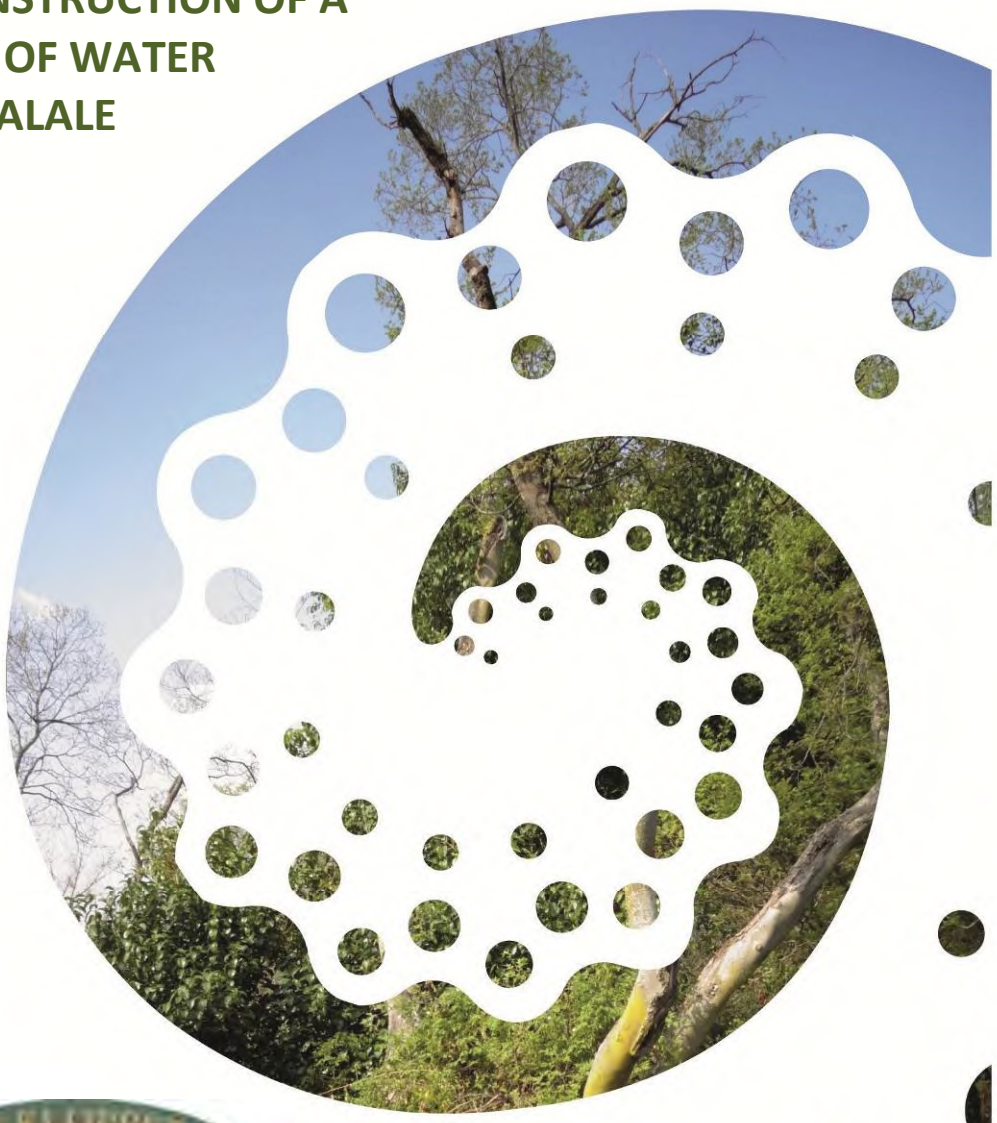
FINAL BASIC ASSESSMENT REPORT FOR THE PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER VAALWATER AREA LEPHALALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE



SUBMITTED TO:

Limpopo Department of Economic Development, Environment & Tourism

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APPLICANT:

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February 2021

EXECUTIVE SUMMARY

Introduction

SPOOR Environmental Services (PTY) Ltd. was appointed by Joe Kloppers as the Environmental Assessment Practitioner to manage the Environmental Management process relevant to the construction and operation of a proposed new dam for the storage of water for irrigation.

Locality

The subject property is located approximately 20km northwest of the town Vaalwater, Limpopo Province, South Africa and falls under the jurisdiction of the Lephalale Local Municipality as well as the Waterberg District Municipality. The proposed dam extends over portion 2 of the Farm Doornspruit 215 KQ, which falls within the Vaalwater area and the Lephalale Local Municipality. The project furthermore falls in the A42E quaternary drainage region (QDR) of the Limpopo Water Management Area (WMA). Access to the property are gained via the R517 which runs on the southern border of the application area.

Project Description

The proposed project constitute the storing of the existing lawful water allocation in a dam on Portion 2 of the Farm Doornspruit 215KQ. The proposed dam is for the purposes of agricultural irrigation. The proposed infrastructure includes;

- Dam with a capacity of 52 000m³;
- Dam area of 1, 725 hectares;
- Maximum dam wall height of 4,73m;
- Service spillway on the dam crest and associated outlet infrastructure.

Study Methodology

The approach adopted in compiling the Basic Assessment Report for the proposed project was to discuss the development in terms of its bio-physical and socio-economic components by means of reconnaissance site surveys as well as desktop evaluations. Key environmental issues were identified by superimposing the proposed activities on the existing site environment. Where relevant, alternatives for this phase of the project were compared and evaluated in terms of their anticipated impacts. Interested and affected parties were provided with the Draft Basic Assessment Report intended development along with the relevant authorities. The Limpopo Department of Economic Development, Environment and Tourism will now be consulted to obtain the environmental authorization and their recommendations.

In short, this Basic Assessment Report will describe the following:

- The background to the project;
- a detailed description of the proposed scope of the project;
- The relevant legislation and guidelines that were considered in preparation of the Basic Assessment Report;
- a description of the properties on which the proposed activity is to be located;
- a description of the environment that may be affected by the project which will include all current physical, biological, social, economic, and cultural aspects of the receiving environment;
- details of the public participation process conducted;
- a description of all feasible and reasonable alternatives;
- identification of all physical, biological, social, economic, and cultural environmental impacts of the proposed development on the receiving environment as well as the recommended mitigation measures to reduce any anticipated impacts.

Public Participation

The public participation process which was followed was conducted as set forth in Chapter 6 of the amended Environmental Impact Assessment Regulations, GN No 326 of the NEMA (Act No. 107 of 1998 as amended. A summary of all the comments received by interested and affected parties, as well as the response from the environmental practitioner is included in the comments and response report.

Alternatives

The Following alternatives were considered:

- **Location Alternative:**
  - The original position of the proposed dam was designed to be outside of the 1:100 year floodline and the 30m buffer from the Sterkstroom River. The specialist delineated the riparian edge of the river and determined that the dam position be moved another 30m further, to be outside of the 30m riparian edge buffer. Ultimately, the proposed dam location was moved 15m outside of the riparian buffer. The reason for this is that a further move to the south would move the proposed excavation of the dam into a rocky embankment which would make the proposed dam uneconomic from a construction cost point of view.
- **Scheduling Alternative:**
  - The construction phase of the project will involve site clearing and earth moving. This will cause loose top soils, which may result in silt laden stormwater runoff during downpours and associated degradation of water quality in local water bodies. For this reason, the construction phase of the project must be scheduled (as far as this is possible) to take place during the winter months when there will be less precipitation and therefore less runoff across the site.

Environmental Impacts Identified

Anticipated impacts have been identified and described because of the abovementioned processes and the pertinent impacts are summarized in the table below.

Impact Summary

Potential Impacts	Impact Significance with Mitigation
Geology and Soils:	
❖ Possible scouring and erosion ❖ Possible loss of topsoils ❖ Contaminations	Low Low Low
Hydrology:	
❖ ELU volumes ❖ Surface water contaminations ❖ Sedimentation and siltation	Low Low Low
Stormwater Management:	
❖ Erosion and siltation	Low
Fauna and Flora	
❖ EWR	Medium

Potential Impacts	Impact Significance with Mitigation
❖ Riverine habitat deterioration and loss ❖ Proliferation of alien vegetation	Medium Low
Operational Maintenance	
❖ Damage to and river areas and stormwater infrastructure as a result of lacking operational maintenance	Medium
Local Employment:	
❖ Additional local job opportunities	High (positive)

Comprehensive mitigation measures were developed for each of the identified impacts and are described in detail in Section E of this Report.

Conclusion

South Africa is situated in a semi-arid region and as such, is classified as a water-scarce country. Due to the high variability in availability of river water, storage needs to be implemented in order to assure the water availability for crop irrigation during dry-spells. In addition, the Limpopo Employment, Growth and Development Plan (LEGDP), which culminates from the revision of the Provincial Growth and Development Strategy (PGDS), includes the policy framework that contains the strategic vision of the province with the aim of growing the economy and enhancing sustained economic growth and job creation.

The Joe Kloppers farming operations is one of a number of other irrigation farms in the area where pivot irrigation is used for crop farming. In terms of the ecological impacts, the specialist Ecologist reported that the irrigation dam are not situated in an on-stream position of a sensitive watercourse. The riverine area has been identified and the proposed dam has been moved outside of this area with a buffer of 15m. In addition, calculations made by the specialist Hydrologist indicated that the Ecological water reserve (EWR) for this reach of the Sterkstroom river is exceeded by some margin. The Hydrologist reported that there is adequate information that points to a possible problem with the EWR calculations for the Sterkstroom and that this would need to be revisited by the Department of Water and Sanitation (DWS) to determine accurate EWR volumes. Furthermore, simulated irrigation requirements for the Kloppers farming operations falls within the low to average use scenarios with the maximum use scenario exceeding the water volume available for irrigation from this reach of the Sterkstroom River.

Irrigation requirement calculations for this study were simulated from the WRSM/Pitman models which has been setup to simulate the monthly runoff for the Sterkstroom River, for the period of October 1920 to September 2010, as part of the Water Resources of South Africa, 2012 Study (WR2012) (Bailey and Pitman, 2015). The model has been calibrated on river flow gauge A4H008 on the Sterkstroom River in the vicinity of the study area. The legislated addition of water meters on all the water pumps extracting water from the Sterkstroom River for the Joe Kloppers farming operations will now serve to measure the actual water use for the various farm portions. This will provide real time data that the Joe Kloppers farming operations can use to ensure that it stays within the ELU limits.

To ensure that water use stays within the EWR and ELU limits on a farm by farm basis is critical. Firstly, for the purposes of safeguarding the required water volumes in the Sterkstroom, to allow this river system to function on optimal ecological levels, and secondly to permit water users to use their lawful use volumes. Should there not be enough water to allow for the EWR requirements in the Sterkstroom river, it will have almost immediate negative implications. These include socio ecological impacts such as reduced water availability and reduced water quality.

The reverse of the above scenario is a situation where all the stakeholders, from the Farmer to the WUA to the local and district Municipalities, the provincial Authorities and the DWS WMA Managers, perform their duties responsibly to ensure sustainable water availability for the river system itself and all the lawful water users, in the long term.

In the light of the environmental data described, issues investigated and discussions with interested and affected parties, it is believed that the Environmental Impact Management Process is completed for this Phase of the impact assessment. It will be imperative to implement the mitigation measures and recommendations stipulated by this Basic Assessment Report and the various specialist studies. These mitigation measures and recommendations are included and refined in the Environmental Management Programme of which adherence must form part of the operational stage management stakeholders (Farmer, LDEDET, DWS, the local Water User Association (WUA) etc..

TABLE OF CONTENTS

ABBREVIATIONS

CBA	-	Critical Biodiversity Area
CLO	-	Community Liaison Officer
COIDA	-	Compensation for Occupational Injuries and Diseases Act (No 130 of 1993)
DWS	-	Department of Water and Sanitation
EAP	-	Environmental Assessment Practitioner
ECA	-	Environment Conservation Act
ECO	-	Independent Environmental Control Officer acting on behalf of the Client
EIA	-	Environmental Impact Assessment
ELU	-	Existing Lawful Use
EMPr	-	Environmental Management Programme
ESA	-	Ecological Support Area
EWR	-	Ecological Water Requirement
H&S Rep	-	Health and Safety Representative
IEM	-	Integrated Environmental Management
IDP	-	Integrated Development Plan
I&AP	-	Interested and Affected Parties
LLM	-	Lephalale Local Municipality
MAMSL	-	Metres Above Mean Sea Level
NEMA	-	National Environmental Management Act
NEMBA	-	National Environmental Management Biodiversity Act
NEMWA	-	National Environmental Management Waste Act
NFEPA	-	National Freshwater Ecosystems Priority Areas
NHRA	-	National Heritage Resources Act (Act 25 of 1999)
NWA	-	National Water Act (Act 36 of 1998)
OHS	-	Occupational Health and Safety
OHS Act	-	Occupational Health and Safety Act (No 85 of 1993)
PC	-	Principal Contractor
PHRA	-	Provincial Heritage Resources Authority
PM	-	Project Manager
PPE	-	Personal Protective Equipment
QDR	-	Quaternary Drainage Region
QDSG	-	Quarter Degree Square Grid
SABS	-	South African Bureau of Standards
SAHRA -	-	South African Heritage Resources Agency
SANS	-	South African National Standards
SDF	-	Spatial Development Framework
SHE	-	Safety, Health and Environment
SME	-	Small and Medium Enterprise
SSC	-	Species of Special Concern
TDS	-	Total Dissolved Solids
WDM	-	Waterberg District Municipality
WMA	-	Water Management Area
WUA	-	Water Users Association
WULA	-	Water Use Licence Application

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM

BASIC ASSESSMENT REPORT - EIA REGULATIONS, 2014

Basic Assessment report in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

File Reference Number:	
	(For official use only)
NEAS Reference Number:	
Date Received:	
Due date for acknowledgement:	
Due date for acceptance:	
Due date for decision	

Kindly note that:

1. The report must be compiled by an independent Environmental Assessment Practitioner.

2. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.

3. Where applicable **tick** the boxes that are applicable in the report.

4. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the Department of Economic Development, Environment and Tourism as the competent authority (Department) for assessing the application, it may result in the rejection of the application as provided for in the regulations.

5. An incomplete report may be returned to the applicant for revision.

6. Unless protected by law, all information in the report will become public information on receipt by the department. Any interested and affected party should be provided with the information contained in this report on request, during any stage of the application process.

7. The Act means the National Environmental Management Act (No. 107 of 1998) as amended.

8. Regulations refer to Environmental Impact Assessment (EIA) Regulations of 2014.

9. The Department may require that for specified types of activities in defined situations only parts of this report need to be completed. No faxed or e-mailed reports will be accepted.

10. This application form must be handed in at the offices of the Department of Economic Development, Environment and Tourism:-

Postal Address:	**Physical Address:**
Central Administration Office Environmental Impact Management P. O. Box 55464 **POLOKWANE** 0700	Central Administration Office Environmental Affairs Building 20 Hans Van Rensburg Street / 19 Biccard Street **POLOKWANE** 0699
Queries should be directed to the Central Administration Office: Environmental Impact Management:- **For attention:** Mr E. V. Maluleke **Mobile:** 082 947 7755 **Email:** malulekeev@ledet.gov.za	

VIEW THE DEPARTMENT'S WEBSITE AT HTTP://WWW.LEDET.GOV.ZA/ FOR THE LATEST VERSION OF THE DOCUMENTS.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section?

YES	NO
	X

If YES, please complete the form entitled "Details of specialist and declaration of interest" or appointment of a specialist for each specialist thus appointed:

Any specialist reports must be contained in Appendix D.

1. ACTIVITY DESCRIPTION

Describe the activity, which is being applied for, in detail[1]:

The application constitute the storing of the existing lawful water allocation in a dam on Portion 2 of the Farm Doornspruit 215KQ. The proposed dam is for the purposes of agricultural irrigation. The proposed infrastructure includes;

- Dam with a capacity of 52 000m³;
- Dam area of 1, 725 hectares;
- Maximum dam wall height of 4,73m;
- Service spillway on the dam crest and associated outlet infrastructure.

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) the property on which or location where it is proposed to undertake the activity;

(b) the type of activity to be undertaken;

(c) the design or layout of the activity;

(d) the technology to be used in the activity;

(e) the operational aspects of the activity; and

(f) the option of not implementing the activity.

Describe alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The

[1] Please note that this description should not be a verbatim repetition of the listed activity as contained in the relevant Government Notice, but should be a brief description of activities to be undertaken as per the project description.

determination of whether site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the Department may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

Paragraphs 3 – 13 below should be completed for each alternative.

3. ACTIVITY POSITION

Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees, minutes, and seconds. The projection that must be used in all cases is the Hartebeeshoek 94 WGS84 spheroid in a national or local projection.

List alternative sites, if applicable.

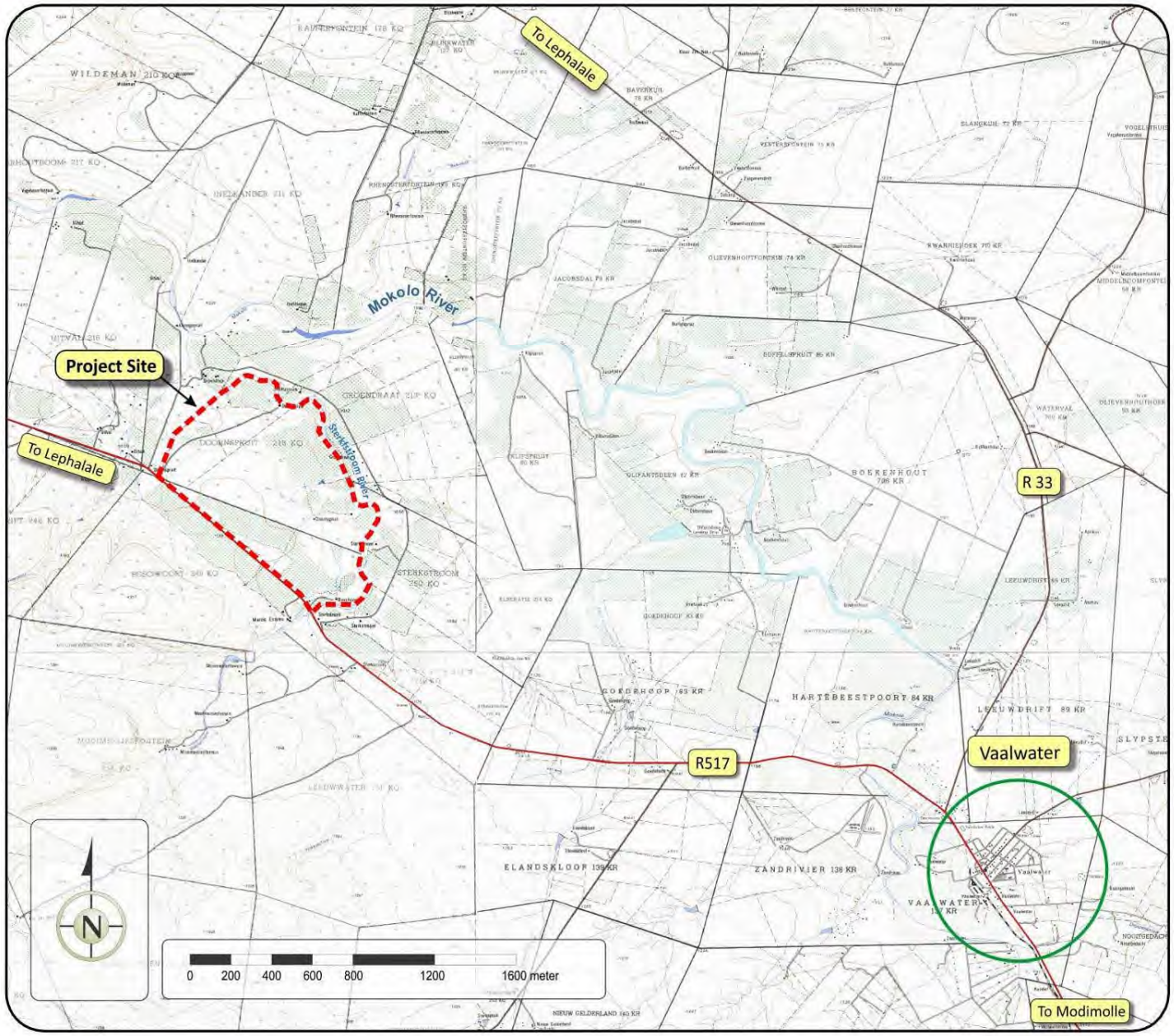
	Latitude (S):			Longitude (E):		
Alternative:						
Alternative S1[2] (preferred or only site alternative)	24˚	11'	52.83"	27˚	57'	32.05"
Alternative S2 (if any)	24˚	11'	53.40"	27˚	57'	31.81"
Alternative S3 (if any)	°	'	"	°	'	"

In the case of linear activities:

Alternative:	**Latitude (S):**			**Longitude (E):**		
Alternative S1 (preferred or only route alternative)						
• Starting point of the activity	°	'	"	°	'	"
• Middle/Additional point of the activity	°	'	"	°	'	"
• End point of the activity	°	'	"	°	'	"
Alternative S2 (if any)						
• Starting point of the activity	°	'	"	°	'	"
• Middle/Additional point of the activity	°	'	"	°	'	"
• End point of the activity	°	'	"	°	'	"
Alternative S3 (if any)						
• Starting point of the activity	°	'	"	°	'	"
• Middle/Additional point of the activity	°	'	"	°	'	"
• End point of the activity	°	'	"	°	'	"

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250 meters along the route for each alternative alignment.

[2] "Alternative S.." refer to site alternatives.



Legend:

Project Site

2427BB Topographical Map Sheets

Project:

Storage of Water in a Dam
Joe Kloppers

Proponent:

Joe Kloppers

Consultant:

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Lynnwoodridge 0040

Figure 1:

Locality Map

Legend:

Project Site

Joe Kloppers
Dam 7 Position
24° 11.876'S 27° 57.519'E

Project:

Storage of Water in a Dam
Joe Kloppers

Proponent:

Joe Kloppers

Consultant:

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Figure 2:

Dam 7 Locality

Legend:

- Original Dam Position Proposal
- Amended Dam Position Proposal to incorporate riverine buffer area

Project:

Storage of Water in a Dam
Joe Kloppers

Proponent:

Joe Kloppers

Consultant:

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Old & New Dam Localities

4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Alternative:	**Size of the activity:**
Alternative A1[3] (preferred activity alternative)	17 250 m^2
Alternative A2 (if any)	
Alternative A3 (if any)	m^2

or,

<u>for linear activities:</u>

Alternative:	**Length of the activity:**
Alternative A1 (preferred activity alternative)	m
Alternative A2 (if any)	m
Alternative A3 (if any)	m

Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Alternative:	**Size of the site/servitude:**
Alternative A1 (preferred activity alternative)	17 250 m^2
Alternative A2 (if any)	
Alternative A3 (if any)	m^2

5. SITE ACCESS

Does ready access to the site exist?	**YES**	**NO**
If NO, what is the distance over which a new access road will be built		m

Describe the type of access road planned:

Existing gravel farm access routes will be used. No new access routes will be constructed.

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

[3] "Alternative A.." refer to activity, process, technology or other alternatives.

6. SITE OR ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document.

The site or route plans must indicate the following:

6.1 the scale of the plan which must be at least a scale of 1:500;
6.2 the property boundaries and numbers of all the properties within 50 metres of the site;
6.3 the current land use as well as the land use zoning of each of the properties adjoining the site or sites;
6.4 the exact position of each element of the application as well as any other structures on the site;
6.5 the position of services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, street lights, sewage pipelines, storm water infrastructure and telecommunication infrastructure;
6.6 all trees and shrubs taller than 1.8 metres;
6.7 walls and fencing including details of the height and construction material;
6.8 servitudes indicating the purpose of the servitude;
6.9 sensitive environmental elements within 100 metres of the site or sites including (but not limited thereto):
- rivers;
- the 1:100 year flood line (where available or where it is required by Department of Water Affairs);
- ridges;
- cultural and historical features;
- areas with indigenous vegetation (even if it is degraded or invested with alien species);

6.10 for gentle slopes the 1 metre contour intervals must be indicated on the plan and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the plan; and
6.11 the positions from where photographs of the site were taken.

7. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix B to this form**.** It must be supplemented with additional photographs of relevant features on the site, if applicable.

8. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of 1:200 as Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

9. ACTIVITY MOTIVATION

a) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	**R1 990 000.00**	
What is the expected yearly income that will be generated by or as a result of the activity?	R Varies	
Will the activity contribute to service infrastructure?	YES	NO
Is the activity a public amenity?	YES	NO
How many new employment opportunities will be created in the development phase of the activity?	20	

What is the expected value of the employment opportunities during the development phase?	R120 000.00
What percentage of this will accrue to previously disadvantaged individuals?	52%
How many permanent new employment opportunities will be created during the operational phase of the activity?	1
What is the expected current value of the employment opportunities during the first 10 years?	R600 000.00
What percentage of this will accrue to previously disadvantaged individuals?	100%

b) Need and desirability of the activity

Motivate and explain the need and desirability of the activity (including demand for the activity):

NEED:			
i.	Was the relevant municipality involved in the application?	YES	NO
ii.	Does the proposed land use fall within the municipal Integrated Development Plan?	YES	NO
iii.	If the answer to questions 1 and / or 2 was NO, please provide further motivation / explanation:		

DESIRABILITY:			
i.	Does the proposed land use / development fit the surrounding area?	YES	NO
ii.	Does the proposed land use / development conform to the relevant structure plans, Spatial development Framework, Land Use Management Scheme, and planning visions for the area?	YES	NO
iii.	Will the benefits of the proposed land use / development outweigh the negative impacts of it?	YES	NO
iv.	If the answer to any of the questions 1-3 was NO, please provide further motivation / explanation:		
v.	Will the proposed land use / development impact on the sense of place?	YES	NO
vi.	Will the proposed land use / development set a precedent?	YES	NO
vii.	Will any person's rights be affected by the proposed land use / development?	YES	NO
viii.	Will the proposed land use / development compromise the "urban edge"?	YES	NO
ix.	If the answer to any of the question 5-8 was YES, please provide further motivation / explanation.		
	The proposed project might set a president in the sense that other farmers in the area will also see the benefit of storage of irrigation water in dams and would therefore want to construct their own dams.		

BENEFITS:			
i.	Will the land use / development have any benefits for society in general?	YES	NO

ii.	Explain:		
	The construction of the proposed dam will enable the farmer to store his legal volume of water abstracted from the Sterkstroom River. This in itself will set a president for the legal abstraction and storage of water. The storage of the irrigation water will contribute to water security for the farmer which will allow him to manage periods of low rainfall and drought more sustainably and to still be able to produce crops. This will in turn contribute to the economic sustainability of the farming operation's value chain and to food security in general.		
iii.	Will the land use / development have any benefits for the local communities where it will be located?	YES X	NO
iv.	Explain:		
	As aforementioned the construction of the proposed dam will contribute to the continued economic sustainability of the whole local value chain related to the crops produced at the farm. In addition, the water storage will also assist in more sustainable agricultural production which will in turn require a more constant workforce. A prolonged agricultural production cycle (compared to one that has to stop as a result of the lack of irrigation, related to dryland production) will also secure more sustained food production for the local and larger area.		

10. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy, or guideline:	Administering authority:	Date:
National Environmental Management Act, 1998 (Act No. 107 of 1998 as amended).	National & Provincial	27 November 1998
National Water Act, 1998 (Act No. 36 of 1998) as amended	National	1998
The National Environmental Management: Biodiversity Act (Act 10 of 2004)	National & Provincial	2004
The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008	National & Provincial	06 March 2008
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEM:AQA)	National & Provincial	2004
National Heritage Resources Act, 1999 (Act No. 45 of 1999 (NHRA)	National & Provincial	April 1999
Occupational Health and Safety Act (No 85 of 1993)	National Department of Labour	23 June 1993
EIA Regulations	National & Provincial	4 December 2014
Waterberg District Municipality Bioregional Plan	Municipal & Provincial	January 2016
Limpopo Conservation Plan Version 2 (LCP_v2)	Provincial	2013

11. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	YES	NO
If yes, what estimated quantity will be produced per month?	100 m^3	

How will the construction solid waste be disposed of (describe)?

Construction waste will comprise mainly of excess spoil material from excavation activities, construction material, general waste from site personnel, and sewage.

Where will the construction solid waste be disposed of (describe)?

Spoil material will be re-used where possible (as backfill or erosion mitigation works) while excess spoil will need to be disposed of off-site. Spoil material will be moved with small tipper trucks to a predetermined spoil site (usually excavated) identified by the contractor (off-site). On closing the spoil site, the area will be covered with a layer of topsoil and re-vegetated.
General waste will be kept in bins within the construction site and will be collected and disposed of on a weekly basis or failing this will be disposed of into a skip and transported to the nearest landfill site. Spent canisters for paints and solvents will be the responsibility of the respective Contractor dispose of at a suitably licensed landfill site or to sub contract to a specialist contractor.

Will the activity produce solid waste during its operational phase?	YES	NO
If yes, what estimated quantity will be produced per month?		m^3

How will the solid waste be disposed of (describe)?

N/A

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?

N/A

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the department to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?	YES	NO

If yes, inform the department and request a change to an application for scoping and EIA.

Is the activity that is being applied for a solid waste handling or treatment facility?	YES	NO

If yes, then the applicant should consult with the Department to determine whether it is necessary to change to an application for scoping and EIA.

b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	YES	NO
If yes, what estimated quantity will be produced per month?		m^3
Will the activity produce any effluent that will be treated and/or disposed of onsite?	Yes	NO

If yes, the applicant should consult with the Department to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?	YES	NO

If yes, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		Cell:	
E-mail:		Fax:	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

N/A

c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere?	YES	NO
If yes, is it controlled by any legislation of any sphere of government?	YES	NO

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If no, describe the emissions in terms of type and concentration:

During construction, there will be localized release of dust due to excavations and the hauling of materials around the site. Localised exhaust emissions will also occur, however a significant increase in concentrations of hydrocarbons, nitrogen oxides and carbon monoxide are not anticipated.

d) Generation of noise

Will the activity generate noise?	YES	NO
If yes, is it controlled by any legislation of any sphere of government?	YES	NO

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If no, describe the noise in terms of type and level:

During construction, there will be localized increases of noise levels as a result of the construction vehicles and personnel. Noise hinderance is not anticipated due to the remoteness of the activity.

12. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es)

municipal	water board	groundwater	river, stream, dam, or lake	other	the activity will not use water
			X		

If water is to be extracted from groundwater, river, stream, dam, lake, or any other natural feature, please indicate

the volume that will be extracted per month: ±26 679.91 m³

Does the activity require a water use permit from the Department of Water Affairs? YES: X NO:

If yes, please submit the necessary application to the Department of Water Affairs and attach proof thereof to this application if it has been submitted.

13. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

The stormwater drainage channels on the farm properties has been designed to channel towards the proposed dam to reduce the volume that needs to be pumped conventionally from the Sterkstroom River

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

None

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. For linear activities (pipelines, etc) as well as activities that cover large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section C and indicate the area, which is covered by each copy No. on the Site Plan.

Section C Copy No. (e.g. A): **0**

2. Paragraphs 1 - 6 below must be completed for each alternative.

3. Has a specialist been consulted to assist with the completion of this section? YES: NO: X

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed:

All specialist reports must be contained in Appendix D.

Property description/physical address: Portion 2 of the Farm Doornspruit 215KQ.

(Farm name, portion etc.) Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application.

N/A

In instances where there is more than one town or district involved, please attach a list of towns or districts to this application.

Current land-use zoning:

Agricultural

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to , to this application.

Is a change of land-use or a consent use application required?	YES	~~NO~~
Must a building plan be submitted to the local authority?	YES	~~NO~~

Locality map:

An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.) The map must indicate the following:

- an indication of the project site position as well as the positions of the alternative sites, if any;
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees, minutes, and seconds. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection)

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative S1:

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S2 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S3 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

2. LOCATION IN LANDSCAPE – APPLICABLE TO ALTERNATIVE S1 AND S2

Indicate the landform(s) that best describes the site:

2.1 Ridgeline		2.6 Plain	
2.2 Plateau		2.7 Undulating plain / low hills	

2.3 Side slope of hill/mountain		2.8 Dune	
2.4 Closed valley		2.9 Seafront	
2.5 Open valley			

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following (tick the appropriate boxes)?

	Alternative S1:		**Alternative S2 (if any):**		**Alternative S3 (if any):**	
Shallow water table (less than 1.5m deep)	YES	~~NO~~	YES	~~NO~~	YES	NO
Dolomite, sinkhole, or doline areas	YES	~~NO~~	YES	~~NO~~	YES	NO
Seasonally wet soils (often close to water bodies)	~~YES~~	NO	~~YES~~	NO	YES	NO
Unstable rocky slopes or steep slopes with loose soil	YES	~~NO~~	YES	~~NO~~	YES	NO
Dispersive soils (soils that dissolve in water)	YES	~~NO~~	YES	~~NO~~	YES	NO
Soils with high clay content (clay fraction more than 40%)	YES	~~NO~~	YES	~~NO~~	YES	NO
Any other unstable soil or geological feature	YES	~~NO~~	YES	~~NO~~	YES	NO
An area sensitive to erosion	~~YES~~	NO	~~YES~~	NO	YES	NO

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. (Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted).

