.
- ❖ **Mokolo Crocodile River (West) Water Augmentation Project Phase 2A:** Transfer water from the Crocodile River (West) to the Steenbokpan and Lephalale areas, including the implementation of the River Management System in the Crocodile River (West) and its tributaries. Phase 2A is the focus of this Environmental Impact Assessment.

In essence, water from the Mokolo Dam will primarily be provided to existing consumers such as Matimba Power Station, Municipal users in the vicinity of Lephalale (Ellisras), 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) (pollution abatement measure) for Medupi and Matimba Power Stations.

The overall Mokolo Crocodile River (West) Water Augmentation Project Phase 2A consists of the following components:

- ❖ **Water Transfer Infrastructure** - transfer of water from Crocodile River (West) to Lephalale;
- ❖ Borrow Pits - sourcing of construction material; and
- ❖ River Management System - manage 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.

This Environmental Impact Assessment Report specifically deals with the Water Transfer Infrastructure component.

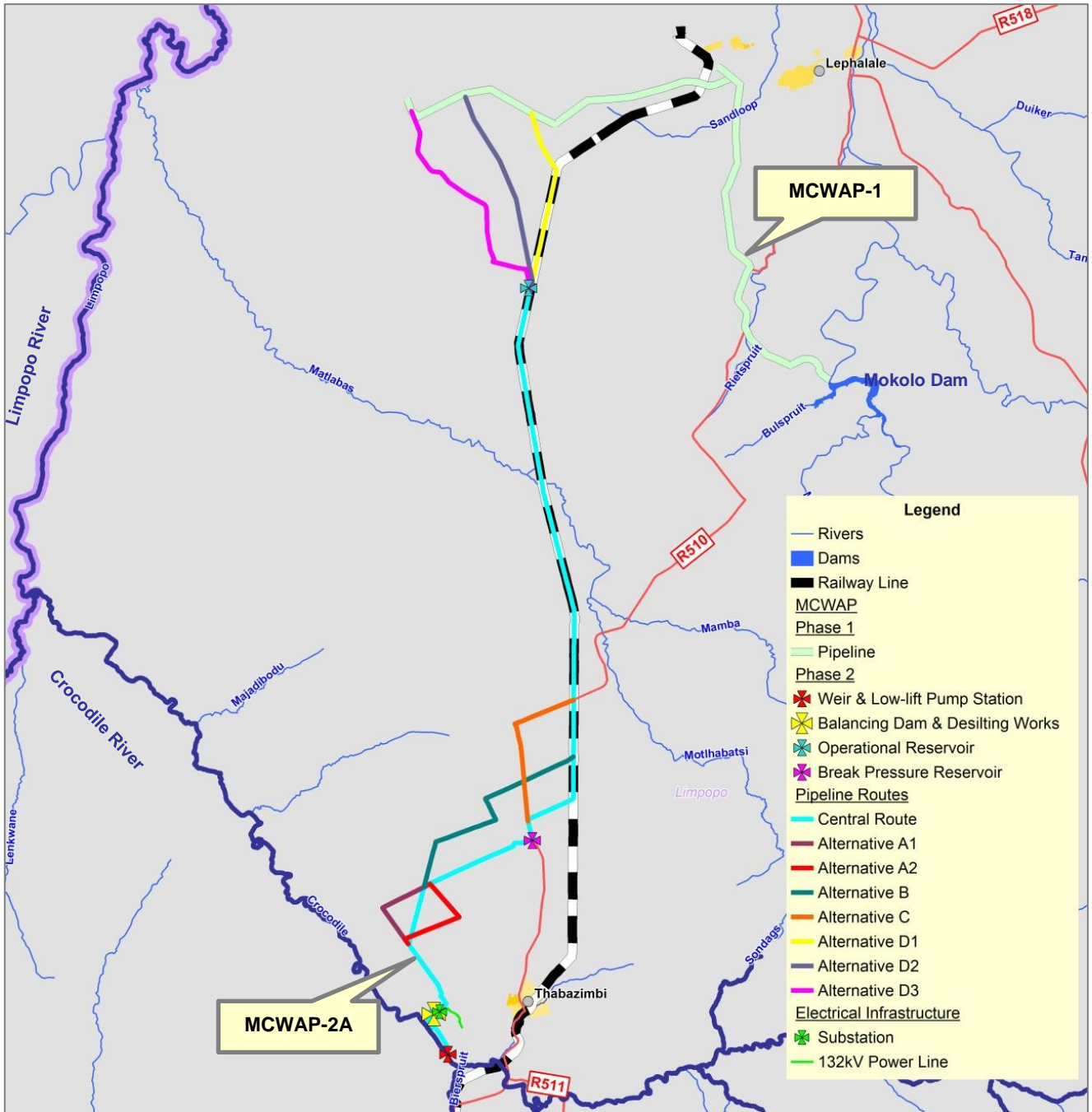


Figure 1: MCWAP Phases 1 and 2
 (Note: gauging weirs and pipeline route Alternatives E and D4 not shown)

3.2 Project Location

The project is located within the western part of the Limpopo Province. The footprint of the proposed project traverses the Thabazimbi Local Municipality (LM) and Lephalale LM, which fall within the jurisdiction of the Waterberg District Municipality (DM). Refer to **Figure 2**. The locality map is provided in **Figure 3**. Maps are also contained in **Appendix A** of the Final EIA Report.

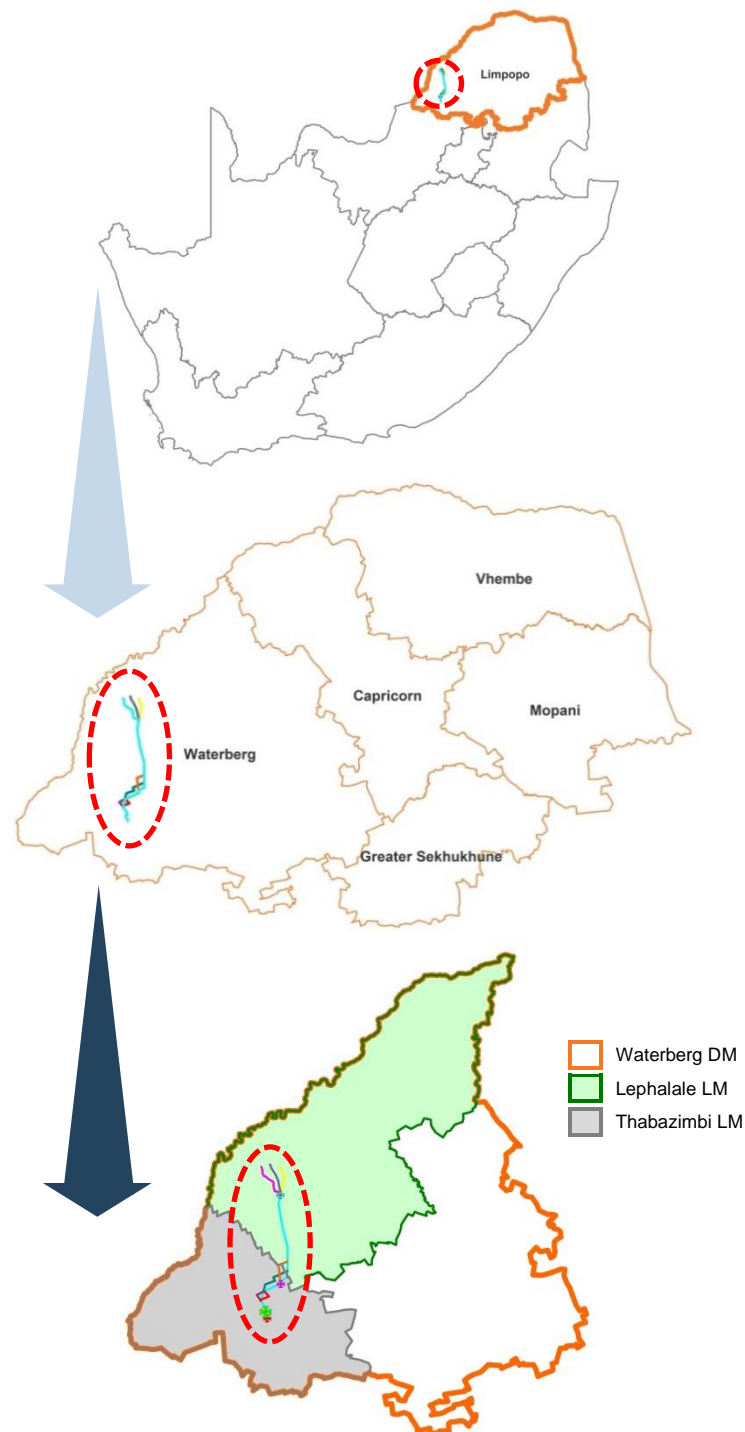


Figure 2: National, Provincial and Municipal Maps of MCWAP-2A WTI

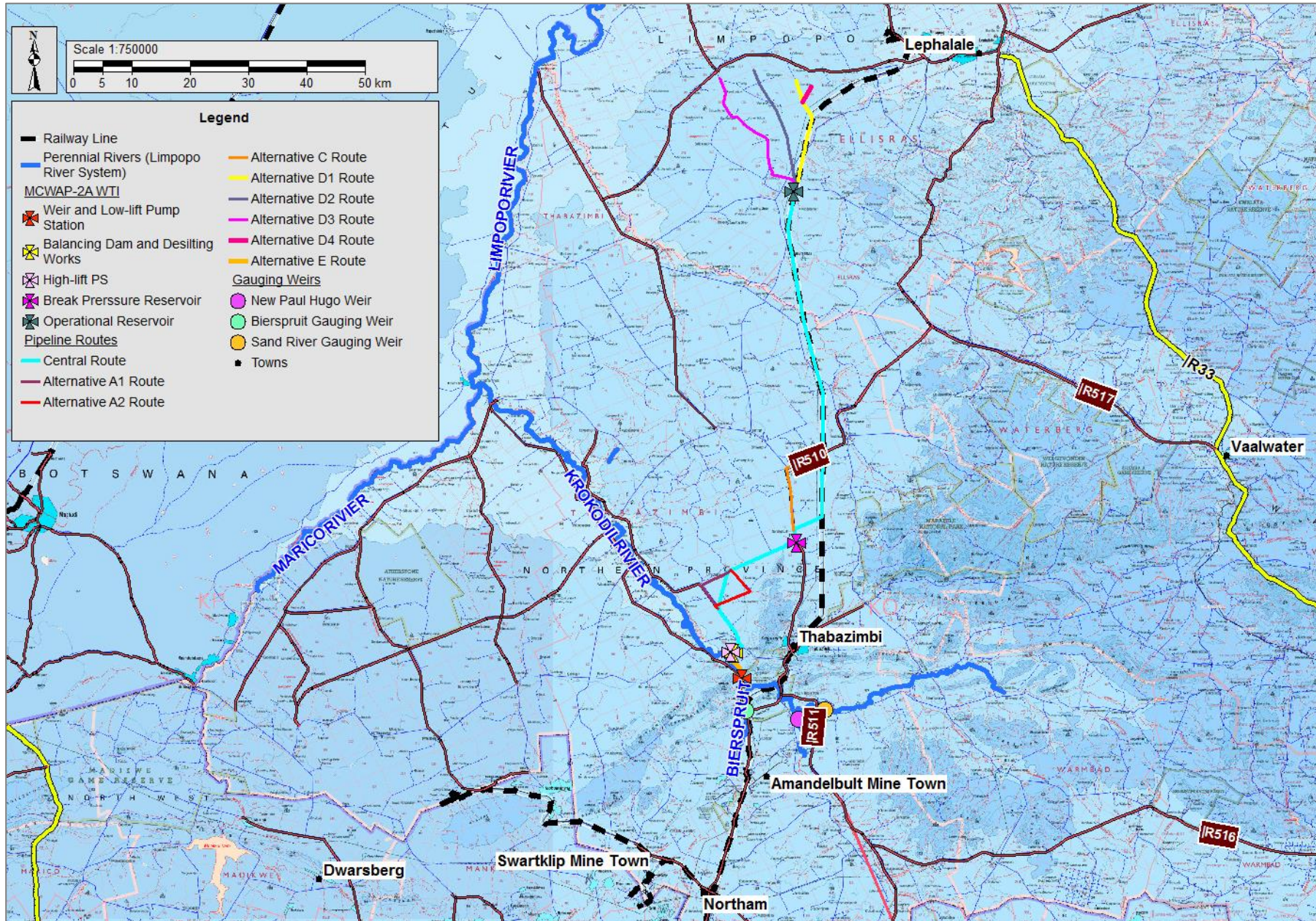


Figure 3: Locality Map

The proposed pipeline route commences from the Vlieëpoort Mountains at the weir site on the Crocodile River, in the south-western point of the project area. From there it runs in a predominantly northern direction along existing roads, farm boundaries and a railway line, until it reached its destination near Steenbokpan. Thabazimbi is situated approximately 10 km to the north-east of the Vlieëpoort weir site and Lephalale is situated approximately 30 km to the east of the Alternative D1 pipeline route's terminal point.

A more detailed route description is provided in the Final EIA, in **Section 9.4.3** and detailed maps are contained in **Appendix B**.

3.3 Project Components

The major scheme components for MCWAP-2A WTI are listed in **Table 2**.

Table 2: MCWAP-2A WTI Components

Component	Main Features
Vlieëpoort Abstraction Weir on the Crocodile River (West)	Type: Mass gravity concrete structure Spillway: Stepped Ogee Height: approximately 4 – 6 m above river bed level to be optimised during tender design stage Two 2 m ³ /s pump inlets plus 1 standby Abstraction capacity: 125 million m ³ /a Energy dissipation: Roller bucket Outlet works: 5 m ³ /s
Low-lift Pumping Station	Construction: Concrete Capacity Civil: 125 million m ³ /a Capacity Mechanical and Electrical: 75 million m ³ /a with provision to increase to max 125 million m ³ /a Power requirement: 4MVA Continuous abstraction aligned with releases Size: 25 x 70 m
Low-lift Rising Main (2 pipes)	Type: Steel pipes with welded joints Length: 5 340 m Diameter: ND1300 Capacity Civil: 75 million m ³ /a
Sedimentation Works	Type: 8 Concrete channels each 120 m long x 2,5 m wide x 5 m deep Capacity: Civil: 75 million m ³ /a
Balancing Reservoir	Type: Earth fill Size: 620 x 440 m Compartments: 5 each 400 m long x 100 m wide by 10,5 to 13 m deep Capacity Civil: 75 million m ³ /a state storage volume
High-lift Pumping Station	Construction: Reinforced concrete, masonry and steel frame structure Capacity: 75 million m ³ /a pumped over 95% of time (Q=3.1 m ³ /s) Power requirement: 20MVA Size: 120 x 300 m
High-lift Rising Main to BPR	Type: Steel pipes with welded joints Length: 29 000 m Diameter: ND1300 Capacity Civil: 75 million m ³ /a
BPR	Type: Lined earth fill embankment Capacity Civil: 90 000 m ³

Component	Main Features										
	Size: Three compartments of 30 000 m ³										
Gravity Pipeline from BPR to OR	Type: Steel pipes with welded joints Length: 63 570 m Capacity Civil: 75 million m ³ /a Diameter: ND1700										
OR	Type: Lined earth fill embankment Capacity Civil: 90 000 m ³ Size: Three compartments of 30 000 m ³										
Gravity pipeline from Operational Reservoir to Medupi Tee-off via Steenbokpan	Type: Steel pipes with welded joints <table border="1" data-bbox="576 506 1353 667"> <thead> <tr> <th data-bbox="576 506 963 539">Diameter</th> <th data-bbox="963 506 1353 539">Length</th> </tr> </thead> <tbody> <tr> <td data-bbox="576 539 963 573">ND2200</td> <td data-bbox="963 539 1353 573">9 200 m</td> </tr> <tr> <td data-bbox="576 573 963 607">ND1400</td> <td data-bbox="963 573 1353 607">17 000 m</td> </tr> <tr> <td data-bbox="576 607 963 640">ND1200</td> <td data-bbox="963 607 1353 640">18 250 m</td> </tr> <tr> <td data-bbox="576 640 963 674">ND900</td> <td data-bbox="963 640 1353 674">14 560 m</td> </tr> </tbody> </table> Capacity Civil: 75 million m ³ /a	Diameter	Length	ND2200	9 200 m	ND1400	17 000 m	ND1200	18 250 m	ND900	14 560 m
Diameter	Length										
ND2200	9 200 m										
ND1400	17 000 m										
ND1200	18 250 m										
ND900	14 560 m										
Ancillary infrastructure	Gauging Weirs Crocodile (West) River management system Access roads Accommodation, offices, workshops and security measures										

4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by DWS and TCTA (implementing agent) as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed MCWAP-2A WTI.