4. GROUNDCOVER

Indicate the types of groundcover present on the site: Applicable to Alternatives S1 and S2

The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition[E]	~~Natural veld with scattered aliens[E]~~	~~Natural veld with heavy alien infestation[E]~~	Veld dominated by alien species[E]	Gardens
Sport field	Cultivated land	Paved surface	Building or other structure	Bare soil

If any of the boxes marked with an "[E] "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner does not have the necessary expertise.

5. LAND USE CHARACTER OF SURROUNDING AREA - APPLICABLE TO ALTERNATIVES S1 AND S2

Indicate land uses and/or prominent features that does currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

5.1 Natural area	X	5.22 School	
5.2 Low density residential		5.23 Tertiary education facility	
5.3 Medium density residential		5.24 Church	
5.4 High density residential		5.25 Old age home	
5.5 Medium industrial [AN]		5.26 Museum	
5.6 Office/consulting room		5.27 Historical building	
5.7 Military or police base/station/compound		5.28 Protected Area	
5.8 Spoil heap or slimes dam [A]		5.29 Sewage treatment plant [A]	
5.9 Light industrial		5.30 Train station or shunting yard [N]	
5.10 Heavy industrial [AN]		5.31 Railway line [N]	
5.11 Power station		5.32 Major road (4 lanes or more)	
5.12 Sport facilities		5.33 Airport [N]	
5.13 Golf course		5.34 Harbour	
5.14 Polo fields		5.35 Quarry, sand or borrow pit	
5.15 Filling station [H]		5.36 Hospital/medical centre	
5.16 Landfill or waste treatment site		5.37 River, stream, or wetland	X
5.17 Plantation		5.38 Nature conservation area	
5.18 Agriculture	X	5.39 Mountain, koppie or ridge	
5.19 Archaeological site		5.40 Graveyard	
5.20 Quarry, sand or borrow pit		5.41 River, stream, or wetland	X
5.21 Dam or Reservoir		5.42 Other land uses (describe)	

If any of the boxes marked with an "[N] "are ticked, how will this impact / be impacted upon by the proposed activity?

N/A

If any of the boxes marked with an "[An]" are ticked, how will this impact / be impacted upon by the proposed activity?

If YES, specify and explain:	N/A
If NO, specify:	

If any of the boxes marked with an "[H]" are ticked, how will this impact / be impacted upon by the proposed activity.

If YES, specify and explain:	N/A
If NO, specify:	

6. CULTURAL/HISTORICAL FEATURES - APPLICABLE TO ALTERNATIVES S1 AND S2

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including	YES	NO
Archaeological or palaeontological sites, on or close (within 20m) to the site?	Uncertain	

If YES, explain:	N/A

If uncertain, conduct a specialist investigation by a recognised specialist in the field to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist:	N/A

Will any building or structure older than 60 years be affected in any way?	YES	NO
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	YES	NO

If yes, please submit or, make sure that the applicant or a specialist submits the necessary application to SAHRA or the relevant provincial heritage agency and attach proof thereof to this application if such application has been made.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT

The person conducting a public participation process must take into account any guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of the application which is subjected to public participation by—

(a) fixing a notice board (of a size at least 60cm by 42cm; and must display the required information in lettering and in a format as may be determined by the department) at a place conspicuous to the public at the boundary or on the fence of—

  (i) the site where the activity to which the application relates is or is to be undertaken; and

  (ii) any alternative site mentioned in the application;

(b) giving written notice to—

  (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;

  (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

  (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

  (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;

  (v) the municipality which has jurisdiction in the area;

  (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and

  (vii) any other party as required by the department;

(c) placing an advertisement in—

  (i) one local newspaper; or

  (ii) any official *Gazette* that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the local municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official *Gazette* referred to in sub regulation 54(c)(ii); and

(e) using reasonable alternative methods, as agreed to by the department, in those instances where a person is desiring of but unable to participate in the process due to—

  (i) illiteracy;

  (ii) disability; or

  (iii) any other disadvantage.

2. CONTENT OF ADVERTISEMENTS AND NOTICES

A notice board, advertisement or notices must:

(a) indicate the details of the application which is subjected to public participation; and

(b) state—

(i) that the application has been submitted to the department in terms of these Regulations, as the case may be;

(ii) whether basic assessment or scoping procedures are being applied to the application, in the case of an application for environmental authorisation;

(iii) the nature and location of the activity to which the application relates;

(iv) where further information on the application or activity can be obtained; and

(v) the manner in which and the person to whom representations in respect of the application may be made.

3. PLACEMENT OF ADVERTISEMENTS AND NOTICES

Where the proposed activity may have impacts that extend beyond the municipal area where it is located, a notice must be placed in at least one provincial newspaper or national newspaper, indicating that an application will be submitted to the department in terms of these regulations, the nature and location of the activity, where further information on the proposed activity can be obtained and the manner in which representations in respect of the application can be made, unless a notice has been placed in any *Gazette* that is published specifically for the purpose of providing notice to the public of applications made in terms of these Regulations.

Advertisements and notices must make provision for all alternatives.

4. DETERMINATION OF APPROPRIATE MEASURES

The practitioner must ensure that the public participation is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees, ratepayers associations and traditional authorities where appropriate. Please note that public concerns that emerge at a later stage that should have been addressed may cause the department to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was inadequate.

5. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments and respond to each comment of the public before the application is submitted. The comments and responses must be captured in a comments and response report as prescribed in these Regulations and be attached to this application. The comments and response report must be attached under Appendix E.

6. AUTHORITY PARTICIPATION

Please note that a complete list of all organs of state and or any other applicable authority with their contact details must be appended to the basic assessment report or scoping report, whichever is applicable.

Authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input.

Name of Authority informed:	Comments received (Yes or No)
Lephalale Local Municipality Department of Environmental Management	No
Department of Water Affairs Limpopo Water Management Area	No
South African Heritage Resources Agency	Yes
Limpopo Department of Rural Development and Land Reform Deputy Director: Capricorn & Waterberg District (REID)	No
Limpopo Department of Agriculture and Rural Development	No
Limpopo Department of Public Works, Roads and Infrastructure	No
Vaalwater SAPS	No

7. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for linear activities, or where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub regulation to the extent and in the manner as may be agreed to by the department.

Proof of any such agreement must be provided, where applicable.

Has any comment been received from stakeholders?

YES	NO
X	

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

Summary of Comment from Stakeholders and the feedback provided by the EAP during phase 1 (Notification Phase) of the public participation process:

Immediate Neighbours, Adjacent Landowners and Landowners

The following aspects were noted by the adjacent landowners:

- Mr Radie van Wyk of the Farm Elserafie 214 KQ replied on the BID and noted that he supported the development.

NGOs, CBOs, Conservancies, Residential Associations, Service Providers

- Mr Andre Burger of the Welgevonden Game Reserve registered as and I&AP on the project and noted that they have no concerns at the moment. They requested to be kept abreast of further developments on the project.

Summary of Comment from Stakeholders and the feedback provided by the EAP during phase 2 (Draft BAR Comment Phase) of the public participation process:

Ward Councillors

- No comments were received to date.

Government Departments

- A Digital and a hard copy (In CD Format) of the Draft BA was submitted to the DWS in Polokwane. No comments were received from the DWS or any State Department.

Local Authorities

- A Digital and a hard copy (In CD Format) of the Draft BA was submitted to the office of the acting Municipal Manager and the Head of the Parks and Infrastructure sections. The Draft report was also submitted to the Waterberg District Municipality. Read receipts were received from the Vaalwater SAPS, but no further comment or feedback were received by the EAP.

Immediate Neighbours, Adjacent Landowners and Landowners

- No further comment was received from adjacent landowners.

Other NGOs, CBOs, Conservancies, Residential Associations, Service Providers

- The Draft BA Report was submitted to the Welgevonden Nature Reserve as well as the Mokolo and the Vaalwater Sub Water Users Associations. Read receipts were received from the Water Users Associations, but no further comment or feedback were received by the EAP.

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

List the main issues raised by interested and affected parties.

None

Response from the practitioner to the issues raised by the interested and affected parties (A full response must be given in the Comments and Response Report that must be attached to this report as Annexure E):

Immediate Neighbours, Adjacent Landowners and Landowners The EAP thanked Mr van Wyk for his participation. *Other NGOs, CBOs, Conservancies, Residential Associations, Service Providers* The EAP registered the Welgevonden Game Reserve and notified Mr Burger that they would be kept abreast of further developments in the BA process.

2. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

List the potential direct, indirect and cumulative property/activity/design/technology/operational alternative related impacts (as appropriate) that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed.

In accordance with the requirements of the NEMA, 1998 (Act 107 of 1998) the potential and anticipated impacts will be assessed in terms of the criteria and rating scales listed below. Where possible Specialists will be required to assess the potential and anticipated impacts relating to their specialist fields in the same order to ensure that the impacts are interpreted correctly.

Criteria	Rating Scales	Notes
Nature	❖ Positive	This is an evaluation of the type of effect the construction, operation and management of the proposed development would have on the affected environment.
	❖ Negative	
	❖ Neutral	
Extent	❖ Low	Site-specific, affects only the development footprint.
	❖ Medium	Local (limited to the site and its immediate surroundings, including the surrounding towns and settlements within a 10 km radius).
	❖ High	Regional (beyond a 10 km radius) to national.
Duration	❖ Low	0-4 years (i.e. duration of construction phase).

	❖ Medium	5-10 years.
	❖ High	More than 10 years to permanent.
Intensity	❖ Low	Where the impact affects the environment in such a way that natural, cultural, and social functions and processes are minimally affected.
	❖ Medium	Where the affected environment is altered but natural, cultural, and social functions and processes continue albeit in a modified way; and valued, important, sensitive, or vulnerable systems or communities are negatively affected.
	❖ High	Where natural, cultural, or social functions and processes are altered to the extent that the impact will temporarily or permanently cease these functions and processes; and valued, important, sensitive, or vulnerable systems or communities are substantially affected.
Frequency of Occurrence	❖ Continuous	Where Impact will occur without interruption
	❖ Intermittent	Impact occurring from time to time without any periodicity
	❖ Periodic	Impact occurring at more or less regular intervals
	❖ Time-linked	Impact occurring only or mostly at specific times e.g. at night or during office hours
Probability (the likelihood of the impact occurring)	❖ Low	It is highly unlikely or less than 50 % likely that an impact will occur.
	❖ Medium	It is between 50 and 70 % certain that the impact will occur.
	❖ High	It is more than 75 % certain that the impact will occur, or it is definite that the impact will occur.
Reversibility	❖ Low	Low ability of environment to be reverted to pre-impact state if cause of impact is removed
	❖ Medium	Medium ability of environment to be reverted to pre-impact state if cause of impact is removed
	❖ High	High ability of environment to be reverted to pre-impact state if cause of impact is removed
Potential for impact on irreplaceable resources	❖ Low	No irreplaceable resources will be impacted.
	❖ Medium	Resources that will be impacted can be replaced, with effort.
	❖ High	There is no potential for replacing a particular vulnerable resource that will be impacted.
Consequence **(a combination of extent, duration, intensity, and the potential for impact on irreplaceable resources).**	❖ Low	A combination of any of the following: - Intensity, duration, extent, and impact on irreplaceable resources are all rated low. - Intensity is low and up to two of the other criteria are rated medium. - Intensity is medium and all three other criteria are rated low.
	❖ Medium	Intensity is medium and at least two of the other criteria are rated medium.
	❖ High	Intensity and impact on irreplaceable resources are rated high, with any combination of extent and duration. Intensity is rated high, with all of the other criteria being rated medium or higher.
Significance **(all impacts including potential cumulative impacts)**	❖ Low	Low consequence and low probability. Low consequence and medium probability. Low consequence and high probability.
	❖ Medium	Medium consequence and low probability.

		Medium consequence and medium probability. Medium consequence and high probability. High consequence and low probability.
	❖ High	High consequence and medium probability. High consequence and high probability.
Confidence **(Degree of confidence in the predictions, based on the availability of information and the specialist's knowledge and expertise)**	❖ High	High degree of confidence in the predictions
	❖ Medium	Medium degree of confidence in the predictions
	❖ Low	Low degree of confidence in the predictions

An explanation of the above-mentioned impact criteria is provided below. Only the above-mentioned criteria will be considered during the assessment of impact significance. In addition, the degree of confidence in the prediction of impacts, the nature of applicable mitigation measures and legal requirements applicable to the impacts will also be described.

Nature
This is an evaluation of the type of effect the construction, operation and management of the proposed development would have on the affected environment. Will the impact change in the environment be positive, negative, or neutral? This description will include that which will be affected and the manner in which the effect will transpire. There may be a number of possible activities contributing to the same impact. Vice versa there may be a number of different impacts resulting from a single activity.

Extent or Scale
This refers to the spatial scale at which the impact will occur. Extent of the impact is described as: low (site-specific - affecting only the footprint of the development), medium (limited to the site and its immediate surroundings and closest towns) and high (regional and national). This refers to the actual physical footprint of the impact, not to the spatial significance. It is acknowledged that some impacts, even though they may be of small extent, are of very high importance, e.g. impacts on species of very restricted range.

Duration
The lifespan of the impact is indicated as low (short-term: 0-4 years, typically impacts that are quickly reversible within the construction phase of the project), medium-term: (5-10 years, reversible over time) and high (long-term: greater than 10 years and continue for the operational life span of the proposed development).

Intensity or Severity
This is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Does the activity destroy the impacted environment, alter its functioning, or render it slightly altered? The EAP will quantify the magnitude of the impacts and outline the rationale used**.**

Impact on Irreplaceable Resources
This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could possibly be replaced by natural processes (e.g. by natural colonisation from surrounding areas), through artificial means (e.g. by re-seeding disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible, but in social systems substitutes are often possible (e.g. by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g. red data species that are restricted to a particular site or habitat of very limited extent.

Consequence
The consequence of the potential impacts is a summation of above criteria, namely the extent, duration, intensity, and impact on irreplaceable resources.

Probability of Occurrence
The probability of the impact actually occurring based on professional experience of the EAP with environments of a similar nature to the site and/or with similar projects. Probability is described as low (improbable), medium (distinct possibility), and high (most likely). It is important to distinguish between probability of the impact occurring and probability that the activity causing a potential impact will occur. Probability is defined as the probability of the impact occurring, not as the probability of the activities that may result in the impact.

Significance
Impact significance is defined to be a combination of the consequence (as described below) and probability of the impact occurring. The relationship between consequence and probability highlights that the risk (or impact significance) must be evaluated in terms of the seriousness (consequence) of the impact, weighted by the probability of the impact actually occurring. In simple terms, if the consequence and probability of an impact is high, then the impact will have a high significance. The significance defines the level to which the impact will influence the proposed development and/or environment. It determines whether mitigation measures need to be identified and implemented and whether the impact is important for decision-making.

Degree of Confidence in Predictions
The EAP will provide an indication of the degree of confidence (low, medium, or high) that there is in the predictions made for each impact, based on the available information and their level of knowledge and expertise. Degree of confidence is not considered in the determination of consequence or probability.

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation, and significance rating of impacts after mitigation that are likely to occur as a result of the construction phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Alternative A1 (Preferred Activity Alternative)
PRE-CONSTRUCTION AND CONSTRUCTION PHASE
BIO-PHYSICAL ENVIRONMENT

Potential impacts:	**Significance rating of impacts (positive or negative):**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**	**Risk of the impact and mitigation not being implemented**
Start of Construction Phase: Security	Medium (negative)	❖ Local authorities (e.g. Lephalale Local Municipality, Vaalwater Police Station) as well as the surrounding land owners must be notified of the commencement of the construction activities in advance of the actual start of the activities. The contractor must communicate the dangers of the construction site and that the site is specifically out of bounds for small children.	Low (positive)	Low
	High (positive)	❖ Detailed contact sheets with the relevant contact no's of all the relevant contact personnel as well as the local EMS departments must be placed in the Contractors offices and the relevant other congregating areas at the construction camp for easy access in the case of emergency. This contact detail and its locality must also be communicated to the construction phase personnel at the relevant meetings and tool box talks.	Medium (positive)	Medium

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
	Medium (negative)	❖ Full documentation (ID, contact details and of next of kin) of all construction personnel must be kept on file at the site office and no unauthorized persons may be allowed on site.	Low (negative)	Low
Environmental awareness	High (positive)	❖ Environmental awareness inductions must be held for all employees to ensure that Stakeholders and Staff understand their responsibilities and to adhere to the content of the EMPr (See Appendix F).	High (positive)	Medium
Availability of EMPr	Low (negative)	❖ The EMPr is drafted in such a manner that Section 8 can be reproduced (photocopied) and handed out to the relevant project managers, site managers, contractors and sub-contractors who must use it as a monitoring tool whereby check-ups (weekly or monthly, whichever is applicable) can be performed and added to a final monthly report or project completion report to track the monitoring of the project effectively over the lifetime of the construction phase of the development.	Low (negative)	Low
Ablution facilities	Medium (negative)	❖ Sufficient temporary ablution facilities in the form of chemical toilets (one for every 15 workers) must be provided for all workers during the construction phase of the development. The contractor shall be entirely responsible for	Low (negative)	Medium

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		enforcing their use and for maintaining such latrines in a clean, orderly, and sanitary condition. These facilities shall be positioned within walking distance from wherever employees are employed on the works.		
Proper personal conduct	Medium (negative)	❖ Activities such as littering, informal settlement, loud music and other ill-mannered behaviour will be regarded as unacceptable and it will be the responsibility of the various contractors and other employers to ensure that workers under their supervision conduct themselves appropriately. These actions must be reported to the Contractor who will see to the issuing of the relevant fines. See Appendix 1 of the EMPr.	Low (negative)	Low
	Medium (negative)	❖ A complaints register must be maintained on site. Complaints must be discussed at the construction technical meetings and specific responsibility must be assigned to manage each complained. The responsible parties must report back at the technical meeting as to the progress in terms of the management of each compliant up until it is resolved. The relevant penalties must be levied in terms of non-compliance to this management measure.	Low (negative)	Low
	Low	❖ The, the contractor must	Low	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
	(negative)	provide suitably visible signage informing people that the site is a construction site and private property and that no access is allowed for any unauthorized persons.	(negative)	
Construction Camp:				
Security	Medium (negative)	❖ Local authorities (e.g. Lephalale Local Municipality, Vaalwater Police Station, Lephalale EMS Departments) as well as the surrounding land owners must be notified of the commencement of the construction activities by the PC well in advance of the actual start of the activities. The contractor must, communicate the dangers of the construction site and that the site is specifically out of bounds for small children.	Low (negative)	Medium
Specific site selection for the construction camps	Low (negative)	❖ No new construction camp is to be established but the existing farm infrastructure is to be used for this purpose. The principle to be followed is that the camp must be situated practically but where possible in an area where the site is already disturbed. The location of this site must be communicated to the ECO who should then perform a screening of the site.	Low (negative)	Low
	Medium (negative)	❖ The chosen site for the construction camp must not be located less than 100m	Low (negative)	Medium

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		horizontally from any drainage way and outside of the 1:100-year flood line of any of these drainage ways.		
Removal of plant material	Medium (negative)	❖ Vegetation clearance for the erection of the construction camp must be kept to an absolute minimum and must adhere to the footprint of an area no larger than the camps themselves.	Low (negative)	Medium
	Medium (negative)	❖ Topsoil (top 300mm layer minimum) must be protected in accordance with the detailed recommendations included in the EMPr. Also see Hydrology.	Low (negative)	Medium
Flora and Faunal species	Low (negative)	❖ No damage and/or removal/ trapping/snaring of indigenous plant or animal material for cooking or any other purposes will be allowed. See Appendix 1 of the EMPr. (Also See Fauna and Flora Section).	Low (negative)	Medium
Fires	High (negative)	❖ Care must be taken to prevent veld fires. A designated cooking area must be established where cooking will be performed. This area must be supplied with a permanent fire extinguisher which is in working order. Cooking may only be performed with gas or electrical stoves.	Medium (negative)	Low
Possible contamination by fuels and other construction materials	High (negative)	❖ Vehicles and construction plant must be inspected and maintained on a regular basis (weekly) to ensure that soils are not being contaminated by	Medium (negative)	Medium

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		leakages or other pollutants.		
	High (negative)	❖ All construction materials which may cause soil and sub soil contamination must be kept in suitable watertight containers and these containers must be checked regularly by the ECO.	Medium (negative)	Medium
Waste .	Medium (negative)	❖ Adequate water, sanitation and solid waste disposal facilities must be provided or arranged for prior to occupation of the site. Solid waste should be sorted into categories and that which is not suited to be dumped in an appropriate waste skip at the temporary facility e.g. cement must be dumped at a recognized registered waste disposal facility designed for this purpose.	Low (negative)	Medium
	Medium (negative)	❖ A suitable site must be selected for the waste skip site and this site should only contain materials that do not pose any risk in terms of surface or sub surface environmental contamination (e.g. building rubble). This site must also be suitably rehabilitated after completion of the construction activities.	Low (negative)	Low
Temporary Fuel Tank	High (negative)	❖ Any temporary on-site Fuel tank should be accommodated in a watertight bunker at the existing farm facilities, which is able to carry the total volume of the tank itself. Should an accidental puncture of the fuel	Low (negative)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		tank occur, the appropriate specialist (See Appendix 2 of the EMPr) should be contacted immediately for clear up operations. The top soils and sub soils of the site of the spillage must be removed in total and be disposed of at a fittingly licensed facility by the specialist and be filled up to the top of the excavation with healthy soils.		
	High (negative)	❖ All fuel and lubricant oriented areas (for storage and waste) at the service site (e.g. diesel tanks, workshop shed, and compressor shed) must also be situated at the existing farming maintenance facilities. These areas must be constructed with impervious concrete floors and oil and fuel resistant walls, with watertight sumps at the end of the catchment drains of these areas. Sumps must be pumped into suitable containers and removed by an appropriate specialist, to a suitably licensed waste disposal facility.	Low (negative)	Low
Possible contamination from construction camp	High (negative)	❖ An earth berm or drainage ditch (@ 450mm high) must be constructed or straw bales placed around the construction camp to prevent stormwater entering from outside the camp and to prevent contaminated water leaving the camp. This earth berm must also be maintained throughout the construction phase.	Low (negative)	High

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
Site Rehabilitation	High (negative)	❖ Total rehabilitation must be done on and around the site and the appropriate authority (LDEDET) must be informed of the completion of the construction phase for the necessary inspections to take place.	Medium (negative)	Low
Cutting & Blasting: Cut and fill sites	Medium (negative)	❖ Specific cut and fill sites should be inspected by a qualified engineer and signed off as stable and safe for work before construction commences.	Low (negative)	Low
	Medium (negative)	❖ Cognisance should be taken of the Geotechnical site conditions, specifically with reference to potentially collapsible soils.	Low (negative)	Low
Use of explosives	Medium (negative)	❖ Where the excavation work involves the use of explosives, a method statement must be developed in accordance with the applicable explosives legislation, The Explosives Act 2003 (Act 15 of 2003) by an appointed person who is competent in the use of explosives for excavation work and the contractor shall ensure that the procedures therein are followed.	Low (negative)	Low
	Medium (negative)	❖ Where there is a reasonable possibility of damage to power and telephone lines or any other property, the contractor shall suitably adapt his method of blasting and the size of	Medium-Low (negative)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		charges and shall use adequate protective measures, such as cover blasting, to limit the risk of damage as far as possible. Specific requirements relating to certain services may be included in the Project Specifications.		
	Medium (negative)	❖ Vibrations caused by blasting operations must be recorded by one or more blasting seismographs of a type as approved by the Engineer and in positions as described by the specialist blasting Consultant.	Medium-Low (negative)	Low
	Medium (negative)	❖ The Engineer shall be given 24 hours' notice by the Contractor before each blasting operation is carried out.	High (positive)	Low
Rehabilitation of site	Medium (positive)	❖ Material (only natural) from cutting should be used for the shaping of earth berms or for landscaping.	Medium (positive)	Medium
Geology and Soils:		❖ See detail under Construction Camp		
Hydrology: High rainfall in 24 hours	Medium (negative)	❖ A construction management plan should be implemented to specify appropriate time for the bulk of the construction activities to commence (preferably May to early October)	Low (negative)	High
Scouring and erosion resulting from increased volumes	Medium (negative)	❖ Special attention must be given to site drainage details. Qualified engineers must	Low (negative)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
and velocities of stormwater across the site		inspect the impacted areas and adequate in stream drainage structures must be designed and constructed to avoid scouring and erosion around these structures and ultimate failure.		
Siltation of downstream water bodies and stormwater management structures.	High (negative)	❖ Drainage structures must be designed by qualified engineers and in a way the disposes of the site stormwater in a safe matter, which is not harmful to the surrounding environment in any way. Typical precautionary measures include sufficient infiltration structures to reduce overall stormwater build up at the lowest point of the site and stormwater energy dissipaters in major stormwater channels.	Medium (negative)	Medium
	Low (negative)	❖ Maximum infiltration must be attained at each specific site and infiltration structures must be designed and constructed to this effect to limit the overall increase in stormwater volume and velocity as far as possible.	Low (negative)	Low
	Low (negative)	❖ Special attention must also be given to the design of the stormwater structures at the discharge ends of the stormwater system so as not to cause erosion damage where this system discharges.	Low (negative)	Low
Possible groundwater pollution from site	High (negative)	❖ On site waste disposal must strictly be prohibited during the construction phase and	Low (negative)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
establishment.		disposal must be carried out with standard sealed chemical toilets and waste disposal containers.		
	High (negative)	❖ Vehicles and construction plant must be inspected and maintained on a regular basis (weekly) to ensure that soils are not being contaminated by leakages or other pollutants.	Low (negative)	Medium
	High (negative)	❖ All fuel and lubricant oriented areas (for storage and waste) at the service site (e.g. diesel tanks, workshop shed, and compressor shed) must be constructed with impervious concrete floors and oil and fuel resistant walls, with watertight sumps at the end of the catchment drains of these areas. Sumps must be pumped into suitable containers and removed by an appropriate specialist, to a suitably licensed waste disposal facility.	Low (negative)	Low
Fauna and Flora: Disturbances to existing fauna and flora species.	Medium (negative)	❖ Vegetation clearance for the erection of the construction camps must be kept to an absolute minimum and must adhere to the footprint of an area no larger than the camps themselves.	Low (negative)	High
	Low (negative)	❖ No damage and/or removal/ trapping/snaring of indigenous plant or animal material for cooking or any other purposes will be allowed. See Appendix 1 of the EMPr.	Low (negative)	Medium

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
Alteration of the riverine habitat	Medium (negative)	❖ The riverine area must be clearly demarcated and construction activities must avoid this area.	Low (negative)	Medium
	Medium (positive)	❖ On finalization of construction, the area around the proposed dam must be fully rehabilitated.	Medium (positive)	Low
Proliferation of alien vegetation	Medium (negative)	❖ The project ECO must monitor the proliferation of alien and invasive vegetation with special reference to the Water hyacinth (*Eichhornia crassipes*), Syringa Tree (*Melia Azerarach*), Silver oak tree (*Grevillia robusta*) and Poplar (*Populus alba*). Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998).	Low (negative)	Medium
Site Sensitive Features: ❖ Sterkstroom River Demarcation	High (positive)	❖ The riverine buffer area of the Sterkstroom River must be clearly demarcated and supplied with warning signage. All construction staff must be made aware of the sensitivity of the aquatic areas.	High (positive)	Low
Construction camps	Medium	❖ No construction camps and	Low	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
and laydown areas	(negative)	laydown areas may be located within the 32m buffer or within 100m horizontally of the river.	(negative)	
Site clearance for construction	High (negative)	❖ Construction and maintenance of the dam infrastructure must preferably take place during the winter months and must be completed at the highest quality levels and in the shortest possible time.	Medium (negative)	High
Soils conservation	Medium (negative)	❖ Vegetation clearance for construction camps and along the actual construction footprint must be kept to an absolute minimum.	Low (negative)	Medium
	Medium (negative)	❖ Topsoil (top 300mm layer minimum) must be protected in accordance with the detailed recommendations included in the EMPr. Also see Construction Camps and Hydrology.	Low (negative)	High
Stormwater control	High (negative)	❖ Stormwater protection in the form of hay bales or similar must be placed between the construction area and the water surface are of the river. This must be maintained throughout the construction phase.	Medium (negative)	Medium
	High (negative)	❖ Stormwater discharge structures must be designed by a qualified engineer and must include silt and litter traps as well as energy dissipating features to ensure erosion free discharge of stormwater into river and the wetland areas	Medium (negative)	Medium

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		where this is required. Stormwater discharge structures must also be floodproof.		
Rehabilitation	High (positive)	❖ Areas where construction or maintenance activities took place within the 32m buffer area of the river and within the river itself must preferably be rehabilitated from a landscape point of view to allow for the shortest possible recovery time and associated restored ecological functioning.	Medium (negative)	Low
Management of alien invasive species	Medium (negative)	❖ Alien invasive species eradication and control must be implemented during the construction phase to protect natural riverine and wetland habitat and curb against excessive water use.	High (positive)	Medium
Maintenance activities	Medium (negative)	❖ All construction personnel and maintenance staff (operational phase) must be inducted on the river sensitivities and clear instructions on operational procedure for any maintenance activity within the riverine areas must be implemented. Specific induction aspects must include product use in riverine areas, spill management, planning of maintenance within riverine areas as well as riverine rehabilitation procedures.	Low (negative)	Medium
SOCIO-ECONOMIC ENVIRONMENT				
Local Employment: A limited number of temporary jobs may	Medium (positive)	❖ The maximum number of employment opportunities must be	High (positive)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
be created for the duration of the construction phase.		created by making use of labour intensive construction methods. In addition, the proposed project must also make use of the maximum extent of local SME's as far as possible.		
	High (positive)	❖ Members of the local community should be employed as far as possible.	High (positive)	Low
	High (positive)	❖ Opportunities for unskilled/ low-skilled workers should be maximised. On-the-job training should form part of the employment period and contract, to contribute to skills development.	High (positive)	Low
	High (positive)	❖ An equal number of males and females should be employed.	High (positive)	Low
Traffic: Accidents may occur during construction due to the presence of construction vehicles during construction.	High (negative)	❖ Local authorities (e.g. the Lephalale Local Municipality, Vaalwater Police Station, Lephalale EMS Departments) as well as the surrounding land owners must be notified of the commencement of the construction activities at least 6 weeks before the actual start of the activities.	Medium (negative)	Medium
	High (negative)	❖ The Contractor must ensure that drivers of construction vehicles carries the adequate training and associated licences and permits to drive the applicable construction vehicle and plant.	Medium (negative)	Medium

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
Noise: There will be an increase in noise due to construction activities	Medium (negative)	❖ Noisy activities related to the construction phase of the development (e.g. vehicles, compressors, workers) must be kept to the necessary minimum.	Low (negative)	Low
	Medium (negative)	❖ Construction activities must be restricted to between 8:00 in the mornings and 17:00 in the afternoon and not on any weekend or public holidays.	Low (negative)	Medium
	Medium (negative)	❖ Construction vehicles and equipment must be regularly serviced to avoid the noise that these machines may make if in disrepair.	Low (negative)	Low
	Low (negative)	❖ Construction workers and staff must be supplied with sufficient protective clothing and other gear (e.g. ear plugs) and must furthermore be trained how to use this gear properly.	Low (negative)	Low
Air Quality: During construction dust will be generated that can reduce visibility for drivers.	Low (negative)	❖ Dust suppression must be performed according to the seasonal changes and according to the prevailing site-specific circumstances via a dust suppression truck on the site roads, other construction areas and the plant parking areas.	Low (negative)	Medium
Access: Site access & utilization of existing roads.	Low (negative)	❖ Access to the site to be through existing roads to the site.	Low (negative)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
	Medium (negative)	❖ Construction vehicles must take cognisance of the existing traffic flow onto the R517 and surrounding routes and always provide right of way.	Low (negative)	Low
Heritage Impacts: Heritage resources of value could be found during site preparation and construction.	Low (negative)	❖ Employees, contractors, and construction workers should be informed to report any unusual finds during the construction phase to the EAP, to implement the correct procedures according to the South African Heritage Resources Act to conserve these finds appropriately. As a general rule of thumb, any construction must be halted immediately should an unusual item be unearthed. The site EAP should be informed, and a photo record be taken and sent to a Specialist for recommendation and further action.	Low (negative)	Low
OPERATIONAL PHASE				
BIO-PHYSICAL ENVIRONMENT				
Geology and Soils Rehabilitation monitoring	Low (negative)	❖ The entire construction area must be monitored quarterly for at least one year after completion of the construction phase to ensure that vegetation has established successfully.	Low (negative)	Medium
	Low (negative)	❖ Any areas where 100% vegetation cover has not been	Low (negative)	High

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		established must be reseeded with the recommended grass seed mix.		
	Low (negative)	❖ Areas where erosion has occurred must be rehabilitated and stabilized so that erosion will not occur in future.	Low (negative)	Low
Surface and Groundwater Exiting lawful water use volumes (ELU)	High (negative)	❖ Water meters must be installed at all surface and groundwater abstraction points to ensure that the farming operation stays within its legal water use limits.	Medium (negative)	Low
Ecological Water Reserve (EWR) High rainfall in 24 hours	High (negative)	❖ The DWS will need to re-determine the accurate EWR values for the Mokolo catchment in order for Farmers to know the sustainable water use limits of their operations and to ensure the optimum ecological functioning of the Mokolo and Sterkstroom rivers.	Medium (negative)	High
Stormwater Management:	Low (negative)	❖ Special attention must be given to the site drainage details, especially in terms of the dam wall and overflow structures. The entire dam must be maintained in terms of the Dam Structural Maintenance Plan and the relevant maintenance and repair actions must be taken as soon as a deviation (from the recommendations of the Structural Maintenance Plan) is noted. (See Appendix D_4)	Low (negative)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
	Low (negative)	❖ Stormwater structures must be monitored and maintained on a continual basis throughout the lifetime of the project.	Low (negative)	Low
Fauna and Flora: Riverine buffer area	Medium (negative)	❖ The riverine buffer area between the proposed dam and the Sterkstroom river must be excluded from any future agricultural activity and must be rehabilitated to reach productive ecological functioning	Low (negative)	Medium
Alien invasive vegetation control	Medium (negative)	❖ Proliferation of alien and invasive species is expected within disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the proposed filling development. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, must be controlled.	Low (negative)	High
	High (positive)	❖ Removal of the alien and weed species encountered at the proposed infrastructure must take place to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational and rehabilitation/ maintenance	High (positive)	High

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		phases.		
Waste Management: General waste	Low (negative)	❖ Adequate general waste disposal facilities must be provided for. General waste should be sorted into categories and recycled as far as possible. General waste which is not suited to recycled must be collected and removed to the municipal waste facility.	Low (negative)	Low
Hazardous waste	High (negative)	❖ All hazardous waste including used oils and fuels and wash water containing hydrocarbons must be managed in accordance with its hazardous substance category. Hazardous wastes must be taken away to the nearest hazardous waste handling facility on managed by an appropriate hazardous waste Contractor.	Low (negative)	Medium
Site Sensitive Features: ❖ Sterkstroom River Monitoring and maintenance	High (positive)	❖ Concurrent monitoring and maintenance actions must be conducted on the dam infrastructure to ensure that the structures are structurally and functionally sound. Where ever this is not the case, faulty infrastructure or degraded areas must be repaired in line with the Dam Structural Maintenance Plan or	High (positive)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
		rehabilitated immediately, so that the Sterkstroom river is not negatively affected. See Appendix D_4.		
SOCIO-ECONOMIC ENVIRONMENT				
Local Employment: Local labour	High (positive)	❖ The maximum number of local employment opportunities must be created by making use of labour intensive operational methods. Opportunities for unskilled/ low-skilled workers should be maximised. On-the-job training should form part of the employment period and contract, to contribute to skills development.	High (positive)	Low
	High (positive)	❖ Only members of the local communities must be employed. An equal number of males and females should be employed.	High (positive)	Low
Safety: Water Safety	Medium (negative)	❖ The Farm management must ensure that the farm staff and visitors are aware of the dangers of the dam, especially during periods of heavy precipitation and resultant high stormwater flows.	High (positive)	Low
	High (positive)	❖ The relevant safety instructions and contact details of the local Lephalale EMS services must be clearly displayed and all of the management staff must be aware of the location of these contact details.	High (positive)	Low

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented

Alternatives

Alternative S2 – *N/A Exactly the Same as For Alternative S1*				
Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented

Alternative S3 – *N/A*				
Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented

NO-GO				
Potential impacts:	**Significance rating of impacts (positive or negative):**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**	**Risk of the impact and mitigation not being implemented**
BIOPHYSICAL ENVIRONMENT				
Climate & Hydrology: Scouring and erosion	Low (N/A)	❖ No additional impacts should dam not be constructed.	Low (negative)	N/A
Surface water deterioration	Low (negative)	❖ Water quality flowing into the Sterkstroom might decrease slightly as the dam acts as a silt trap for stormwater.	Low (positive)	N/A
Geology and Soils: Scouring and erosion	Low	❖ No additional impacts should	Low	N/A

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
	(negative)	dam not be constructed.	(negative)	
Vegetation and Animal Life: Disturbances to existing fauna and flora	Low (positive)	❖ No potential disturbances to the existing site fauna and flora.	Low (positive)	N/A
Alien invasive species	Medium (negative)	❖ No management of alien invasive species on site.	Medium (negative)	N/A
SOCIO-ECONOMIC ENVIRONMENT				
Dam Infrastructure	High (negative)	❖ The need for sustained availability of water for crop irrigation was discussed in the sections above. It is important in terms of sustained crop production albeit in a reduced rate during times of low river flow or drought. Increased crop production security in turn translates into employment security for the farm employees as well as the local and greater farming value chain. Lastly, increased crop production security also translates into food security.	High (negative)	N/A.
Employment Opportunities:	Medium (negative)	❖ It is foreseen that various temporary jobs can be created during the construction phase of the project. If the proposed development does not proceed, these opportunities will not materialize.	Medium (positive)	Medium
Safety				

Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
	Medium (positive)	❖ There will be no additional safety risks to the site area	Medium (positive)	N/A
Impeded Traffic Flow	Medium (positive)	❖ There will be no additional traffic impediment.	Medium (positive)	N/A
Air Quality	Medium (positive)	❖ There will be no additional air quality related impacts.	Medium (positive)	N/A
Noise	Low (positive)	❖ There will be no additional noise related impacts.	Low (positive)	N/A

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

- ❖ Freshwater Resource Assessment
- ❖ Heritage Impact Assessment
- ❖ Dam Design Report

Describe any gaps in knowledge or assumptions made in the assessment of the environment and the impacts associated with the proposed development.

- ❖ Studies and assessments were only conducted for the immediate site environment and more distant impacts of the site environment on the proposed development were therefore only assessed to a limited extent.
- ❖ All information provided by the Applicant and specialists is valid and accurate. For specific details on assumptions made and knowledge gaps in terms of the Specialist Assessments, please refer to Appendix D.

3. IMPACTS THAT MAY RESULT FROM THE DECOMMISSIONING AND CLOSURE PHASE

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation, and significance rating of impacts after mitigation that are likely to occur as a result of the decommissioning and closure phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Alternative S1 (Proposed Activity Alternative)

PLEASE NOTE: There is no decommissioning envisaged for this development even in the long-term. Should the development need to be decommissioned for some unforeseen reason, it will trigger listed activities in terms of the National Environmental Management Act, 107 of 1998. Therefore, potential impacts would be identified and assessed at that time.				
Potential impacts:	**Significance rating of impacts (positive or negative):**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**	**Risk of the impact and mitigation not being implemented**

Alternative S2 – *N/A*				
Potential impacts:	**Significance rating of impacts (positive or negative):**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**	**Risk of the impact and mitigation not being implemented**

Alternative S3 – *N/A*				
Potential impacts:	**Significance rating of impacts (positive or negative):**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**	**Risk of the impact and mitigation not being implemented**

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

N/A

Where applicable indicate the detailed financial provisions for rehabilitation, closure, and ongoing post decommissioning management for the negative environmental impacts.

N/A

4. CUMULATIVE IMPACTS

Describe potential impacts that, on their own may not be significant, but is significant when added to the impact of other activities or existing impacts in the environment. Substantiate response:

Ecological Water Reserve (EWR) and Existing Lawful Water Use (ELU)
To ensure that water use stays within the EWR and ELU limits for the Sterkstroom River and the larger Mokolo River Catchment, on a farm by farm basis is of critical importance. It is important firstly, for the purposes of safeguarding the required water volumes in the Sterkstroom River, to allow these river systems to perform at optimal ecological functionality, Should there not be enough water to allow for the EWR requirements to be met it will have almost immediate negative implications. These include socio-ecological impacts such as reduced water availability because of the inability of the watercourse to store water (e.g. to low water levels can cause an over vegetated watercourse) and reduced water quality (e.g. stagnant pools of water with decomposing vegetation).

Secondly over extraction will simply lead to downstream water users not being able to use their lawful use volumes.

The reverse of the above scenario is a situation where all the stakeholders, from the Farmer to the Water Users Associations (WUA) to the local and district Municipalities, the provincial Authorities and the DWS WMA Managers, perform their duties responsibly to ensure sustainable water availability for the river system itself and all the lawful water users, in the long term.

Riverine Habitat
The proposed dam is situated to the south of the Sterkstroom river and also drains into this river. Alterations to the overall ecological integrity the Sterkstroom River within the study area have occurred, primarily due to the agricultural activities on its banks. The Freshwater Specialist reported that due to the extent of the agricultural disturbances, the riparian area has been heavily modified impacting negatively on the ecological functioning of the river and also inhibiting is potential for the agricultural uses here. It is for this reason that it is important that the prescribed repair and mitigation measures be implemented, and their success be monitored over the lifetime of the project.

Employment Opportunities:
The development and construction of the proposed dam infrastructure with its associated services will result in limited new job opportunities but it will however sustain and strengthen the existing employment model by supporting sustained agricultural production from season to season. In the light of the local socio-economic profile, every additional employment opportunity will make a significant contribution towards the reduction of unemployment in the area.

5. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Alternative A1 (preferred alternative)

Possible impacts anticipated to occur during the construction phase include:

- Erosion and loss of topsoils;
- Siltation and resulting decrease in surface water quality of local water bodies;
- Soil and water contaminations;
- Riverine habitat loss;
- Proliferation of alien invasive vegetation;
- Security.

Possible impacts anticipated to occur during the operational phase:

- Over abstraction of surface water volumes;
- EWR not being met;
- Riverine habitat loss;
- Proliferation of alien invasive vegetation.

Initially, the majority of the anticipated environmental impacts would be limited to the construction phase of the project and will therefore be of a temporary nature. Impacts caused during the operational phase of the proposed infrastructure can be minimised to where productive ecological processes can be maintained. Both the construction and the operational phase impacts can be mitigated significantly provided that the mitigation and rehabilitation measures included in the BAR and EMPr are strictly adhered to.

No-go alternative (compulsory)

This alternative would result in no construction related environmental impacts considering that the dam development would not be pursued. In terms of the operation of the proposed infrastructure the No-Go alternative will result in reduced availability of the Farmers ELU, reduced irrigation capability and reduced long term agricultural production capacity, which in turn may lead to reduced food security as well as a reduced ability to provide sustained employment opportunities.

Alternative A2

N/A

Alternative A3

N/A

For more alternatives please continue as alternative D, E, etc.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?

YES	NO
X	

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment):

N/A

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the department in respect of the application:

ELU and EWR

- Water meters must be installed at all the abstraction points and the data must be used to ensure that the farming operations stays within its ELU volumes;
- The Mokolo Catchment's EWR must be re-examined by the DWS ensure that the accurate reserve is determined in order for surrounding water users to know within what limits they can use the local resource without causing permanent damage to the resources which will in turn put their agricultural production abilities at risk.

Ground-and Surface Water Quality, Soils:

- All stormwater channels must be lined with grass and frequent rock strips to ensure limited erosion and maximum infiltration of stormwater. Stormwater infrastructure must be maintained at all times;
- Ensure vehicles and heavy machinery used on-site are regularly inspected for leaks and serviced at frequent intervals;
- Construction and operational maintenance activities must be performed outside the riparian buffer.
- Chemical sanitary facilities must be provided for construction workers and emptied on regular intervals;
- All materials, fuels and chemicals must be stored in a secured, sealed and bunded area to prevent pollution from spillages and leakages. The use of chemicals should be controlled;
- Regular, ongoing monitoring and maintenance must be undertaken of the infrastructure in terms of the approved Structural Maintenance Plan.

Riverine Rehabilitation and Monitoring:

- Post construction rehabilitation must be performed in line with the recommendations of the Freshwater Specialist;
- Monitoring of the success of the rehabilitation procedures must be done quarterly. Repairs must be done where stormwater damage causes erosion and barren areas must be regressed with the prescribed grass mix;

Alien Invasive Specie Management and Control

- Alien invasive control must be managed in line with the recommendations with the freshwater Specialist.

Operational Maintenance

- Regular, ongoing monitoring and maintenance must be undertaken of the infrastructure in terms of the approved Structural Maintenance Plan.

Safety:

- Detailed contact sheets with the relevant contact no's of all the relevant contact personnel as well as the local EMS departments must be placed in the contractors and Farmers offices and the relevant other congregating areas at the construction camp for easy access in the case of emergency. This contact detail and its locality must also be communicated to the construction phase personnel at the relevant meetings and tool box talks;
- The necessary warning signage must be applied to the site to warn that the site is under construction and of the relevant hazards;
- Employees should be trained regularly on fire safety and there should be fire marshals;
- The prescribed industry specific fire safety precautions in terms of the Occupational Health and Safety Act must be adhered to.

Environmental Management Programme Report (EMPr)

- The site-specific recommendations and mitigation measures as pointed out in the EMPr should be made a condition of the authorization. (Appendix F).

Is an EMPr attached?

YES	NO

The EMPr must be attached as Appendix F.

SECTION F: APPENDIXES

The following appendixes must be attached as appropriate:

Appendix A: Site plan(s)

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports

Appendix E: Comments and responses report

Appendix F: Environmental Management Programme (EMPr)

Appendix G: Other information

SECTION G: DECLARATION BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

I, **JC van Rooyen** declare that I –

(a) act as the independent environmental practitioner in this application;
(b) do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
(c) do not have and will not have a vested interest in the proposed activity proceeding;
(d) have no, and will not engage in, conflicting interests in the undertaking of the activity;
(e) undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2006;
(f) will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
(g) will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the Department in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the Department may be attached to the report without further amendment to the report;
(h) will keep a register of all interested and affected parties that participated in a public participation process; and
(i) will provide the Department with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

Signature of the Environmental Assessment Practitioner:

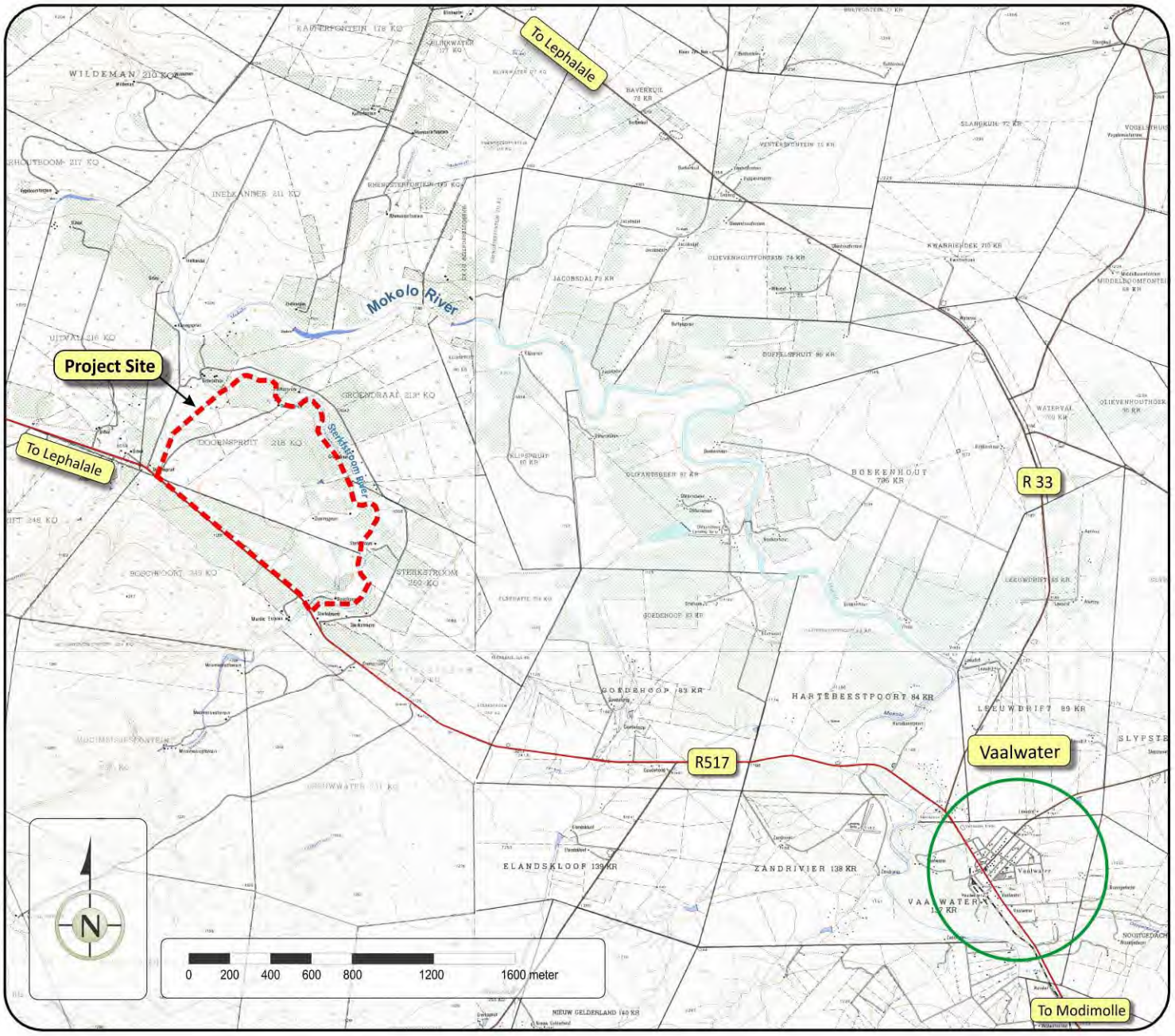
SPOOR Environmental Services (PTY) Ltd.
Name of company:

Date:

APPENDIXES TO THE FINAL BA REPORT

APPENDIX A

SITE PLANS



Legend:

Project Site

2427BB Topographical Map Sheets

Project:

Storage of Water in a Dam
Joe Kloppers

Proponent:

Joe Kloppers

Consultant:

spoor environmental services
t: +27(0)12 804 1181
f: +27(0)86 763 5635
e: info@spoorenvironmental.co.za
w: spoorenvironmental.co.za
p: Suite 448 P/Bag X025
Lynnwoodridge 0040

Figure 1:

Locality Map

Legend:

Project Site

Joe Kloppers
Dam 7 Position
24° 11.876'S 27° 57.519'E

Project:

Storage of Water in a Dam
Joe Kloppers

Proponent:

Joe Kloppers

Consultant:

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Lynnwoodridge 0040

Figure 2:

Dam 7 Locality

Legend:

- Original Dam Position Proposal
- Amended Dam Position Proposal to incorporate riverine buffer area

Project:

Storage of Water in a Dam
Joe Kloppers

Proponent:

Joe Kloppers

Consultant:

spoor environmental services
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f: +27(0)86 763 5635
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p: Suite 448 P/Bag X025
Lynnwoodridge 0040

Old & New Dam Localities

APPENDIX B

SITE PHOTOGRAPHS

(Taken from the Centre of the Site)

North

North East

East

South East

South

South West

West

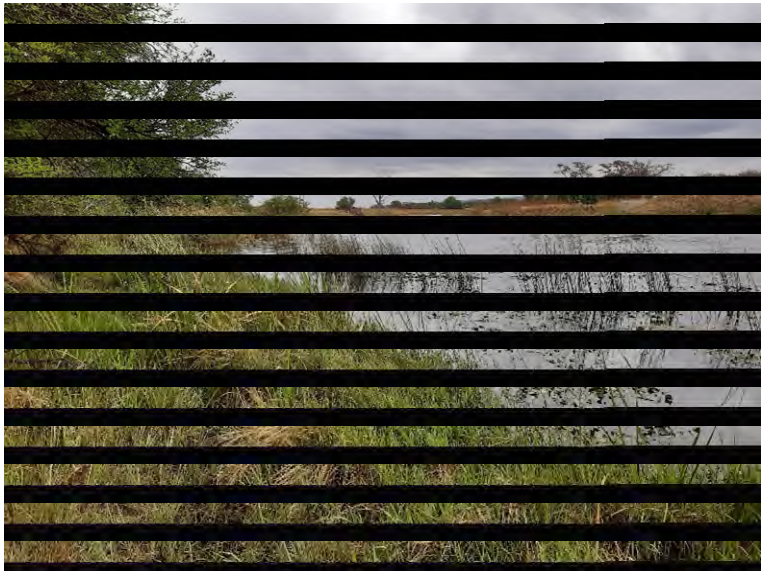
North West

Area to the west of the proposed dam (Farm barns and manager housing)

Stormwater drainage channel from pivots south west of the dam

Eastern boundary of the proposed dam looking south

Eastern boundary of the proposed dam looking north



Southern banks of the Sterkstroom river to the direct north of the proposed dam and looking west

Southern banks of the Sterkstroom river to the direct north of the proposed dam and looking west

Riverine area bewteen the proposed dam and the southern banks of the Sterkstroom River

APPENDIX C

FACILITY ILLUSTRATIONS

PROPOSED DAM

LOCAL SURVEY BY PG CONSULTING ENGINEERS

SERVICE SPILLWAY POSITION - SEE DETAILS ON DRW 003

OUTLET PIPE POSITION

MOKOLO RIVER 30m BUFFER ZONE

MOKOLO RIVER 1:100-YEAR FLOOD EXTENT

DAM BASIN
NOC LEVEL - 1059.5 m
FSL - 1059.0 m
GROSS STORAGE CAPACITY - 51 331m^3
FULL SUPPLY AREA - 17 252 m^2
CUT/FILL VOLUME - 16 400 m^3

ORIGINAL SIZE A3

AMENDMENTS

NR.	DATE	APPROVED	DESCRIPTION	PAR.

NOTES:

GENERAL NOTES:
1. ALL WORK MUST COMPLY WITH THE BY-LAWS AND "SPECIFICATIONS" OF THE LOCAL AUTHORITY, NATIONAL" BUILDING REGULATIONS AND SABS 1200.
2. ALL DIMENSIONS AND LEVELS SHALL BE CHECKED ON SITE BEFORE WORK COMMENCES AND ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IN WRITING.
3. THE ENGINEER WILL ASSIST THE CONTRACTOR IN "STAKING LINES, WHERE AFTER THE CONTRACTOR" SHALL TAKE OVER ALL SETTING OUT PEGS AND SURVEY BEACONS AND MAINTAIN THEM DURING THE CONSTRUCTION PERIOD.

J KLOPPERS BOEREDRY

JOE KLOPPERS
P.O. BOX 103
VAALWATER
0530
EMAIL: KLOPPERSEDNA@GMAIL.COM
CELL: 083 454 0438

Client/Employer

CONSULTANT:

PG CONSULTING ENGINEERS
PASSIONATE ABOUT DAMS

DESIGNED	DRAWING CHECKED
MS MULDER	MF JOUBERT
CHECKED	DRAWN
MF JOUBERT	MS MULDER
APPROVED	SIGNATURE
MF JOUBERT	

Pr. No. 201670207

JOE KLOPPERS - DAM 7

Project

PLAN LAYOUT

Plan Description

DATE	SCALE
16/04/2020	1:1 000

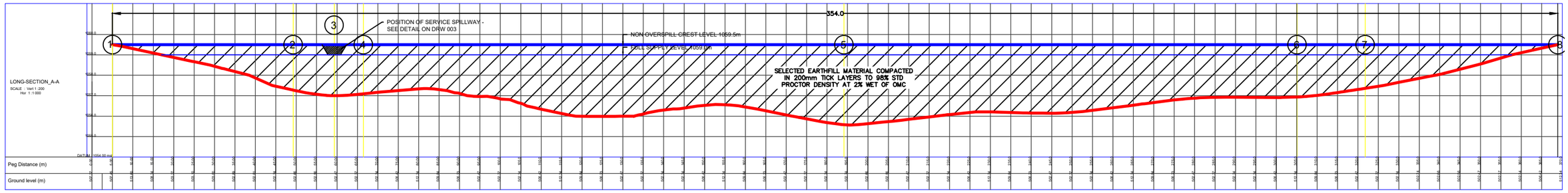
DRAWING NUMBER: D-001

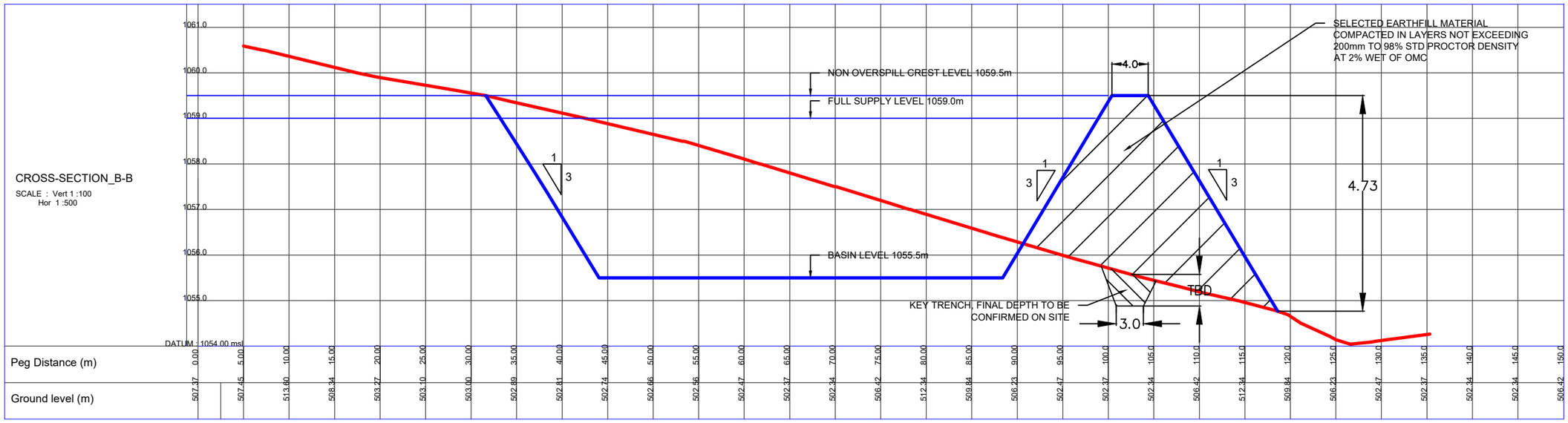
REVISION NO: A

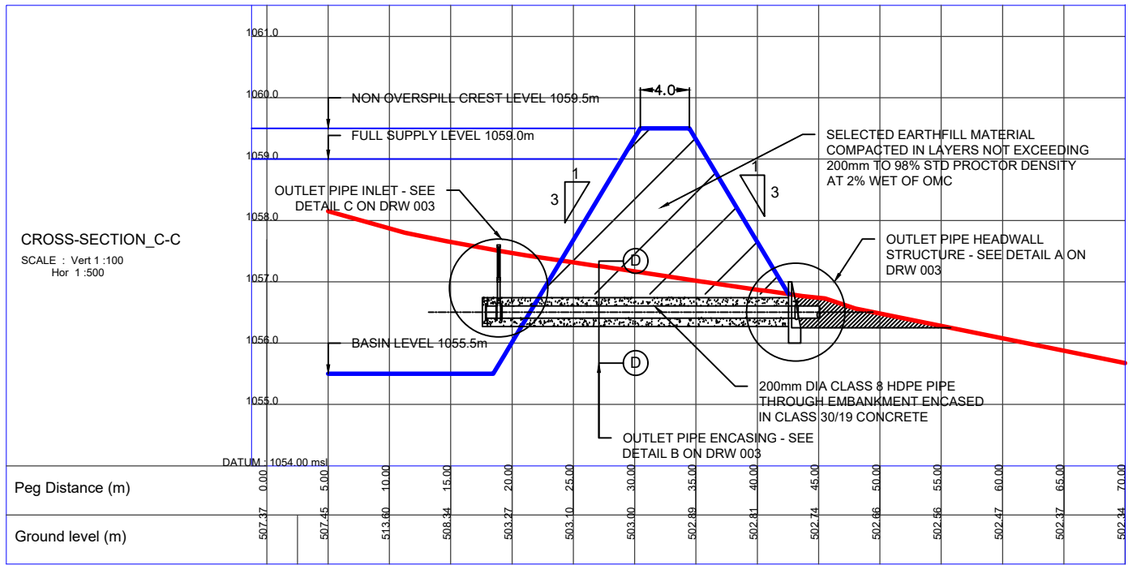
PROJECT NUMBER: 074

SECTIONS

LOCAL SURVEY BY PG CONSULTING ENGINEERS







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ORIGINAL SIZE A3

AMENDMENTS				
NR.	DATE	APPROVED	DESCRIPTION	PAR.

NOTES:

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CONSULTANT:

PG CONSULTING ENGINEERS
PASSIONATE ABOUT DAMS

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MF JOUBERT	MS MULDER
APPROVED	SIGNATURE
MF JOUBERT	
Pr. No. 201670207	

JOE KLOPPERS - DAM 7

Project

SECTIONS

Plan Description

DATE	SCALE
16/04/2020	AS SHOWN

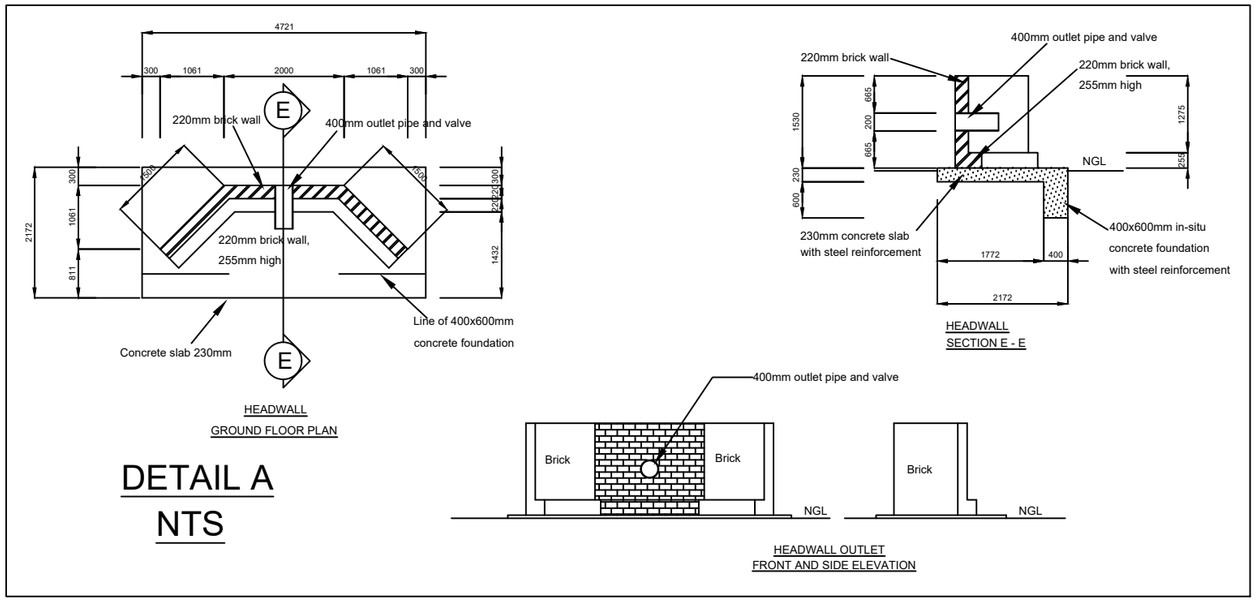
DRAWING NUMBER: D-002

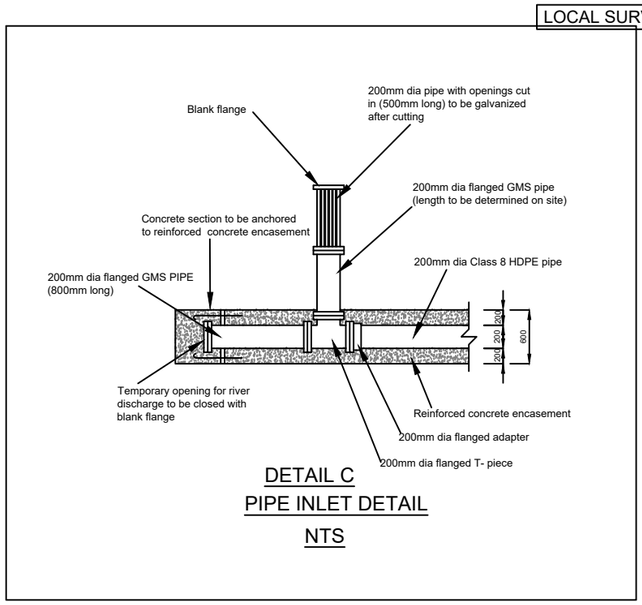
REVISION NO: A

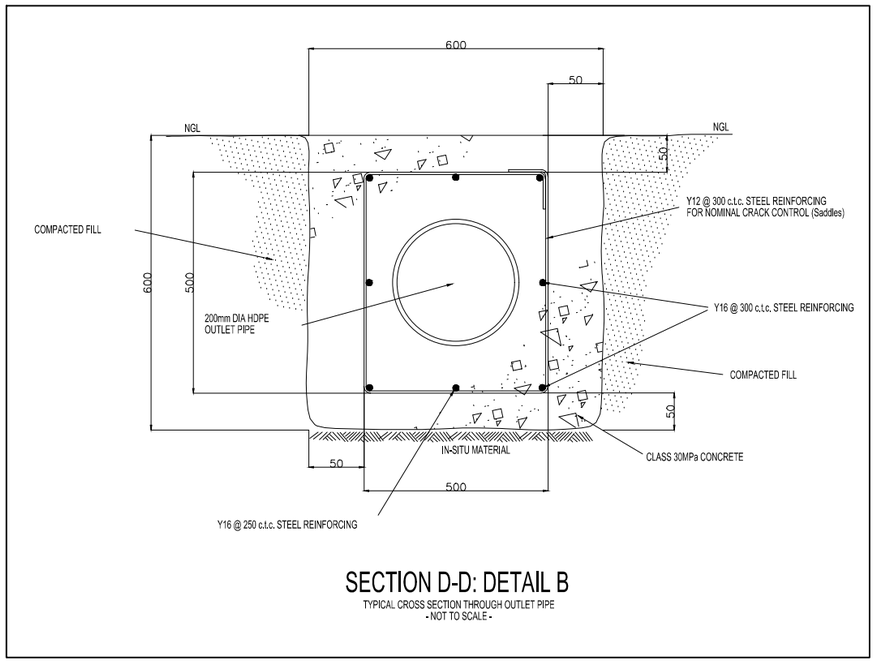
PROJECT NUMBER: 074

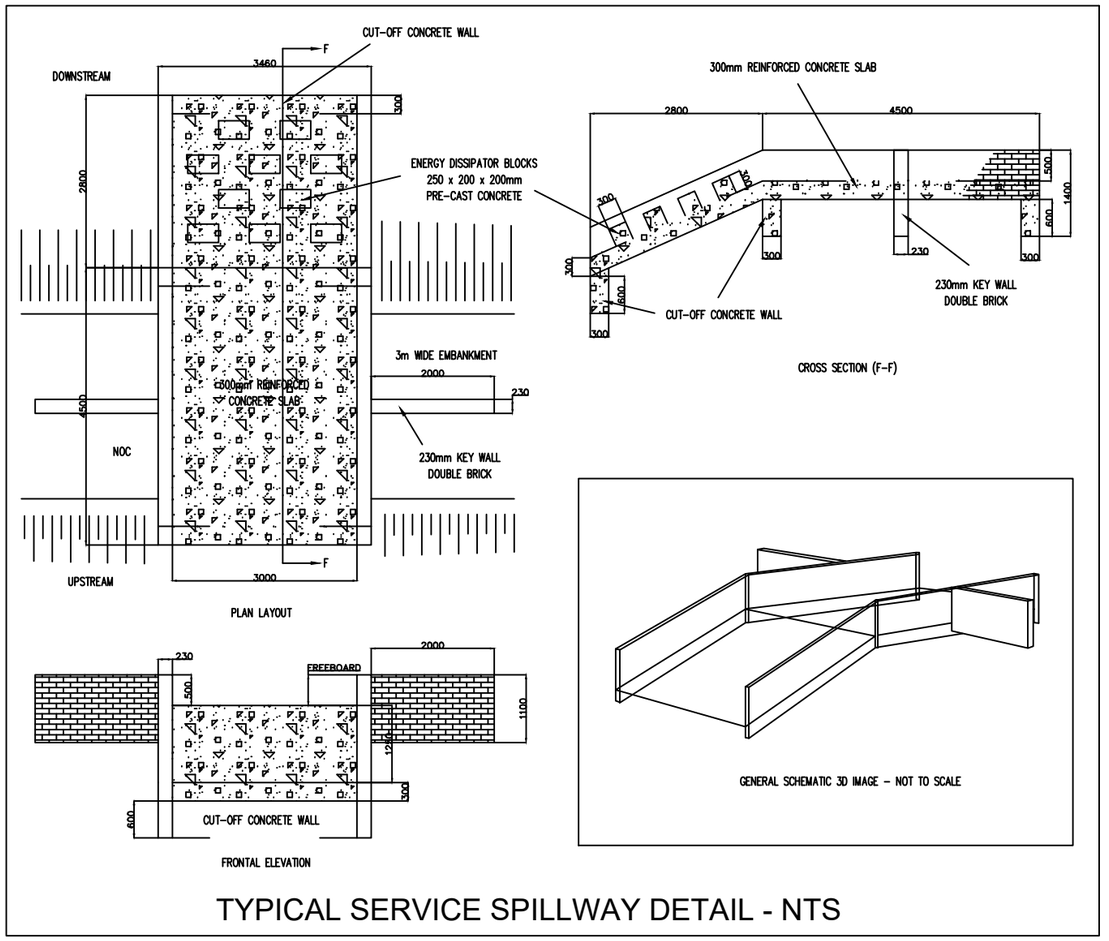
DAM DESIGN DETAIL

LOCAL SURVEY BY PG CONSULTING ENGINEERS









0 5 10 15 20 30 50mm

ORIGINAL SIZE A3

AMENDMENTS				
NR.	DATE	APPROVED	DESCRIPTION	PAR.