In accordance with Appendix 4, Section 1(a) of GN No. R 982 of 4 December 2014 (as amended), this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Gauteng and KwaZulu-Natal (KZN). The core members of Nemai Consulting that were involved with compiling the EMPr for the project are captured in **Table 3** below, and their respective Curricula Vitae are contained in in the body of the EIA Report.

Table 3: EMPr Core Team Members

Name	Qualifications	Experience
Mr D. Henning	MSc (River Ecology)	<ul style="list-style-type: none"> • 17 years' experience. • Prepared Environmental Management Plans and EMPs for various bulk water related projects, including: <ul style="list-style-type: none"> ○ 80 km bulk water pipeline from Randfontein to Rustenburg, North-West; ○ Ncwabeni Off-Channel Storage and associated infrastructure, KZN; ○ Mokolo Crocodile West Water Augmentation Project Phase 1, Limpopo; and ○ Foxwood Dam and associated infrastructure, Eastern Cape. • Acted as the Environmental Control Officer (ECO) on various projects, including: <ul style="list-style-type: none"> ○ Construction of the Spring Grove Dam, as part of the Mooi-Mgeni Transfer Scheme (Phase 2), KZN; ○ 40 km bulk water pipeline from the De Hoop Dam to a pumping station in Steelpoort, for the Olifants River Water Resources Development Project - Phase 2C.
Ms D. Naidoo	BSc Eng (Chem)	<ul style="list-style-type: none"> • 21 years' experience. • Project Manager for various bulk water related projects, including: <ul style="list-style-type: none"> ○ Raising of Hazelmere Dam, KZN; ○ Empangeni Bulk Outfall Sewer, 40 km pipeline, KZN; ○ Mtwalume Dam, Vulamehlo Cross Border Water Scheme in KZN; and ○ Foxwood Dam and associated infrastructure, Eastern Cape.
Mr C. v. d. Hoven	BSc (Hons) (Environmental Studies)	<ul style="list-style-type: none"> • 2 years' experience. • Prepared EMPs for various projects, including: <ul style="list-style-type: none"> ○ Lerome Bulk Water Supply Scheme, North-West; ○ Lanseria Outfall Sewer pipeline, Gauteng; ○ Eldorado Park water pipeline upgrade, Gauteng; and ○ Mapleton Pumping Station Upgrade, Gauteng.

5 LEGISLATION AND GUIDELINES CONSIDERED

5.1 Overview of Legislation

Activities during the pre-construction, construction and operational phases will be undertaken according to recognised best industry practices and will include measures prescribed within this EMPr. The EMPr shall form part of the contract documents, and informs the Contractor about his duties in the fulfilment of the project objectives, with particular reference to the mitigation of environmental impacts that may potentially be caused by construction activities associated with the project. The Contractor will note that obligations imposed by the EMPr are legally binding in terms of environmental legislation.

All project activities must comply with all relevant South African legislation and regulations. All environmental statutory requirements should be included in the Contractors' conditions. Some of the pertinent environmental legislation that has bearing on the proposed development is captured in the table below.

Table 4: Environmental legislative Framework

Legislation	Relevance
Constitution of the Republic of South Africa (Act No. 108 of 1996)	<ul style="list-style-type: none"> Chapter 2 – Bill of Rights; and Section 24 – environmental rights.
National Environmental Management Act (Act No. 107 of 1998) (NEMA)	<ul style="list-style-type: none"> Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment). Section 28 – Duty of care and remediation of environmental damage; and Environmental management principles.
GN No. R 982 of 4 December 2014 (as amended)	<ul style="list-style-type: none"> Purpose - regulate the procedure and criteria as contemplated in Chapter 5 of NEMA relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.
GN No. R. 983 of 4 December 2014 (as amended) (Listing Notice 1)	<ul style="list-style-type: none"> Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA; and The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014 (as amended). However, according to Regulation 15(3) of GN No. R 982, a Scoping and Environmental Impact Reporting Process (S&EIR) must be applied to an application if the application is for two or more activities as part of the same

Legislation	Relevance
	development for which S&EIR must already be applied in respect of any of the activities.
GN No. R. 984 of 4 December 2014 (Listing Notice 2)	<ul style="list-style-type: none"> • Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA; and • The investigation, assessment and communication of potential impact of activities must follow a S&EIR, as prescribed in regulations 21 - 24 of GN No. R 982 of 4 December 2014 (as amended).
GN No. R. 985 of 4 December 2014 (Listing Notice 3)	<ul style="list-style-type: none"> • Purpose - list activities and identify competent authorities under sections 24(2), 24(5) and 24D of NEMA, where environmental authorisation is required prior to commencement of that activity in specific identified geographical areas only; and • The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014 (as amended). However, according to Regulation 15(3) of GN No. R 982, S&EIR must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities.
National Water Act (Act No. 36 of 1998) (NWA)	<ul style="list-style-type: none"> • Chapter 3 – Protection of water resources; • Section 19 – Prevention and remedying effects of pollution; • Section 20 – Control of emergency incidents; and • Chapter 4 – Water use.
National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEM:PAA)	<ul style="list-style-type: none"> • Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)	<ul style="list-style-type: none"> • Management and conservation of the country's biodiversity; and • Protection of species and ecosystems.
National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA)	<ul style="list-style-type: none"> • Air quality management; • Section 29 – pollution prevention plans (Notice 172 of 2014: Greenhouse gases as priority air pollutants); • Section 32 – dust control; • Section 34 – noise control; and • Section 35 – control of offensive odours.
National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA)	<ul style="list-style-type: none"> • Chapter 4 – Waste management measures; and • Chapter 5 – licensing requirements for listed waste activities.
National Forests Act (No. 84 of 1998) (NFA)	<ul style="list-style-type: none"> • Section 15 – Authorisation required for impacts to protected trees.
Hazardous Substances Act (Act No. 05 of 1973)	Provisions for the control of substances which may cause injury or ill-health to or death of human beings.
Occupational Health & Safety Act (Act No. 85 of 1993)	<ul style="list-style-type: none"> • Provisions for Occupational Health & Safety; and • Major Hazardous Installation Regulations.
National Heritage Resources Act (Act No. 25 of 1999) (NHRA)	<ul style="list-style-type: none"> • Section 34 – protection of structure older than 60 years; • Section 35 – protection of heritage resources; • Section 36 – protection of graves and burial grounds; and

Legislation	Relevance
	<ul style="list-style-type: none"> Section 38 – Heritage Impact Assessment for e.g. linear development exceeding 300m in length; development exceeding 5 000 m² in extent.
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	<ul style="list-style-type: none"> Control measures for erosion; and Control measures for alien and invasive plant species.
National Forestry Act (Act No. 84 of 1998) (NFA)	<ul style="list-style-type: none"> Section 15 – authorisation required for impacts to protected trees.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA)	<ul style="list-style-type: none"> Permit required for borrow pits will be required for the project.
Limpopo Environmental Management Act (Act No. 7 of 2003) (LEMA)	<ul style="list-style-type: none"> Deals with <i>inter alia</i> protected areas, wild and alien animals, professional hunting, aquatic biota and aquatic systems, invertebrates, indigenous plants, preservation of caves and cave-formations, limited development areas, mountain catchment areas, environmental pollution, as well as permits, permissions, exemptions and exclusions.
NEM:BA Alien and Invasive Species Regulations (GN No. R 598 of 1 August 2014)	<ul style="list-style-type: none"> Prevention the introduction and spread of alien and invasive species across South Africa.

5.2 Authorisations Required

The various forms of environmental authorisation that may be required for the project are listed in **Table 5**.

Table 5: Authorisations related to the project

Description	Legal Reference	Regulatory Authority
Approval required for listed activities in terms of the EIA Regulations of 2014 (as amended) associated with the project. Scoping and EIA process conducted.	<ul style="list-style-type: none"> NEMA; and EIA Regulations (GN No. R. 982, R. 983, R. 984 and R. 985 of 4 December 2014, (as amended). 	DEA
<p>The project entails the following activities that constitute water uses in terms of Section 21 of the NWA:</p> <ul style="list-style-type: none"> Section 21(a) - 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(i) - Altering the bed, banks, course or characteristics of a 	NWA	DWS

Description	Legal Reference	Regulatory Authority
watercourse (instream works for abstraction works, gauging weirs, access roads' crossings, pipeline crossings, etc.); and <ul style="list-style-type: none"> 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)). 		
<ul style="list-style-type: none"> Permits to be obtained if protected trees are to be cut, disturbed, damaged, destroyed or removed. Regulated activities pertaining to protected fauna and flora species. 	NFA	Department of Agriculture, Forestry and Fisheries (DAFF)
	NEM:BA	DEA
	LEMA	Limpopo Department of Economic Development, Environment and Tourism (LDEDET)
Permits to be obtained if heritage resources are to be impacted on and for the removal of graves.	NHRA	South African Heritage Resources Agency (SAHRA)
Permits required for blasting.	Explosives Regulations (GN R109 of 17 January 2003)	SAPS Explosives

Additional legal requirements include the following:

- ❖ All waste (general and hazardous) generated during the construction phase may only be disposed of at appropriately licensed sites in terms of NEM:WA;
- ❖ Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards;
- ❖ 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;
- ❖ Construction Regulations (2003) published under the Occupational Health and Safety Act (No. 85 of 1993) apply to construction activities including “the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work”. A “health and safety plan” which addresses hazards identified, and includes safe work procedures to mitigate, reduce or control the hazards identified, is required under this Act;
- ❖ DWS will need to conform to all its legal obligations as part of the acquisition of land for the construction and operation of the project; and
- ❖ Compliance with the relevant municipal by-laws.

5.3 Project Specifications

The EMPr focuses more on performance criteria for environmental compliance, whereas the detail on how the project is to meet these performance criteria is provided in the project specification in the form of minimum standards and measures to be implemented by the Contractor. The Contractor shall provide detailed method statements on how the performance criteria will be met, through the application of the specification. These methods are to be reviewed and approved by the Engineer to ensure that they are adequate.

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

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

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

- ❖ 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 river diversions;
- ❖ Method Statement for managing spoil material;
- ❖ Method Statement for controlling alien invasive species and noxious weeds;
- ❖ Method Statement for the decommissioning of the construction works area; and
- ❖ Method Statement for rehabilitation of construction footprint.

Note that the method statements are contractual requirements between the Implementing Agent and the Contractor and therefore not subject to approval by DEA.

6 ROLES & 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 the conditions of the Environmental Authorisation, is provided in **Figure 4**.

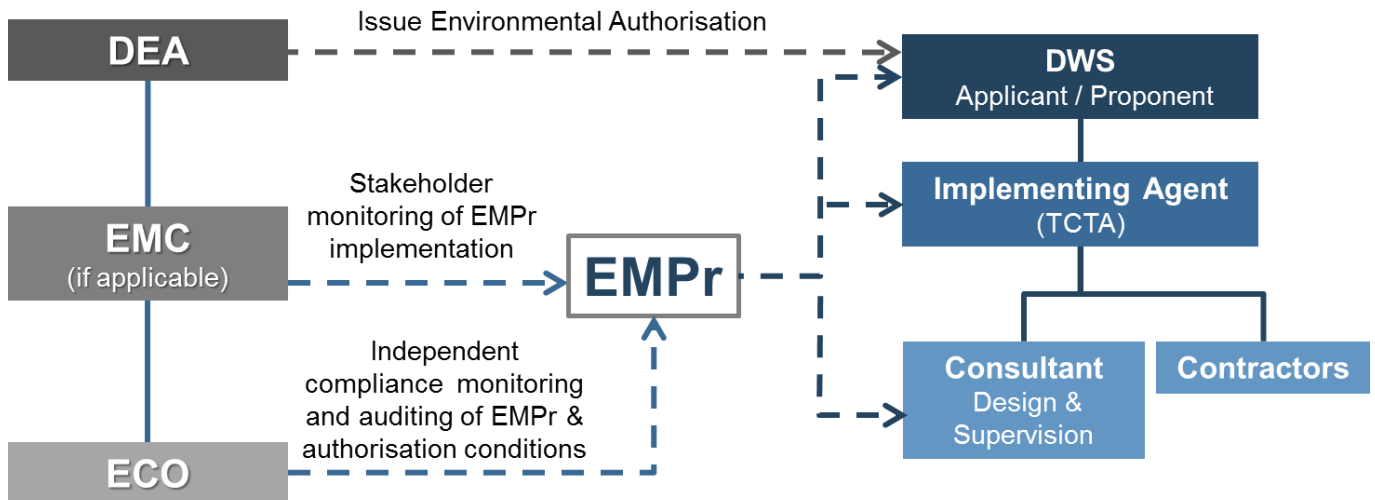


Figure 4: Institutional Arrangements: Roles & Responsibility

6.1 Department of Environmental Affairs

The Department of Environmental Affairs (DEA) is the mandated authority in terms of NEMA that determines whether authorisation can be issued for the project, following a decision-making process conducted as part of the EIA. Conditions are included in the Environmental Authorisation, which need to be complied with by the project applicant (DWS).

DEA also fulfils a compliance and enforcement role with regards to the authorisation. The Department may perform random inspections to check compliance. DEA will also serve as an active member of the Environmental Monitoring Committee (EMC) (if applicable) and will review the monitoring and auditing reports compiled by the Environmental Control Officer (ECO).

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

6.2 Department of Water and Sanitation

DWS is the applicant in terms of NEMA. 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 Environmental Authorisation are satisfied. The liability for non-compliance thus rests with DWS.

DWS has appointed the TCTA as the implementing agent for the project and arrangements for compliance need to be formalised between these parties.