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PASSIONATE ABOUT DAMS

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CHECKED	DRAWN
MF JOUBERT	MS MULDER
APPROVED	SIGNATURE
MF JOUBERT	
Pr. No. 201670207	

JOE KLOPPERS - DAM 7

Project

SECTIONS

Plan Description

DATE	SCALE
16/04/2020	N.T.S
DRAWING NUMBER	
D-003	
REVISION NO:	A
PROJECT NUMBER	074

APPENDIX D

SPECIALIST REPORTS

APPENDIX D_1

FRESHWATER ECOLOGICAL IMPACT ASSESSMENT

THE TERRESTRIAL ASSESSMENT AND FRESHWATER REVIEW FOR THE CONSTRUCTION OF DAM NO. 7

Vaalwater, Limpopo Province

October 2020

CLIENT

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**THE TERRESTRIAL ASSESSMENT AND FRESHWATER REVIEW FOR THE CONSTRUCTION OF DAM NO. 7**
Submitted to	
Report Writer	**Lindi Steyn** Lindi Steyn has a PhD in Biodiversity and Conservation from the University of Johannesburg. She specialises in avifauna and has worked in this specialisation since 2013.
Report Writer	**Martinus Erasmus** Martinus Erasmus obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting EIAs, basic assessments and assisting specialists in field during his studies since 2015.
Report Writer	**Christian Fry** Christian Fry has obtained an MSc in Aquatic Health from the University of Johannesburg and is a registered Professional Scientist (Pr. Sci. Nat: 119082). Christian has 6 years of experience conducting basic assessments, biomonitoring and EIAs for various sectors.
Report Reviewer	**Andrew Husted** Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

Table of Contents

Tables

Figures

1 Introduction & Background

The Biodiversity Company was commissioned to conduct a terrestrial ecology (Fauna & Flora) assessment and a freshwater review as well as compile an alien management plan for the construction of Dam no. 7 on the farm Doornspruit, Vaalwater (Figure 1-1). The following description is as per the concept design report (PG Consulting Engineers, 2020): *The proposed Dam No. 7 will be constructed as an off-channel earth fill embankment dam, equipped with a service spillway across the embankment crest* (Figure 1-2 and Table 1-1). *The dam will be utilized for irrigation and are located on the farm Doornspruit 215 KQ, approximately 19 kilometers north-west of the town Vaalwater in the Waterberg District of the Limpopo Province* (Figure 1-1). *The dam will mainly be fed by authorized water pumped from the Sterkfontein River. A small percentage of natural catchment run off, which is diverted by two stormwater canals, will contribute to the storage. The center co-ordinates of the proposed dam wall are Latitude 24° 11' 52.55" S and Longitude 27° 57' 31.88" E.*

A summary of the dam features is provided in Table 1-1 (PG Consulting Engineers, 2020):

Table 1-1 Features and sizing of the dam

Feature	Size
Gross storage capacity	52 000 m^3
Water surface area at FSL	1.725 ha
Crest Level of non-overspill	CL 1059.50 masl
Full supply level	CL 1059.00 masl
Downstream lowest ground level (as surveyed)	CL 1054.77 masl
Maximum wall height	4.73 m
NOC crest width	4.0 m
Embankment length (including spillway)	354 m
Upstream slope	1(V):3.0(H)
Downstream slope	1(V):2.0(H)
Type of spillway	Service spillway on crest
Total Freeboard	0.5 m
Spillway control section widths	3 m (service spillway)
Outlet works	Single 200 mm diameter Class 9 uPVC pipe encased in concrete

The approach adopted for the assessments has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation". The National Web based Environmental Screening Tool has characterised the terrestrial biodiversity for the project area as "very high sensitivity" while the aquatic biodiversity was said to be "low sensitivity".

The purpose of these specialist studies is to provide relevant input into the environmental authorisation process for the proposed activities associated with the dam development. This report, after taking into consideration the findings and recommendations provided by the

specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

Figure 1-1 Proposed Dam no. 7 location

Figure 1-2 Layout and design of Dam no. 7

2 Document Structure

The table below provides the NEMA (2014) Requirements for Ecological Assessments, and also the relevant sections in the reports where these requirements are addressed:

GNR 326	Description	Section
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page ii. Appendix A
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix A
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 1 & 3
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 6
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 8.1.3
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 6
Appendix 6 (f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a, site plan identifying site alternatives;	Section 8.1.3.5.2
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 8.1.3.5.2 & 10
Appendix 6 (h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 8.1.3.5.2
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity [including identified alternatives on the environment] or activities;	Section 9, 10 & 11
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 10 & 12
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 13
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10 &12
Appendix 6 (n)	A reasoned opinion— i. [as to] whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 13
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	None
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None
Appendix 6 (q)	Any other information requested by the competent authority.	None

3 Terms of Reference

The Terms of Reference (ToR) included the following:

- Description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity) that occur in the project area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical and faunal features within the proposed project areas;
- Identification of conservation significant habitats around the project area which might be impacted;
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application;
- Provide a map to identify sensitive receptors in the project area, based on available maps and database information;
- Provide a freshwater review that includes information from a previous study in the area;
- A request to include a Section 24G application was made for three farm dams constructed within an ephemeral system (located at 24°12'52.68"S 27°57'53.77"E). A GN 509 risk assessment was completed for the construction activities in Section 11.3.
- Provide an alien management plan;
- Conduct risk assessments relevant to the proposed activity; and
- Impact assessment, mitigation and rehabilitation measures to prevent or reduce the possible impacts.

4 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, is not exhaustive and other legislation, policies and guidelines may apply in addition to those listed below (Table 4-1).

Table 4-1 A list of key legislative requirements relevant to these studies in the Limpopo Province

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 43110 (March 2020)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Environmental Management Air Quality Act (No. 39 of 2004)
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
	National Water Act (NWA, 1998)
Provincial	Limpopo Conservation Plan (LEDET, 2018)

	Waterberg District Bioregional Plan (LEDET, 2016)

5 Limitations

The following limitations should be noted for the assessment:

- Only a single season survey will be conducted for the respective studies, this would constitute a wet season survey;
- This assessment has not assessed any temporal trends for the project;
- The aquatic review is based on information from the 2019 and 2020 study (TBC 2019, 2020); and
- The risk assessment completed for the S24G application was completed on desktop information only and Present Ecological State study was conducted.

6 Methodologies

6.1 Terrestrial Assessment

6.1.1 Geographic Information Systems (GIS) Mapping

Existing data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- National Biodiversity Assessment (NBA) (Skowno *et al*., 2019);
- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- Limpopo Conservation Plan (LEDET, 2018); and
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al.,* 2018).

Brief descriptions of the standardised methodologies applied in each of the specialist disciplines are provided below. More detailed descriptions of survey methodologies are available upon request.

6.1.2 Botanical Assessment

The botanical assessment encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution of the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution. The Red List of South African Plants website (SANBI, 2017) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1997);
- A field guide to Wild flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Mesembs of the World (Smith *et al.,* 1998);
- Medicinal Plants of South Africa (Van Wyk *et al.,* 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification guide to southern African grasses. An identification manual with keys, descriptions and distributions (Fish *et al.,* 2015).

Additional information regarding ecosystems, vegetation types, and Species of Conservation Concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012); and
- Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2016).

The field work methodology included the following survey techniques:

- Timed meanders;
- Sensitivity analysis based on structural and species diversity; and
- Identification of floral red-data species.

6.1.3 Floristic Analysis

The early wet season fieldwork and sample sites were placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the proposed project area.

Homogenous vegetation units were subjectively identified using satelite imagery and existing land cover maps. The floristic diversity and search for flora SCC were conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis was placed mostly on sensitive habitats overlapping with the proposed project areas.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and

therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g. livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area.

6.1.4 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of expected species lists;
- Identification of any Red Data or Species of Conservation Concern (SCC) potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.

Mammal distribution data were obtained from the following information sources:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem *et al.,* 2010);
- The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (www.ewt.org.za) (EWT, 2016); and
- Animal Demography Unit (ADU) - MammalMap Category (MammalMap, 2019) (mammalmap.adu.org.za).

While the Avifauna distribution and other pertinent data was obtained from:

- Southern African Bird Atlas Project 2 (SABAP2, 2019);
- Birdlife South Africa (2015);
- Birdlife. (2017). Important Bird Areas Factsheets;
- Checklist of the Birds of the World (Del Hoyo *et al.,* 1996);
- Book of birds of South Africa, Lesotho and Swaziland (Taylor *et al.,* 2015); and
- Roberts – Birds of Southern Africa (Hockey *et al.,* 2005).

The field survey component of the assessment utilised a variety of sampling techniques including, but not limited to, the following:

- Visual observations;
- Identification of tracks and signs; and
- Utilization of local knowledge.

Sites were selected on the basis of GIS mapping and Google Earth imagery and then final selection was confirmed through ground truthing during the surveys. Habitat types sampled included pristine, disturbed and semi-disturbed zones, drainage lines and wetlands.

6.1.5 Herpetology (Reptiles & Amphibians)

A herpetofauna desktop assessment of the possible species in the area was undertaken and attention was paid to the SCCs, sources used included the IUCN (2017) and ADU (2019). Herpetofauna distributional data was obtained from the following information sources:

- South African Reptile Conservation Assessment (SARCA) (sarca.adu.org);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Atlas and Red list of Reptiles of South Africa, Lesotho and Swaziland (Bates *et al.,* 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009);
- Animal Demography Unit (ADU) - FrogMAP (frogmap.adu.org.za);
- Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Mintner *et al.,* 2004); and
- Ensuring a future for South Africa's frogs (Measey, 2011).

A herpetofauna field assessment was conducted in each habitat or vegetation type within the project area, as identified from the desktop assessment, with a focus on those areas which will be most impacted by the proposed development. The herpetological field survey comprised the following techniques:

- Hand searching is used for reptile species that shelter in or under particular habitats. Visual searches, typically undertaken for species which activities occur on surfaces or for species that are difficult to detect by hand-searches or trap sampling.

6.1.6 Aquatic Desktop Assessment

A summary of field assessments conducted during the previous studies (TBC 2019, and TBC, 2020) are indicated in Table 6-1. These methodologies were only implemented at the sites which contained water. Findings and interpretation of results were included in this assessment. For the full methodologies and findings, the previous reports should be consulted.

Table 6-1 Methodologies applied during the biomonitoring study

Aspect	Analyses
Water Quality	In situ (DWAF, 1996).
Habitat	Biotope assessment Visual observations
Biotic indices	SASS5 (Dickens and Graham, 2002); The Average Score Per Taxon (ASPT);

Reference conditions for the macroinvertebrate communities reflect the best conditions that can be expected in rivers and streams within a specific area and reflect natural variations over time. These reference conditions are used as a benchmark against which field data can be

compared. Modelled reference conditions for the Waterberg Ecoregions were obtained from Dallas (2007). The biological bands for the Waterberg Ecoregion are presented in Figure 6-1. Ecological categories based on biological banding are presented in Table 6-2.

Table 6-2 Biological Bands / Ecological categories for interpreting SASS data (adapted from Dallas, 2007)

Class	Ecological Category	Description
A	Natural	Unimpaired. High diversity of taxa with numerous sensitive taxa.
B	Largely natural	Slightly impaired. High diversity of taxa, but with fewer sensitive taxa.
C	Moderately modified	Moderately impaired. Moderate diversity of taxa.
D	Largely modified	Considerably impaired. Mostly tolerant taxa present.
E/F	Seriously Modified	Severely impaired. Only tolerant taxa present.

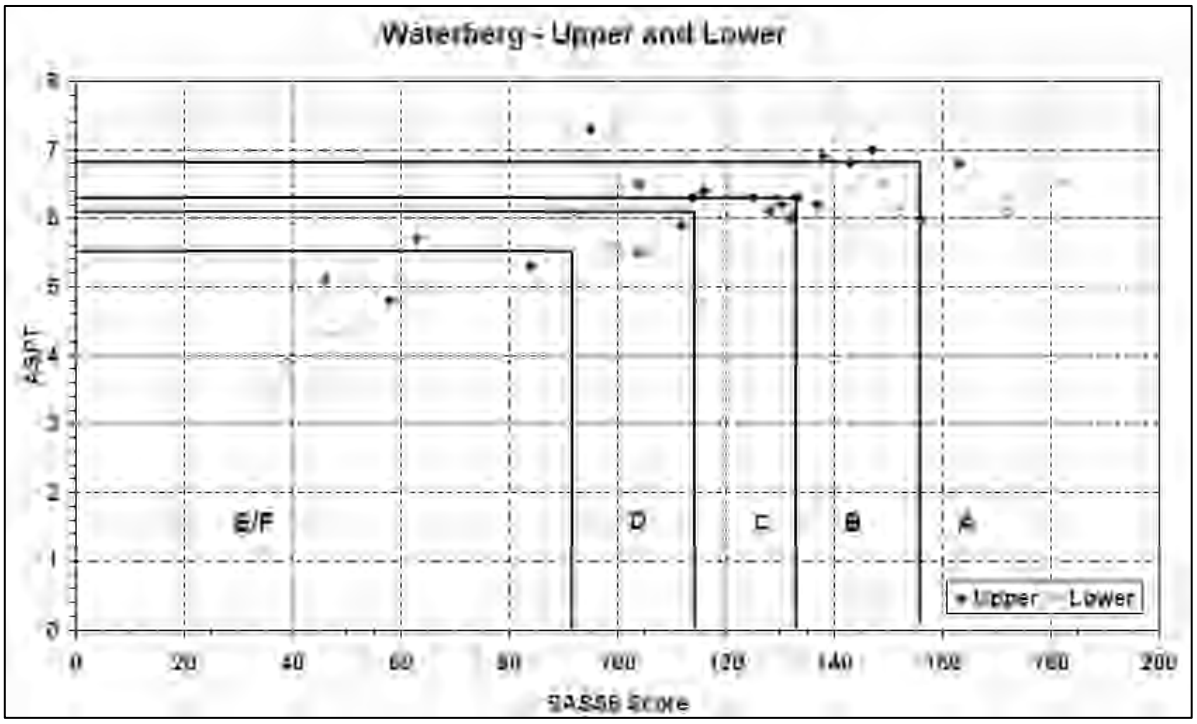

Figure 6-1 Biological Bands for the Waterberg Ecoregion, calculated using percentiles (Dallas, 2007)

6.1.6.1 Riparian Habitat Delineation

The riparian delineation was completed according to DWAF (2005a). Typical riparian cross sections and structures are provided in Figure 6-2. Indicators such as topography and vegetation were the primary indicators used to define the riparian zone. Contour data obtained from topography spatial data was also utilised to support the infield assessment.

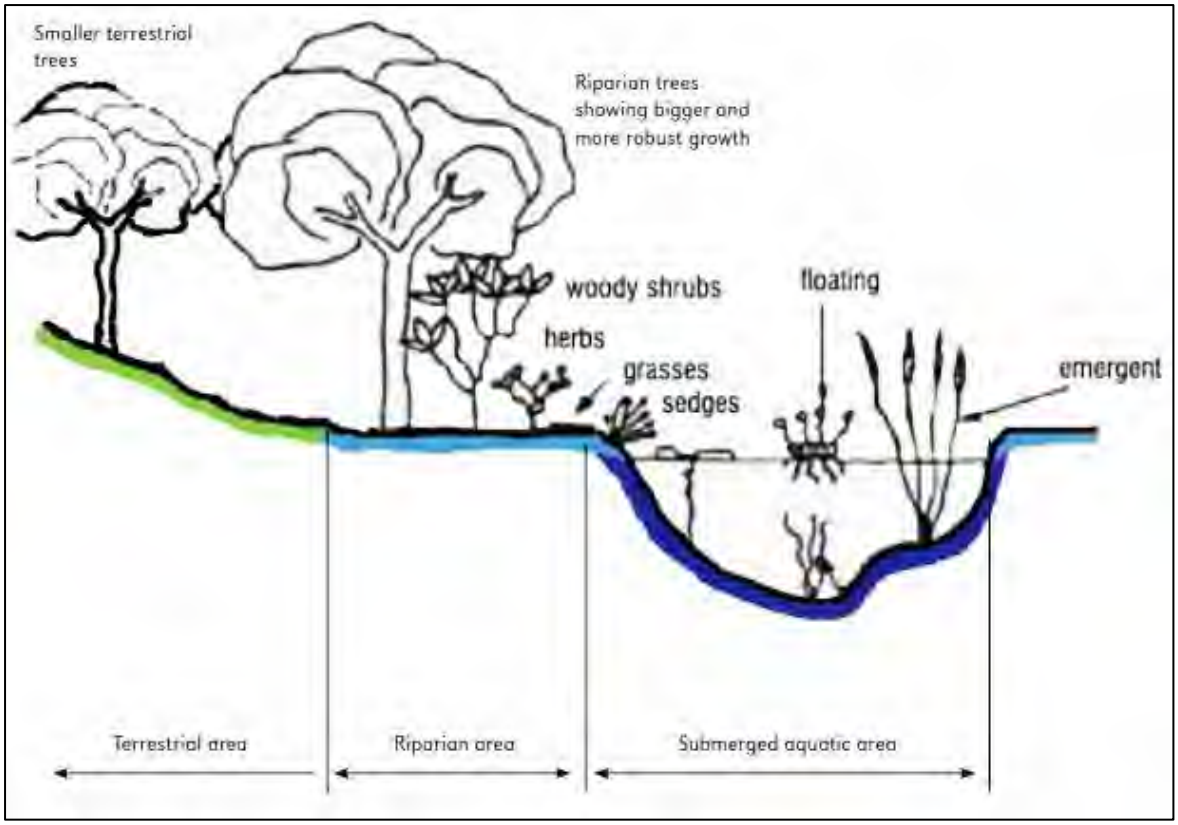

Figure 6-2 Riparian Habitat Delineations (DWAF, 2005a)

6.1.6.2 Resource Quality Objectives

The established Resource Quality Objectives (RQO) for the associated watercourses are presented in the tables below (Table 6-3 and Table 6-4). The in-field methods utilised is presented in Appendix G.

Table 6-3 Summary of Water Resource Classes per Integrated Unit of Analysis and Ecological Categories (RSA Government, 2017)

Integrated Unit of Analysis	Quaternary Catchment	River Name	Ecological Category to be maintained	Mean Annual Runoff (million m^3/a)	Ecological Water Requirements as % of natural Mean Annual Runoff
Upper Mokolo	A42E	Mokolo to confluence with Sterkfontein River	B/C	135.03	13.6

Table 6-4 Resource Quality Objectives for Rivers and Dams in Priority Resource Units (RSA Government, 2017)

Integrated Unit of Analysis	River	Component	Sub Component	RQO	Indicator	Limits		
Upper Mokolo	Mokolo River	Quantity	Low flows	EWR maintenance low and drought flows: Mokolo River at MOK_EWR1a in A42C NMAR = 84.84x10 m3 PES=C/D category. The maintenance low flows and drought flows must be attained to support the aquatic ecosystem and the downstream users.	Base Flows Maintenance flows and drought flows. Monitoring of Mokolo River at A4H002	Month	Maintenance Low flows (m^3/s)	Drought flows (m^3/s)
						Oct	0.110	0.005
						Nov	0.120	0.005
						Dec	0.200	0.020
						Jan	0.550	0.040
						Feb	0.850	0.060
						Mar	0.700	0.050
						Apr	0.500	0.040
						May	0.350	0.030
						Jn	0.270	0.020
						Jul	0.230	0.015
						Aug	0.180	0.010
						Sep	0.100	0.005
		Habitat	Instream	Habitat condition should be improved from a C/D ecological to a B/C category. Good low flows must be maintained to sustain habitat for substrate and habitat sensitive species. Return flows and abstraction in resource unit must be monitored and controlled to protect the instream habitat.	Index of Habitat Integrity, Rapid Habitat Assessment Method and Model (RHAMM)	Instream Habitat Integrity EC = B/C >78%		
			Riparian	Riparian vegetation must be improved from C/D to a C category. Riparian zones must remain in cultivated areas. Cultivation must be managed to prevent loss of riparian zone.	Index of Habitat Integrity,	VEGRAI EC = C >62%		
		Biota	Fish	Fish community should be improved from a C/D ecological category to a C category. Flow velocity/depth must be maintained for various species.	FRAI	Fish ecology category = C FRAI>62% Sample 15+ species per sample effort		
			Aquatic Macroinvertebrates	Macroinvertebrates assemblage must be maintained within a C ecological category condition or improved upon	MIRAI, SASS5	Sites: A4MOKO-VAALW MIRAI EC = C > 62% SASS5 > 120 ASPT > 5.5 Site: A4SAND-TOPBR: MIRAI EC = C > 62% SASS > 120 ASPT > 6.0 Site DWARS 1a MIRAI EC = C > 62% SASS > 120 ASPT > 5.5		

7 Receiving Environment

7.1 Desktop Spatial Assessment

The following features describes the general area and habitat, this assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and SANBI. The desktop analysis and their relevance to this project are listed in Table 7-1.

Table 7-1 Desktop spatial features examined.

Desktop Information Considered	Relevant/Not relevant	Section
Conservation Plan Terrestrial	The project area overlaps with a CBA2 area and is adjacent to a ESA2 area.	7.2
Ecosystem Threat Status	The project area falls across a LC ecosystem	7.3.1
Ecosystem Protection Level	The terrestrial ecosystems associated with the project area is rated as poorly protected	7.3.2
Protected Areas (SAPAD & SACAD)	The project area falls within the Waterberg Biosphere Reserve's transitional zone.	7.4
Important Bird and Biodiversity Areas	The project area falls within the Waterberg IBA	7.5
National Protected Areas Expansion Strategies (NPAES)	Irrelevant: Closest NPAES (Limpopo Central Bushveld) is 15.8 km from the project area	-
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	The project area does not fall across any wetlands or rivers. It does however come into close proximity to an EN river	7.6
NFEPA Rivers and Wetlands	The project area overlaps with a NFEPA river or wetland	7.7
Strategic Water Source Areas (SWSA)	Irrelevant: 9.7 km from the closest SWSA (Waterberg SWSA)	-

7.2 Limpopo Conservation Plan

The Limpopo Conservation Plan, Version 2 (LCPv2), was completed in 2018 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet *et al.,* 2018). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet *et al.,* 2018). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1 (CBA1);
- Critical Biodiversity Area 2 (CBA2);
- Ecological Support Area 1 (ESA1);
- Ecological Support Area 2 (ESA2);
- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be

met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet *et al.,* 2018).

Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Desmet *et al.,* 2018).

Areas with No Natural Habitat Remaining (NNR) are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Desmet *et al.,* 2018).

Figure 7-1 illustrates the project area overlaps with a CBA2 area and is adjacent to a ESA2 area.

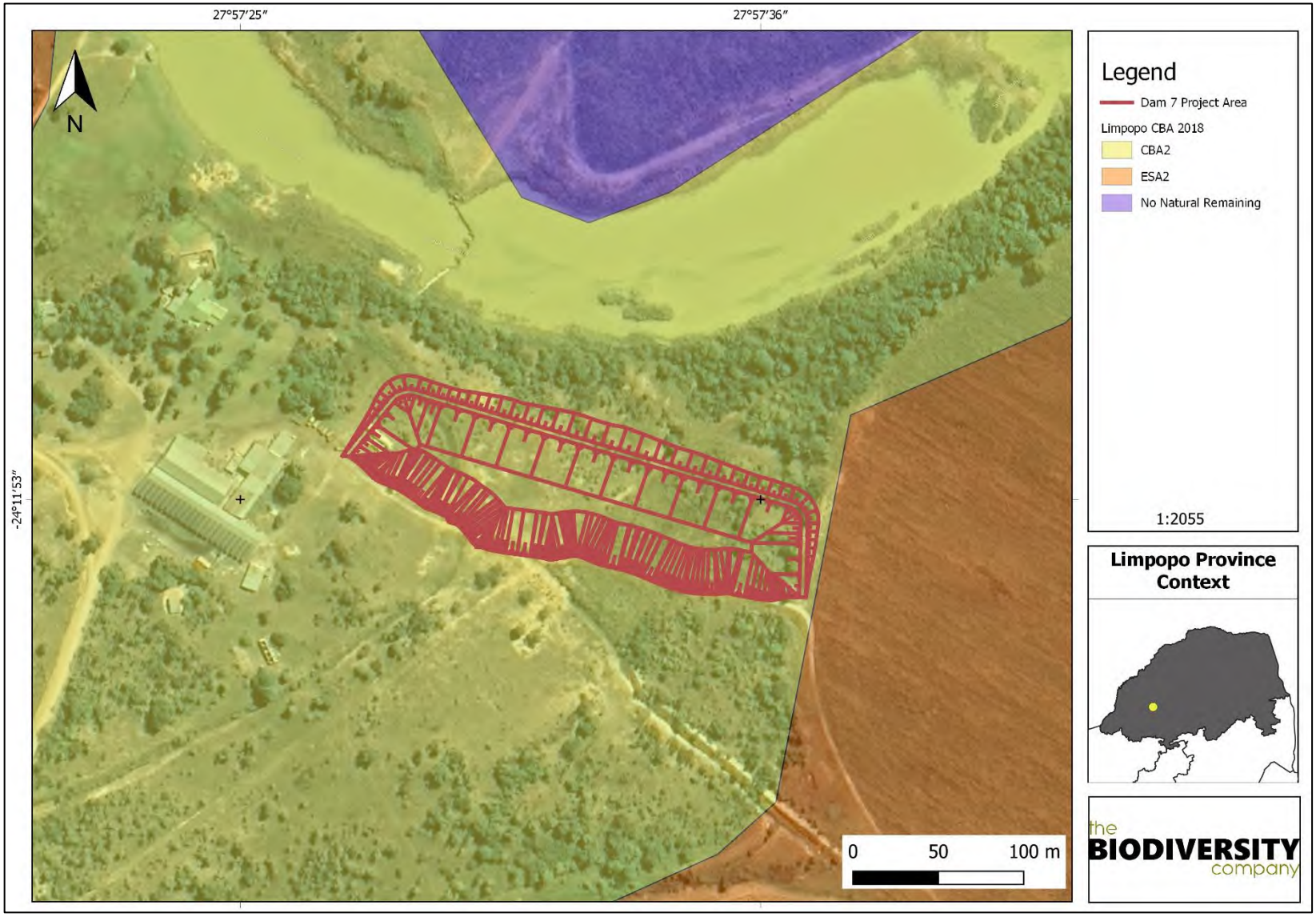

Figure 7-1 The project area superimposed on the Limpopo Conservation Plan (LEDET, 2018)

7.3 The National Biodiversity Assessment

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the DEA and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Skowno *et al*., 2019).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Skowno *et al*., 2019).

The two headline indicators assessed in the NBA are *ecosystem threat status* and *ecosystem protection level* (Skowno *et al*., 2019).

7.3.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Skowno *et al*., 2019).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Skowno *et al*., 2019).

The project area was superimposed on the terrestrial ecosystem threat status (Figure 7-2). As seen in Figure 7-2, the project area falls within a LC ecosystem.

Figure 7-2 The project area showing the regional ecosystem threat status of the associated terrestrial ecosystems (NBA, 2018)

7.3.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al*., 2019).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 7-3). Based on Figure 7-3 the terrestrial ecosystems associated with the development are rated as *poorly protected* for the entire project area.

Figure 7-3 The project area showing the regional level of protection of terrestrial ecosystems (NBA, 2018)

7.4 Protected and Conservation Areas

The Department of Environmental Affairs maintains a spatial database on Protected Areas and Conservation Areas. Protected Areas and Conservation Areas (PACA) Database scheme that used for classifying protected areas (South Africa Protected Areas Database-SAPAD) and conservation areas (South Africa Conservation Areas Database-SACAD) into types and sub-types in South Africa.

The definition of protected areas used in these documents follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the "System of Protected Areas", which consists of the following kinds of protected areas:

- Special nature reserves:
- National parks:
- Nature reserves and
- Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003);
- World heritage sites declared in terms of the World Heritage Convention Act;
- Marine protected areas declared in terms of the Marine Living Resources Act;
- Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).
- The types of conservation areas that are currently included in the database are the following:
- Biosphere reserves;
- Ramsar sites;
- Stewardship agreements (other than nature reserves and protected environments);
- Botanical gardens;
- Transfrontier conservation areas;
- Transfrontier parks;
- Military conservation areas and
- Conservancies

Figure 7 3 indicates that the project is 7.3 km from the Welgevonden Game Reserve and falls within its 10 km protected area buffer (Desmet *et al*., 2013). It also falls within the Waterberg Biosphere Reserve's transitional zone. The Waterberg Biosphere Reserve was named an UNESCO site in 2001. This biosphere reserve represents an area of high biological diversity including many Red Data and orange listed species of conservation concern, and many endemic

species. The habitats are sufficiently represented to ensure that the current high biodiversity is maintained. The low human density ensures large areas of unspoiled wilderness and open spaces are a main characteristic of the Waterberg Biosphere Reserve (http://www.waterbergconservationforum.co.za 2012) (Figure 7-4).