6.3 The Contractor

The Contractor(s) is appointed by the Implementing Agent to undertake construction of the works as specified in the Contract. In order to carry out the requirements of this EMPr, the Contractor must make sure that he/she has a clear understanding of all environmental matters relating to the project.

The responsibilities of the Contractor will as a minimum include:

- ❖ The implementation of and adherence to the Contract Specifications in accordance with the requirements of the EMPr;
- ❖ 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 non-compliance to the Chief Resident Engineer (CRE) within 12 (twelve) hours of the event occurring;
- ❖ Report any non-compliance event that constitutes an emergency immediately and in line with the protocol applicable to that particular emergency event;
- ❖ To ensure that all employees and Sub-contractors attend the Environmental Awareness Training and subsequent refresher training, and are familiar with or made aware of the contents of the Environmental Authorisation and EMPr; and
- ❖ To conduct any remedial work required in terms of the Specifications, the EMPr and Environmental Authorisation as a result of environmental negligence, mismanagement and/or non-compliance.

6.4 The Environmental Control Officer

The role of the ECO is primarily to act as an independent monitor on behalf of DEA and the EMC (if established) for the implementation of the MCWAP-2A WTI in accordance with the requirements of the Environmental Authorisation and the approved EMPr. The ECO must be competent, with a minimum of 5 years' experience.

It is recommended that the ECO undertake weekly inspections of the site, monthly monitoring and biannual full compliance auditing, including an audit at the end of construction and one at the end of the defects notification period. The aforementioned reports will be submitted to the Implementing Agent's Environmental Manager, EMC (if applicable) and DEA for their records.

The role and function of the ECO is to:

- ❖ Conduct third-party monitoring and auditing;
- ❖ Regularly monitor and review the progress towards achieving the specific strategies, objectives and performance targets of the EMPr;
- ❖ Independently verify that mitigation measures and conditions in the EMPr are being applied.
- ❖ Conduct regular site inspections and issue inspection reports;
- ❖ Review monitoring data and evaluate against performance targets;
- ❖ Provide independent reporting to DEA on compliance with the Environmental Authorisation and EMPr;
- ❖ After consultation with the Implementing Agent and the EMC (if established), inform decision-making authorities when there is non-compliance with conditions of approval;
- ❖ Undertake periodic formal auditing of the EMPr compliance;
- ❖ If an EMC is to be established, then the ECO will:
 - Act as the Secretariat to the EMC by providing logistical and organisational support;
 - Prepare minutes of EMC meetings and distribute to members; and
 - Provide independent professional advice to the EMC in the execution of its functions.

As an independent Consultant, the ECO is not responsible for:

- ❖ EMPr implementation;
- ❖ Primary environmental data collection, monitoring and analysis; and
- ❖ Resolving complaints from Interested and Affected Parties (IAPs).

The ECO is not accountable for the implementation of the Environmental Authorisation and the EMPr and is also not linked to the project authorities or the Engineer or the Contractor. Therefore, the ECO does not have the authority to:

- ❖ Make project-related decisions;
- ❖ Issue instructions to either the Engineer or the Contractor;
- ❖ Stop the construction works; and
- ❖ Demand the implementation of specific mitigation and/or corrective measures to the Engineer or Contractor.

6.5 Environmental Monitoring Committee

If applicable, an EMC will be established before commencement of any construction activities and will serve as an additional mechanism for monitoring the implementation of the EMPr and compliance with the Environmental Authorisation, as well as for improving communication amongst key stakeholders. The committee will have an advisory, monitoring and “watch-dog” role for the duration of the construction phase of the project. This committee will report to the Director-General of DEA.

Appropriate Terms of Reference for the EMC will need to be prepared, which will include roles and responsibilities, membership and functionality (amongst others).

If an EMC is established then appropriate Terms of Reference (ToR) will need to be prepared that must address *inter alia* the following:

- ❖ Mandate of the EMC;
- ❖ EMC membership;
- ❖ EMC meetings;
- ❖ Chairperson's responsibilities;
- ❖ Purpose of the EMC;
- ❖ Principles for effective functioning of the EMC;
- ❖ Consent;
- ❖ Responsibility of the Implementing Agent (if applicable);
- ❖ Communication channels;
- ❖ Amendment of the ToR of the EMC;
- ❖ Conflict of interest;
- ❖ Code of ethics; and
- ❖ Adoption.

6.6 The Engineer

The Engineer is appointed as the Implementing Agent's Consultant to design the works and supervise construction. The Engineer will be represented on site for the duration of construction by the 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 and Social Monitor responsible for daily monitoring on his team.

6.7 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 Environmental Authorisation 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. The CRE must make the findings of internal audits available to the Implementing Agent and the ECO.

6.8 The Engineer's Environmental Monitor and Social Monitor

The Environmental Monitor (EM) and Social Monitor (SM) are part of the Engineer's staff, and are responsible for the day-to-day monitoring of the construction activities in relation to their compliance with the EMPr and other relevant specifications. The EM and SM should ensure that any complaints related to the physical and social environment received from the public, are recorded and dealt with appropriately.

The EM and SM must:

- ❖ Be well versed in matters pertaining to environmental management;
- ❖ Understand all relevant environmental legislation and processes;
- ❖ Understand the hierarchy of environmental compliance reporting and the implications of non-compliance;
- ❖ Know and understand the background of the project and the implementation programme;
- ❖ Identify issues and make recommendations in terms of the environmental management requirements;
- ❖ Undertake internal audits (on a monthly basis) to gauge compliance with environmental legislation, conditions of the EA, EMPr and the specifications;
- ❖ Submit the findings of internal audits to the CRE;
- ❖ Keep accurate and detailed records of all EMPr-related activities on site;
- ❖ Check that the Contractor keeps all the permits and certificates on site as required by the EMPr;
- ❖ Advise on the rectification of any pollution, contamination or damage to the project site, rights of way or adjacent land; and
- ❖ Ensure that the CRE is informed of all applicable DEA-approved changes to the EMPr

More specifically the EM should maintain the following on site:

- ❖ A daily site diary;
- ❖ A non-conformance register;
- ❖ A register of audits;
- ❖ Copies of all Method Statements;
- ❖ Monitoring reports of the Contractor;
- ❖ Compliance and audit reports; and
- ❖ Copies of the Environmental Authorisation, EMPr and all permits required during the construction phase.

The SM is responsible for all landowners, land users and interested and affected persons (IAPs) interaction and must maintain and manage any public complaints and issues register.

6.9 The Contractor's Environmental Officer and Social Officer

The Environmental Officer (EO) and Social Officer (SO) are part of the Contractor's staff and are responsible for all activities related to the day-to-day on-site implementation of the EMPr and compliance with the environmental specifications. They are also responsible for the compilation of regular (daily, weekly and monthly) Monitoring Reports for the Engineer.

The EO and SO must liaise with the Engineer on all environmental and related issues (when necessary) and ensure that any complaints received from the public are recorded and dealt with appropriately and expeditiously. The Contractor must ensure that all his employees, visitors and sub-contractors receive Environmental Awareness Training as specified.

The EO and SO should:

- ❖ Be well versed in environmental and social matters;
- ❖ Understand the relevant environmental legislation, international best practices and processes;
- ❖ Understand the hierarchy of environmental compliance reporting, and the implications of non-compliance;
- ❖ Know the background of the project and understand the implementation programme;
- ❖ Be able to resolve conflicts and make recommendations (to the Contractor) in terms of the requirements of the EMPr;
- ❖ Keep accurate and detailed records of all EMPr-related activities on site;
- ❖ Keep the following on file:
 - Material Safety Data Sheets (MSDSs) for all hazardous material stores;
 - Waste disposal certificates;
 - Training registers;
- ❖ Arrange the presentation of environmental awareness training courses/toolbox talks to all site staff, Contractors and Sub-contractors, and monitor the environmental awareness training for all new site personnel employed by the Contractor; and
- ❖ Advise on the rectification of any pollution, contamination or damage to the project site, rights of way and adjacent land.

7 MONITORING

Monitoring is required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.

7.1 Baseline Monitoring

7.1.1 General

Baseline monitoring aims to determine the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects.

7.1.2 Preconstruction (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:

- ❖ Site investigations by appropriate members of the project team and specialists (as relevant);
- ❖ Generate records from survey which include site details, photographs, explanatory notes, etc. (as required);
- ❖ Record the condition of existing structures and infrastructure on the site; and
- ❖ 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.

Note that separate provision is made for Specialist Environmental Investigations in **Section 12.2.1** that need to take place prior to construction activities.

7.1.3 Wetland Assessment

A suitably qualified specialist will be required to assess the wetlands that will be impacted by construction activities. This is required to establish specific rehabilitation requirements.

7.1.4 Environmental Parameters

The environmental parameters to be included in the baseline monitoring, which is to be undertaken by DWS, are shown in **Table 6**.

Table 6: Baseline Monitoring

Environmental Parameter	Monitoring Locations	Requirements
Aquatic Health	<ul style="list-style-type: none"> All major watercourses to be affected by the project, including the Crocodile River (West), Matlabas River and drainage lines. Sites to be located at suitable spots up- and downstream of the construction sites and in-stream works, to be determined in consultation with the ECO. <i>In situ</i> water quality monitoring and biomonitoring to be conducted. 	<ul style="list-style-type: none"> Comply with relevant standards - SANS 5667. Water Quality variables to be tested include: <ul style="list-style-type: none"> Chemical oxygen demand Total ammonia Copper Iron Lead Nitrite/Nitrate Orthophosphate Zinc Faecal coliform bacteria Sodium (Na) Soap, oil and grease Manganese Fluoride
Air Quality	<ul style="list-style-type: none"> Dust fallout units to be located taking into consideration significant sources of air pollution, sensitive receptors, and dominant wind direction. Dust fallout to be measured at / around the following sites (as a minimum) – <ul style="list-style-type: none"> Batching plant; Aggregate stockpiles; Crusher area; Sites where large areas have been cleared (e.g. BPR, OR and abstraction works); Borrow areas and quarries; Sensitive features – Particulate matter (PM₁₀) – strategic monitoring point(s) to be selected. 	<ul style="list-style-type: none"> Dust fallout – comply with ASTM D1739; SANS 1929, SANS 69. Particulate matter (PM₁₀) – comply with the National Ambient Air Quality Standards.
Groundwater	Establish boreholes upstream and downstream of the proposed weir site to define a groundwater level baseline prior to the construction of the weir.	Required to monitor the actual situation regarding sediment conveyance against the established baseline for sediment in suspension downstream of the proposed weir.
Noise & Vibration	Noise and vibration monitoring sampling sites to be located taking into consideration significant sources of noise, sensitive receptors (e.g. see sensitive features listed under Air Quality above), and dominant wind direction. Sites to coincide with dust fallout sites (where relevant).	Comply with SANS 10103:2008.
Traffic	Implement traffic monitoring which includes baseline traffic monitoring, 1 year ahead of construction, to confirm the traffic status quo on the road links that are to be worst affected.	Requirements of the roads authority.

7.2 Environmental Monitoring

Environmental monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded. The parameters

and sampling localities used during the baseline monitoring will form the basis of the environmental monitoring programme.

The environmental parameters to be included as part of the environmental monitoring programme, which is to be undertaken by the Contractor during the construction phase, include the following:

1. Air Quality –
 - Dust fallout;
 - Particulate matter (PM₁₀);
2. Noise;
3. Vibration;
4. Water quality and biomonitoring;
5. Groundwater; and
6. Traffic.

The following requirements need to be incorporated into the programme:

- ❖ Monitoring during normal operations, abnormal situations and emergency situations (e.g. unexpected spillage of hazardous substance);
- ❖ Measuring equipment must be accurately calibrated;
- ❖ Adequate quality control of the sampling must be ensured;
- ❖ Analysis is to be undertaken at a SANS 17025 certified laboratory;
- ❖ Certified methods of testing must be employed;
- ❖ Where legal specifications exist for testing and sampling methods, these must be taken into account; and
- ❖ Establish a process for identifying and implementing corrective measures.

7.3 Compliance Monitoring and Auditing

Compliance monitoring will commence in the pre-construction phase, where those conditions in the Environmental Authorisation that need to be adhered to prior to project implementation will need to be checked and recorded, as well as to check compliance with the provisions in the EMPr. Compliance monitoring will be completed at the end of the defects liability period to check the performance of rehabilitation measures and whether the related objectives have been met.

It is recommended that the ECO undertake weekly inspections of the site, monthly monitoring and biannual full compliance auditing, including an audit at the end of construction and one at the end of the defects notification period.

Auditing of compliance with the Environmental Authorisation and EMPr must be conducted in accordance with Regulation 34 of GN No. R 982 (4 December 2014) in terms of the following:

1. The holder of the Environmental Authorisation must, for the period during which the Environmental Authorisation and EMPr remain valid (*note that TCTA, as the Implementing Agent, will undertake these tasks*) -
 - a. Ensure that the compliance with the conditions of the Environmental Authorisation and EMPr is audited; and
 - b. Submit an environmental audit report to DEA.
2. The environmental audit report must-
 - a. Be prepared by an independent person with the relevant environmental auditing expertise;
 - b. Provide verifiable findings, in a structured and systematic manner, on-
 - i. The level of performance against and compliance of an organization or project with the provisions of the requisite Environmental Authorisation and EMPr; and
 - ii. The ability of the measures contained in the EMPr to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity;
 - c. Contain the information set out in Appendix 7 of GN No. R 982, as amended; and
 - d. Be conducted and submitted to DEA at intervals as indicated in the Environmental Authorisation.
3. The environmental audit report must determine-
 - a. The ability of the EMPr to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis and to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
 - b. The level of compliance with the provisions of Environmental Authorisation and EMPr.

A document handling system must be established to ensure accurate updating of EMPr documents, and availability of all documents required for the effective functioning of the EMPr.

Supplementary EMPr documentation could include:

- ❖ Method Statements;
- ❖ Site instructions;
- ❖ Emergency preparedness and response procedures;
- ❖ Record of environmental incidents;
- ❖ Non-conformance register
- ❖ Training records;
- ❖ Site inspection reports;
- ❖ Monitoring reports;
- ❖ Auditing reports; and
- ❖ Public complaints register (single register for maintained for overall site).

8 ENVIRONMENTAL TRAINING & 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:

- ❖ Induction course for all workers before commencing work on site;
- ❖ Refresher courses (as and when required);
- ❖ 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); and
- ❖ 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.

9 EMPr 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 shall also be required where the existing system:

- ❖ Does not make adequate provision for protecting the environment against the pre-construction, 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; and
- ❖ 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 ECO and EMC (if appointed), however significant changes will require formal approval from DEA.

10 ENVIRONMENTAL ACTIVITIES, ASPECTS AND IMPACTS

10.1 Environmental Activities

10.1.1 *Pre-construction Phase*

The main project activities as well as high-level environmental activities undertaken in the pre-construction phase are listed in **Table 7**.