Figure 7-4 The conservation area associated with the project area (SACAD, 2018)

7.5 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The project area falls within the Waterberg IBA (Figure 7-5). The Waterberg IBA consists of the whole Waterberg Plateau. The Kransberg is the western sector of the Waterberg range and falls within the Marakele National Park. The Kransberg holds a large colony of Cape vulture (*Gyps coprotheres*), approximately 800-850 pairs. The IBA also supports many other raptor species such as: Martial Eagle *Polemaetus bellicosus*, Verreauxs' Eagle *Aquila verreauxii*, Jackal Buzzard *Buteo rufofuscus* and African Harrier-Hawk *Polyboroides typus*. Breeding populations of

Peregrine Falcon *Falco peregrinus*, Lanner Falcon *F. biarmicus*, Black Stork *Ciconia nigra* and Cape Eagle-Owl *Bubo capensis* occurs in this IBA.

Woodland bird species found in this IBA include Red-crested Korhaan *Lophotis ruficrista*, Monotonous Lark *Mirafra passerina*, Barred Wren-Warbler *Calamonastes fasciolatus*, Southern White-crowned Shrike *Eurocephalus anguitimens*, Scaly-feathered Finch *Sporopipes squamifrons*, Violet-eared Waxbill *Uraeginthus granatinus* and Black-faced Waxbill *Estrilda erythronotos*. Half-collared Kingfisher *Alcedo semitorquata* and Mountain Wagtail *Motacilla clara* occur along the mountain streams. Along some of the rivers White-backed Night Heron *Gorsachius leuconotus* and African Finfoot *Podica senegalensis* can be found. Buff-streaked Chat *Campicoloides bifasciata* and Cape Rock Thrush *Monticola rupestris*, which are endemic to South Africa, Lesotho and Swaziland, also occur in the IBA.

Biome-restricted species include Kurrichane Thrush *Turdus libonyanus*, White-bellied Sunbird *Cinnyris talatala*, Barred Wren-Warbler and Burchell's Starling *Lamprotornis australis*, which are common. White-throated Robin-Chat *Cossypha humeralis* is considered fairly common and Buff-streaked Chat, Kalahari Scrub Robin *Erythropygia paena* and Gurney's Sugarbird are regarded as uncommon (Birdlife South Africa, 2015A).

Figure 7-5 The important bird and biodiversity areas in relation to the project area (IBA, 2015)

7.6 South African Inventory of Inland Aquatic Ecosystems

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018.

The project area does not fall across any wetlands or rivers. It does however come into close proximity to an EN river (Figure 7-6).

Figure 7-6 The project area in relation to the NBA threat status of the rivers

Figure 7-7 The project area in relation to the NBA protection level of the rivers

7.7 National Freshwater Ecosystem Priority Areas

The NFEPA spatial data has been incorporated in the above mentioned SAIIAE spatial data set. However, to ensure that this data sets are considered we included it as the Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011) are intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011). The project area does not overlaps with a FEPA wetland (Figure 7-8) or a FEPA river, it does however come into close proximity to a non FEPA river.

Figure 7-8 The project area in relation to the NFEPA spatial data.

7.8 Hydrological Setting

The project area is located within the A42E quaternary catchment, however the downstream T3 site falls within the A42F quaternary catchment, within the Limpopo Water Management Area (WMA) (NWA, 2016). The relevant watercourses and spatial framework for this project fall within a single Sub-Quaternary Reaches (SQR), which includes a reach of the Sterkfontein River (A42D-346). The Sterkfontein River flows into the Mokolo River, which eventuates into the Limpopo River.

A total of three survey sites were selected for the review, an upstream site T1, mid-stream site T2, and a downstream site T3 (Figure 7-9) (Figure 7-10). These sites were selected from the previous riverine study conducted (TBC, 2019 and TBC, 2020) to effectively establish the ecological condition of the Strekstroom River in the project area.

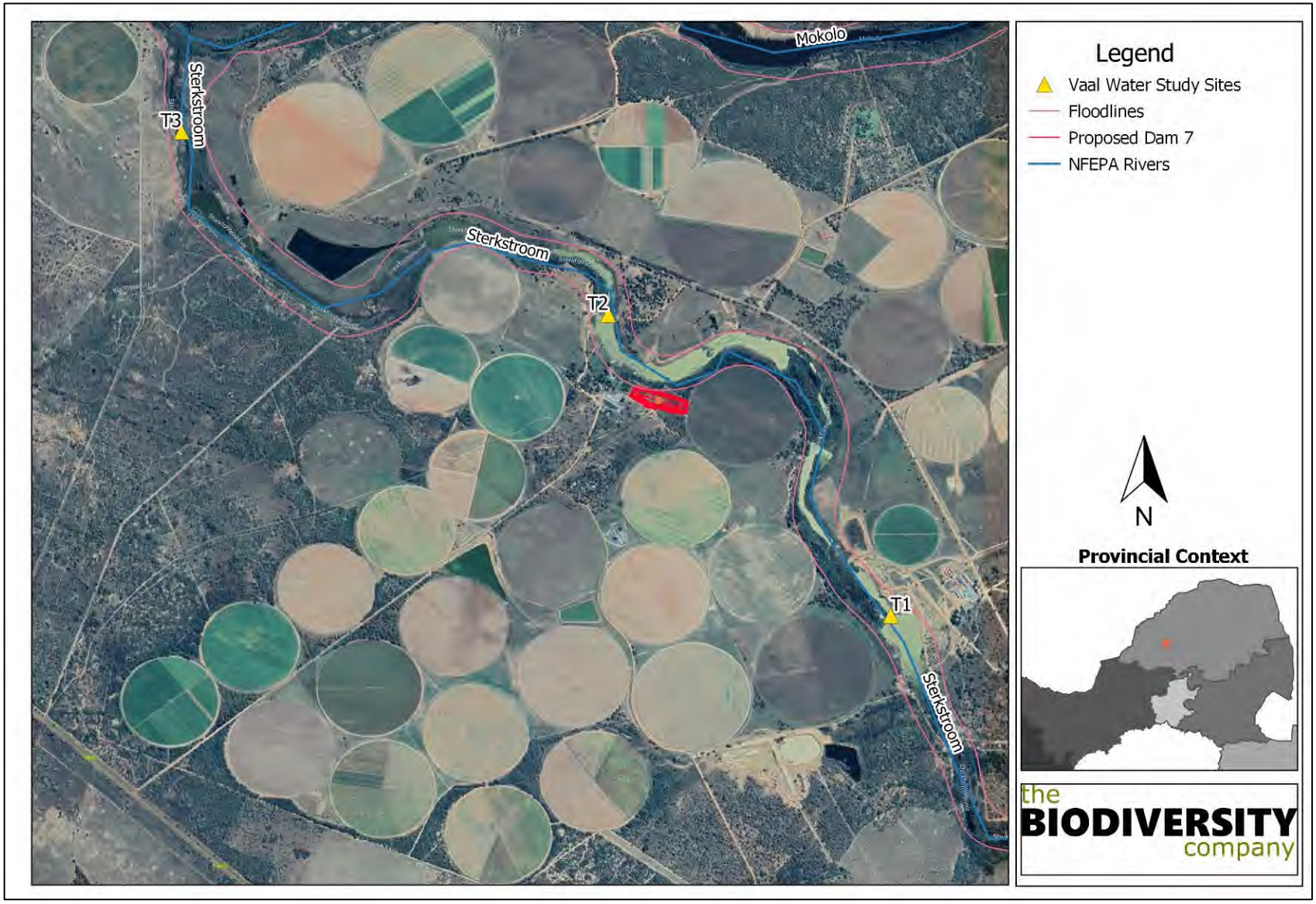

Figure 7-9 Illustration of the aquatic sampling points associated with the project area

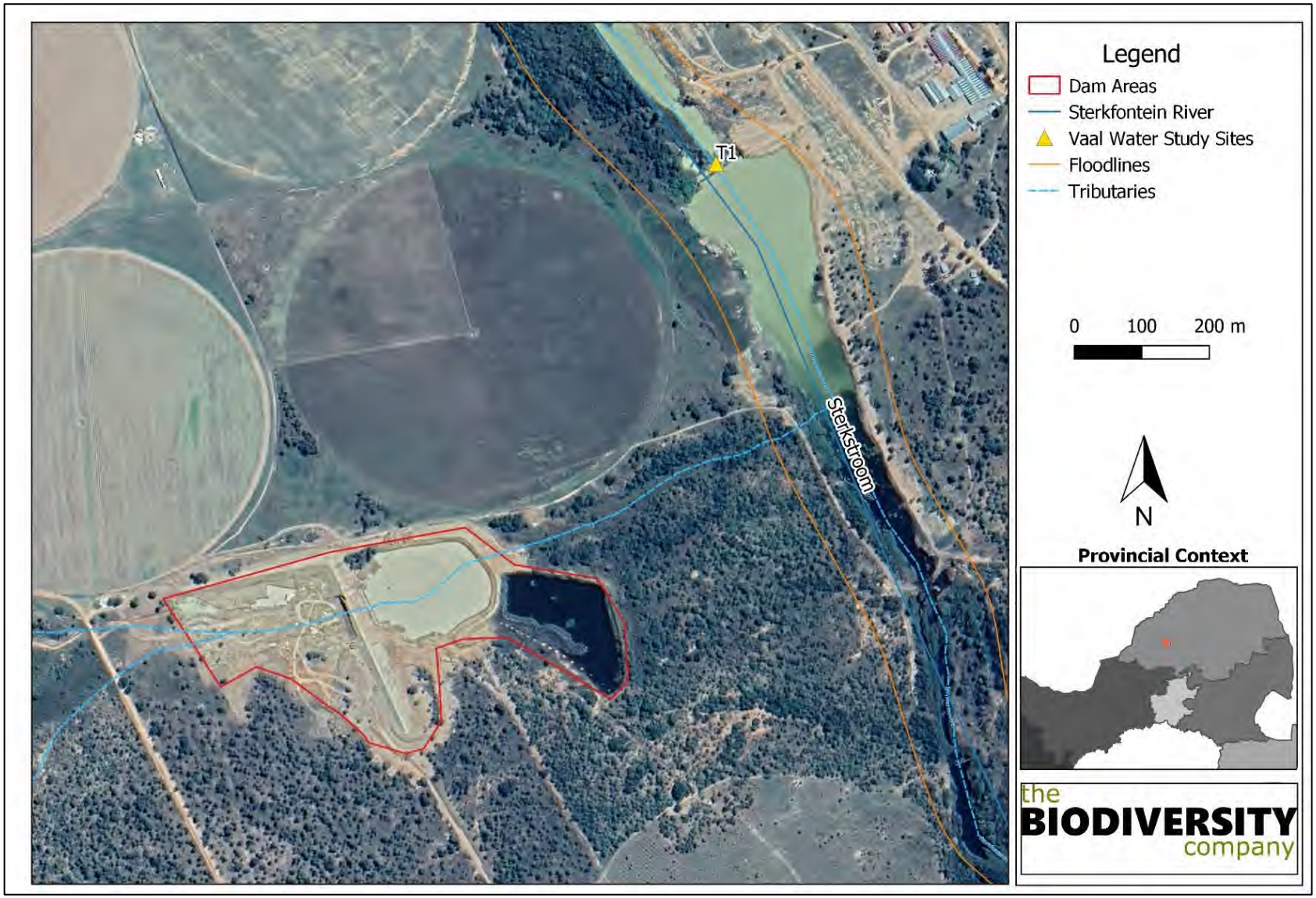

Figure 7-10 Illustration of the aquatic sampling points associated with the project area

8 Results and Discussion

8.1.1 Terrestrial Desktop Assessment

8.1.1.1 Vegetation Assessment

The project area is situated within the savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia*, *Senegalia* and *Albizia*) and a generally dense herbaceous layer (Scholes & Walker, 1993).

8.1.1.1.1 Vegetation Types

The savanna biome comprises many different vegetation types. The project area is situated within the Central Sandy Bushveld according to Mucina & Rutherford (2006) (Figure 8-1).

8.1.1.1.2 Central Sandy Bushveld

Central Sandy Bushveld is undulating terrain at altitudes of 850-1450m. These areas are sometimes found between mountains, sandy plains and catenas that support tall, deciduous *Terminalia sericea* and *Burkea africana.*

Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the **Central Sandy Bushveld** vegetation type:

Tall Trees: *Senegalia burkei*, *Vachellia robusta*, *Sclerocarya birrea* subsp. *caffra*.

Small Trees: *Burkea africana*, *Combretum apiculatum*, *C. zeyheri*, *Terminalia sericea*, *Ochna pulchra*, *Peltophorum africanum*, *Searsia leptodictya*.

Tall Shrubs: *Combretum hereroense*, *Grewia bicolor*, *G. monticola*, *Strychnos pungens*.

Low Shrubs: *Agathisanthemum bojeri*, *Indigofera filipes*, *Felicia fascicularis*, *Gnidia sericocephala*.

Geoxylic Suffrutex: *Dichapetalum cymosum*.

Woody Climber: *Asparagus buchananii*.

Graminoids: *Brachiaria nigropedata*, *Eragrostis pallens*, *E. rigidior*, *Hyperthelia dissoluta*, *Panicum maximum*, *Perotis patens*, *Anthephora pubescens*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Brachiaria serrata*, *Elionurus muticus*, *Eragrostis nindensis*, *Loudetia simplex*, *Schmidtia pappophoroides*, *Themeda triandra*, *Trachypogon spicatus*.

Herbs: *Dicerocaryum senecioides*, *Barleria macrostegia*, *Blepharis integrifolia*, *Crabbea angustifolia*, *Evolvulus alsinoides*, *Geigeria burkei*, *Hermannia lancifolia*, *Indigofera daleoides*, *Justicia anagalloides*, *Kyphocarpa angustifolia*, *Lophiocarpus tenuissimus*, *Waltheria indica*, *Xerophyta humilis*.

Geophytic Herb: *Hypoxis hemerocallidea*.

Succulent Herb: *Aloe greatheadii* var. *davyana*.

Biogeographically Important Taxa (Central Bushveld endemics)

Graminoid: *Mosdenia leptostachys*.

Herb: *Oxygonum dregeanum* subsp. *canescens* var. *dissectum*.

Conservation Status

The conservation status of this vegetation community was listed by Mucina and Rutherford (2006) as VU. The national conservation target of 19% of which less than 3% is statutorily conserved across many nature reserves.

Figure 8-1 The project area showing the vegetation type based on the Vegetation map of South Africa, Lesotho and Swaziland (BGIS, 2018)

8.1.1.1.3 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2019) database, 246 plant species have the potential to occur in the project area and its surroundings (Figure 8-2 and Table 8-1). Of these 246 plant species (Appendix B), 1 species is listed as being Species of Conservation Concern (SCC) (Figure 8-2).

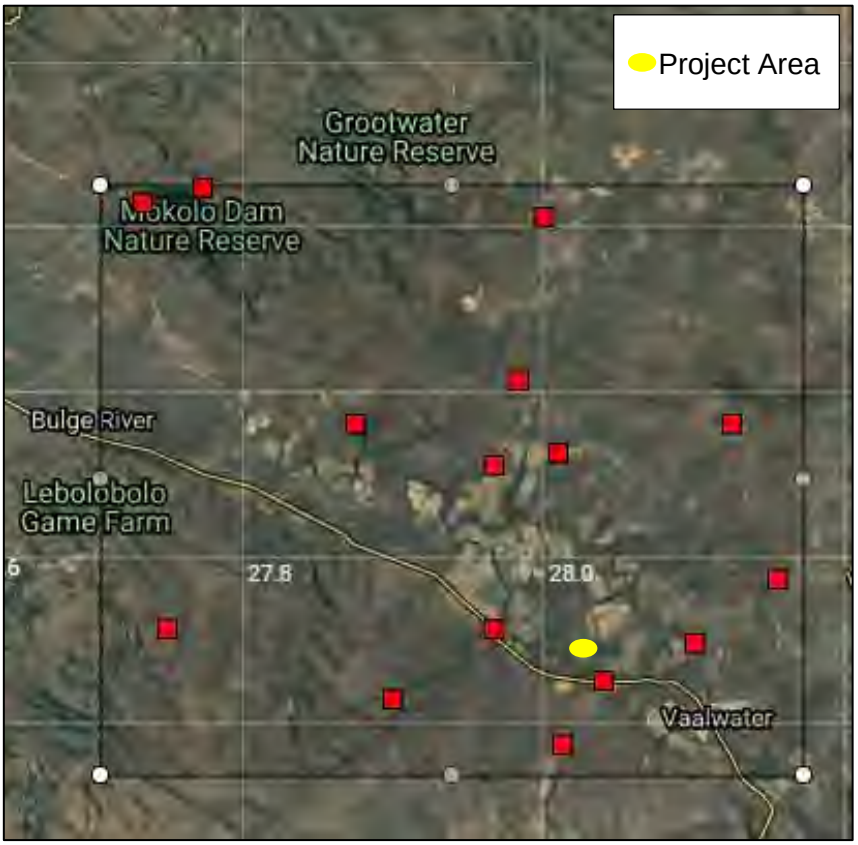

Figure 8-2 Map showing the grid drawn in order to compile an expected plant species list (BODATSA-POSA, 2019)

Table 8-1 Plant Species of Conservation Concern with the potential to occur in the project area

Family	Taxon	Author	IUCN	Ecology
Apocynaceae	*Ceropegia turricula*	E.A.Bruce	NT	Indigenous; Endemic

8.1.1.2 Faunal Assessment

8.1.1.2.1 Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 329 bird species have the potential to occur in the vicinity of the project area. The full list of potential bird species is provided in Appendix C.

Of the potential bird species, 14 species are listed as SCC either on a regional or global scale (Table 8-2). The SCC include the following:

- One (1) species that are listed as CR on a regional basis;
- Three (3) species that are listed as EN on a regional basis;
- Six (6) species that are listed as VU on a regional basis; and
- Four (4) species that are listed as NT on a regional basis.

On a global scale, one (1) species as CR, one (1) as EN, two (2) as VU and two (2) species as NT (Table 8-2). Eight species have a low likelihood of occurrence in the project area due to a lack of suitable habitat, in some instances they might be seen close to the project area but will not be residents.

Table 8-2 List of bird species of regional or global conservation importance that could potentially occur in close vicinity to the project area.

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC	Moderate
Aquila rapax	Eagle, Tawny	EN	LC	Low
Aquila verreauxii	Eagle, Verreaux's	VU	LC	Low
Ciconia abdimii	Stork, Abdim's	NT	LC	Low
Ciconia nigra	Stork, Black	VU	LC	Low
Coracias garrulus	Roller, European	NT	LC	High
Falco biarmicus	Falcon, Lanner	VU	LC	High
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Moderate
Gyps africanus	Vulture, White-backed	CR	CR	Low
Gyps coprotheres	Vulture, Cape	EN	EN	Low
Neotis denhami	Bustard, Denham's	VU	NT	Moderate
Podica senegalensis	Finfoot, African	VU	LC	Low
Polemaetus bellicosus	Eagle, Martial	EN	VU	Low
Sagittarius serpentarius	Secretarybird	VU	VU	Moderate

Alcedo semitorquata (Half-collared Kingfisher) is listed as NT on a regional scale and occurs across a large range. This species generally prefers narrow rivers, streams, and estuaries with dense vegetation onshore, but it may also move into coastal lagoons and lakes. It mainly feeds on fish (IUCN, 2017). The possibility of occurrence is moderate based on proximity of the project area to the nearby river.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a high chance of this species occurring in the project area as they prefer to forage in open/disturbed agricultural areas which can be found adjacent to the project area.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to its migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There is a small amount of suitable habitat within the project area and adjacent to it and as such the likelihood of occurrence is rated as moderate.

Neotis denhami (Denhams Bustard) is listed as VU on a regional scale and NT on a global scale. It occurs in flat, arid, mostly open country such as grassland, karoo, bushveld, thornveld, scrubland and savanna but also including modified habitats such as wheat fields and firebreaks Collisions with power lines may be a significant threat in parts of the range, particularly South Africa (IUCN, 2007). The habitat at the project site does provide marginally suitable habitat for this species and therefore its likelihood of occurrence is rated as moderate.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high due to the grasslands and riparian areas present in and around the project area, as well as the agricultural areas present in which this species may forage.

8.1.1.2.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 91 mammal species that could be expected to occur within the project area. Species limited to nature reserves in South Africa was removed from the expected species list (Appendix D).

Of the 91 small to medium sized mammal species, fifteen (15) are listed as being of conservation concern on a regional or global basis (Table 8-3). The list of potential species includes:

- Two (2) that are listed as EN on a regional basis;
- Three (3) that are listed as VU on a regional basis; and
- Nine (9) that are listed as NT on a regional scale.

On a global scale 3 are listed as VU and 4 as NT (Table 8-3). Eleven of the species are expected to have a low likelihood of occurrence due to a lack of suitable habitat.

Table 8-3 List of mammal Species of Conservation Concern that may occur in the project area as well as their global and regional conservation statuses.

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Aonyx capensis	Cape Clawless Otter	NT	NT	Low
Atelerix frontalis	South Africa Hedgehog	NT	LC	High
Cloeotis percivali	Short-eared Trident Bat	EN	LC	Low
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Crocuta crocuta	Spotted Hyaena	NT	LC	Low
Dasymys incomtus	African Marsh rat	NT	LC	Low
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Leptailurus serval	Serval	NT	LC	High
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Pelea capreolus	Grey Rhebok	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	High
Redunca fulvorufula	Mountain Reedbuck	EN	LC	Low
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU	Low

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), A. frontalis populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is some areas of suitable habitat in the project area and therefore the likelihood of occurrence is rated as high.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the more arid Karoo region of South Africa, the habitat in the project area can be considered to be sub-optimal for the species and the likelihood of occurrence is rated as moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. The grassland habitat combined with the proximity to the rive results in a high likelihood of occurrence.

Poecilogale albinucha (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wider habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is sufficient habitat for this species in the project area and the likelihood of occurrence of this species is therefore considered to be high.

8.1.1.2.3 Herpetofauna (Reptiles & Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2019) 84 reptile species have the potential to occur in the project area (Appendix E). Three (2) of the expected species are SCCs (IUCN, 2017). The specie was given a low likelihood of occurrence, this is based on the lack of suitable habitat.

Table 8-4 Reptiles SCCs expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Crocodylus niloticus	Nile Crocodile	VU	LC
Lygodactylus waterbergensis	Waterberg Dwarf Gecko	NT	NT
Pseudocordylus transvaalensis	Northern Crag Lizard	NT	NT

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2020) 30 amphibian species have the potential to occur in the project area (Appendix F). None of the species are species of conservation concern.

8.1.2 Aquatic Review

The results presented below is as per the TBC (2019 and 2020) reports on the Sterkfontein reach associated with the proposed activities and does not present the current conditions in the system. However, not significant changes to the system when compared with the current conditions are expected.

8.1.2.1 Site summaries

Site summaries are presented in Table 8-5 to Table 8-7. Each summary reflects changes observed between the 2019 and 2020 studies, and how the sites compare to stipulated RQOs and the 2019 baseline study (TBC, 2019) for the respective reaches. Flows were only assessed using visual observations.

Table 8-5 Summary for site T1 on the Sterkfontein River (February 2020

Site Code	T1	**Audit Date**	12/02/2020
Upstream		**Downstream**	
			
Coordinates		-24.207983° 27.969792°	
Desktop data for the Sub-Quaternary Reach: A42D-346		**River Name**	**Sterkfontein**
Present Ecological Status	class D	**Ecological Importance Class**	Moderate
Default Ecological Category	class B	**Ecological Sensitivity**	High
Water Quality Baseline 2019			
pH	**Conductivity (µS/cm)**	**DO (mg/l)**	**Temperature (°C)**
6.2	22	6.9	29
Water Quality February 2020			
pH	**Conductivity (µS/cm)**	**DO (mg/l)**	**Temperature (°C)**
6.96	353	7.26	24
Macroinvertebrate Assessment 2019			
SASS5 Score	**No. of Taxa**	**ASPT**	**Ecological category (Dallas 2007)**
136	25	5.4	**class C**
Macroinvertebrate Assessment 2020			
SASS5 Score	**No. of Taxa**	**ASPT**	**Ecological category (Dallas 2007)**
134	26	5.2	**class C**
Biotope			
Baseline 2019	44 (class D)	**February 2020**	50 (class D)

Discussion
The water quality results from the 2020 study indicate an increase in dissolved solids within the reach, however, remaining water quality parameters remained stable from the 2019 assessment. Macroinvertebrate communities were comparable to those observed during the 2019 study, indicating stable conditions within the reach. Similar flows were observed within the Sterkfontein between the 2019 and 2020 surveys.

Table 8-6 Summary for site M1 on the Mokolo River (February 2020)

Site Code	T2	**Audit Date**	12/02/2020
Upstream		**Downstream**	
			
Coordinates		-24.193951° 27.956611°	
Desktop data for the Sub-Quaternary Reach: A42D-346		**River Name**	**Sterkfontein**
Present Ecological Status	class D	**Ecological Importance Class**	Moderate
Default Ecological Category	class B	**Ecological Sensitivity**	High
Water Quality Baseline 2019			
pH	**Conductivity (µS/cm)**	**DO (mg/l)**	**Temperature (°C)**
6.2	32	5.3	29
Water Quality February 2020			
pH	**Conductivity (µS/cm)**	**DO (mg/l)**	**Temperature (°C)**
7.19	377	6.75	26
Macroinvertebrate Assessment 2019			
SASS5 Score	**No. of Taxa**	**ASPT**	**Ecological category (Dallas 2007)**
101	21	4.8	**class D**
Macroinvertebrate Assessment 2020			
SASS5 Score	**No. of Taxa**	**ASPT**	**Ecological category (Dallas 2007)**
102	19	5.4	**class D**
Biotope			
Baseline 2019	39 (class E)	**February 2020**	50 (class D)
Discussion			
Similar to site T1, modifications within the reach were limited to an increase in dissolved solid concentrations within the reach. Flows were similar to those observed during the 2019 study, indicating constant flows during the high flow periods.			

Table 8-7 Summary for site T3 on the Sterkfontein River (February 2020)

Site Code	T3	**Audit Date**	12/02/2020
Upstream		**Downstream**	
			
Coordinates		-24.185429° 27.936700°	
Desktop data for the Sub-Quaternary Reach: A42D-346		**River Name**	**Sterkfontein**
Present Ecological Status	class D	**Ecological Importance Class**	Moderate
Default Ecological Category	class B	**Ecological Sensitivity**	High
Water Quality Baseline 2019			
pH	**Conductivity (µS/cm)**	**DO (mg/l)**	**Temperature (°C)**
6.3	27	5.8	30
Water Quality February 2020			
pH	**Conductivity (µS/cm)**	**DO (mg/l)**	**Temperature (°C)**
7.42	453	6.95	26
Macroinvertebrate Assessment 2019			
SASS5 Score	**No. of Taxa**	**ASPT**	**Ecological category (Dallas 2007)**
65	14	4.6	**class E/F**
Macroinvertebrate Assessment 2020			
SASS5 Score	**No. of Taxa**	**ASPT**	**Ecological category (Dallas 2007)**
134	26	5.2	**class C**
Biotope			
Baseline 2019	31 (class E)	**February 2020**	45 (class D)
Discussion			
Water quality results indicated conditions falling with TWQRs. Increases in dissolved solids and pH were observed from the 2019 study. An increase in biotic integrity was observed from the 2019 study, as reflected by the macroinvertebrate community. Flows were similar to those observed during the 2019 study.			

8.1.2.2 Indicators

The use of the Macroinvertebrate Response Assessment Index (MIRAI) was applied to determine the drivers modifying the macroinvertebrate community with the Sterkfontein River and results were obtained from the TBC 2019 and 2020 reports. The results of the MIRAI for the considered river reach are provided in Table 8-8. Results indicate largely modified macroinvertebrate communities during the 2019 and 2020 surveys within the Sterkfontein reach. Flow modification persist as the dominant driver within the reach. This is attributed to numerous instream impoundments and abstraction within the reach. Numerous taxa expected in reference conditions were absent from the reach, particularly those with preferences of flowing waters, these include Trichorythidae, Perlidae, and Heptageniidae. The presence of instream impoundments has further resulted in the loss of instream habitats due to inundation

Table 8-8 MIRAI for the Sterkstroom River

Invertebrate Metric Group	2020 Score Calculated	2019 Score Calculated
Flow modification	46	45
Habitat	67	56
Water Quality	55	53
Ecological Score	56	51
Invertebrate Category	class D	class D

8.1.2.3 Riparian Delineation

The riparian zone of the study area was largely modified as a result of significant modifications to the river channel, including inundation of the main Sterkfontein River and ingenous vegetation clearing. The riparian delineations for the Dam 7 impoundment is anticipated to have a direct impact on the riparian zones are presented below (Figure 8-3). Further, the proposed Dam 7 infrastructure intrudes into the floodlines delineated by Hydrospatial (Pty) Ltd (Hydrospatial, 2019). A recommended buffer of 30 m should be implemented from the edge of the riparian zone or the delineated floodline, whichever is greatest.

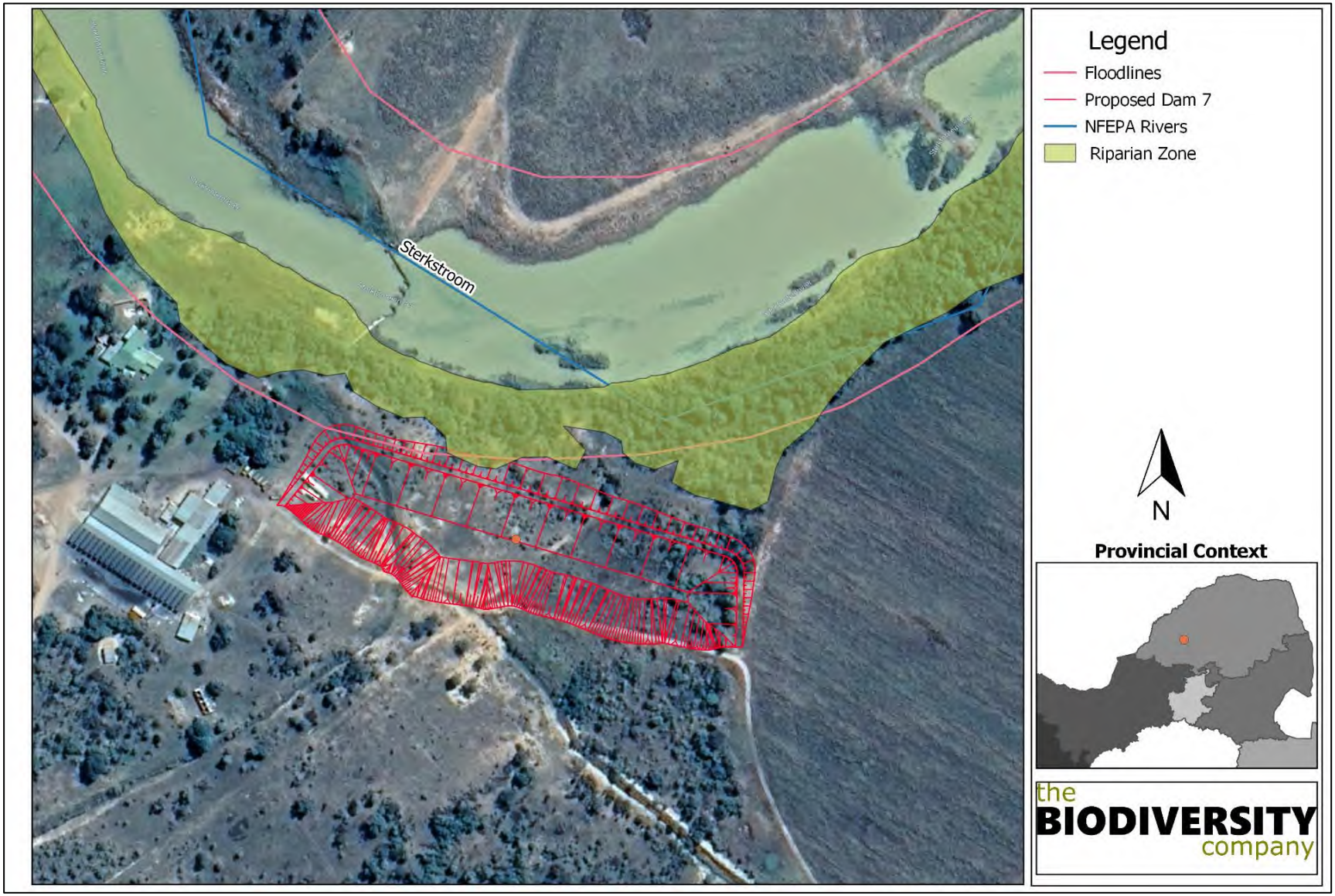

Figure 8-3 Proposed Dam 7 Riparian Delineation

8.1.3 Terrestrial Field Survey

The field survey for the project area was conducted on the 14th of October 2020. During the survey the floral and faunal communities within the project area were assessed. The corridor was ground-truthed on foot, which included spot checks in pre-selected areas to validate desktop data. Photographs were recorded during the site visit and some are provided in this section of the report. All site photographs are available on request.