Table 7: Activities associated with Pre-Construction Phase

<u>Project Phase: Pre-construction</u>
Project Activities
<ul style="list-style-type: none"> • Negotiations and agreements with the affected landowners, tenants, occupiers of land, stakeholders and authorities • Initiate legal process required for land acquisition • Detailed engineering design • Detailed geotechnical investigations, including geophysical investigations • Survey and mark construction servitude • Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary) • Possible removal of trees within construction servitude • Procurement process for Contractors • Review Contractor's method statements (as relevant) • Selective improvements of access roads to facilitate the delivery of construction plant and materials • Arrangements for accommodation of construction workers (off site) • The building of a site office and ablution facilities • Confirmation of arrangements with individual landowners / tenants / occupiers of land for managing and mitigating issues such as fencing and gate dimensions for traversing servitude, traversing patterns of livestock / game over servitude, access to livestock / game drinking points, security, opening and closing of gates and access to private property • Confirmation of the location and condition of all buildings, assets and structures within the servitude • Determining and documenting the road conditions for all identified haul roads • Fencing of construction servitude • Conduct detailed hydraulic analysis to determine the optimum positioning of the scour valves
High Level Environmental Activities
<ul style="list-style-type: none"> • Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation • Search, rescue and relocation of red data, protected and endangered species, heritage resources and graves (based on area of influence of the construction activities). Develop Search, Rescue and Relocation Management Plan, based on findings of walk through survey • Develop Environmental Monitoring Programme (air quality, water quality, noise, traffic, social) • Conduct further baseline environmental studies for Environmental Monitoring Programme • Barricading of sensitive environmental features (e.g. graves) • Obtain permits for impacts to species of conservation concern • Obtain permits if heritage resources are to be impacted on and for the relocation of graves • Establish EMC • On-going consultation with IAPs • Other activities as per EMPr

10.1.2 Construction Phase

The main project activities as well as high-level environmental activities undertaken in the construction phase are listed in **Table 8**.

Table 8: Activities associated with Construction Phase

<u>Project Phase: Construction</u>
Project Activities
<ul style="list-style-type: none"> • Site establishment • Relocation of existing structures and infrastructure • Prepare access roads • Establish construction laydown areas • Bulk fuel storage • Delivery of construction material • Transportation of equipment, materials and personnel • Storage and handling of material • Construction employment • Site clearing (as necessary) • Excavation • Blasting • Establishment and operation of crusher • Establishment and operation of batching plant • Establishment and operation of materials testing laboratory • Concrete Works • Steel works • Mechanical and Electrical Works • Temporary river diversions for abstraction weir, gauging weirs and pipeline crossings • Electrical supply • Pipe delivery, offloading and stringing • Construction of pipeline • Construct air and scour valves • Construct access chambers • Install final Cathodic Protection measures and AC mitigation measures • Install pipeline markers • Construction of abstraction weir and low-lift pumping station • Construction of balancing dam, sedimentation works and high-lift pumping station • Construction of BPR • Construction of OR • Construction of gauging weirs • Cut and cover activities • Stockpiling (sand, crushed stone, aggregate, etc.) • Waste and wastewater management
High Level Environmental Activities
<ul style="list-style-type: none"> • Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation

<u>Project Phase: Construction</u>
<ul style="list-style-type: none"> • Ongoing search, rescue and relocation of red data, protected and endangered species, medicinal plants, heritage resources and graves (based on area of influence of the construction activities) – permits to be in place
<ul style="list-style-type: none"> • Implement Environmental Monitoring Programme (air quality, water quality, noise, traffic, social)
<ul style="list-style-type: none"> • Reinstatement and rehabilitation of construction domain (as necessary)
<ul style="list-style-type: none"> • Convene EMC Meetings
<ul style="list-style-type: none"> • On-going consultation with IAPs
<ul style="list-style-type: none"> • Other activities as per EMPr

10.1.3 Operation Phase

The main project activities as well as high-level environmental activities undertaken in the operational phase are listed in **Table 9**.

Table 9: Activities associated with Operation Phase

<u>Project Phase: Operation</u>
Project Activities
<ul style="list-style-type: none"> • Maintenance of infrastructure
<ul style="list-style-type: none"> • Comply with Operation and Maintenance Manual
<ul style="list-style-type: none"> • Adhere to Operating Rule
<ul style="list-style-type: none"> • Operation of scheme
<ul style="list-style-type: none"> • Implement the River Management System
<ul style="list-style-type: none"> • Abstraction weir - <ul style="list-style-type: none"> ○ Low flows over the stepped overspill crest of the weir will be measured and become part of the data informing the River Management System. This will allow for the monitoring of the flow downstream thereby allowing verification that the ELU are met.
<ul style="list-style-type: none"> • Low-lift pumping station - <ul style="list-style-type: none"> ○ Monitoring of river releases and flows ○ Monitoring of the water level over the abstraction weir ○ Monitoring of the “general health” of all the mechanical & electrical equipment ○ Monitoring of all security and control access ○ Monitoring of the flow out of the low-lift pumping station ○ Control of gravel trap radial gate and pumping bay sluice gates ○ Control of automatic trash rack cleaning system ○ On/Off control of individual submersible pumps in various configurations to deliver a specific total abstraction rate
<ul style="list-style-type: none"> • Desilting Works - <ul style="list-style-type: none"> ○ Monitoring of silt levels ○ Monitoring of the “general health” of all the mechanical & electrical equipment ○ Control of inlet manifold valves ○ Control of outlet sluice gates/valves ○ Control of flushing sluice gates/valves ○ Systematic removal or discharge of silt from infrastructure

<u>Project Phase: Operation</u>
<ul style="list-style-type: none"> • Balancing Dam - <ul style="list-style-type: none"> ○ Monitoring of flow into reservoir ○ Monitoring of flow out of reservoir ○ Monitoring of water levels in all compartments ○ Monitoring of leakage detection system ○ Monitoring of all security and control access ○ Monitoring of the “general health” of all the mechanical & electrical equipment ○ Control of inlet manifold valves ○ Control of outlet valves ○ Control of silt flushing valves
<ul style="list-style-type: none"> • Bulk Water Pipeline - <ul style="list-style-type: none"> ○ Create maintenance access track along pipeline servitude ○ Conduct routine maintenance inspections of the project infrastructure ○ Monitor cathodic protection system ○ Scouring of pipeline, where the water conveyed and stored within this system will be released into the receiving watercourses along the alignment from scour valves ○ Undertake maintenance and repair works, where necessary
<ul style="list-style-type: none"> • On-going consultation with directly affected parties
High Level Environmental Activities
<ul style="list-style-type: none"> • Monitoring Programme (flow, groundwater, sediment, erosion, etc.)
<ul style="list-style-type: none"> • Satisfy requirements in terms of Ecological Water Requirements (EWR) and Existing Lawful Users giving effect to NWA
<ul style="list-style-type: none"> • Implement the River Management System
<ul style="list-style-type: none"> • On-going consultation with IAPs
<ul style="list-style-type: none"> • Other activities as per EMPr for Operational Phase

10.2 Environmental Aspects

Environmental aspects are regarded as those components of an organisation’s activities, products and services that are likely to interact with the environment and cause an impact.

10.2.1 *Pre-construction Phase*

The environmental aspects listed in **Table 10** have been identified for the proposed project during the pre-construction phase, which are linked to the project activities (note that only high level aspects are provided).

Table 10: Environmental aspects associated with Pre-Construction Phase

<u>Project Phase: Pre-construction</u>
Environmental Aspects
<ul style="list-style-type: none"> • Inadequate consultation with landowners / tenants / occupiers of land
<ul style="list-style-type: none"> • Inadequate environmental and compliance monitoring
<ul style="list-style-type: none"> • Poor construction site planning and layout
<ul style="list-style-type: none"> • Land occupancy by temporary buildings, provisional on-site facilities and storage areas
<ul style="list-style-type: none"> • Inaccurate pre-construction environmental walk through survey (including search and rescue)
<ul style="list-style-type: none"> • Absence of relevant permits (e.g. for protected trees, heritage resources)
<ul style="list-style-type: none"> • Lack of barricading of sensitive environmental features
<ul style="list-style-type: none"> • Poor waste management

<u>Project Phase: Pre-construction</u>
<ul style="list-style-type: none"> Absence of ablution facilities

10.2.2 Construction Phase

The environmental aspects listed in **Table 11** have been identified for the proposed project during the construction phase, which are linked to the project activities (note that only high level aspects are provided).

Table 11: Environmental aspects associated with Construction Phase

<u>Project Phase: Construction</u>
Environmental Aspects
• Inadequate consultation with landowners / tenants / occupiers of land
• Inadequate environmental and compliance monitoring
• Lack of environmental awareness creation
• Indiscriminate site clearing
• Poor site establishment
• Poor management of access and use of access roads
• Inadequate provisions for working on steep slopes
• Poor transportation practices
• Poor fencing arrangements
• Erosion
• Disruptions to existing services
• Disturbance of topsoil
• Poor management of excavations
• Inadequate storage and handling of material
• Inadequate storage and handling of hazardous material
• Poor maintenance of equipment and plant
• Poor management of labour force
• Pollution from ablution facilities
• Inadequate management of construction camp
• Poor waste management practices – hazardous and general solid, liquid
• Wastage of water
• Disturbance to landowners / tenants / occupiers of land
• Poor management of pollution generation potential
• Damage to significant flora (if encountered)
• Damage to significant fauna (if encountered)
• Influence to resource quality of the Crocodile River (West) and its tributaries from river diversions, in-stream works and activities in the riparian zones
• Environmental damage where drainage lines are crossed
• Environmental damage of sensitive areas
• Disruption of archaeological and cultural features (if encountered)
• Poor reinstatement and rehabilitation

10.2.3 Operation Phase

The environmental aspects listed in **Table 12** have been identified for the proposed project during the operation phase, which are linked to the project activities (note that only high level aspects are provided).

Table 12: Environmental aspects associated with Operation Phase

Project Phase: Operation
Environmental Aspects
<ul style="list-style-type: none"> Inadequate consultation with landowners / tenants / occupiers of land
<ul style="list-style-type: none"> Inadequate environmental and compliance monitoring
<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"> Inadequate management of access, routine maintenance and maintenance works
<ul style="list-style-type: none"> Inadequate management of vegetation
<ul style="list-style-type: none"> Not satisfying the requirements in terms of EWR and Existing Lawful Users i.t.o. NWA
<ul style="list-style-type: none"> Scouring of poor quality sediment from desilting works back to the Crocodile River (West)
<ul style="list-style-type: none"> Poor scouring practices for bulk water pipeline
<ul style="list-style-type: none"> Inadequate management of light pollution and noise from pumping stations
<ul style="list-style-type: none"> Failure to comply with health, safety and environmental specifications
<ul style="list-style-type: none"> Downstream erosion

10.3 Potential Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable.

10.3.1 Construction and Operation Phase

Refer to **Table 13** for the potential significant impacts associated with the activities and environmental aspects for the construction and operation phase.

Table 13: Potential significant environmental impacts

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
Land Use	<ul style="list-style-type: none"> Temporary loss of land used for agriculture and game farming within pipeline servitude. Permanent loss of land at abstraction works, low-lift pumping station, balancing dam, desilting works, high-lift pumping station, BPR, OR and chambers. 	<ul style="list-style-type: none"> Permanent loss of land at abstraction works, low-lift pumping station, balancing dam, desilting works, high-lift pumping station, BPR, OR and chambers. Servitude restrictions and inspections. Operation and maintenance functions. Impacts to land use surrounding

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	<ul style="list-style-type: none"> • Servitude restrictions. • Disturbances on game farms. 	Hartbeespoort Dam due to fluctuating water levels.
Climate	<ul style="list-style-type: none"> • Emission of greenhouse gases during construction. 	<ul style="list-style-type: none"> • Impacts of climate change on the yield and operation of the scheme.
Geology	<ul style="list-style-type: none"> • Blasting related impacts. • Sourcing of construction aggregate and associated impacts (e.g. borrow pits, haul roads). • Disposal of spoil material. • Unsuitable geological conditions – risks to structural integrity of infrastructure. • Significant work will be required to prepare the foundation for the abstraction weir. 	-
Geohydrology	<ul style="list-style-type: none"> • Potential disturbance of the aquifer from blasting. • Contamination of groundwater primary aquifer with water from more saline secondary aquifer as a result of blasting. • Potential contamination of groundwater during the construction stage. • Possible influence to groundwater flow as a result of trenching during construction. 	<ul style="list-style-type: none"> • Possible pollution of the aquifer with water during the maintenance of the infrastructure. • Impacts to the recharge of the alluvial aquifer downstream of the abstraction weir, due to surface water and groundwater interactions.
Soil	<ul style="list-style-type: none"> • Soil erosion (e.g. steep terrain and instream works). • Soil contamination through poor construction practices and inadequate management of dangerous goods (e.g. fuel). 	<ul style="list-style-type: none"> • Soil erosion (e.g. steep terrain and instream works).
Hydrology	<ul style="list-style-type: none"> • Temporary impacts to flow during the instream works associated with the construction of the weir and pipeline crossings. 	<ul style="list-style-type: none"> • Alteration of flow regime by the weir structure. • Impact of the proposed Abstraction Works on flood levels and on infrastructure up- and downstream of the weir. • Reduction in the average levels of the upstream impoundments during the operation of the scheme.
Water Quality	<ul style="list-style-type: none"> • Sedimentation from instream works. • Water quality impacts due to spillages and poor construction practices. 	<ul style="list-style-type: none"> • During the maintenance of the pipeline and reservoirs the raw water conveyed and stored within this system, which is water of poor quality from the Crocodile River, will be released into the Matlabas River and other watercourses from scour valves.
River Morphology	<ul style="list-style-type: none"> • The weir structure in the Crocodile River and the pipeline crossings at watercourses may lead to the alteration of the morphology of the watercourse (e.g. destabilisation of bed and banks of watercourses). 	<ul style="list-style-type: none"> • Destabilisation of river structure due to inadequate reinstatement and rehabilitation.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
Riparian Habitat	<ul style="list-style-type: none"> • Encroachment of construction activities into riparian zones / wetlands. • Inundation of instream habitat as a result of the weir's backwater effect. • Loss of riparian and instream vegetation within construction domain. 	<ul style="list-style-type: none"> • Disturbances of riparian vegetation may lead to erosion and encroachment of exotic vegetation.
Wetlands and Pans	<ul style="list-style-type: none"> • Crossing of wetlands and pans by the pipeline and access roads. • Inundation of wetlands as a result of the weir's backwater effect. 	<ul style="list-style-type: none"> • Destabilisation of wetlands due to inadequate reinstatement and rehabilitation. • Impacts to wetlands downstream of the abstraction point (surface-groundwater interactions).
Water Use	<ul style="list-style-type: none"> • Impacts to existing water users (e.g. sedimentation). 	<ul style="list-style-type: none"> • Impact of the abstraction from the Crocodile River (West) and of the management of the system on the existing agricultural water users. • Water availability in the Crocodile River (West). • Impacts to recreational use at Hartbeespoort Dam due to fluctuating water levels.
Aquatic Ecology	<ul style="list-style-type: none"> • Disruptions to aquatic biota community due to water contamination, temporary alteration of flow and disturbance to habitat during construction (instream works). 	<ul style="list-style-type: none"> • The abstraction weir and gauging weirs will act as instream barriers that will prevent the migration of aquatic biota. • The abstraction weir will serve as a morphological modification and the backwater created by the structure will change the affected upstream river reach from a lotic to more of a lentic ecosystem. This will result in changes to the aquatic community structure and remove certain habitats from potential utilisation. • Impairment of ecosystem functioning in Hartbeespoort Dam due to fluctuations in water levels.
Sediment Regime	<ul style="list-style-type: none"> • Sedimentation from instream works. 	<ul style="list-style-type: none"> • Management of sediment at abstraction works to be stored and returned to the Crocodile River (West) during operational phase
Terrestrial Ecology - Flora	<ul style="list-style-type: none"> • Encroachment into CBAs and ESAs, which are important in terms of biodiversity, ecosystem functionality and ecological processes. • Vegetation will primarily be lost in areas that are to be cleared for the project infrastructure. The potential loss of significant flora species may occur. • Clearing of vegetation for construction purposes may result in the proliferation of exotic vegetation, which could spread beyond the construction domain. 	<ul style="list-style-type: none"> • The establishment of trees within the pipeline servitude will not be allowed as roots may compromise the stability of the pipeline.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
<p>Terrestrial Ecology - Fauna</p>	<ul style="list-style-type: none"> • Ecosystem disruption may occur where clearing is undertaken to allow for the construction of the project infrastructure. • Sections of the alternative pipeline routes traverse or pass in close proximity to enclosures where sensitive game is kept. • Fauna could be adversely affected through construction-related activities (noise, dust, light pollution, illegal poaching, and habitat loss). This is especially relevant to sensitive game species (including exotic game). • The construction servitude will minimise animal movement. This is particularly significant on smaller game farms or in instances where access to watering points will be affected. • Possible disturbance to the bat cave that is situated in the Mooivallei area during construction. 	<ul style="list-style-type: none"> • Disruptions to game farms during operation and maintenance activities.
<p>Socio-economic Environment</p>	<ul style="list-style-type: none"> • Loss of land (including structures and cultivated areas) through project infrastructure. • Loss of agricultural production. • Risk to game and livestock as a result of construction related hazards. • Loss of income in eco-tourism sector (hunting and game farming). • Potential damage to property (e.g. gates, fences, structures). • Servitude restrictions; • Use of local road network. • Safety and security. • Impact to visual quality and sense of place. • Nuisance from dust and noise. • Light pollution. • Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS). • Reduction in property value. • If the projected development materialise the population and specifically the urban population of Lephalale will grow substantially. 	<ul style="list-style-type: none"> • Use of local road network for operation and maintenance purposes. • Impact to visual quality and sense of place. • Provision of light at infrastructure may cause light pollution. • Inundation of low level bridges due to the weir's backwater effect. • The pumping stations will be operating continuously and may cause noise pollution. • Cumulative impacts to properties that are already affected by existing linear infrastructure. • Impacts to smaller properties, where the servitude may affect the critical mass required to continue with the current land use. • The operating level of the Hartbeespoort Dam will fluctuate as per seasonal rains, with associated impacts to the surrounding recreational water users (active and passive).
<p>Agriculture</p>	<ul style="list-style-type: none"> • Loss of cultivated land within construction domain. • Loss of grazing land within construction domain. 	<ul style="list-style-type: none"> • Potential impacts to water users (and associated agro-economic impact from reduced crop and food production) downstream of the

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	<ul style="list-style-type: none"> Loss of stock watering points within construction domain. Disruptions to farming operations as a result of construction-related use of existing access roads. Loss of fertile soil through land clearance. 	<ul style="list-style-type: none"> abstraction works on the Crocodile River. Permanent loss of cultivated land due to physical infrastructure.
Historical and Cultural Features	<ul style="list-style-type: none"> Heritage and cultural resources could be destroyed or damaged through construction activities. 	-
Existing Structures & Infrastructure	<ul style="list-style-type: none"> Risk of damaging existing services, infrastructure and structures during construction. Disruptions to traffic on local road network during construction. This is associated with road crossings, where the pipeline route follows existing road alignments and as a result of general use of the roads by construction vehicles. 	<ul style="list-style-type: none"> Impact of the proposed Abstraction Works on flood levels and on infrastructure up- and downstream of the weir. Servitude restrictions.
Transportation	<ul style="list-style-type: none"> Increase in traffic on the local road networks. Develop temporary access and haul roads. Risks to road users. 	<ul style="list-style-type: none"> Permanent access along the pipeline servitude will be required after construction.
Solid Waste	<ul style="list-style-type: none"> Waste generated from site preparations (e.g. plant material). Domestic waste. Surplus and used building material. Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags). Wastewater (sanitation facilities, washing of plant, operations at the batching plant, etc.). Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks. 	-
Aesthetics	<ul style="list-style-type: none"> Visual quality and sense of place to be adversely affected by construction activities. 	<ul style="list-style-type: none"> High visibility of permanent infrastructure. Loss of "sense of place". Section of cleared vegetation along access road. Provision of light at infrastructure may cause light pollution. Inadequate reinstatement and rehabilitation of construction footprint. Visual impacts of lowered water levels at Hartbeespoort Dam.
Air Quality	<ul style="list-style-type: none"> Excessive dust levels as a result of construction activities 	-

11 SENSITIVE ENVIRONMENTAL FEATURES

Figure 5 shows a sensitivity map of the Best Practicable Environmental Option (BPEO) for the MCWAP-2A WTI. Within the context of the project area, cognisance must be taken of the following sensitive environmental features for which mitigation measures are included in the EIA Report and EMPr:

- ❖ All watercourses in the project area, which include the Crocodile River (West) and its tributaries (including Bierspruit and Sand River), Matlabas River and its tributaries, as well as wetlands (including pans);
- ❖ Heritage and archaeological sites, as identified through the Heritage Impact Assessment;
- ❖ Flora and fauna species of conservation concern;
- ❖ Game farming and the associated sensitive and high-value wildlife;
- ❖ Dolomitic conditions (balancing dam, desilting works and high-lift pumping station);
- ❖ The alluvial deposits of the Crocodile River (West) constitute the primary aquifer in terms of ground water utilization;
- ❖ Current land use (including agriculture, ecotourism, wildlife farming and wildlife ranching);
- ❖ Safety and security of the public;
- ❖ Steep areas that are susceptible to erosion, such as the low mountains encountered in the Vlieëpoort region;
- ❖ Koppies that occur along the pipeline route;
- ❖ Traffic and pedestrians on the public roads (including the D1649, D3677, R510 and D175) and private roads;
- ❖ All existing infrastructure and structures;
- ❖ Sensitive socio-economic receptors, which include (amongst others):
 - Farm houses and dwellings of farm labourers;
 - The settlement in Steenbokpan;
 - The Matshaneng Primary School on the Steenbokpan Road;
 - Churches;
 - Smaller / narrower farms (e.g. along railway line);
 - Properties that are traversed by the MCWAP-2A pipeline that are already affected by other linear infrastructure (e.g. power lines, roads, railway line);
 - Farm stalls; and
 - Tourists.

The sensitivity maps are shown in **Figures 5 - 7** needs to be made available to the implementation team (including the Project Manager, ECO and Contractor) in GIS format to allow for further consideration and adequate interpretation at an appropriate scale.

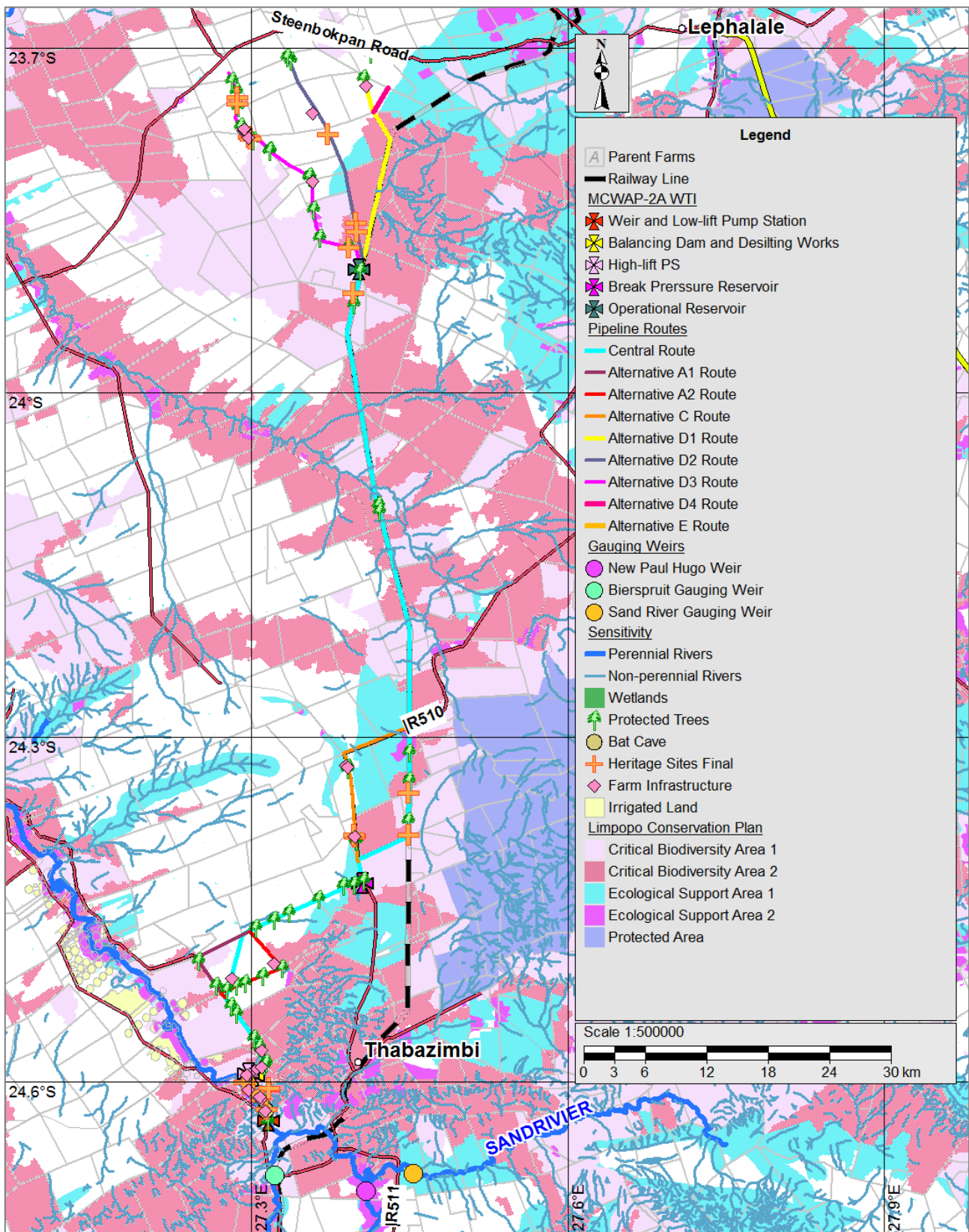


Figure 5: Overall Sensitivity Map

(Note: not all sensitive features shown; Farm Portions not shown due to scale)

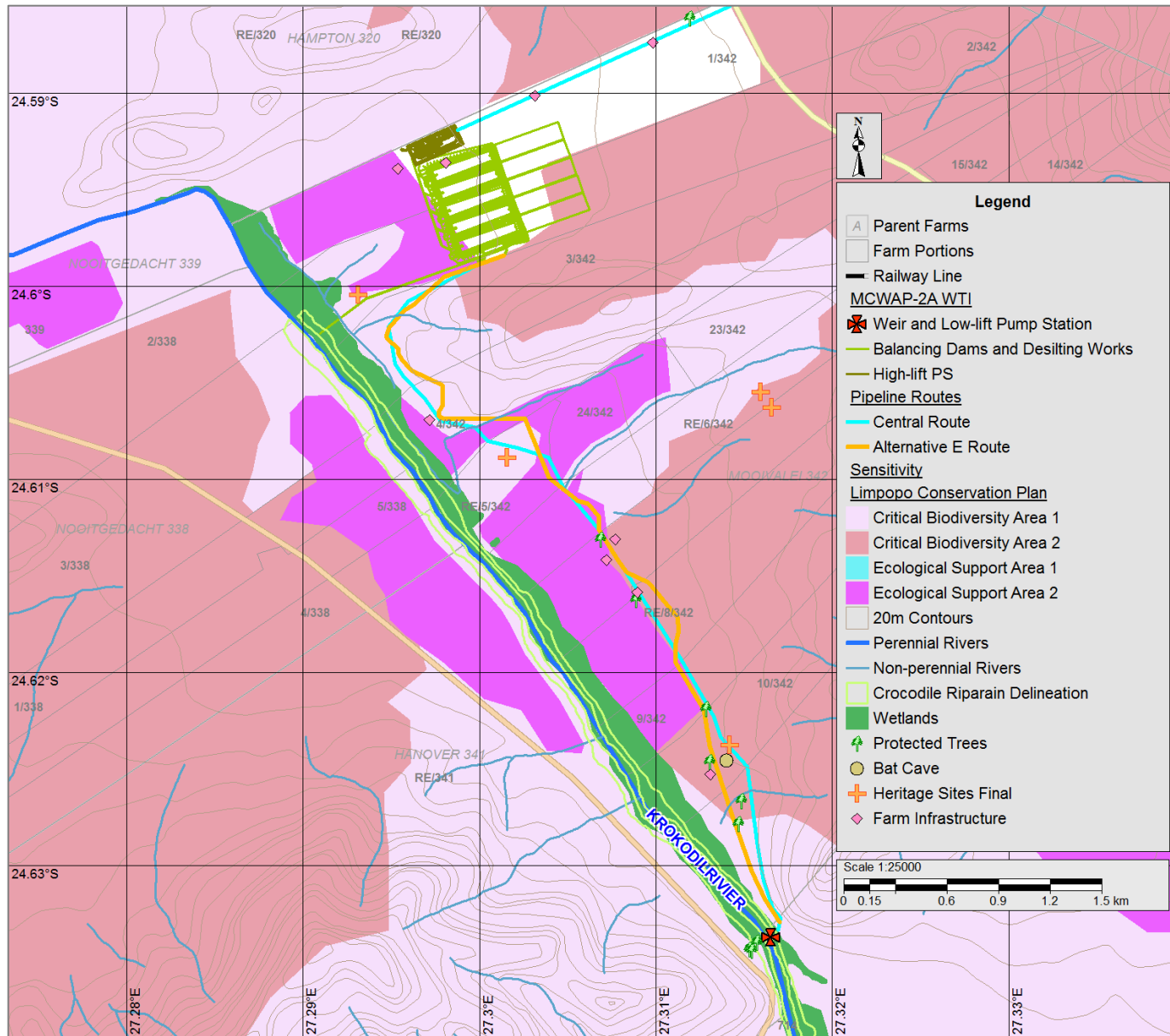


Figure 6: Sensitivity Map – Southern Section

(Note: not all sensitive features shown; buildings based on topographical map)