8.1.3.1 Flora Assessment

The vegetation assessment was conducted throughout the extent of the project area. A total of 61 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 8-9). Plants listed as Category 1 alien or invasive species under the National Environmental Management: Biodiversity Act (NEMBA) appear in green text. Plants listed in Category 2 or as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text.

Table 8-9 Trees, shrubs and weeds recorded at the project area

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
Agave americana	Century plant			Naturalized exotic weed
Aloe davyana	Grasaalwyn	LC	Not Endemic	
Argemone ochroleuca	Mexican poppy			NEMBA Category 1b
Asparagus cooperi	Haakdoring	LC	Not Endemic	
Bidens pilosa	Blackjack			Naturalized exotic weed
Boophone disticha	Poisen Bulb	LC	Not Endemic	
Carissa bispinosa	Num-num	LC	Not Endemic	
Ceratotheca triloba	African Foxglove	LC	Not Endemic	
Chloris gayana	Rhodes grass			Naturalized exotic weed
Combretum zeyheri	Raasblaar	LC	Not Endemic	
Conyza bonariensis	Hairy Fleabane			Naturalized exotic weed
Cymbopogon nardus	Giant Turpentine Grass	LC	Not Endemic	
Cynodon dactylon	Couch Grass, Quick Grass	LC	Not Endemic	
Datura ferox	Large Thorn Apple			NEMBA Category 1b.
Datura stramonium	Common Thorn Apple			NEMBA Category 1b.
Digitaria eriantha	Finger Grass	LC	Not Endemic	
Diospyros lycioides	Bluebush Star-apple	LC	Not Endemic	
Ehretia rigida	Puzzle Bush	LC	Endemic	
Eragrostis pallens	Gemsbokgras	LC	Not Endemic	
Eragrostis rigidior	Curly Leaved Love Gras	LC	Not Endemic	
Euclea crispa	Blue Guarri	LC	Not Endemic	
Flaveria bidentis	Smelterbossie			NEMBA Category 1b
Gomphrena celosioides	Bachelor's button			Naturalized exotic weed
Grewia flava	Velvet Raisin	LC	Not Endemic	

Grewia flavescens	Grewia flavescens	LC	Not Endemic	
Gymnosporia buxifolia	Common Spike-thorn	LC	Not Endemic	
Heteropogon contortus	Speargrass	LC	Not Endemic	
Hilliardiella sutherlandii		LC	Not Endemic	
Justicia odora	Scented Justicia	LC	Not Endemic	
Ledebouria revoluta	Bokhoe	LC	Not Endemic	
Leonotis leonurus	Wild Dagga	LC	Not Endemic	
Melia azedarach	"Syringa", Persian Lilac			NEMBA Category 1b.
Melinis repens	Natal Red Top	LC	Not Endemic	
Monopsis decipiens	Butterfly Monopsis	LC	Not Endemic	
Morus alba	White Mulberry, Common Mulberry		Not Endemic	NEMBA Category 3
Ocimum americanum	American basil			Naturalized exotic weed
Olea europaea subsp. cuspidata	African Olive	LC	Not Endemic	
Opuntia ficus-indica	Prickly pear			NEMBA Category 1b
Peltophorum africanum	African Wattle	LC	Not Endemic	
Phragmites australis	Common Reed	LC	Not Endemic	
Phragmites mauritianus	Laeveldfluitjiesriet	LC	Not Endemic	
Pogonarthria squarrosa	Herringbone Grass	LC	Not Endemic	
Pterocarpus rotundifolius	Round-leaved Bloodwood	LC	Not Endemic	
Sansevieria pearsonii	Elephant's Toothpick	LC	Not Endemic	
Schkuhria pinnata	Dwarf Marigold			Naturalized exotic weed
Schotia brachypetala	Weeping Boer-bean	LC	Not Endemic	
Searsia pyroides	Common Wild Currant	LC	Not Endemic	
Senegalia caffra	Common Hook-thorn	LC	Not Endemic	
Senegalia erubescens	Blue Thorn	LC	Not Endemic	
Senegalia nigrescens	Knob Thorn	LC	Not Endemic	
Sesbania punicea	Red Sesbania			NEMBA Category 1b
Sporobolus africanus	Ratstail Dropseed	LC	Not Endemic	
Tagetes minuta	Khaki Bush			Naturalized exotic weed
Terminalia sericea	Silver Cluster-leaf	LC	Not Endemic	
Typha capensis	Bulrush, Common Cattail	LC	Not Endemic	
Urochloa mosambicensis	Bushveld Signal Grass	LC	Not Endemic	
Vachellia karroo	Sweet Thorn	LC	Not Endemic	
Vachellia robusta subsp. robusta	Broad-pod Robust Thorn	LC	Not Endemic	
Verbena bonariensis	Wild Verbena			NEMBA Category 1b.
Xerophyta retinervis	Monkey's Tail	LC	Not Endemic	
Ziziphus mucronata	Blinkblaar-wag-'n-bietjie	LC	Not Endemic	

8.1.3.2 Alien and Invasive Plants

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of these systems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014, and was amended in February 2018 in the Government Gazette No. 41445. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;

- The relevant invasive species management programme developed in terms of regulation 4; and
- Any directive issued in terms of section 73(3) of the Act.

Eight (8) Category 1b invasive plant species were recorded within the project area and it is recommended that an alien invasive plant management programme be implemented in compliance of section 75 of the Act as stated above. The NEMBA listed species identified within the project area are marked in green (Table 8-9).

Figure 8-4 Some of the floral species observed during the field assessment: A) Justicia odora, B) Boophone disticha , C) Xerophyta retinervis and D) Monopsis decipiens.

8.1.3.3 Alien Invasive Plant (AIP) Management plan

It is not known (or confirmed) the number of 1b[1] alien plant species that are located in the project area. Any identified alien plant species must be removed from the project area, but especially so from the marginal riverine area associated with the Sterkfontein River. Both mechanical and chemical removal options are available (*Table 8-10*), but it is preferred that mechanical removal first be implemented. Then based on the outcome and success of the mechanical control, the chemical control may then be considered. Chemical control must be overseen by a certified removal expert. Contractors using herbicides are required to have a permit according to Fertilizer, Farm Feeds, Agricultural Remedies, and Stock Remedies Act (Act No. 36 of 1947).

Table 8-10 NEMBA 1 Alien plant species recorded and recommended clearing strategy for the IAS identified

Scientific Name	Common Name	Recommended Clearing Strategy
Argemone ochroleuca	Mexican poppy	Mechanical removal of plants, especially seedlings. These weeds are controlled by using shallow cultivation with a spade or gardening fork. Post-emergence herbicides can also be used to control these plants (Bromilow 2010)
Datura ferox *Datura stramonium*	Thorn apple	Mechanical removal by hand pulling for small infestation or when small. Post emergence herbicides (Bromilow 2010).
Flaveria bidentis	Smelterbossie	Shallow cultivation, hand pulling or conventional herbicides
Melia azedarach	Syringa	Hand pull seedlings. Adults, cut stump or frill. Several herbicides can be used including Confront 360 SL (L7314), Plenum 160 ME (L7702), Chopper 100 SL (L3444), Hatchet 100 SL (L7409) Access 240 SL (L4920) and Timbrel 360 SL (L4917). (Methods recommended by the Working for Water Programme).
Opuntia ficus-indica	Prickly pear	Mechanical removal laborious: cutting, stacking and burning. Chemical control possible with several herbicides such as MSMA and glyphosate, stem injection is preferred.
Sesbania punicea	Red Sesbania	Mechanical control via slashing induces regrowth, so follow up with foliar spray or physical removal.Bat time is after spring Seedlings and coppice to 1m should receive foliar spray with herbicide.
Verbena bonariensis	Wild Verbena	Can easily be controlled by cultivation and with broadleaved herbicides. The mature plant is tough and more tolerant to herbicides and will need to be hand pulled (Bromilow 2010).

8.1.3.3.1 Prevention of Future Invasions

To put measures in place to prevent the introduction of new NEM:BA listed IAS onto the property, and from spreading from the property to neighbouring properties.

Preventative actions

- No listed invasive and alien plant species must be planted;
- Areas bordering onto neighbouring land must be prioritized for control to prevent existing invasive plants from spreading beyond the boundaries of the property; and
- No listed invader animal species must be introduced on the property.

Early Detection and Rapid Response and Eradication actions

- Regularly survey the property to detect any new or emerging listed invasive plant species;

[1] National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM:BA). **Category 1b**: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy.

- Report Category 1a species immediately to the Department of Environmental Affairs/Provincial Conservation Agency/Local Municipality/South African National Biodiversity Institute (SANBI) EDRR programme and ask for assistance with the control of the species;
- Do not allow emerging or new species to produce seeds, or start growing vegetative, act immediately by removing them;
- Update the species list by including these species and indicate where on the property they were located; and
- Increase surveillance in the areas after the species were controlled to quickly remove re-sprouting plants or seedlings.

A collaborative effort with the DWS should be made to manage IAS within the catchment to ensure long term effective management of IAS.

8.1.3.3.2 Monitoring

The following monitoring framework should be adapted to ensure that IAS are continually monitored, and progress is recorded (Table 3). The monitoring of the area throughout the process is crucial in order to prevent IAS growing and spreading out of control.

Table 8-11 NEMBA 1 Alien plant species recorded and recommended clearing strategy for the IAS identified

What	Frequency	How	Response
How effective are the control methods	4-6 months after every operation	Survey the cleared areas and look for regrowth. Before and after pictures are very effective. Look out for non-target effects of herbicide application.	If the survey reveals that the control methods are effective, e.g. low levels of re-sprouting, continue following the herbicide mixtures and control methods. If non-target plants are dying off where herbicides were applied, ensure appropriate training for herbicide applicators, demonstrate the off-target effects to herbicide applicators to ensure they are using the correct methods and herbicides. (If the results show that the control methods are not effective, adapt by e.g. cutting lower above ground or changing herbicides or timing of herbicide application.
Do the infestation levels decrease	Annually	Survey the cleared areas and record species, densities and size. Before and after pictures are very effective.	If the infestation levels are not decreasing, reconsider clearing intervals and look at clearing methods. If infestation levels are decreasing - continue clearing, you are doing well!

8.1.3.4 Fauna

8.1.3.4.1 Avifauna

Twenty-Six (26) bird species were recorded in the project area during the October 2020 survey based on either direct observations, vocalisations, or the presence of visual tracks & signs (Table 8-12) (Figure 8-5).

Table 8-12 A list of avifaunal species recorded for the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC

Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Phalacrocorax lucidus	Cormorant, White-breasted	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC

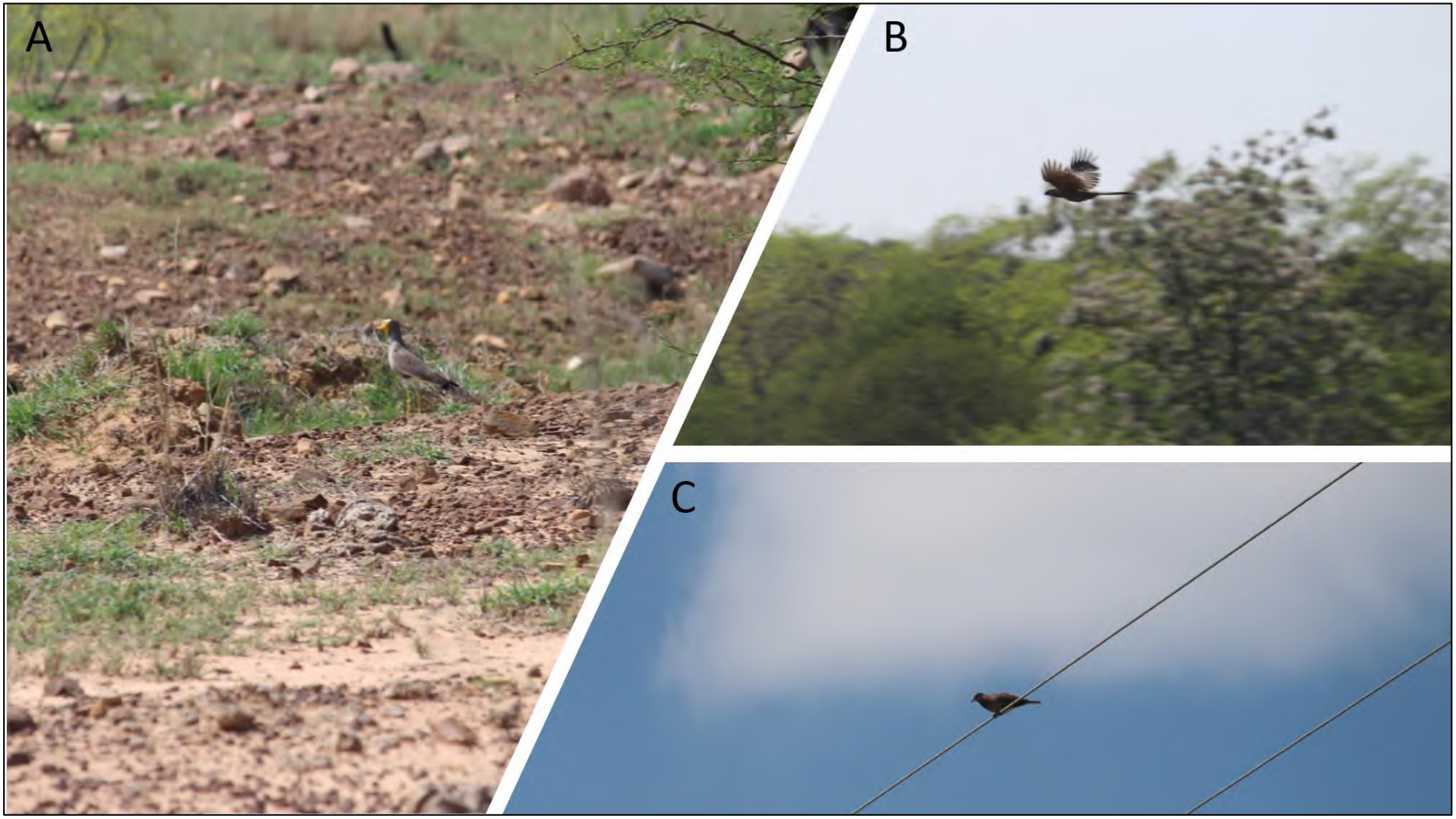

Figure 8-5 Some of the avifaunal species observed during the field assessment: A) Lapwing, African Wattled and B) Go-away-bird, Grey and C) Dove, Laughing.

8.1.3.4.2 Mammals

Overall, mammal diversity in the project area was considered to be low, with 4 species recorded. Four mammal species were recorded during the survey based on direct observations and/or the presence of visual tracks & signs (Table 8-13 and Figure 8-6).The Cape Ground Squirrel den locality will not be impacted if the development footprint is limited to the proposed alignment.

Table 8-13 Mammal species recorded in the project area during survey .

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Felis silvestris	African Wildcat	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC

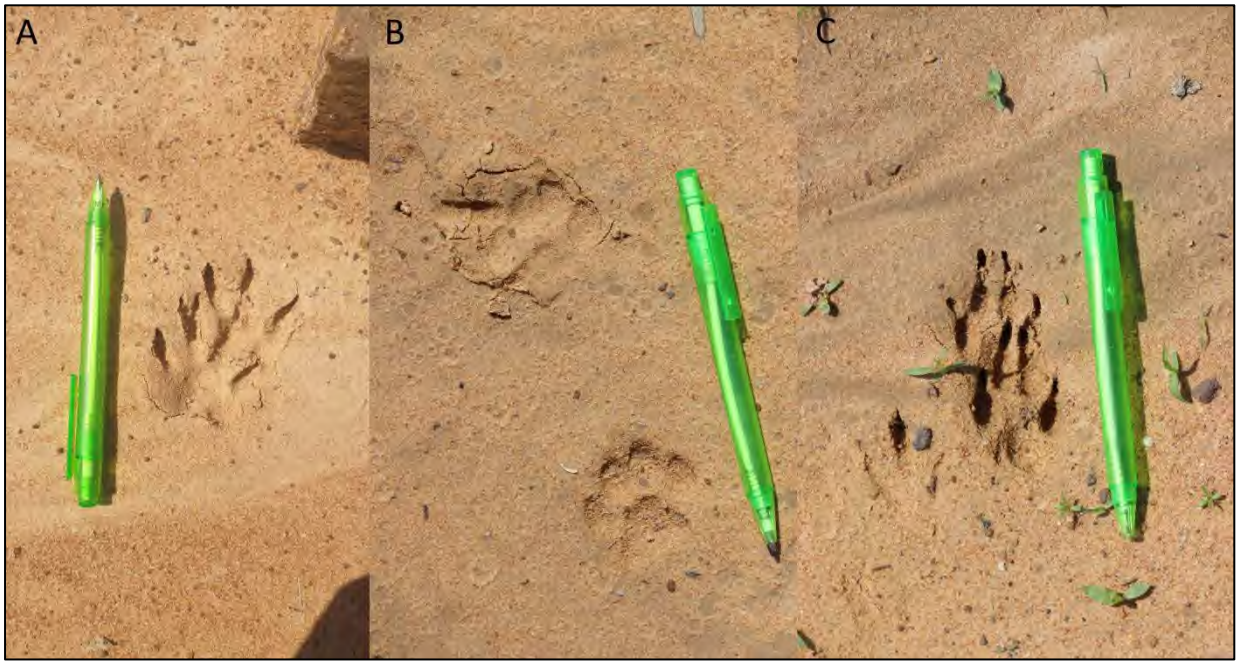

Figure 8-6 Some of mammal species recorded within the project area; A) Water Mongoose , B) African Wildcat and C) Black-backed Jackal

8.1.3.4.3 Herpetofauna (Reptiles & Amphibians)

Herpetofauna diversity was considered to be low with three species recorded in the project area during the survey.

Table 8-14 Herpetofauna collected within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Reptiles			
Boaedon capensis	Brown House Snake	LC	LC

Leptotyphlops scutifrons	Peters' Thread Snake	LC	Unlisted
Trachylepis striata	Striped Skink	LC	Unlisted

Figure 8-7 Some of reptile species recorded within the project area; A) Brown House Snake and B) Leptotyphlops scutifrons

8.1.3.5 Habitat Assessment and Sensitivity

8.1.3.5.1 Habitat Assessment

The main habitat types identified across the project area were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey ; the delineated habitats can be seen in Figure 8-8 and Figure 8-9 are illustrations of these habitats from the project area. Emphasis was placed on limiting timed meander searches within the natural habitats and therefore habitats with a higher potential of hosting SCC. Each of the habitats identified are discussed in the sub-sections below.

Degraded Bushveld

This habitat are areas where the bushveld has been altered due to historic and/or current human activity and the associated impacts. The condition of this bushveld has been degraded, mainly due to historic land clearing as well as the surrounding agricultural land use.

This habitat unit can thus be regarded as important, not only within the local landscape, but also regionally; it acts as the only remaining greenlands, used for habitat, foraging area and movement corridors for fauna within a landscape fragmented by agriculture to more natural areas where they may reproduce. The habitat sensitivity of the habitat is regarded as moderate, due to the role of this habitat to biodiversity within a fragmented local landscape, not to mention the various ecological dataset which classes it as CBA. This habitat also has a higher potential to returning to a more natural state if left undisturbed.

Modified Bushveld

This habitat includes areas where the bushveld has been altered due to historic land clearing. This habitat includes an artificial channel that has been constructed to direct the flow of water into the Sterkfontein River. This habitat is regarded as modified due to the nature of the modification of the area to such a point where it wouldn't be able to return to its previous state without anthropogenic influence. Due to the nature of this habitat, it is regarded as having a low sensitivity.

Figure 8-8 Habitats identified in the project area.

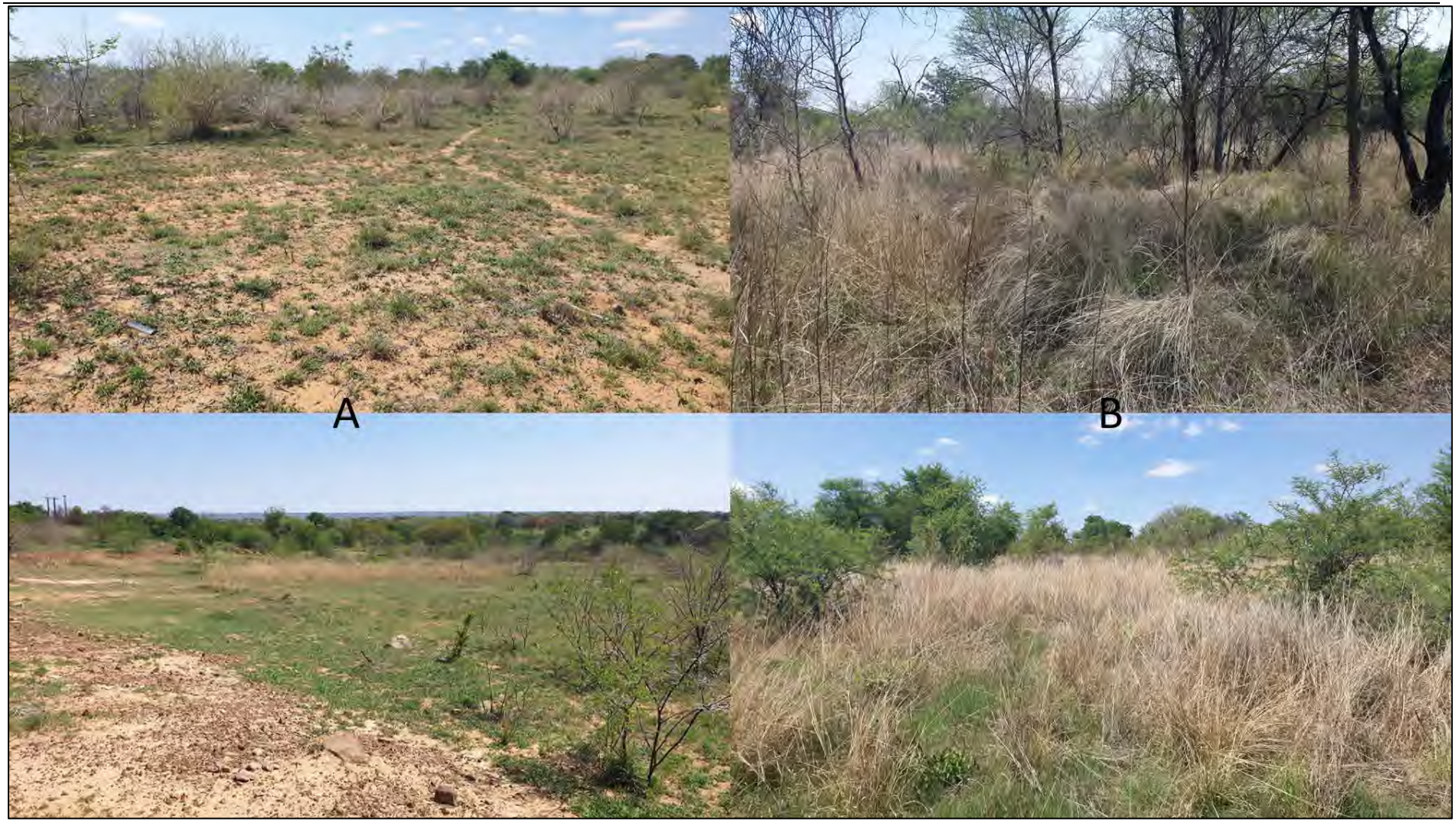

Figure 8-9 Habitats observed in the project area: A) Modified Bushveld and B) Degraded Bushveld

8.1.3.5.2 Habitat Sensitivity

The biodiversity theme sensitivity as indicated in the screening report was derived to be Very High (Figure 8-10), it can be downloaded at (https://screening.environment.gov.za/screeningtool/#/pages/welcome).

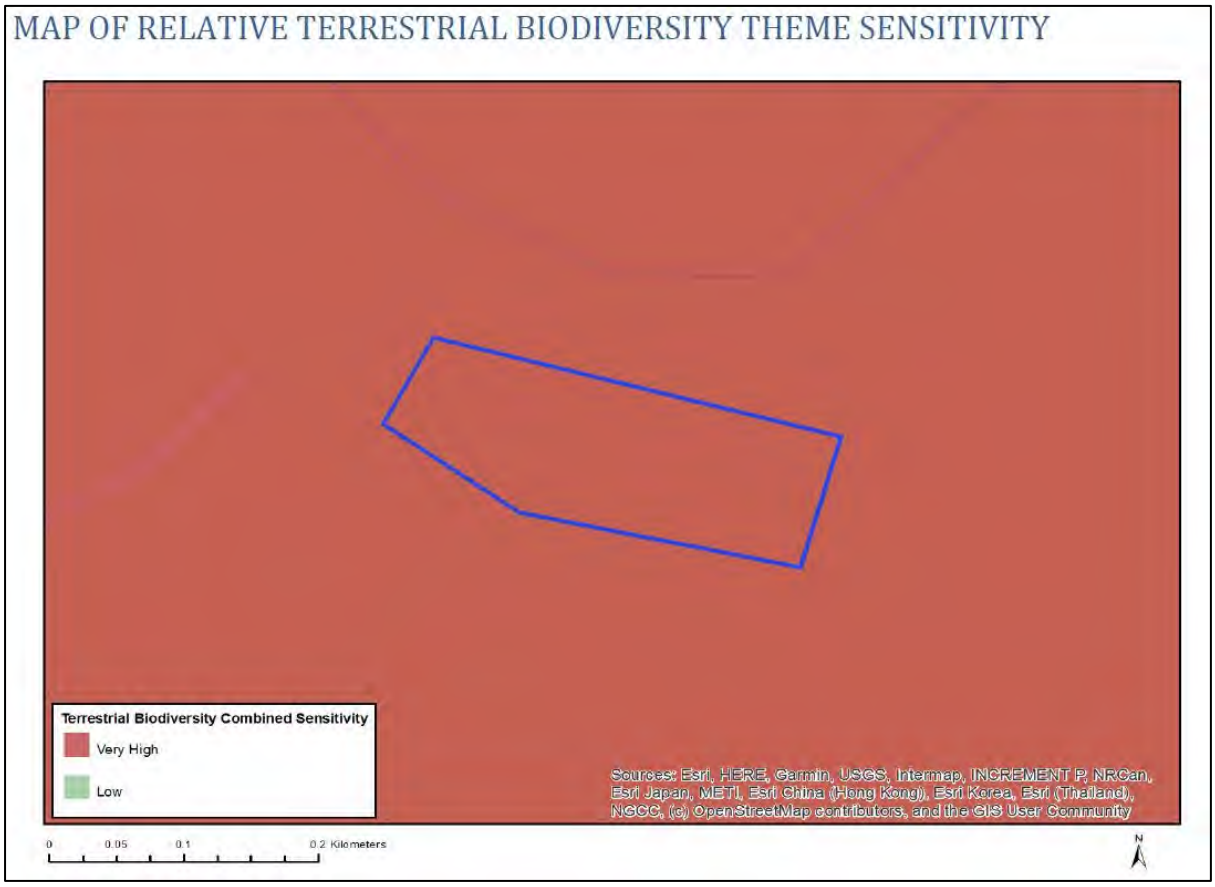

Figure 8-10 Biodiversity Sensitivity of the project area

The completion of the terrestrial biodiversity assessment differs from the very high sensitivity of certain habitats that overlap with the screening report and therefore contradicts the screening report. If left undisturbed and given time to recover, the degraded bushveld may corroborate with the screening report, but due to the presence of the surrounding agricultural land use, may be unlikely.

As per the terms of reference for the project, GIS sensitivity maps are required in order to identify sensitive features in terms of the relevant specialist discipline/s within the study area. The sensitivity scores identified during the field survey for each terrestrial habitat are mapped.

In terms of terrestrial habitats, areas that were classified as having a low sensitivity are those areas which were deemed by the specialists to have been impacted upon and/or were modified from their original condition due to activities such as clearing of vegetation and also aspects associated with an urban area such as littering and infringement.

The habitats rated as moderate sensitivity are habitats that;

- May serve as and represent CBA if enabled to recover, as per the Limpopo Conservation Plan; and

- May support various species but is also connected to the adjacent CBA and may play an important role in the ecosystem if left to recover from the superficial impacts.

It is important to note that this map does not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments but is done in relation to the legislation.

Figure 8-11 Biodiversity sensitivity relevant to the project area

9 Impact Assessment

Potential impacts were evaluated against the data captured during the fieldwork to identify relevance to the project area, specifically the proposed development footprint area. The relevant impacts were then subjected to a prescribed impact assessment methodology. The details of this methodology can be provided on request.

The construction of the proposed dam is envisioned to include the following according to the concept design report (PG Consulting Engineers, 2020):

a) Clearing and grubbing of entire dam solum (footprint);

b) Excavation and preparation of cut-off trench along the embankment center line;

c) Excavation and foundation preparation for concrete encased outlet pipe;

d) Construction and forming new homogeneous earth fill embankment;

e) Construction of service spillway on embankment crest and downstream slope;

f) Installation of 200mm diameter HDPE outlet pipe, encased in reinforced concrete;

and equipped with a closing mechanism on the downstream side;

g) Installation of headwall protection structure at outlet pipe exit; and

h) Grass establishment (hydro-seeding) on entire embankment after construction.

9.1 Current Impacts

The current impacts observed during surveys are listed below. Photographic evidence of a selection of these impacts is shown in Figure 9-1.

- Historic Agriculture;
- Roads (and associated traffic and wildlife road mortalities);
- Footpaths and litter associated with the human infringement;
- Alien and/or Invasive Plants (AIP);
- Vegetation removal (Mechanical).

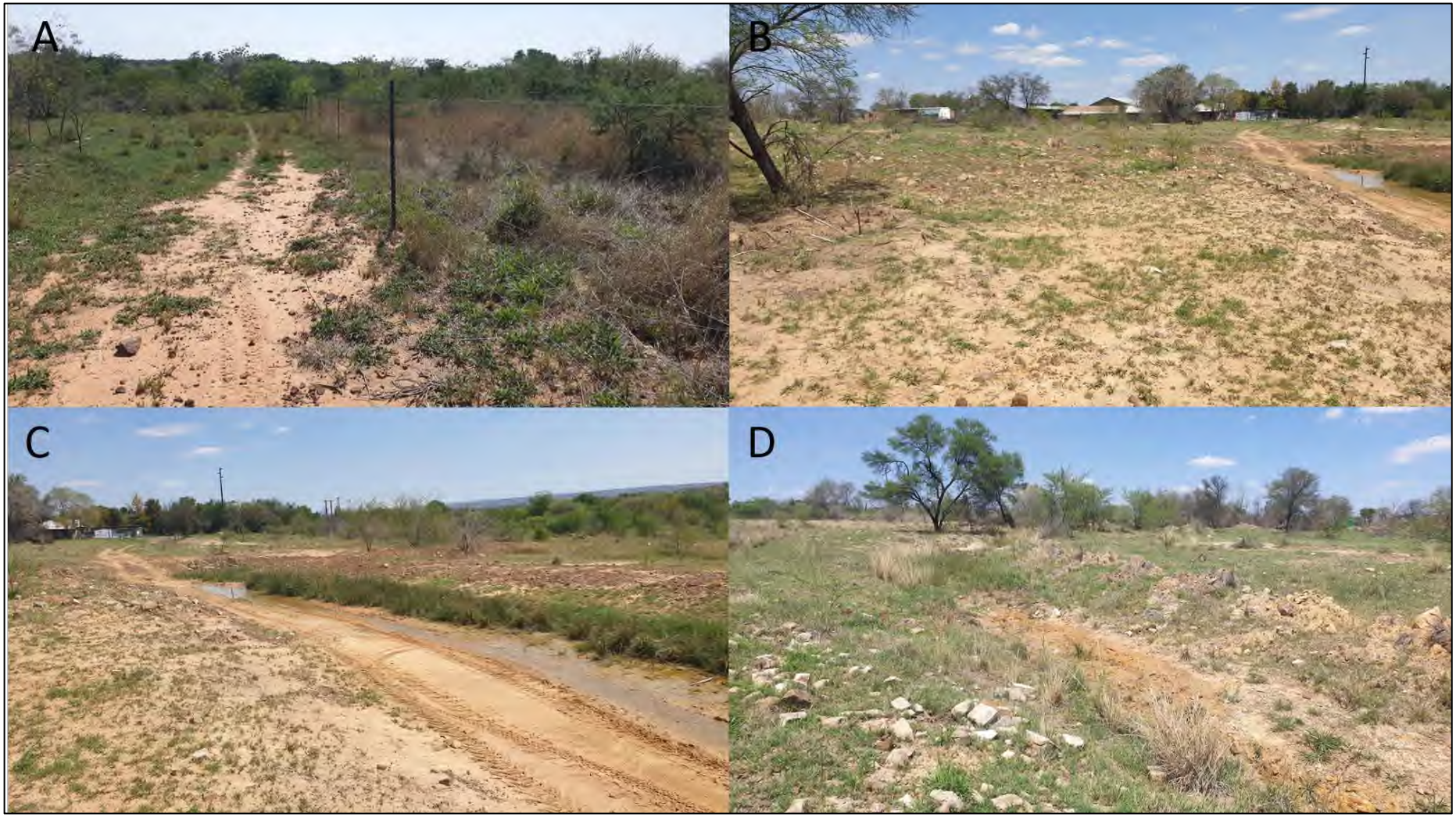

Figure 9-1 Some of the identified impacts within the project area; A) Fencing, B) Vegetation clearance ,C) Secondary road and D) Artificial Channel creation

9.2 Terrestrial Impact Assessment

Potential impacts were evaluated against the data captured during the desktop and field assessments to identify relevance to the project area. The relevant impacts associated with the proposed development were then subjected to a prescribed impact assessment methodology which is available on request.