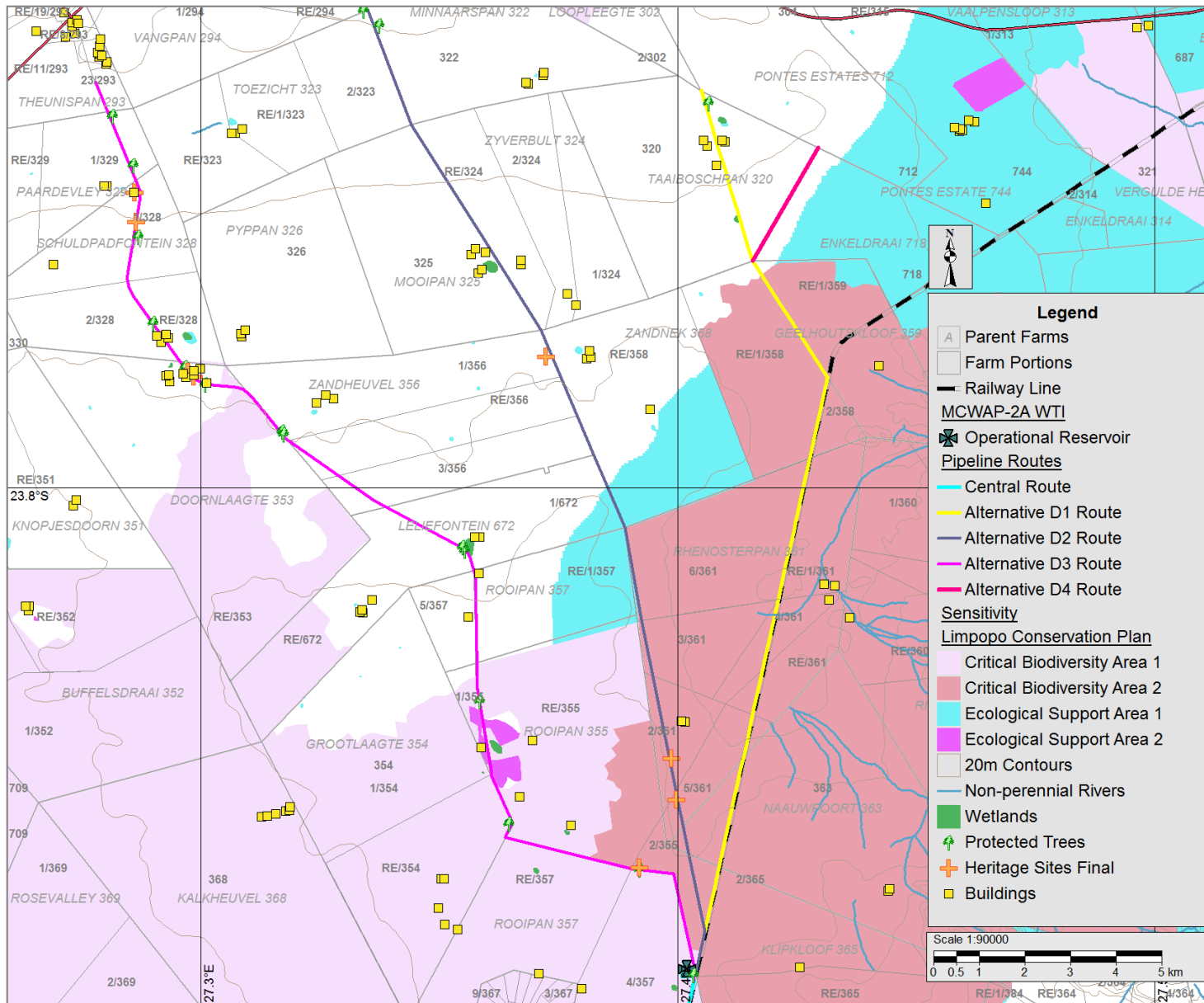


Figure 7: Sensitivity Map – Northern Section

(Note: not all sensitive features shown; buildings based on topographical map)

12 IMPACT MANAGEMENT

12.1 Introduction

The framework for the subsequent management measures consists of the following:

- ❖ **Management objectives** – i.e. desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources);
- ❖ **Targets** – i.e. level of performance to accomplish management objectives;
- ❖ **Management actions** – i.e. practical actions aimed at achieving management objectives and targets;
- ❖ **Responsibilities**; and
- ❖ **Monitoring requirements**.

12.2 General Environmental Requirements

General environmental requirements during the remainder of the project life-cycle (excluding decommissioning) include the following:

- ❖ The design needs to consider and incorporate environmental requirements and sensitive environmental features.
- ❖ Where practicable and economical, development designs to compliment the natural surroundings in order to preserve a sense of place (e.g. facade detailing of pumping stations to blend the structures with the natural environment).
- ❖ Define and communicate roles and responsibilities for the implementation of the EMPr;
- ❖ Undertake negotiations and confirm arrangements with landowners and/or land users regarding:
 - Use of all private roads, with associated traffic arrangements;
 - Land occupancy (construction facilities);
 - Domestic animals (avoiding impacts to livestock);
 - Wildlife;
 - Protocol for lodging complaints;
 - Possible loss of access;
 - Existing structures and infrastructure (including temporary and permanent water management structures and infrastructure);
 - Fencing and gate dimensions for traversing servitude;
 - Traversing patterns of game and/livestock;
 - Access to game and/livestock drinking points;
 - Security;
 - Opening and closing of gates and access to private property; and

- Claims procedure for damage to property and assets (include game and livestock).
- ❖ Ensure that all existing structures within the construction area are identified and recorded.
- ❖ Properties may not be accessed for construction purposes unless consent has been granted by the landowner, or until the land acquisition process has been concluded
- ❖ Construction and operational activities need to be planned and coordinated in consultation with the affected farmers in order to minimise impacts on land use (including crop production, ecotourism, game-farming, etc.).
- ❖ Project components to avoid watercourses, as far as possible, with suitable buffers (minimum of 32 m) and mitigation measures in place.
- ❖ Implement the mitigation strategy for species of conservation significance, as contained in the EIA Report.

12.3 Pre-construction Phase

The planning or pre-construction phase largely entails conducting the necessary specialist studies, determining the site layout and carrying out the requisite environmental processes to obtain authorisation. This phase will also include conducting environmental baseline studies for various parameters for management of impacts and record purposes.

12.3.1 Specialist Environmental Investigations

Management Objective:

Identify sensitive and protected environmental features in addition to those that have been identified as part of the EIA process.

Target:

1. All sensitive and protected environmental features to be identified in the construction domain (all the components of the project) and inundation area.
2. All relevant approvals to be obtained prior to relocation of red data, protected and endangered flora and fauna species, medicinal plants, heritage resources and graves.

Management Actions:

- The Heritage Impact Assessment recommended that a Phase 1 palaeontology assessment be undertaken along the Central Route prior to construction.
- Permits from the DAFF and LEDET (where relevant) are required before construction commences in order to cut, disturb, destroy or remove protected trees.
- It is recommended that search, rescue and relocation be conducted taking into consideration red data, protected and endangered flora and fauna species. For flora species, the following factors need to be considered (amongst others) as part of this plan:
 - Detailed plan of action (including timeframes, methodology and costs);

- Site investigations;
 - Consultation with authorities and stakeholders;
 - Marking of species to be relocated;
 - Applying for permits;
 - Identification of suitable areas for relocation;
 - Aftercare; and
 - Monitoring (including targets and indicators to measure success).
- The desktop study shows that the Horned Baboon Spider (*Ceratogyrus darlingi*) is expected to occur in the area, and it is therefore suggested that during the walk down survey, if any of these are found, a permit from LEDET will be required before relocation can take place.
 - The ecological status of the Matlabas River needs to be determined during the high-flow period, prior to construction. This will determine the requirements for scouring (i.e. draining water from the pipeline, typically during maintenance).
 - Determine the risk to the bat cave (subterranean chambers) in Mooivallei area based on outcomes of the geotechnical investigations. Shift the low pressure pipeline within the 100 m that was assessed to avoid the bat cave as much as possible.

Responsibilities:

- DWS / implementing agent to appoint suitably qualified specialists.
- Specialists to execute the management actions.

Monitoring Requirements:

Approvals, permits and licences are to be in place with due consideration to the project programme.

Implementation Timeframe:

Prior to any construction activities.

12.3.2 Approvals, Permits and Licensing Requirements

Management Objective:

Compliance with applicable legislation to prevent unauthorised activities and negative impacts to protected environmental features.

Target:

Obtain requisite approvals for the relevant protected environmental features.

Management Actions:

- 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 Integrated Water Use Licence from DWS for water uses in terms of Section 21 of the NWA.
- 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.

Responsibilities:

- DWS / implementing agent to appoint suitably qualified specialists.
- Specialists to seek and obtain relevant approvals.

Monitoring Requirements:

Approvals, permits and licences are to be in place with due consideration to the project programme.

Implementation Timeframe:

Prior to any potential adverse impacts to protected environmental features, based on legal provisions and requirements of mandated authorities.

12.3.3 Administrative Requirements

Management Objective:

Ensure that all administrative measures and arrangements associated with the compliance with the Environmental Authorisation and EMPr are in place.

Target:

- Administrative measures and arrangements are confirmed, checked and maintained.
- Document control procedure is in place, in accordance with the Environmental Management System to be employed on site.

Management Actions:

- Adequate financial provision is made for the implementation of the conditions of the Environmental Authorisation and the mitigation measures contained in the EMPr. 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.

Responsibilities:

- Proponent – administrative provisions for compliance.
- Engineer and ECO - to monitor compliance.
- Contractor – administrative provisions for compliance.

Monitoring Requirements:

- Document control procedure.
- Filing systems.
- Financial provisions (e.g. bill of quantities, budgets, etc.).

Implementation Timeframe:

Throughout the duration of the construction period.

12.3.4 Construction Site Planning and Layout

Management Objective:

Proper planning and layout of the construction domain to ensure protection of sensitive environmental features. Refer to sensitive features highlighted in **Section 11**, findings from pre-construction survey, further environmental studies, etc.

Target:

1. No negative impacts to sensitive environmental features as a result of poor construction site planning and layout.
2. The entire construction footprint is to be included in the pre-construction survey.

Management Actions:

- Conduct a pre-construction survey of the area to be affected by construction activities. This must include site investigations with photographic records.
- Suitable specialist(s) are to identify sensitive environmental features (including fauna, flora, watercourses and heritage sites) where special care needs to be taken, and implement the

required suitable mitigation measures to safeguard these features (e.g. barricading, signage and awareness creation). Refer to the findings of the EIA specialist studies.

- 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 Contractor is to produce a site plan for the approval of 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. The plan must show the following (as relevant):
 - Buildings and structures;
 - 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;
 - Vehicle and equipment stores;
 - Workshops;
 - Wash bays;
 - Fuel stores;
 - Hazardous substance stores;
 - Sensitive environmental features; and
 - Any other activities, facilities and structures deemed relevant.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Photographic record as part of the pre-construction survey of areas to be affected by construction activities.
- Approved site plan.
- Barricading and signage.
- Records of awareness creation.

Implementation Timeframe:

Prior to the establishment of any construction site for the overall project.

12.3.5 Managing Geotechnical Investigations

Management Objective:

Manage the possible negative environmental impacts associated with detailed geotechnical investigations.

Target:

1. No deviations from agreements made with the landowners.
2. No damage to sensitive environmental features (e.g. marked and barricaded heritage resources, protected trees, watercourses, structures and infrastructure).
3. Rehabilitation of test pits.

Management Actions:

- Suitable access arrangements are to be made in accordance with agreements prior to site investigations. Requirements stipulated in the protocol for access to farms, provided by Agri-SA and Transvaal Agricultural Union South Africa (TAU-SA) should be adhered to at all times.
- Safe operation of plant and equipment required for geotechnical investigations.
- Adequate management of domestic/construction waste produced during the investigations.
- Implement measures to mitigate soil erosion, loss of vegetation and pollution associated with the geotechnical investigations.
- Prevent damage to sensitive environmental features.
- Landscape and rehabilitate test pits.

Responsibilities:

- Project Manager/Engineer and ECO - to monitor compliance.
- Geotechnical team to implement management actions.

Monitoring Requirements:

- Public complaints register.

Implementation Timeframe:

Prior to geotechnical investigations up to reinstatement and rehabilitation of affected areas.

*12.3.6 Environmental Awareness Creation***Management Objective:**

Ensure that the Contractor, construction workers and site personnel are aware of the relevant provisions of the EMPr, sensitive environmental features and agreements made with the affected landowners and community members.

Target:

1. All construction workers and employees are to have completed appropriate environmental training before being allowed on the construction site.
2. A record of environmental training undertaken is to be kept on site.

Management Actions:

- 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.
- 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Records of environmental training and awareness creation.

Implementation Timeframe:

Throughout the duration of the construction period.

12.3.7 On-going Consultation with Community and Affected Parties

Management Objective:

- 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.

Target:

1. 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.
2. No deviations from agreements made with individual landowners and community members.

Management Actions:

- 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.
- All negotiations and payments relating to compensating affected landowners should be conducted and concluded before construction begins.
- The loss of productive land or of business value is to be handled in terms of prevailing RSA legislation.
- For safety reasons, hunting should halt when pipeline construction is ongoing in relevant areas.
- Provide all information, especially technical findings, in a language that is understandable to the general public. The dominant local languages are 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.
- Where necessary always provide prompt and clear feedback to communities.

- 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4 Construction Phase

12.4.1 Management of Security

Management Objective:

The safety and security of the public is of paramount importance and must not be compromised by the activities associated with the construction phase.

Target:

- No security related incidents associated with the labour force and construction activities.

Management Actions:

- Involve the local Community Policing Forums or other security associations.
- 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.
- Ensure suitable management of the labour force to prevent security-related issues or disturbance to landowners and community members.
- A security policy shall 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.
- The camp sites 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.

- See requirements in EMPr for *Management of Labour Force* and *Management of Health and Safety*.
- See requirements in EMPr for *Management of Access* and *Fencing Arrangements*.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Intact fencing along construction servitude.
- Public complaints register.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.2 Site Clearing

Management Objective:

- Manage environmental impacts associated with site clearing.
- Ensure that only areas that are specifically required for the construction purposes are cleared.

Target:

No damage is caused to sensitive environmental features outside of the demarcated construction areas, including marked and barricaded heritage resources, protected trees, watercourses, cultivated areas, structures and infrastructure.

Management Actions:

- 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- No clearing outside of construction domain.
- Intact fencing for construction servitude.
- Intact barricading of sensitive environmental features.
- Public complaints register.
- Approved Contractor's method statement.

Implementation Timeframe:

Prior to and during clearing of any construction site.

12.4.3 Site Establishment

Management Objective:

Minimise negative environmental impacts associated with site establishment.

Target:

1. No deviations from agreements made with individual landowners and community members.
2. No damage to sensitive environmental features outside demarcated construction areas during site establishment.
3. Site layout approved by Engineer.
4. No access or encroachment into no-go areas.
5. No justifiable complaints regarding general disturbance and nuisance received from the affected landowners and community members.

Management Actions:

- 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

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Intact barricading of sensitive environmental features.
- Intact fencing for construction servitude.
- Public complaints register.
- Contractor's method statement.
- Secured construction servitude.

Implementation Timeframe:

Prior to and during site establishment.

12.4.4 Management of Existing Services and Infrastructure

Management Objective:

- Prevent impacts to existing services.
- Adhere to agreements made with owners/custodians of the services.

Target:

1. No unwarranted complaints regarding adverse impacts to existing services and infrastructure.
2. No adverse impacts to existing services and infrastructure.
3. All relevant approvals to be obtained prior to working within existing servitudes (including roads, railway line, power lines, telephone lines, etc.).

Management Actions:

- 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.
- See requirements in EMPr for *Management of Waste*.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Contractor's method statement.
- Agreements with owners of services.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.5 Management of Access and Traffic

Management Objective:

- Ensure that all construction vehicles use only dedicated access routes to construction sites.
- Ensure proper access control.
- Prevent unlawful access to the construction domain.
- Adhere to agreements made with individual landowners and community members regarding access.
- Ensure the safety of all road users by implementing proper signage and traffic control measures.
- Limit construction-related nuisance to service nodes.

Target:

1. No reports of construction vehicles using other unauthorised routes.
2. No complaints regarding blocking of access to properties.
3. No direct harm to livestock/game/wild animals due to inadequate access control.
4. No transporting of unsafe loads. Permits are to be obtained for abnormal loads.
5. No speeding.
6. No accidents.

Management Actions:

- Ensure compliance with biosecurity protocols of affected properties, in relation to the construction on the related properties.
- Investigate and consult farmers and local communities on the need to provide suitable access points around the construction sites for people and animals.
- 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 are capable of accommodating 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.
- 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.
- Ensure that, at all times, people have access to their properties as well as to social facilities such as schools, churches, transport, shops, etc.

- 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 according to the geometric design and limitations of heavy vehicles.
- The access roads need to provide sufficient width for heavy vehicles to navigate around curves in the road.
- 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.
- The payloads delivered by heavy vehicles need to be recorded and audited to prevent overloading of heavy vehicles.
- Abnormal load permits must be acquired for the transport of abnormal loads.
- Traffic accommodation to South-African Road Traffic Signs Manual standards where any construction affects an existing road.
- Time restrictions for delivery vehicles through built-up and socially sensitive areas.
- Access roads are to be maintained in a suitable condition.
- Clearly mark pedestrian-safe access routes within the construction areas.
- Suitable erosion protective measures are to be implemented for access roads during the construction phase.
- Traffic safety measures (e.g. traffic warning signs, flagmen) are to be implemented where applicable.
- Clearly demarcate all construction access roads.
- Proper access control is to be maintained to prevent livestock from accessing construction areas.
- Consult with property owners, local authorities and communities to ensure that all affected parties are informed of the timing and extent of any disruptions.
- A continuous condition survey of the local roads to be used during the construction phase should be made.
- Delivery routes should be defined and adhered to during the construction phase.
- Maintenance of local roads should take place during the construction phase, ensuring 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.
- Construction adjacent or alongside game farms should be restricted as to the lengths of open trench that is permitted. This length should be reduced to as short as practicable and cost effective.
- See requirements in EMPr for *Fencing Arrangements*.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Signage displayed and maintained.
- Contractor's method statement.
- Maintenance of access control to construction sites.
- Maintenance of private access roads.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.6 Fencing Arrangements

Management Objective:

- 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.
- Minimise disturbance to animals.

Target:

1. No deviations from agreements made with individual landowners and/or land users regarding fencing.
2. No direct harm to livestock/game animals due to inadequate fencing arrangements.
3. Disturbed or damaged fencing to be reinstated / replaced to meet pre-existing conditions.

Management Actions:

- 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:
 - 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; and
- 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Agreements with landowners.
- Fencing register.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.7 Management of Labour Force

Management Objective:

- Ensure suitable management of the labour force to prevent security-related issues or disturbance to landowners and community members.
- Optimise the use of local labour.
- Provide a work environment that is conducive to effective labour relations.

Target:

1. No complaints from landowners and community members regarding trespassing or misconduct by construction workers.
2. All unskilled labour to be sourced from local area.

Management Actions:

- Prohibit trespassing of construction workers on private property.
- 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 shall 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.

- 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.
- Liaise with the South African Police Services (SAPS) and Community Policing Forums to ensure that construction sites are monitored.
- Prevent loitering within the vicinity of the construction camp as well as construction sites.
- 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.
- 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.

Responsibilities:

- Implementing Agent - employment targets.
- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Labour-related targets.

Implementation Timeframe:

Throughout the duration of the construction period.

*12.4.8 Management of Construction Camps***Management Objective:**

Minimise environmental impacts associated with construction camp and eating areas.

Target:

1. No environmental contamination associated with construction camp and eating areas.
2. Minimise visual impact associated with construction camp and eating areas.
3. Prevent socio-economic impacts associated with the construction camp.

Management Actions:

- 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.
- Employ appropriate access control measures.

- Suitable security to be provided at the construction camp 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.
- See requirements in EMPr for *Management of Waste, Management of Water, Management of Labour Force, Management of Ablution Facilities, Management of Storage and Handling of Non-Hazardous Material, Management of Workshop and Equipment, etc.*

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- 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.

Implementation Timeframe:

Period from when the construction camp is created up to de-establishment.

12.4.9 Management of Ablution Facilities

Management Objective:

Minimise environmental impacts associated with ablution facilities.

Target:

1. No environmental contamination associated with ablution facilities.
2. Minimise visual impact associated with ablution facilities.

Management Actions:

- Provide sufficient ablution facilities (e.g. mobile / portable / VIP toilets) at the construction camp and along construction sites, which conform to all relevant health and safety standards and codes.

- No pit latrines, french drain systems or soak away systems shall 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 shall 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 shall occur at a maximum ratio of 1 toilet per 15 workers.
- All temporary / portable / mobile toilets shall 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 shall be adequately screened from public view.
- These facilities will be maintained in a hygienic state and serviced regularly.
- Toilet paper shall be provided.
- The Contractor shall 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:
 - Proper positioning of the shower, and specifically its discharge point, shall 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; and
 - Use of the shower facilities must be limited to staff or authorised persons only.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Maintenance register for ablution facilities.
- Waste disposal certificates.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.10 Management of Visual Aspects

Management Objective:

- Minimise impacts to the aesthetics / visual quality.
- Ensure that the visual appearance of the construction site is not an eyesore the adjacent areas.

Target:

No verified complaints regarding impacts to visual quality.

Management Actions:

- 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.
- See requirements in EMPr for *Management of Reinstatement and Rehabilitation*.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.11 Management of Water

During the construction stage, water will be required for various purposes, such as concrete batching, washing of plant and equipment in dedicated areas, dust suppression, potable use by construction workers, etc.

Management Objective:

- Minimise environmental impacts associated with storm water as well as water services for construction workers.

Target:

1. No visual evidence of erosion caused by wastewater or storm water practices.
2. No environmental contamination associated with wastewater or storm water practices.
3. No water wastage (water conservation).

Management Actions:

- All construction activities to comply with the NWA.
- Water for construction purposes will be sourced directly from watercourses on site and groundwater (boreholes) will also be utilised. Water tankers will also supply water to the site.
- Prevent leakages from pipes or taps.
- Establish a dedicated vehicle maintenance area and wash-bay, where suitable storm water management measures are in place to prevent pollution.
- Manage storm water from construction site to avoid environmental contamination and erosion.
- Storm water runoff from workshops, vehicle maintenance area, wash-bay and other potential pollution sources shall be collected and treated in hydrocarbon separation pits/tanks before discharged to drains and waterways.
- 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.
- Prevent erosion on access roads due to construction traffic.

Responsibilities:

- Engineer and ECO – to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Water monitoring programme – water use and discharges.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.12 Management of Topsoil

Management Objective:

Ensure suitable removal, storage, and transportation of topsoil for re-use during rehabilitation.

Target:

1. At least 95% of recovered topsoil from disturbed areas is to be stored for future use.
2. No visual evidence of erosion from topsoil stockpiles.
3. No visual evidence of erosion from areas where topsoil has been reinstated.

Management Actions:

- 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Condition of topsoil stockpiles.
- Dust monitoring.
- Rehabilitated areas.
- Contractor's method statement.

Implementation Timeframe:

Prior to site clearing up to when topsoil is used for rehabilitation.

*12.4.13 Management of Excavations***Management Objective:**

Minimise environmental impacts associated with excavations.

Target:

1. No damage to sensitive environmental features outside construction area during excavations.
2. No harm to people or animals as a result of excavations.

Management Actions:

- 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Barricading of excavations.
- Excavation register.
- Contractor's method statement.

Implementation Timeframe:

Prior to excavations up to reinstatement.

*12.4.14 Management of Storage and Handling of Non-Hazardous Material***Management Objective:**

Effective and safe management of materials on site, in order to minimise the impact of non-hazardous materials on the environment.

Target:

1. No pollution due to handling, use and storage of non-hazardous material.

Management Actions:

- Materials to be suitably stored to prevent environmental contamination and visual impacts. Storage requirements to be determined based on chemical qualities of material and MSDS.
- Where required, stored material to be protected from rain and run-off to avoid environmental contamination.
- Materials to be appropriately transported to avoid environmental contamination.
- Loose loads (e.g. sand, stone chip, refuse, paper and cement) to be covered when vehicles travel on public roads.
- Suitable remedial measures, depending on the nature of the contaminant and the receiving environment, to be instituted for spillages.
- Materials to be suitably used to prevent environmental contamination.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- MSDS register.
- Contractor's method statement.

Implementation Timeframe:

Period during which materials are stored and handled on site.

12.4.15 Management of Storage and Handling of Hazardous Material

Management Objective:

Ensure the protection of the natural environment and the safety of personnel on site, by the correct management and handling of hazardous substances.

Target:

1. No pollution due to handling, use and storage of hazardous material.
2. In the event of a spill, appropriate containment, clean up and disposal of contaminated material. Spills to be cleaned within 24 hours.

Management Actions:

- 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.
- 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.
- Proper and timeous notification of any pollution incidents associated with hazardous materials.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- MSDS register.
- Training register.
- Disposal certificates.
- Contractor's method statement.

Implementation Timeframe:

Period during which hazardous materials are stored and handled on site.

*12.4.16 Management of Waste***Management Objective:**

- Minimise negative environmental impacts associated with waste.
- Apply waste management principles to prevent, minimise, recycle or re-use material, with disposal as a last option.

Target:

1. No littering on construction site.
2. Maintain a clean and tidy construction site.
3. A 100% record of all waste generated and disposed of at waste disposal facilities.
4. Valid disposal certificates for all waste disposed.
5. Provision of adequate waste containers that are easily accessible and maintained.
6. Waste bins are to be removed and cleaned weekly.

Management Actions:

- Waste management activities must comply with the NEM:WA.

- 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 shall 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 shall 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Waste register.
- Recycling targets.
- Disposal certificates.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

*12.4.17 Management of Blasting***Management Objective:**

Minimise environmental impacts associated with blasting.

Target:

1. Compliance with blasting-related legislation and standards.
2. No blasting-related impacts to private property, livestock, wildlife or human health.

3. Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels.

Management Actions:

- Prior to commencing with blasting activities, the blasting Contractor should submit a Method Statement which should comply with the Explosives Regulations (2003) and all relevant SANS standards and health and safety standards for mitigating blasting.
- The Contractor shall 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 shall 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Noise and vibration levels.
- Public complaints register.
- Contractor's method statement.

Implementation Timeframe:

Prior to blasting up to safe completion of blasting.

12.4.18 Management of Workshop and Equipment

Management Objective:

Minimise environmental impacts associated with workshops and equipment use.

Target:

1. No environmental contamination associated with workshops and equipment use.

Management Actions:

- Maintenance of equipment and vehicles will be performed in such a manner so as to avoid any environmental contamination (e.g. use of drip trays).
- No washing of plant may occur on the construction site. Plant to be washed in dedicated areas.
- Drip trays will be provided for the stationary plant and for the "parked" plant.
- All vehicles and equipment will be kept in good working order and serviced regularly. Leaking equipment will be repaired immediately or removed from the site.
- Suitable storage and disposal of hydraulic fluids and other vehicle oils (see section on *Management of Storage and Handling of Hazardous Material*).
- Wastewater from workshop to be disposed in accordance with the EMPr section on *Management of Water*.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- Water monitoring programme – discharges.
- Training register.
- Contractor's method statement.

Implementation Timeframe:

- Period from when the workshop is created up to de-establishment.
- Period during which equipment is utilised.

12.4.19 Management of Pollution Generation Potential

Management Objective:

Ensure that all possible causes of pollution are mitigated as far as possible to minimise impacts to the surrounding environment.

Target:

1. No verified complaints regarding pollution.
2. No measurable signs of pollution.
3. Dust fallout -
 - a. Fenceline 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.
2. Particulate matter (PM₁₀) -
 - a. 24 hr = 120 µg/m³ (more than four times a year);
 - b. Annual = 50 µg/m³;
 - c. Comply with the National Ambient Air Quality Standards.
3. Noise -
 - a. L_{Aeq} (equivalent continuous sound level) during daytime hours (06:00 to 22:00) = 45 dBA;
 - b. L_{Aeq} during night-time hours (22:00 to 06:00) = 35 dBA;
 - c. Comply with SANS 10103:2008.
4. Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels.
5. Water quality – construction activities must be limited to high flow season and may not cause an adverse impact that results in more than a 10% change in baseline values.
6. All water discharges to comply with legal requirements associated with the NWA, including GN No. 399.

Management Actions:

- **Noise** -
 - 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 shall be monitored at the nearest sensitive receptor and where the noise is generated.
 - 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.
 - Standardised noise measurements should be carried out on individual equipment at the delivery to site to construct a reference data-base and regular checks carried out to

ensure that equipment is not deteriorating and to detect increases which could lead to increase in the noise impact over time and increased complaints.

- Environmental noise monitoring should be carried out at regularly to detect deviations from pre noise levels and enable corrective measures to be taken where warranted.

▪ **Dust** -

- 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, borrow pits, 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, pre-notification of affected parties).

▪ **Lights** -

- 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).

▪ **Erosion** -

- Protect areas of the construction site that are susceptible to erosion (e.g. steep sections), through suitable measures (e.g. watering, planting, retaining structures, commercial anti-erosion compounds).
- Any erosion channels caused by construction activities to be suitably stabilised and rehabilitated.
- All efforts to prohibit ponding on surface and ensure storm water runoff is channelled from the site must be made. The method used will be appropriate to the expected storm water flows and the topography and geology of the site.

▪ **Cement and Concrete Batching** -

- 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.
- Wastewater from batching operations to be disposed in accordance with the EMPr 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 waste water 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.
- Contractor to conduct environmental monitoring for air quality (dust and PM₁₀), noise and water quality.

Monitoring Requirements:

- Public complaints register.
- Evidence of pollution.
- Review periodic results from environmental monitoring (water quality, groundwater, noise, vibration, air and dust).
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

*12.4.20 Management of Flora***Management Objective:**

- Manage impacts to protected flora species within the construction domain.
- Preserve protected flora species outside of the construction domain.
- Control alien plants and noxious weeds.