9.2.1 Loss of Irreplaceable Resources

Loss of irreplaceable resources will not occur.

9.2.2 Identification of Additional Potential Impacts

9.2.2.1 Construction Phase

The following potential impacts on the biodiversity were considered for the construction phase of the project. This phase refers to the period during construction when the proposed infrastructure is constructed. This phase usually has the largest direct impact on biodiversity. The following potential impacts to terrestrial biodiversity were considered:

- Destruction, further loss and fragmentation of the vegetation community;
- Introduction of alien species, especially plants; and
- Displacement of faunal community (Including SCC) due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration and possible poaching).

9.2.2.2 Operational Phase

This phase refers to when construction has been completed and the proposed infrastructure has been built and is functional. The following potential impacts were considered

- Continued encroachment and displacement of the natural vegetation community due to alien invasive plant species and erosion;
- Continued displacement and fragmentation of the faunal community, particularly the disruption of natural faunal movement corridors;
- Increased anthropogenic disturbances (noise, human presence, litter and poaching/snaring);

9.2.3 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. The mitigation actions required to lower the risk of the impact are provided in Section 10 of this report.

9.2.3.1 Construction Phase

Table 9-1 summarises the significance of potential impacts associated with the development on biodiversity before and after implementation of mitigation measures. Prior to implementation of mitigation measures the significance of impact to the vegetation community, introduction of alien species and fauna were rated as “Moderately-High”. Implementation of

mitigation measures reduced the significance of potential impact on the biodiversity community to a ‘Low’ level.

9.2.3.2 Operational Phase

Table 9-2 summarises the significance of the operational phase impacts on biodiversity before and after implementation of mitigation measures. The impact significance of encroachment by alien invasive plant species was rated as ‘Moderately-High’ prior to mitigation. Implementation of mitigation measures reduced the significance of the impact to an ‘Absent’ level.

Table 9-1 Assessment of significance of potential impacts on terrestrial biodiversity associated with the construction phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, further loss and fragmentation of the vegetation community	5	3	3	3	4		3	2	2	2	2	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**
Introduction of alien spp, especially plants	4	4	4	3	4		3	2	2	2	2	
	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**
Displacement of faunal community (Including potential SCC) due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration and possible poaching).	4	4	3	3	4		3	2	2	2	2	
	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**

Table 9-2 Assessment of significance of potential impacts on terrestrial biodiversity associated with the operational phase of the project

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	**Spatial Scope**	**Severity of Impact**	**Sensitivity of Receiving Environment**	**Probability of Impact**	**Significance**	**Duration of Impact**	**Spatial Scope**	**Severity of Impact**	**Sensitivity of Receiving Environment**	**Probability of Impact**	**Significance**
Continued encroachment and displacement of the natural vegetation community due to alien invasive plant species and erosion	4 Life of operation or less than 20 years: Long Term	4 Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	3 Significant / ecosystem structure and function moderately altered	3 Ecology moderately sensitive/ /important	4 Highly likely	**Moderately High**	2 One month to one year: Short Term	2 Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2 Small / ecosystem structure and function largely unchanged	2 Ecology with limited sensitivity/importance	2 Possible	**Absent**
Continued displacement and fragmentation of the faunal community, particularly the disruption of natural faunal movement corridors	4 Life of operation or less than 20 years: Long Term	4 Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	4 Great / harmful/ ecosystem structure and function largely altered	3 Ecology moderately sensitive/ /important	3 Likely	**Moderate**	2 One month to one year: Short Term	2 Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2 Small / ecosystem structure and function largely unchanged	2 Ecology with limited sensitivity/importance	2 Possible	**Absent**
Increased anthropogenic disturbances (noise, human presence, litter and poaching/snaring);	4 Life of operation or less than 20 years: Long Term	4 Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	3 Significant / ecosystem structure and function moderately altered	3 Ecology moderately sensitive/ /important	3 Likely	**Moderate**	2 One month to one year: Short Term	2 Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2 Small / ecosystem structure and function largely unchanged	2 Ecology with limited sensitivity/importance	2 Possible	**Absent**

10 Specialist Management Plan

The aim of the management outcomes is to present the mitigations in such a way that the can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines Table 10-1 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial study.

The focus of mitigation measures is to reduce the significance of potential impacts associated with the development and thereby to:

- Prevent the further loss and fragmentation of vegetation communities and the CBA areas in the vicinity of the project area;
- As far as possible, reduce the negative fragmentation effects of the development and enable safe movement of faunal species; and
- Prevent the direct and indirect loss and disturbance of faunal species and community (including occurring and potentially occurring species of conservation concern).

Table 10-1 Mitigation measures including requirements for timeframes, roles and responsibilities for the terrestrial study

Management outcome: Vegetation and Habitats				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
The areas to be developed must be specifically demarcated to prevent movement into sensitive surrounding environments, especially the Sterkfontein River and the associated riparian area.	Life of operation	Project manager, Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation (All moderate sensitivity areas)	Ongoing
Areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon (including fencing off the defined project area);	Life of operation	Project manager, Environmental Officer	Development within demarcated areas	Ongoing
All construction/operational and access must make use of the existing roads;	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
All laydown, chemical toilets etc. should be restricted to low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. No permanent construction structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated project areas.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas and material storage & placement.	Ongoing
Areas that are denuded during construction, especially the area for the new dam need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
All structure footprints to be rehabilitated and landscaped after the development is complete. Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type;	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Footprint rehabilitation	Quarterly monitoring
Progressive rehabilitation as the construction of the dam continues as well as any cleared areas will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Footprint rehabilitation	During Phase
A spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing

equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers				
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
Storm Water run-off & Discharge Water Quality	Life of operation	Environmental Officer & Design Engineer	Water Quality	Monthly
It should be made an offence for any staff to /take bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the rehabilitated areas.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Fauna				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
A qualified environmental control officer must be on site when construction begins. The area must be walked though prior to construction to ensure no faunal species remain in the habitat and get killed. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated.	Construction Phase	Environmental Officer, Contractor	Presence of any faunal SCC	During phase
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments; • Signs must be put up to enforce this	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed • Signs must be put up to enforce this;	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.				
Any holes/excavations need to be sealed to ensure that no fauna species can fall in.	Construction/Operational Phase	Environmental Officer & Design Engineer	Sealing holes/excavations	Daily.
Management outcome: Alien Vegetation and fauna				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Implementation of an alien vegetation management plan and the associated monitoring.	Life of operation	Project manager, Environmental Officer & Contractor	Control, assess presence and encroachment of alien vegetation	Quarterly monitoring
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the likely presence of SCCs	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Life of operation
Management outcome: Dust				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads especially. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated.	Life of operation	Contractor	Dustfall	As per the air quality report and the dust monitoring program.
Management outcome: Waste management				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • Refuse bins will be emptied and secured; • Temporary storage of domestic waste shall be in covered waste skips; and • Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation

Litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing
Management outcome: Environmental awareness training				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

11 Water Resource Risk Assessment

11.1 Alternatives

A single alternative was provided for the risk assessment and is illustrated in Figure 11-1. The alterative is located 15 m south of the original design, increasing the distance between Dam 7 and the delineated flood line and riparian zone.

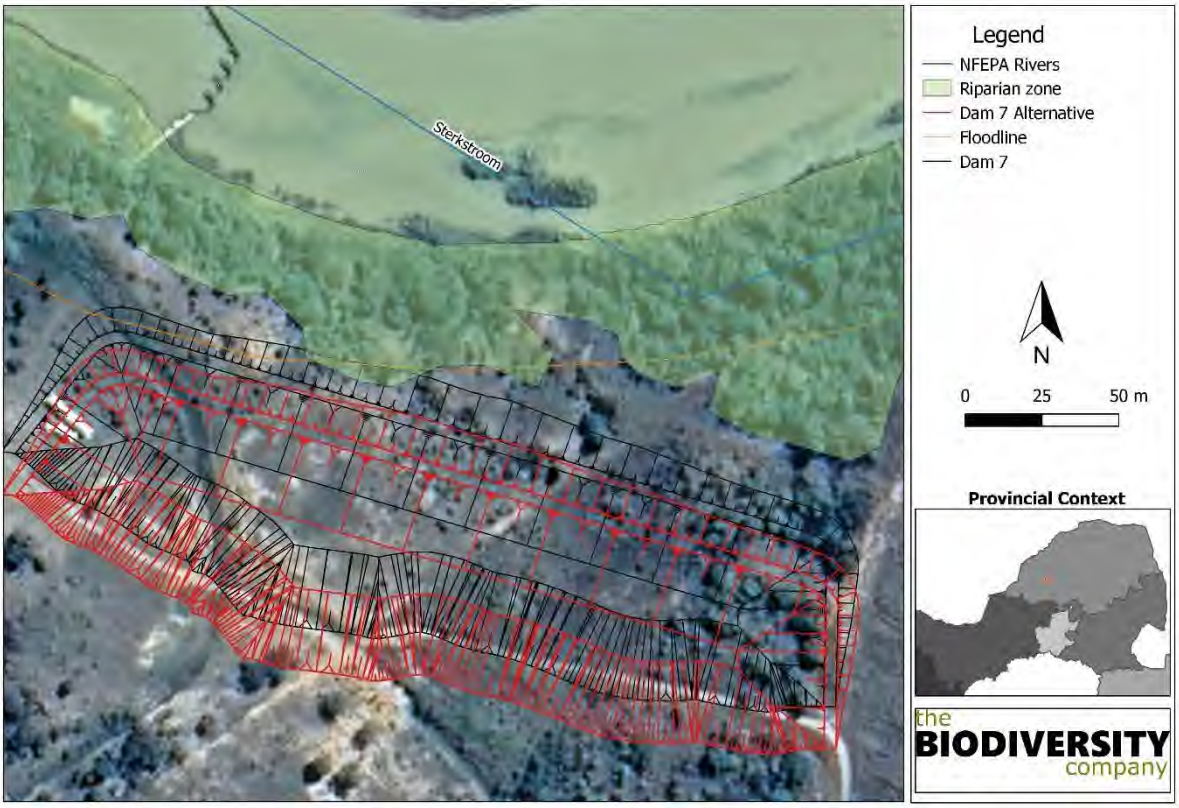

Figure 11-1 Illustration of proposed alternative for Dam 7

11.2 Risk Assessment for Dam 7

The construction of the proposed off channel Dam7 poses few risks to the water resources within the project area. However, due to the proximity of the infrastructure to the riparian zone and floodline, risks to the watercourse may occur. It is highly recommended that the locality of the proposed Dam 7 be adjusted to outside of the recommended buffer of 30 m from the delineated riparian zone and floodlines. Further, risks of dam collapse can have detrimental impacts to downstream systems, and therefore mitigation measures should be in place for unplanned events (Section 12.1.1). The operation of heavy machinery must remain outside of the delineated riparian zones and adequate revegetation must be conducted during the rehabilitation phase to reduce erosion should the project be approved.

The expected activities as well as their anticipated impacts for the project area are provided in Table 11-4 and are expected for the existing location of Dam 7. The standardised DWS risk assessment for the project is presented in Table 11-5 and Table 11-6. Due to the proximity of the proposed dam to the Sterkfontein River riparian vegetation, risks range from low to moderate should adequate mitigation measures be implemented.

Table 11-1 Expected activities, the aspects and impacts identified

Activity	Aspect	Impact
Christian Fry SACNASP (Pr Sci Nat)		
Construction Phase		
Construction of water storage infrastructure	Operation of equipment and machinery	Loss of aquatic habitat Loss of riparian vegetation Siltation of watercourse Erosion of banks and instream habitat Sedimentation of instream habitat Flow sediment equilibrium change Water quality impairment
	Clearing of vegetation	
	Stockpiling of material	
	Earthworks and alteration of river banks	
Operational Phase		
Operation of water storage infrastructure	Alteration of marginal/riparian habitats	Loss of riparian habitat

Table 11-2 Department of Water and Sanitation Section 21 C and I Risk Assessment – Consequence

	Severity							
Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence
Construction Phase								
Operation of equipment and machinery	1	1	1	2	1,25	1	2	4,25
Clearing of vegetation	1	2	2	2	1,75	1	2	4,75
Stockpiling of material	1	2	2	2	1,75	1	2	4,75
Earthworks and alteration of river banks	3	2	3	3	2,75	2	2	6,75
Operational Phase								
Alteration of riparian zone	1	2	2	3	2	1	4	7

Table 11-3 Department of Water and Sanitation Section 21 c and i Risk Assessment - Continued

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
Construction Phase								
Operation of equipment and machinery	2	3	1	2	8	34	Low	Low
Clearing of vegetation	2	4	5	2	13	61,75	Moderate*	Low
Stockpiling of material	2	2	1	3	8	38	Low	Low
Earthworks and alteration of river banks	2	4	5	2	13	87,75	Moderate	Moderate
Operation Phase								
Alteration of riparian zone	5	3	5	2	15	105	Moderate	Moderate

In accordance with General Notice 509 "Risk is determined after considering all listed control / mitigation measures. Borderline Low / Moderate risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80) subject to listing of additional mitigation measures detailed below

11.3 Section 24G Aquatic Risk Assessment

11.3.1 Current Impacts Identified

As per the typical conditions of a Section 24G application an assessment and evaluation of the impact to the environment was conducted during the site investigation in October 2020 and the use of aerial imagery (Google Earth). Historical imagery indicates the presence of an ephemeral system within the project area prior to the construction of the centre pivots adjacent to the tributary (Figure 11-2). Google Earth Imagery dated 2012 indicates the relatively intact nature of the system, with a single road crossing and a small impoundment (Figure 11-3).

The water course, including the riparian zone was delineated using aerial imagery prior to the dam construction (Google Earth, 2012). The delineated habitat superimposed over the impact area of the constructed dam is presented in Figure 11-4. The drainage line is approximately 1.8 km, of which 600 m has been disturbed by the construction activities. Impacts to the watercourse include the destruction of instream habitat, bank and channel modification, clearing of riparian vegetation, flow modification and drainage patterns. As the water course is characterised as an ephemeral system, the likely impact to aquatic biota is limited.

Figure 11-2 Illustration of the surrounding land use adjacent to the drainage line (Google Earth, 1984)

Figure 11-3 Illustration of the drainage line prior to the construction of the three dams (Google Earth, 2012)

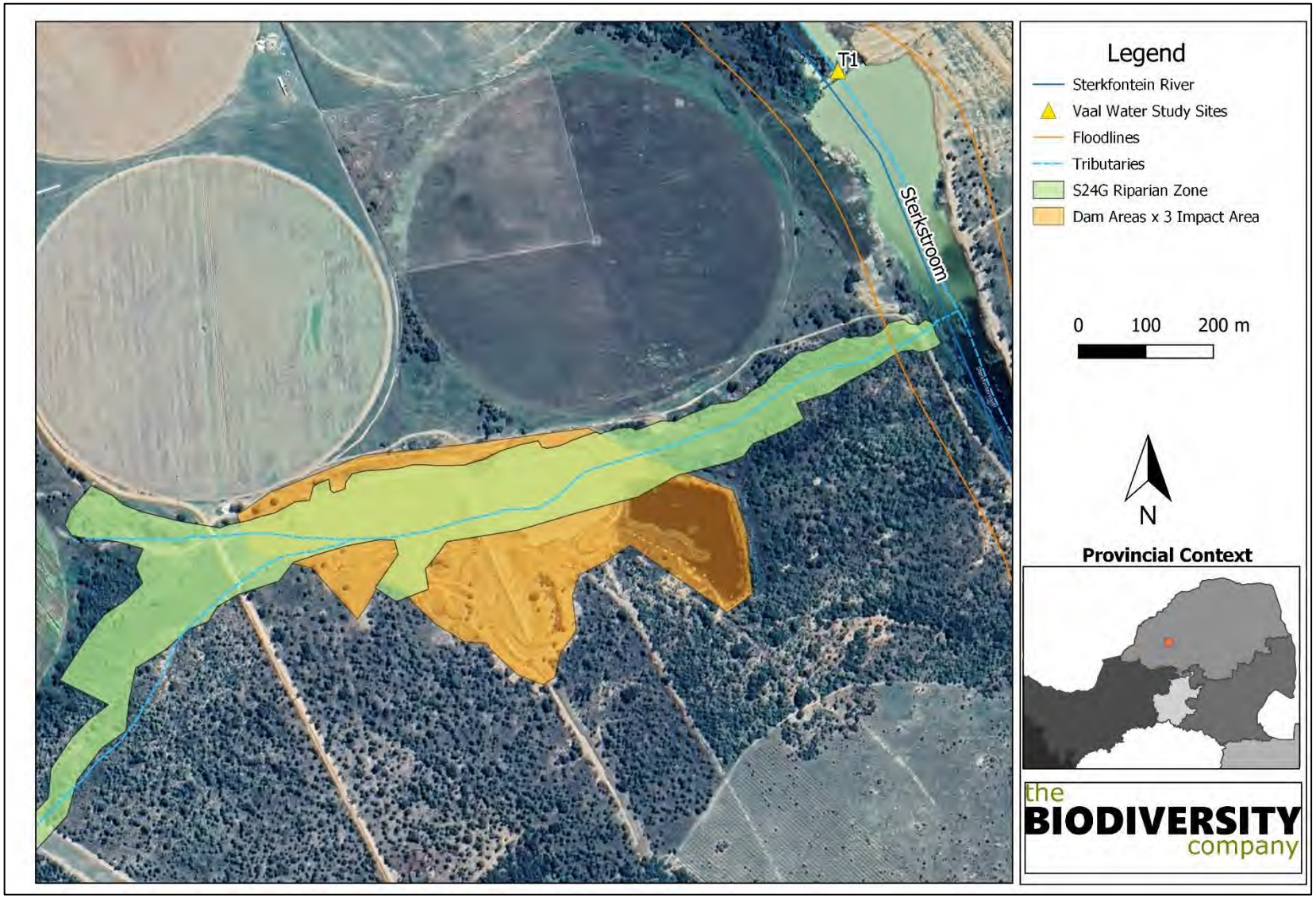

Figure 11-4 Illustration of the dam construction impact area overlaid by the delineated water course, including the riparian zone

Impacts identified on site are illustrated in the section below along with GPS coordinates. The following impacts were identified:

- A: Instream impoundments, modification to river banks and alteration of water flows. This was observed in the drainage line (Figure 11-5);
- B: Off-channel structures whereby the river banks and flow of the Sterkfontein River were impacted (Figure 11-6);
- C: Erosion of instream channel due to culvert at the road crossing (Figure 11-7);
- D: Riparian vegetation was cleared thereby altering the river bank (Figure 11-8).

Figure 11-5 Instream impoundment and soil disturbance(Taken October 2020; 24°12'53.07"S; 27°57'38.25"E)

Figure 11-6 Off stream water storage facility(Google Earth Imagery,2019)

Figure 11-7 Illustration of channel modification due to erosion (Taken October 2020; 24°12'53.07"S; 27°57'38.25

Figure 11-8 Illustration of riparian vegetation clearing (Google Earth, 2019)

11.3.2 Risk Assessment for the Completed Activities

The expected activities as well as their anticipated impacts for the project area are provided inTable 11-4. The standardised DWS risk assessment for the project is presented in Table 11-5 and Table 11-6.

Table 11-4 Expected activities, the aspects and impacts identified

Activity	Aspect	Impact
Christian Fry SACNASP (Pr Sci Nat)		
Construction Phase		
Construction of water storage infrastructure	Operation of equipment and machinery	Modification to flow regime Loss of aquatic habitat Siltation of watercourse Erosion of banks and instream habitat Sedimentation of instream habitat Flow sediment equilibrium change Water quality impairment
	Clearing of vegetation	
	Stockpiling of material	
	Earthworks and alteration of river banks	
	Diverting of watercourse for construction activities	
Operational Phase		
Operation of water storage infrastructure	Alteration of drainage	Modification to flow regime Loss of aquatic habitat Siltation of watercourse Erosion of banks and instream habitat Sedimentation of instream habitat Flow sediment equilibrium change Water quality impairment
	Alteration of flow dynamics	
	Alteration of marginal/riparian habitats	

Table 11-5 Department of Water and Sanitation Section 21 C and I Risk Assessment – Consequence

	Severity							
Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence
Construction Phase								
Operation of equipment and machinery	1	1	1	2	1,25	1	2	4,25
Clearing of vegetation	1	2	2	2	1,75	1	2	4,75
Stockpiling of material	1	2	2	2	1,75	1	2	4,75
Earthworks and alteration of river banks	3	2	3	3	2,75	2	2	6,75
Diverting of watercourse for construction activities	3	2	3	3	2,75	2	2	6,75
Operational Phase								
Alteration of drainage	3	1	2	3	2,25	1	4	7,25
Alteration of flow	3	1	2	3	2,25	1	4	7,25
Alteration of riparian zone	1	2	2	3	2	1	4	7

Table 11-6 Department of Water and Sanitation Section 21 C and I Risk Assessment - Continued

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
Construction Phase								
Operation of equipment and machinery	2	3	1	2	8	34	Low	Low
Clearing of vegetation	2	4	5	2	13	61,75	Moderate*	Low
Stockpiling of material	2	2	1	3	8	38	Low	Low
Earthworks and alteration of river banks	2	4	5	2	13	87,75	Moderate	Moderate
Diverting of watercourse for construction activities	2	4	5	2	13	87,75	Moderate	Moderate
Operation Phase								
Alteration of drainage	5	4	5	2	16	116	Moderate	Moderate
Alteration of flow	5	4	5	2	16	116	Moderate	Moderate
Alteration of riparian zone	5	3	5	2	15	105	Moderate	Moderate
In accordance with General Notice 509 "Risk is determined after considering all listed control / mitigation measures. Borderline Low / Moderate risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80) subject to listing of additional mitigation measures detailed below								

The activities for the active project have the potential to degrade water and habitat quality within the considered riverine systems. The modification to riverine habitat was observed using aerial imagery and confirmed during the site visit.

Habitat quality impacts are likely to include altered water volumes, sedimentation, bed, channel and flow modification, as well as the specific loss of habitats through direct modification of river channels and riparian zones. These changes will alter the ecological function of watercourse.

The impacts of the proposed project will largely occur during the construction phase. This is a result of the physical disturbance which will alter natural drainage and vegetation cover. The extent of the potential impacts arising from the proposed project will impact areas where direct interactions between watercourses and the impoundments occur.

12 Mitigation Actions and Rehabilitation Plan

12.1 Mitigation Actions

The following mitigation measures are provided:

- The farming footprint area should not extend any further towards the Sterkfontein River. A buffer zone of 30 m from the river edge must be established as a no-go area for all farming activities/clearing;
- The footprint area of the proposed activities must be clearly demarcated to avoid unnecessary disturbances to natural areas. This includes laydown yards and excavation areas to be disturbed. Unnecessary entry into riparian areas and instream habitats must be avoided;
- Alien vegetation management must take place in the established 30m buffer zone and thereby allow for the natural succession of native riparian species;
- Stabilisation of banks and intake channels through the use of gabions or Reno mattresses, and the re-vegetation of any disturbed areas;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous species) to protect the exposed soil. Exposed areas require revegetation to reduce erosion, and increase flood attenuation;
- A suitable storm water plan must be compiled for the area. This plan must attempt to reduce erosion and sedimentation of the water course, and preventing erosion of the receiving environment. It is preferable that run-off velocities be reduced with energy dissipaters and flows discharged into the local watercourses;
- Silt traps and fences must be placed in the preferential flow paths along the furrows to prevent sedimentation of the watercourse;
- Prevent access of vehicles into the instream and riparian zones, which can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas; and

- All employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks from machinery or chemicals used for farming.

12.1.1 Unplanned Events

The planned activities will have known impacts as discussed above; however, unplanned events may occur on any project and may have potential impacts which will need mitigation and management. Table 12-1 is a summary of the findings from a riverine ecology perspective. Please note not all potential unplanned events may be captured herein and this must therefore be managed throughout all phases.

Table 12-1 Unplanned Events, Low Risks and their Management Measures

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spill into wetland/riverine habitat	Contamination of sediments and water resources associated with the spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Uncontrolled erosion	Sedimentation of downstream river reach.	Erosion control measures must be put in place. This is particularly important in spillways.
Flooding during construction	Significant habitat degradation of downstream areas.	A flood emergency response plan should be drafted.

12.2 Rehabilitation Plan

Following the completion of the construction activities, rehabilitation of the footprint area will be required. The following section will provide details pertaining to the rehabilitation of the impacted footprint area. It is noted that the proposed rehabilitation is provided for the riverine and areas only.

Considering the nature of the project, there are two affected components, specifically the instream and marginal riverine habitats. Therefore, instream and riparian rehabilitation methods will be applicable.

The following broad rehabilitation principles that are relevant to the proposed plan are provided below (Table 12-2). Specific measures that need to be implemented at the specific areas are provided in Table 12-3.

Table 12-2 Riverine rehabilitation principles applicable to the proposed construction

Rehabilitation Principles	Comment
Planning must be undertaken with appropriate stakeholder participation.	No public participation was completed for this project. However, it can be anticipated that the rehabilitation plan must be aligned to support local agricultural activities.
Legal implications of rehabilitation must be considered	The rehabilitation is aligned with the proposed applications (Section 24G).
Rehabilitation should be integrated with the surrounding landscape and should follow a landscape approach	A baseline aquatic assessment has been completed. Rehabilitation should be completed with the surrounding landuse and topography in mind. It is noted that the topography is largely lowland.
Rehabilitation should recognize and take into consideration adaptive management.	The project must undertake concurrent rehabilitation actions to ensure that large scale rehabilitation of the entire area is not required at the end of the proposed activity.

Table 12-3 Rehabilitation Actions

	Access Routes
1.	Compacted soils need to be scarified/ripped and vegetated to reflect local indigenous flora;
2.	Contouring should be completed to align with surrounding topography which will avoid ponding and erosion;
3.	If required, fertilizers should be applied to increase the rate of revegetation;
4.	Where access to the river bed has been made, the riverbank must be reinstated and revegetated to its original profile.
	River Channel Structures
1.	River banks need to be protected with gabion structures where erosional forces may destabilize river banks;
2.	Areas where spillways discharge should have large aggregate placed to avoid future erosion during overflow events;
3.	River banks and 30 m within the riparian zone needs to be revegetated and contoured, these areas need to be established as no go areas;
4.	Compacted soils need to be scarified/ripped and vegetated to reflect local indigenous flora;
5.	Contouring should be completed to align with surrounding topography which will avoid ponding and erosion;
6.	If required, fertilizers should be applied to increase the rate of revegetation;
7.	If soils were removed and stockpiled, these must be replaced in the order that they were originally found; and
8.	No foreign debris must be present in the river bed and should be disposed of appropriately, this includes the left-over sediment screens.
9.	Where there has been a loss of connectivity, such as in the Unnamed Tributary, the instream river channel should be rehabilitated to its historical position.

	Marginal Vegetation
1.	Where riverine vegetation has been removed, the vegetation shall be established systematically following the completion of the project.
2.	Effective alien invasive plant management must be implemented for at-least 12 months following the completion of the construction.
	Monitoring
1.	Stipulation in the Resource Quality Objectives indicate the requirement for maintenance low flows within the Mokolo Reach. It is recommended that a low flow study be conducted to assess the flow modifications during the low flow period.

12.2.1 Timeframes

The proposed rehabilitation plan should be implemented immediately. The remaining rehabilitation actions should be implemented within 30 days of the cessation of the construction phase.

Table 12-4 Plant species which should be considered for rehabilitation efforts

Wetland	Risks	Objectives	Plant species	Recommendation
Embankments	Erosion, bank collapse and steep banks	To slow water flows and provide soil stability	• *Cynodon dactylon,* • *Eragrostis gummiflua,* • *Aristida congesta subsp. congesta,* • *Aristida junciformis,* • *Eragrostis tef,* • *Panicum maximum* • *Phragmites australis (wet)*	Slope banks and slight contouring to aid in plant establishment and slowing of water flows down the slopes. Seed should be sowed in a mix.
Channel	Erosion, soil dispersion and downstream impacts	Trapping of sediment, water filtration, improvement of plant diversity	• *Setaria sphacelata var. sericea,* • *Imperata cylindrica,* • *Sporobolus africanus,* • *Typha capensis,* • *Digitaria eriantha*	Seed should be sowed in a mix and towards the end of the dry season.

Trees and Shrubs				
Family	**Taxon**	**IUCN**	**Diagnostic**	**Ecology**
Combretaceae	*Combretum erythrophyllum*	LC	tree	Indigenous
Euphorbiaceae	*Croton pseudopulchellus*	LC	tree; shrub;	Indigenous
Moraceae	*Ficus sycomorus*	LC	tree;	Indigenous
Moraceae	*Ficus thonningii*	LC	tree;	Indigenous
Scrophulariaceae	*Freylinia tropica*	Rare	shrub; tree;	Indigenous
Sapotaceae	*Mimusops zeyheri*	LC	Tree; shrub;	Indigenous
Oleaceae	*Olea europaea subsp. africana*	LC	tree	Indigenous
Sapindaceae	*Pappea capensis*	LC	shrub; tree;	Indigenous
Fabaceae	*Schotia brachypetala*	LC	tree;	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	LC	tree	Indigenous
Euphorbiaceae	*Spirostachys africana*	LC	tree;	Indigenous
Loganiaceae	*Strychnos spinosa subsp. spinosa*	LC	shrub; tree;	Indigenous
Myrtaceae	*Syzygium cordatum*	LC	shrub; tree;	Indigenous

Fabaceae	*Vachellia karroo*	LC	tree	Indigenous
Fabaceae	*Vachellia xanthophloea*	LC	tree	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris*	NE	herb;	Indigenous

13 Conclusion

13.1 Biodiversity

13.1.1 Dam 7

The project area has been altered both currently and historically. The agricultural land-use the area has had an impact on both the fauna and the flora in the area, which is evident in the degraded and modified habitats. However, the degraded bushveld can be regarded as important, not only within the local landscape, but also regionally; as they are used for habitat, foraging and movement corridors for fauna within a fragmented landscape to more natural areas where they may reproduce. The degraded Bushveld was rated with a moderate sensitivity because it:

- May serve as and represent CBA if enabled to recover, as per the Limpopo Conservation Plan; and
- May support various species but is also connected to the adjacent CBA as well as the Sterkfontein River and may play an important role in the ecosystem if left to recover from the superficial impacts.

The ecological integrity, importance and functioning of these terrestrial biodiversity areas provide a variety of ecological services considered beneficial, with one key service being the maintenance of biodiversity. The preservation of these systems is the most important aspect to consider for the proposed project.

13.1.1.1 Impact Statement

An impact statement is required as per the NEMA regulations with regards to the proposed development.

Considering the above-mentioned information, no fatal flaws are evident for the proposed project. It is the opinions of the specialists that the project, may be favourably considered, on condition all prescribed mitigation measures and supporting recommendations are implemented.

13.2 Aquatic Ecology

13.2.1 Dam 7

The desktop review of the Sterkfontein indicates that the river reach is a largely modified state. This is attributed to numerous instream impoundments and agricultural activities within the river segment. As the proposed Dam 7 water source has been authorised (pumped from the Sterkfontein River), the impacts related with the construction are associated with the proximity of the proposed activities to the Sterkfontein River, and the delineated riparian zone and floodlines. The proposed alternative increases the distance between the dam infrastructure and the delineated riparian zone and floodlines, however, the infrastructures remains within 10 m of the floodline and riparian zones, limiting the size of the buffer between the water course and the proposed dam site.

13.2.1.1 Impact Statement

Risks are associated with vegetation clearing, erosion and subsequent downstream sedimentation, and operation of heavy machinery adjacent to the water course. It is recommended that the locality of the dam be reassessed, and 30 m buffer from the water course habitat and floodline, whichever is greater, be applied. Adequate mitigation measures must be in place to reduce potential erosion and sedimentation of the Sterkfontein River, and correct rehabilitation of disturbed areas must be conducted to stabilise the disturbed areas and reduce erosion.

13.2.2 Section 24G for Three Dams

The ephemeral system assessed for the Section 24G was found to be in a critically modified state, as habitat degradation within the reach has occurred. Approximately 600 m of the 1.8 km water course has been modified, permanently negatively affecting the ecosystem integrity and function of the ephemeral system. The construction of the three dams has resulted in a direct loss of instream and riparian habitat, and hydrological function of the drainage line to the Sterkfontein system.

13.2.2.1 Impact Statement

An impact statement is required as per the NEMA regulations with regards to the proposed development.

Should the S24G application be denied, a comprehensive rehabilitation plan must be developed and implemented. As extensive habitat degradation has occurred within the reach, should the application be successful, a comprehensive rehabilitation plan must be implemented to landscape and revegetate disturbed areas. Further, it is highly recommended that a comprehensive environmental flow assessment be conducted within the Mokolo and Sterkfontein catchments to determine the ecological reserve and the cumulative impacts within the catchment associated with the agricultural activities and to ensure the resource quality objectives are achieved for the catchment. All water uses for the constructed dams must be authorised.