Target:

1. No unpermitted disturbance to protected flora species.
2. Ongoing eradication of alien plants and noxious weeds.

Management Actions:

- Implement a Biodiversity Protection Policy.
- 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.
- Search, rescue and relocation of red data, protected and endangered flora species affected by construction.
- 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 brush-cutters as opposed to earth-moving equipment, where practicable and economical.
- 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.
- Eradication method to be approved by the Engineer and ECO.
- Implement a monitoring programme for eradication of alien invasive plants and noxious weeds.
- 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.
- Ensure that all construction personnel have the appropriate level of environmental awareness and competence. Photographs of protected and sensitive flora species must be displayed in the construction camp to heighten awareness.
- 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.
- See requirements in EMPr for additional control measures for the protection of flora –
 - *Specialist Environmental Investigations;*
 - *Approvals, Permits and Licensing Requirements;*
 - *Construction Site Planning and Layout;*
 - *Environmental Awareness Creation;*
 - *Site Clearing;*
 - *Site Establishment;*
 - *Management of Topsoil;*
 - *Management of Flora;* and
 - *Management of Reinstatement and Rehabilitation.*

Responsibilities:

- Proponent - acquire permits.
- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Permits.
- Targets and objectives established as part of the search, rescue and relocation efforts.
- Barricading of protected flora species.
- Encroachment of alien invasive plants and noxious weeds.
- Successful rehabilitation.
- Contractor's method statement.

Implementation Timeframe:

From pre-construction phase up to end of defects liability period (as relevant for specific management actions).

12.4.21 Management of Fauna

Management Objective:

- Ensure the protection of animals (including wildlife and livestock).
- Adhere to agreements made with landowners and community members regarding animals.

Target:

1. No direct / indirect harm to animals from construction activities.
2. No deviations from agreements made with individual landowners and community members regarding animals.

Management Actions:

- 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.
- 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.
- 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.
- 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.
- 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.
- No trapping or any other method of catching of any animal may be performed on site.
- Illegal hunting is prohibited.
- Measures to safeguard the bat cave in the Mooivallei area:
 - No damage to the bat caves in the Mooivallei area due to construction activities;
 - Determine the risk to the bat cave (subterranean chambers) in Mooivallei area based on outcomes of the geotechnical investigations;

- 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 Mooivallei area (cave) shall 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.; and
- Toolbox talks should be provided to contractors regarding disturbance to bats.
- Animals residing within the designated area shall not be unnecessarily disturbed.
- Toolbox talks should be provided to contractors regarding disturbance to animals.
- Measures for wildlife farming and wildlife ranching -
 - All breeding camps must have a protective buffer zone adjacent to the fence line of the construction servitude. This must be implemented by the landowner and claimed for.
 - Erect new fences on both sides of the pipeline construction corridor and secure wildlife on wildlife ranches and farms;
 - 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.
 - 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.
 - Disruption of activities by functional wildlife enterprises must be avoided, if possible.
 - 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.

- See requirements in EMPr for additional control measures for the protection of fauna –
 - *Specialist Environmental Investigations;*
 - *Approvals, Permits and Licensing Requirements;*
 - *Construction Site Planning and Layout;*
 - *Environmental Awareness Creation;*
 - *Site Clearing;*
 - *Site Establishment;*
 - *Management of Access and Traffic;*
 - *Management of Topsoil;* and
 - *Management of Reinstatement and Rehabilitation.*

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Proponent - acquire permits.
- Permits.
- Contractor's method statement.

Implementation Timeframe:

From pre-construction phase up to end of defects liability period (as relevant for specific management actions).

12.4.22 Management of Watercourses

Management Objective:

- 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).
- Existing Water Uses (as defined in the NWA) not to be affected.
- Structure and functions of watercourses affected by construction activities to be returned to pre-construction state.

Target:

1. Unaltered downstream flow regime for watercourses affected by construction activities.

2. Downstream water quality to remain within acceptable ranges, as determined through baseline monitoring.
3. Existing Lawful Water Uses in accordance with NWA not to be affected.
4. EWR in accordance with NWA for the Crocodile River (West) and Matlabas River to be satisfied during the construction period.

Management Actions:**▪ General -**

- Include mitigation measures identified as part of environmental sensitivity walk down survey.
- Construction areas should be demarcated and watercourses marked as “restricted” in order to prevent the unnecessary impacts to these systems.
- Storm water channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion.
- See requirements in EMPr for additional measures to manage impacts to watercourses, including -
 - *Specialist Environmental Investigations;*
 - *Approvals, Permits and Licensing Requirements;*
 - *Construction Site Planning and Layout;*
 - *Management of Water;*
 - *Management of Pollution Generation Potential;* and
 - *Management of Reinstatement and Rehabilitation.*

▪ Flow -

- Construction activities shall 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
- Minimise construction footprint where the construction activities take place in-stream or in close proximity to watercourses.
- Prevent erosion on steep slopes.
- Minimise influence to downstream flow regime when diverting and impeding flow for cofferdams, temporary river crossings or for any other purposes.
- Do not hinder flow in natural drainage lines.
- Construction activities not to adversely interfere with downstream water users.

• River morphology -

- Reinstatement (shaping) and rehabilitate (riparian vegetation) affected areas in riparian zone and watercourse channel. Structure and function to be returned to pre-construction state.
- 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 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.
- **Water quality** -
 - Undertake water quality monitoring and biomonitoring in the affected watercourses.
 - All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area.
 - Storage area and ablution facilities not to be located closer than 30m from edge of riparian habitat.
 - Where necessary, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be 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 unnaturally 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). These are to be serviced regularly and removed when no longer in use. Materials can be re-used.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Review periodic results from water quality monitoring and biomonitoring.
- Erosion monitoring.
- Contractor's method statement.
- Conditions of WUL

Implementation Timeframe:

- Measures pertaining to the general protection of water resources - throughout the duration of the construction period.

- Measures pertaining to working within the riparian zones of watercourses - prior to watercourse crossings up to reinstatement and rehabilitation of affected watercourses.

12.4.23 Management of Heritage Features

Management Objective:

Comply with legislative requirements with regards to archaeological and cultural resources, as well as graves.

Target:

1. No archaeological and cultural resources or graves to be damaged during construction.

Management Actions:

- Include mitigation measures identified as part of environmental sensitivity walk down survey.
- Search, rescue and relocation of heritage sites affected by construction.
- Incorporate findings from the Phase 1 palaeontology assessment be undertaken along the Central Route.
- 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 CRE 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.
- The site-specific mitigation measures provided for below from the Heritage Impact Assessment (PSG Heritage, 2018) 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.
 - MCWAP Site 2 and 3 -
 - A grave relocation process must be undertaken.

- A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin in order to obtain their consent for the relocation.
- Bilingual site and newspaper notices indicating the intent of the relocation.
- Permits from all the relevant and legally required authorities.
- An exhumation process that keeps the dignity of the remains and family intact.
- An exhumation process that will safeguard the legal rights of the families as well as that of the mining company.
- The process must be done by a reputable company well versed in the mitigation of graves.
- MCWAP Site 8 -
 - An archaeological watching brief must be implemented during the construction phase. This watching brief is aimed at monitoring the construction and excavation work for any subterranean archaeological deposits and features which may be exposed during these development activities.
 - The above-mentioned watching brief must be implemented for all construction work undertaken within 100m of the position of MCWAP Site 8.
- MCWAP Site 9 -
 - The site must be recorded with photographs and a layout plan.
 - A permit application must be lodged with the SAHRA to allow for the subsequent mitigation measures to be implemented.
 - Once the permit is received, archaeological mitigation of the site can be undertaken. Such archaeological mitigation may include Surface Collection, Shovel Test Pits and archaeological excavation. These techniques will be used to further assess and interpret the site.
 - A Phase 2 Archaeological Mitigation report must be compiled.
 - The abovementioned report and destruction permit application must be lodged with SAHRA.
 - The mitigation proposed here may only be undertaken under the auspices of a suitably qualified and experienced archaeologist.

Responsibilities:

- Proponent - acquire permits.
- Proponent - appoint Palaeontologist and Heritage Specialist.
- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Permits.
- Contractor's method statement.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.24 Management of Emergency Procedures**Management Objective:**

Minimise environmental impacts associated with emergency procedures.

Target:

1. Approved emergency response procedures, where relevant.
2. No site fires to be caused by construction activities and workers.

Management Actions:

- **Fire** -
 - 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.
- **Accidental Leaks and Spillages** -
 - 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.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Contractor to implement management actions.

Monitoring Requirements:

- Approved Emergency Response Plan.
- Training and awareness creation records.
- Signage displayed.
- Contractor's method statement.
- Incident Register and Report.

Implementation Timeframe:

Throughout the duration of the construction period.

*12.4.25 Management of Health and Safety***Management Objective:**

Provide a safe working environment to construction workers and the public.

Target:

1. Approved Health and Safety Plan.
2. No incidents.
3. Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993), Construction Regulations (2014) and other relevant regulations.

Management Actions:

- 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.
- Contractors should establish HIV/AIDs awareness programmes at their site camps.
- Put in place a monitoring system to monitor health risks throughout the life of the project.

Responsibilities:

- Engineer and ECO - to monitor compliance.
- Dedicated Occupational Health and Safety system to be implemented by Contractor's Safety Officer. To be monitored and audited by the Client's Safety Agent, in terms of the Construction Regulations (2014).
- Contractor to implement management actions.

Monitoring Requirements:

Occupational Health and Safety system – checked by Safety Agent.

Implementation Timeframe:

Throughout the duration of the construction period.

12.4.26 Management of Reinstatement and Rehabilitation**Management Objective:**

- Adequate reinstatement and rehabilitation of construction areas.
- Conduct concurrent or progressive rehabilitation of areas affected by construction activities.

Target:

1. Complete site clean-up.
2. Reinstatement and rehabilitate areas disturbed by construction activities.

Management Actions:

- Rehabilitation Management Plan to be developed, which will include additional measures identified during construction to supplement the reinstatement and rehabilitation provisions included in the EMPr. Targets to be specified for re-growth.
- Ensure that rehabilitation is in line with the surrounding natural environment and pre-construction state of the affected area.
- Cordon off areas that are under rehabilitation as no-go areas.
- **Removal of structures and infrastructure** -
 - 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.
- **Inert waste and rubble** -
 - 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 shall be reinstated and rehabilitated.
 - Load and haul excess spoil and inert rubble to fill in borrow pits/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.
- **Domestic waste** -
 - Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.
- **Hazardous waste and pollution control** -
 - 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.
 - Comply with relevant provisions under the following EMPr sections –
 - *Management of Storage and Handling of Hazardous Material;*
 - *Management of Water;*
 - *Management of Waste;* and
 - *Management of Pollution Generation Potential.*
- **Final shaping** -
 - Make safe all dangerous excavations by backfilling and grading, as required.
 - 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.
- **Topsoil replacement and soil amelioration** -
 - 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.
 - Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
 - 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.
 - Ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.
 - Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.
 - After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.
- **Ripping and scarifying** -
 - Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary it will be based on the site conditions immediately before these works commence.
 - Rip and/or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the works.
 - Rip and/or scarify along the contour to prevent the creation of down-slope channels.
 - Do not rip and/or scarify areas under wet conditions, as the soil will not break up.
- **Planting** -
 - All plant species for use by the project must be reviewed and approved by qualified specialists prior to use on site.
 - Revegetation must match the vegetation type which previously existed, unless otherwise indicated by a suitable specialist.

- Although the use of indigenous vegetation is promoted, where there is a risk of soil erosion (e.g. steep slopes) a suitable specialist must be consulted to determine the most appropriate stabilisation measures.
- Transplanted plants -
 - 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.
- Nursery plants -
 - 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 during the rainy season.
 - After planting, each plant must be well watered, adding more soil upon settlement if necessary.
 - Establish further specifications for nursery plants.
- Seeds and seedlings -
 - 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.
 - 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.
- **Grassing** -
 - 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.

Implementation Timeframe:

Throughout the duration of the construction period, as relevant to the concurrent or progressive reinstatement and rehabilitation of affected areas. Up to end of defects liability period.

12.5 Operational Phase

Where relevant, all management actions are to be carried forward from the construction phase to the operation phase. Specific management measures for the operation phase follow:

12.5.1 Management of Access, Routine Maintenance Inspections and Maintenance Works

Management Objective:

- 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.

Target:

1. 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.
2. Prior notification of affected landowners of operation and maintenance activities.
3. No reports of operation and maintenance vehicles using unauthorised access points and routes.
4. No verified complaints regarding poor practices during operation and maintenance.

Management Actions:

- 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 of operation and maintenance activities.
- 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.
- 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.

- 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 EMPr 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.

Responsibilities:

- Applicant / Operator - to monitor compliance and implement management actions.

Monitoring Requirements:

- Public complaints.
- Unauthorised access to private property.
- Verified damage to private property.
- Evidence of erosion.

12.5.2 Management of Leaks

Management Objective:

Ensure leaks are detected and repaired.

Target:

Timeous detection and repairing of leaks.

Management Actions:

Routine inspection to include detection and timeous repairs of leaks.

Responsibilities:

Applicant / Operator - to monitor compliance and implement management actions.

Monitoring Requirements:

Leak detection and repair system.

12.5.3 Management of Pipeline Scouring

Management Objective:

Prevent environmental impacts associated with scouring.

Target:

1. No visible signs of erosion channels caused by scouring.
2. No de-stabilisation of river morphology due to scouring.

Management Actions:

- 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.

Responsibilities:

Applicant / Operator - to monitor compliance and implement management actions.

Monitoring Requirements:

- Evidence of erosion.
- Water quality and aquatic health of Matlabas River (prior to and after scouring events).

12.5.4 Management of Water Resources

Management Objective:

- 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) from operation and maintenance activities.

Target:

1. EWR for the Crocodile River (West) and Matlabas River to be satisfied during the operational phase.

Management Actions:

- 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.
- Monitoring of the sediment levels in the Crocodile River (West) before and after flushing (scouring from desilting works), as necessary, to determine impacts.
- 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.

Responsibilities:

Applicant / Operator - to monitor compliance and implement management actions.

Monitoring Requirements:

- Monitoring programme (water quality, aquatic health, sediment, ground- and surface water interaction).

12.5.5 Management of Flora and Fauna

Management Objective:

- Control alien invasive plant species within the areas acquired for the Government Waterworks.
- Ensure the protection of animals (including wildlife and livestock).

Target:

1. No direct / indirect harm to animals from operation and maintenance activities.
2. No deviations from agreements made with individual landowners and community members regarding animals.

Management Actions:

- 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.

Responsibilities:

Applicant / Operator - to monitor compliance and implement management actions.

Monitoring Requirements:

- Encroachment of alien invasive plants and noxious weeds into the areas acquired for the Government Waterworks.
- Successful rehabilitation.
- Evidence of erosion.

12.5.6 On-going Consultation with Affected Parties

Management Objective:

- 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 servitude terms and conditions.

Target:

1. No justifiable complaints.
2. Deviations from servitude terms and conditions.

Management Actions:

- Establish lines of communications with landowners.
- Establish processes and procedures to effectively verify and address complaints and claims received from IAPs.

Responsibilities:

Applicant / Operator - to monitor compliance and implement management actions.

Monitoring Requirements:

- Public complaints register.

- Agreements with landowners.

12.5.7 Specific Measures for Hartbeespoort Dam

Management Objective:

- On-going communication with the stakeholders and dam users.

Target:

1. Timeous communication and notification of dam users.

Management Actions:

- 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.

Responsibilities:

DWS - to monitor compliance and implement management actions.

Monitoring Requirements:

- Public complaints register.
- Communication records.