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15 Appendices

Appendix A Specialist declarations

DECLARATION

I, Martinus Erasmus, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Martinus Erasmus

Terrestrial Ecologist

The Biodiversity Company

October 2020

DECLARATION

I, Lindi Steyn, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Lindi Steyn

Terrestrial Ecologist

The Biodiversity Company

October 2020

DECLARATION

I, Christian Fry, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Christian Fry

MSc. Aquatic Health

The Biodiversity Company

October 2020

Appendix B Flora species expected in the project area and surrounds

Family	Taxon	Author	IUCN	Ecology
Malvaceae	*Abutilon angulatum var. angulatum*	(Guill. & Perr.) Mast.	NE	Indigenous
Fabaceae	*Acacia sp.*			
Rubiaceae	*Agathisanthemum bojeri subsp. bojeri*	Klotzsch	LC	Indigenous
Fabaceae	*Alistilus bechuanicus*	N.E.Br.	LC	Indigenous
Poaceae	*Andropogon chinensis*	(Nees) Merr.	LC	Indigenous
Commelinaceae	*Aneilema hockii*	De Wild.	LC	Indigenous
Archidiaceae	*Archidium sp.*			
Fabaceae	*Argyrolobium transvaalense*	Schinz	LC	Indigenous
Poaceae	*Aristida aequiglumis*	Hack.	LC	Indigenous
Poaceae	*Aristida canescens subsp. canescens*	Henrard	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Poaceae	*Aristida scabrivalvis subsp. scabrivalvis*	Hack.	LC	Indigenous
Poaceae	*Aristida spectabilis*	Hack.	LC	Indigenous
Poaceae	*Aristida stipitata subsp. graciliflora*	Hack.	LC	Indigenous
Acanthaceae	*Asystasia mysorensis*	(Roth) T.Anderson		Indigenous
Rhamnaceae	*Berchemia zeyheri*	(Sond.) Grubov	LC	Indigenous
Elatinaceae	*Bergia decumbens*	Planch. ex Harv.	LC	Indigenous
Acanthaceae	*Blepharis breyeri*	Oberm.	LC	Indigenous; Endemic
Acanthaceae	*Blepharis maderaspatensis*	(L.) Roth	LC	Indigenous
Poaceae	*Brachiaria nigropedata*	(Ficalho & Hiern) Stapf	LC	Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B.Clarke	LC	Indigenous
Cyperaceae	*Bulbostylis hispidula subsp. pyriformis*	(Vahl) R.W.Haines	LC	Indigenous
Fabaceae	*Burkea africana*	Hook.	LC	Indigenous
Leucobryaceae	*Campylopus pyriformis*	(F.W.Schultz) Brid.		Indigenous
Apocynaceae	*Carissa bispinosa*	(L.) Desf. ex Brenan	LC	Indigenous
Poaceae	*Cenchrus ciliaris*	L.	LC	Indigenous
Apocynaceae	*Ceropegia crassifolia var. crassifolia*	Schltr.	LC	Indigenous
Apocynaceae	*Ceropegia turricula*	E.A.Bruce	NT	Indigenous; Endemic
Fabaceae	*Chamaecrista absus*	(L.) H.S.Irwin & Barneby	LC	Indigenous
Pteridaceae	*Cheilanthes viridis var. viridis*	(Forssk.) Sw.	LC	Indigenous
Agavaceae	*Chlorophytum galpinii var. galpinii*	(Baker) Kativu	LC	Indigenous
Agavaceae	*Chlorophytum galpinii var. norlindhii*	(Baker) Kativu	LC	Indigenous
Acanthaceae	*Chorisochora transvaalensis*	(A.Meeuse) Vollesen	LC	Indigenous
Vitaceae	*Cissus cactiformis*	Gilg	LC	Indigenous
Ranunculaceae	*Clematis oweniae*	Harv.		Indigenous
Ranunculaceae	*Clematis villosa*	DC.		Indigenous
Ranunculaceae	*Clematis villosa subsp. stanleyi*	DC.	LC	Indigenous

Cleomaceae	*Cleome maculata*	(Sond.) Szyszyl.	LC	Indigenous
Peraceae	*Clutia pulchella var. pulchella*	L.	LC	Indigenous
Combretaceae	*Combretum kraussii*	Hochst.	LC	Indigenous
Combretaceae	*Combretum molle*	R.Br. ex G.Don	LC	Indigenous
Combretaceae	*Combretum nelsonii*	Dummer	LC	Indigenous; Endemic
Combretaceae	*Combretum zeyheri*	Sond.	LC	Indigenous
Commelinaceae	*Commelina africana var. lancispatha*	L.	LC	Indigenous
Burseraceae	*Commiphora africana var. africana*	(A.Rich.) Engl.	LC	Indigenous
Burseraceae	*Commiphora glandulosa*	Schinz	LC	Indigenous
Burseraceae	*Commiphora mollis*	(Oliv.) Engl.	LC	Indigenous
Burseraceae	*Commiphora neglecta*	I.Verd.	LC	Indigenous
Burseraceae	*Commiphora pyracanthoides*	Engl.	LC	Indigenous
Burseraceae	*Commiphora schimperi*	(O.Berg) Engl.	LC	Indigenous
Malvaceae	*Corchorus asplenifolius*	Burch.	LC	Indigenous
Malvaceae	*Corchorus kirkii*	N.E.Br.	LC	Indigenous
Acanthaceae	*Crabbea ovalifolia*	Ficalho & Hiern	LC	Indigenous
Fabaceae	*Crotalaria orientalis subsp. allenii*	Burtt Davy ex I.Verd.	LC	Indigenous
Fabaceae	*Crotalaria sphaerocarpa subsp. sphaerocarpa*	Perr. ex DC.	LC	Indigenous
Fabaceae	*Crotalaria virgultalis*	Burch. ex DC.	LC	Indigenous
Euphorbiaceae	*Croton gratissimus var. subgratissimus*	Burch.	LC	Indigenous
Araliaceae	*Cussonia spicata*	Thunb.	LC	Indigenous
Poaceae	*Cymbopogon pospischilii*	(K.Schum.) C.E.Hubb.	NE	Indigenous
Cyperaceae	*Cyperus albostriatus*	Schrad.	LC	Indigenous
Cyperaceae	*Cyperus capensis*	(Steud.) Endl.	LC	Indigenous; Endemic
Cyperaceae	*Cyperus denudatus*	L.f.	LC	Indigenous
Cyperaceae	*Cyperus esculentus var. esculentus*	L.	LC	Indigenous
Cyperaceae	*Cyperus fastigiatus*	Rottb.	LC	Indigenous
Cyperaceae	*Cyperus rupestris var. rupestris*	Kunth	LC	Indigenous
Cyperaceae	*Cyperus sphaerospermus*	Schrad.	LC	Indigenous
Vitaceae	*Cyphostemma puberulum*	(C.A.Sm.) Wild & R.B.Drumm.	LC	Indigenous
Dichapetalaceae	*Dichapetalum cymosum*	(Hook.) Engl.	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. gerrardii*	Sond.	LC	Indigenous
Poaceae	*Digitaria debilis*	(Desf.) Willd.	LC	Indigenous
Poaceae	*Digitaria eriantha*	Steud.	LC	Indigenous
Ebenaceae	*Diospyros lycioides subsp. guerkei*	Desf.	LC	Indigenous
Apocynaceae	*Diplorhynchus condylocarpon*	(Mull.Arg.) Pichon	LC	Indigenous
Malvaceae	*Dombeya rotundifolia var. rotundifolia*	(Hochst.) Planch.	LC	Indigenous
Hyacinthaceae	*Drimia altissima*	(L.f.) Ker Gawl.	LC	Indigenous
Droseraceae	*Drosera collinsiae*	N.E.Br. ex Burtt Davy	LC	Indigenous

Cyperaceae	*Eleocharis acutangula*	(Roxb.) Schult.	LC	Indigenous
Rubiaceae	*Empogona lanceolata*	(Sond.) Tosh & Robbr.		Indigenous
Poaceae	*Eragrostis chloromelas*	Steud.	LC	Indigenous
Poaceae	*Eragrostis gummiflua*	Nees	LC	Indigenous
Poaceae	*Eragrostis lehmanniana var. chaunantha*	Nees	LC	Indigenous
Poaceae	*Eragrostis nindensis*	Ficalho & Hiern	LC	Indigenous
Poaceae	*Eragrostis pallens*	Hack.	LC	Indigenous
Poaceae	*Eragrostis rigidior*	Pilg.	LC	Indigenous
Poaceae	*Eragrostis stapfii*	De Winter	LC	Indigenous
Poaceae	*Eragrostis superba*	Peyr.	LC	Indigenous
Poaceae	*Eragrostis trichophora*	Coss. & Durieu	LC	Indigenous
Eriocaulaceae	*Eriocaulon abyssinicum*	Hochst.	LC	Indigenous
Fabaceae	*Eriosema pauciflorum var. pauciflorum*	Klotzsch	LC	Indigenous
Asteraceae	*Erlangea misera*	(Oliv. & Hiern) S.Moore	LC	Indigenous
Orchidaceae	*Eulophia angolensis*	(Rchb.f.) Summerh.	LC	Indigenous
Euphorbiaceae	*Euphorbia ingens*	E.Mey. ex Boiss.	LC	Indigenous
Euphorbiaceae	*Euphorbia neopolycnemoides*	Pax & K.Hoffm.	LC	Indigenous
Convolvulaceae	*Evolvulus alsinoides*	(L.) L.	LC	Indigenous
Proteaceae	*Faurea saligna*	Harv.	LC	Indigenous
Asteraceae	*Felicia mossamedensis*	(Hiern) Mendonça	LC	Indigenous
Moraceae	*Ficus thonningii*	Blume		Indigenous
Cyperaceae	*Fimbristylis dichotoma subsp. dichotoma*	(L.) Vahl	LC	Indigenous
Cyperaceae	*Fuirena pubescens var. pubescens*	(Poir.) Kunth	LC	Indigenous
Rubiaceae	*Gardenia volkensii subsp. spatulifolia*	K.Schum.	LC	Indigenous
Iridaceae	*Gladiolus elliotii*	Baker	LC	Indigenous
Iridaceae	*Gladiolus rehmannii*	Baker	LC	Indigenous
Colchicaceae	*Gloriosa rigidifolia*	(Bredell) J.C.Manning & Vinn.	LC	Indigenous; Endemic
Apocynaceae	*Gomphocarpus tomentosus subsp. tomentosus*	Burch.	LC	Indigenous
Malvaceae	*Grewia avellana*	Hiern	LC	Indigenous
Malvaceae	*Grewia occidentalis var. occidentalis*	L.	LC	Indigenous
Malvaceae	*Grewia olukondae*	Schinz	LC	Indigenous
Pedaliaceae	*Harpagophytum zeyheri subsp. zeyheri*	Decne.	LC	Indigenous
Asteraceae	*Helichrysum callicomum*	Harv.	LC	Indigenous
Asteraceae	*Helichrysum kraussii*	Sch.Bip.	LC	Indigenous
Asteraceae	*Helichrysum setosum*	Harv.	LC	Indigenous
Malvaceae	*Hermannia grisea*	Schinz	LC	Indigenous; Endemic
Malvaceae	*Hermannia stellulata*	(Harv.) K.Schum.	LC	Indigenous
Apiaceae	*Heteromorpha arborescens*	(Spreng.) Cham. & Schltdl.		Indigenous
Malvaceae	*Hibiscus engleri*	K.Schum.	LC	Indigenous

Malvaceae	*Hibiscus waterbergensis*	Exell	LC	Indigenous; Endemic
Poaceae	*Hyparrhenia quarrei*	Robyns	LC	Indigenous
Hypericaceae	*Hypericum lalandii*	Choisy	LC	Indigenous
Poaceae	*Hyperthelia dissoluta*	(Nees ex Steud.) Clayton	LC	Indigenous
Fabaceae	*Indigofera adenoides*	Baker f.	LC	Indigenous
Fabaceae	*Indigofera melanadenia*	Benth. ex Harv.	LC	Indigenous
Fabaceae	*Indigofera oxalidea*	Welw. ex Baker	LC	Indigenous
Fabaceae	*Indigofera vicioides var. vicioides*	Jaub. & Spach	LC	Indigenous
Convolvulaceae	*Ipomoea coptica*	(L.) Roth ex Roem. & Schult.	LC	Indigenous
Convolvulaceae	*Ipomoea ommanneyi*	Rendle	LC	Indigenous
Convolvulaceae	*Ipomoea transvaalensis*	A.Meeuse	LC	Indigenous
Poaceae	*Ischaemum fasciculatum*	Brongn.	LC	Indigenous
Cyperaceae	*Isolepis costata*	Hochst. ex A.Rich.	LC	Indigenous
Juncaceae	*Juncus dregeanus subsp. dregeanus*	Kunth	LC	Indigenous
Acanthaceae	*Justicia betonica*	L.	LC	Indigenous
Acanthaceae	*Justicia minima*	A.Meeuse	LC	Indigenous; Endemic
Acanthaceae	*Justicia petiolaris subsp. petiolaris*	(Nees) T.Anderson	LC	Indigenous
Crassulaceae	*Kalanchoe paniculata*	Harv.	LC	Indigenous
Kirkiaceae	*Kirkia acuminata*	Oliv.	LC	Indigenous
Thymelaeaceae	*Lasiosiphon microcephalus*	(Meisn.) J.C.Manning & Magee		Indigenous
Hyacinthaceae	*Ledebouria revoluta*	(L.f.) Jessop	LC	Indigenous
Lamiaceae	*Leonotis martinicensis*	(Jacq.) J.C.Manning & Goldblatt	LC	Indigenous
Limeaceae	*Limeum fenestratum var. fenestratum*	(Fenzl) Heimerl	LC	Indigenous
Linderniaceae	*Lindernia parviflora*	(Roxb.) Haines	LC	Indigenous
Cyperaceae	*Lipocarpha chinensis*	(Osbeck) J.Kern	LC	Indigenous
Fabaceae	*Listia heterophylla*	E.Mey.	LC	Indigenous
Malvaceae	*Melhania transvaalensis*	Szyszyl.	LC	Indigenous; Endemic
Poaceae	*Miscanthus junceus*	(Stapf) Pilg.	LC	Indigenous
Fabaceae	*Mundulea sericea subsp. sericea*	(Willd.) A.Chev.	LC	Indigenous
Haloragaceae	*Myriophyllum aquaticum*	(Vell.) Verdc.		Not indigenous; Cultivated; Naturalised; Invasive
Lythraceae	*Nesaea cordata*	Hiern	LC	Indigenous
Nymphaeaceae	*Nymphaea nouchali var. caerulea*	Burm.f.	LC	Indigenous
Lamiaceae	*Ocimum americanum var. americanum*	L.	LC	Indigenous
Lamiaceae	*Ocimum angustifolium*	Benth.	LC	Indigenous
Oleaceae	*Olea europaea subsp. cuspidata*	L.		Indigenous
Apocynaceae	*Orbea carnosa subsp. keithii*	(Stent) Bruyns	LC	Indigenous

Osmundaceae	*Osmunda regalis*	L.	LC	Indigenous
Oxalidaceae	*Oxalis depressa*	Eckl. & Zeyh.	LC	Indigenous
Anacardiaceae	*Ozoroa paniculosa var. paniculosa*	(Sond.) R.Fern. & A.Fern.	LC	Indigenous
Rubiaceae	*Pachystigma triflorum*	Robyns	LC	Indigenous; Endemic
Poaceae	*Panicum natalense*	Hochst.	LC	Indigenous
Poaceae	*Panicum repens*	L.	LC	Indigenous
Malvaceae	*Pavonia burchellii*	(DC.) R.A.Dyer	LC	Indigenous
Malvaceae	*Pavonia clathrata*	Mast.	LC	Indigenous
Malvaceae	*Pavonia transvaalensis*	(Ulbr.) A.Meeuse	LC	Indigenous; Endemic
Fabaceae	*Pearsonia uniflora*	(Kensit) Polhill	LC	Indigenous
Asteraceae	*Pegolettia tenuifolia*	Bolus	LC	Indigenous; Endemic
Apocynaceae	*Pentarrhinum insipidum*	E.Mey.	LC	Indigenous
Polygonaceae	*Persicaria madagascariensis*	(Meisn.) S.Ortiz & Paiva		Indigenous
Phyllanthaceae	*Phyllanthus incurvus*	Thunb.	LC	Indigenous
Phyllanthaceae	*Phyllanthus pentandrus*	Schumach. & Thonn.	LC	Indigenous
Pittosporaceae	*Pittosporum viridiflorum*	Sims	LC	Indigenous
Plantaginaceae	*Plantago longissima*	Decne.	LC	Indigenous
Lamiaceae	*Plectranthus montanus*	Benth.		Indigenous
Poaceae	*Pogonarthria squarrosa*	(Roem. & Schult.) Pilg.	LC	Indigenous
Caryophyllaceae	*Pollichia campestris*	Aiton	LC	Indigenous
Asteraceae	*Polydora angustifolia*	(Steetz) H.Rob.	LC	Indigenous
Polygalaceae	*Polygala producta*	N.E.Br.	LC	Indigenous
Polygalaceae	*Polygala sphenoptera var. sphenoptera*	Fresen.	LC	Indigenous
Potamogetonaceae	*Potamogeton octandrus*	Poir.	LC	Indigenous
Fabaceae	*Pterocarpus rotundifolius subsp. rotundifolius*	(Sond.) Druce	LC	Indigenous
Amaranthaceae	*Pupalia lappacea var. lappacea*	(L.) A.Juss.	LC	Indigenous
Cyperaceae	*Pycreus flavescens*	(L.) P.Beauv. ex Rchb.	LC	Indigenous
Cyperaceae	*Pycreus macranthus*	(Boeck.) C.B.Clarke	LC	Indigenous
Cyperaceae	*Pycreus nitidus*	(Lam.) J.Raynal	LC	Indigenous
Vitaceae	*Rhoicissus tridentata subsp. cuneifolia*	(L.f.) Wild & R.B.Drumm.	NE	Indigenous
Fabaceae	*Rhynchosia totta var. rigidula*	(Thunb.) DC.		Indigenous
Ricciaceae	*Riccia congoana*	Steph.		Indigenous
Ricciaceae	*Riccia okahandjana*	S.W.Arnell		Indigenous
Bryaceae	*Rosulabryum capillare*	(Hedw.) J.R.Spence		Indigenous
Lamiaceae	*Rotheca louwalbertsii*	(P.P.J.Herman) P.P.J.Herman & Retief	LC	Indigenous
Acanthaceae	*Ruellia patula*	Jacq.	LC	Indigenous
Amaryllidaceae	*Scadoxus puniceus*	(L.) Friis & Nordal	LC	Indigenous
Asteraceae	*Schistostephium crataegifolium*	(DC.) Fenzl ex Harv.	LC	Indigenous

Poaceae	*Schmidtia pappophoroides*	Steud.	LC	Indigenous
Fabaceae	*Schotia brachypetala*	Sond.	LC	Indigenous
Acanthaceae	*Sclerochiton ilicifolius*	A.Meeuse	LC	Indigenous; Endemic
Anacardiaceae	*Searsia leptodictya forma leptodictya*	(Diels) T.S.Yi, A.J.Mill. & J.Wen	NE	Indigenous
Anacardiaceae	*Searsia pallens*	(Eckl. & Zeyh.) Moffett	LC	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett	LC	Indigenous
Anacardiaceae	*Searsia rigida var. dentata*	(Mill.) F.A.Barkley	LC	Indigenous; Endemic
Selaginellaceae	*Selaginella dregei*	(C.Presl) Hieron.	LC	Indigenous
Asteraceae	*Senecio inaequidens*	DC.	LC	Indigenous
Fabaceae	*Senegalia burkei*	(Benth.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Senegalia caffra*	(Thunb.) P.J.H.Hurter & Mabb.	LC	Indigenous
Fabaceae	*Senegalia erubescens*	(Welw. ex Oliv.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Sesbania bispinosa var. bispinosa*	(Jacq.) W.Wight	NE	Not indigenous; Naturalised
Poaceae	*Setaria sphacelata var. torta*	(Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	LC	Indigenous
Malvaceae	*Sida cordifolia subsp. cordifolia*	L.	LC	Indigenous
Malvaceae	*Sida dregei*	Burtt Davy	LC	Indigenous
Solanaceae	*Solanum catombelense*	Peyr.	LC	Indigenous
Solanaceae	*Solanum tomentosum*	L.		Indigenous
Rubiaceae	*Spermacoce senensis*	(Klotzsch) Hiern	LC	Indigenous
Malpighiaceae	*Sphedamnocarpus pruriens subsp. galphimiifolius*	(A.Juss.) Szyszyl.	LC	Indigenous
Malpighiaceae	*Sphedamnocarpus pruriens subsp. pruriens*	(A.Juss.) Szyszyl.	LC	Indigenous
Poaceae	*Sporobolus pyramidalis*	P.Beauv.	LC	Indigenous
Lamiaceae	*Stachys natalensis var. natalensis*	Hochst.	LC	Indigenous
Orobanchaceae	*Striga elegans*	Benth.	LC	Indigenous
Loganiaceae	*Strychnos cocculoides*	Baker	LC	Indigenous
Loganiaceae	*Strychnos madagascariensis*	Poir.	LC	Indigenous
Loganiaceae	*Strychnos spinosa subsp. spinosa*	Lam.	LC	Indigenous
Fabaceae	*Stylosanthes fruticosa*	(Retz.) Alston	LC	Indigenous
Lamiaceae	*Syncolostemon canescens*	(Gurke) D.F.Otieno	LC	Indigenous
Loranthaceae	*Tapinanthus sp.*			
Fabaceae	*Tephrosia lupinifolia*	DC.	LC	Indigenous
Fabaceae	*Tephrosia purpurea subsp. leptostachya*	(L.) Pers.	NE	Indigenous
Combretaceae	*Terminalia sericea*	Burch. ex DC.	LC	Indigenous
Poaceae	*Themeda triandra*	Forssk.	LC	Indigenous
Acanthaceae	*Thunbergia neglecta*	Sond.	LC	Indigenous
Poaceae	*Trachypogon spicatus*	(L.f.) Kuntze	LC	Indigenous
Euphorbiaceae	*Tragia rupestris*	Sond.	LC	Indigenous

Zygophyllaceae	*Tribulus zeyheri subsp. zeyheri*	Sond.	LC	Indigenous
Poaceae	*Trichoneura grandiglumis*	(Nees) Ekman	LC	Indigenous
Poaceae	*Triraphis schinzii*	Hack.	LC	Indigenous
Malvaceae	*Triumfetta angolensis*	Sprague & Hutch.	LC	Indigenous
Malvaceae	*Triumfetta annua forma annua*	L.	NE	Indigenous
Fabaceae	*Tylosema fassoglense*	(Schweinf.) Torre & Hillc.	LC	Indigenous
Poaceae	*Urochloa brachyura*	(Hack.) Stapf	LC	Indigenous
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Fabaceae	*Vachellia robusta subsp. robusta*	(Burch.) Kyal. & Boatwr.	LC	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris*	(L.f.) Thunb.	NE	Indigenous
Rubiaceae	*Vangueria sp.*			
Lamiaceae	*Vitex rehmannii*	Gurke	LC	Indigenous
Campanulaceae	*Wahlenbergia denticulata var. transvaalensis*	(Burch.) A.DC.	LC	Indigenous; Endemic
Campanulaceae	*Wahlenbergia krebsii subsp. krebsii*	Cham.	LC	Indigenous
Convolvulaceae	*Xenostegia tridentata subsp. angustifolia*	(L.) D.F.Austin & Staples	LC	Indigenous
Xyridaceae	*Xyris capensis*	Thunb.	LC	Indigenous
Xyridaceae	*Xyris congensis*	Buttner	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	Sond.	LC	Indigenous
Fabaceae	*Zornia capensis subsp. capensis*	Pers.	LC	Indigenous
Fabaceae	*Zornia glochidiata*	Rchb. ex DC.	LC	Indigenous

Appendix C Avifauna species expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Accipiter badius	Shikra	Unlisted	LC
Accipiter melanoleucus	Sparrowhawk, Black	Unlisted	LC
Accipiter minullus	Sparrowhawk, Little	Unlisted	LC
Accipiter tachiro	Goshawk, African	Unlisted	LC
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Actophilornis africanus	Jacana, African	Unlisted	LC
Afrotis afraoides	Korhaan, Northern Black	Unlisted	LC
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Amadina fasciata	Finch, Cut-throat	Unlisted	Unlisted
Amaurornis flavirostris	Crake, Black	Unlisted	LC
Amblyospiza albifrons	Weaver, Thick-billed	Unlisted	LC
Anaplectes rubriceps	Weaver, Red-headed	Unlisted	LC
Anas capensis	Teal, Cape	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas smithii	Shoveler, Cape	Unlisted	LC
Anas sparsa	Duck, African Black	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anhinga rufa	Darter, African	Unlisted	LC
Anthoscopus caroli	Penduline-tit, Grey	Unlisted	LC
Anthus caffer	Pipit, Bushveld	Unlisted	LC
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus leucophrys	Pipit, Plain-backed	Unlisted	LC
Anthus lineiventris	Pipit, Striped	Unlisted	LC
Anthus vaalensis	Pipit, Buffy	Unlisted	LC
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Apus barbatus	Swift, African Black	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Apus horus	Swift, Horus	Unlisted	LC
Aquila pennatus	Eagle, Booted	Unlisted	LC

Aquila rapax	Eagle, Tawny	EN	LC
Aquila spilogaster	Hawk-eagle, African	Unlisted	LC
Aquila verreauxii	Eagle, Verreaux's	VU	LC
Aquila wahlbergi	Eagle, Wahlberg's	Unlisted	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Ardea purpurea	Heron, Purple	Unlisted	LC
Ardeola ralloides	Heron, Squacco	Unlisted	LC
Aviceda cuculoides	Hawk, African Cuckoo	Unlisted	LC
Batis molitor	Batis, Chinspot	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bradornis mariquensis	Flycatcher, Marico	Unlisted	LC
Bradornis pallidus	Flycatcher, Pale	Unlisted	LC
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC
Bubalornis niger	Buffalo-weaver, Red-billed	Unlisted	LC
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubo lacteus	Eagle-owl, Verreaux's	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Buphagus erythrorhynchus	Oxpecker, Red-billed	Unlisted	Unlisted
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Burhinus vermiculatus	Thick-knee, Water	Unlisted	LC
Buteo rufofuscus	Buzzard, Jackal	Unlisted	LC
Buteo vulpinus	Buzzard, Common	Unlisted	Unlisted
Butorides striata	Heron, Green-backed	Unlisted	LC
Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC
Camaroptera brachyura	Camaroptera, Green-backed	Unlisted	LC
Camaroptera brevicaudata	Camaroptera, Grey-backed	Unlisted	Unlisted
Campephaga flava	Cuckoo-shrike, Black	Unlisted	LC
Campethera abingoni	Woodpecker, Golden-tailed	Unlisted	LC
Campethera bennettii	Woodpecker, Bennett's	Unlisted	LC
Caprimulgus europaeus	Nightjar, European	Unlisted	LC
Caprimulgus pectoralis	Nightjar, Fiery-necked	Unlisted	LC
Caprimulgus rufigena	Nightjar, Rufous-cheeked	Unlisted	LC
Caprimulgus tristigma	Nightjar, Freckled	Unlisted	LC
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted
Cercomela familiaris	Chat, Familiar	Unlisted	LC
Cercotrichas leucophrys	Scrub-robin, White-browed	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Chalcomitra amethystina	Sunbird, Amethyst	Unlisted	LC

Charadrius hiaticula	Plover, Common Ringed	Unlisted	LC
Charadrius pecuarius	Plover, Kittlitz's	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chlidonias leucopterus	Tern, White-winged	Unlisted	LC
Chlorocichla flaviventris	Greenbul, Yellow-bellied	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Chrysococcyx klaas	Cuckoo, Klaas's	Unlisted	LC
Ciconia abdimii	Stork, Abdim's	NT	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Ciconia nigra	Stork, Black	VU	LC
Cinnyricinclus leucogaster	Starling, Violet-backed	Unlisted	LC
Cinnyris afer	Sunbird, Greater Double-collared	Unlisted	LC
Cinnyris mariquensis	Sunbird, Marico	Unlisted	LC
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Circaetus cinereus	Snake-eagle, Brown	Unlisted	LC
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC
Cisticola aberrans	Cisticola, Lazy	Unlisted	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola ayresii	Cisticola, Wing-snapping	Unlisted	LC
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola textrix	Cisticola, Cloud	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Clamator glandarius	Cuckoo, Great Spotted	Unlisted	LC
Clamator jacobinus	Cuckoo, Jacobin	Unlisted	LC
Clamator levaillantii	Cuckoo, Levaillant's	Unlisted	LC
Colius colius	Mousebird, White-backed	Unlisted	LC
Colius striatus	Mousebird, Speckled	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Columba livia	Dove, Rock	Unlisted	LC
Coracias caudatus	Roller, Lilac-breasted	Unlisted	LC
Coracias garrulus	Roller, European	NT	LC
Coracias naevius	Roller, Purple	Unlisted	LC
Coracina caesia	Cuckoo-shrike, Grey	Unlisted	LC
Corvus albus	Crow, Pied	Unlisted	LC
Corvus capensis	Crow, Cape	Unlisted	LC
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Cossypha humeralis	Robin-chat, White-throated	Unlisted	LC

Coturnix coturnix	Quail, Common	Unlisted	LC
Coturnix delegorguei	Quail, Harlequin	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra gularis	Seedeater, Streaky-headed	Unlisted	LC
Crithagra mozambicus	Canary, Yellow-fronted	Unlisted	LC
Cuculus canorus	Cuckoo, Common	Unlisted	LC
Cuculus clamosus	Cuckoo, Black	Unlisted	LC
Cuculus gularis	Cuckoo, African	Unlisted	LC
Cuculus solitarius	Cuckoo, Red-chested	Unlisted	LC
Cursorius temminckii	Courser, Temminck's	Unlisted	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna bicolor	Duck, Fulvous	Unlisted	LC
Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC
Dendroperdix sephaena	Francolin, Crested	Unlisted	LC
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC
Dendropicos namaquus	Woodpecker, Bearded	Unlisted	LC
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC
Dryoscopus cubla	Puffback, Black-backed	Unlisted	LC
Egretta alba	Egret, Great	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Emberiza capensis	Bunting, Cape	Unlisted	LC
Emberiza flaviventris	Bunting, Golden-breasted	Unlisted	LC
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC
Eremomela icteropygialis	Eremomela, Yellow-bellied	Unlisted	LC
Eremomela scotops	Eremomela, Green-capped	Unlisted	LC
Eremomela usticollis	Eremomela, Burnt-necked	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Estrilda erythronotos	Waxbill, Black-faced	Unlisted	LC
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Euplectes progne	Widowbird, Long-tailed	Unlisted	LC
Eurocephalus anguitimens	Shrike, Southern White-crowned	Unlisted	LC
Falco amurensis	Falcon, Amur	Unlisted	LC
Falco biarmicus	Falcon, Lanner	VU	LC
Falco rupicolus	Kestrel, Rock	Unlisted	LC
Falco subbuteo	Hobby, Eurasian	Unlisted	LC

Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinago nigripennis	Snipe, African	Unlisted	LC
Gallinula angulata	Moorhen, Lesser	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Glareola nordmanni	Pratincole, Black-winged	NT	NT
Glaucidium perlatum	Owlet, Pearl-spotted	Unlisted	LC
Granatina granatina	Waxbill, Violet-eared	Unlisted	LC
Gyps africanus	Vulture, White-backed	CR	CR
Gyps coprotheres	Vulture, Cape	EN	EN
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC
Halcyon chelicuti	Kingfisher, Striped	Unlisted	LC
Halcyon leucocephala	Kingfisher, Grey-headed	Unlisted	LC
Halcyon senegalensis	Kingfisher, Woodland	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hirundo abyssinica	Swallow, Lesser Striped	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC
Hirundo dimidiata	Swallow, Pearl-breasted	Unlisted	LC
Hirundo fuligula	Martin, Rock	Unlisted	Unlisted
Hirundo rustica	Swallow, Barn	Unlisted	LC
Hirundo semirufa	Swallow, Red-breasted	Unlisted	LC
Hirundo smithii	Swallow, Wire-tailed	Unlisted	LC
Indicator indicator	Honeyguide, Greater	Unlisted	LC
Indicator minor	Honeyguide, Lesser	Unlisted	LC
Ispidina picta	Pygmy-Kingfisher, African	Unlisted	LC
Ixobrychus minutus	Bittern, Little	Unlisted	LC
Kaupifalco monogrammicus	Buzzard, Lizard	Unlisted	LC
Lagonosticta rhodopareia	Firefinch, Jameson's	Unlisted	LC
Lagonosticta rubricata	Firefinch, African	Unlisted	LC
Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC
Lamprotornis australis	Starling, Burchell's	Unlisted	LC
Lamprotornis chalybaeus	Starling, Greater Blue-eared	Unlisted	LC
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius atrococcineus	Shrike, Crimson-breasted	Unlisted	LC
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC

Lophotis ruficrista	Korhaan, Red-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Macronyx capensis	Longclaw, Cape	Unlisted	LC
Malaconotus blanchoti	Bush-shrike, Grey-headed	Unlisted	LC
Megaceryle maximus	Kingfisher, Giant	Unlisted	Unlisted
Melaenornis pammelaina	Flycatcher, Southern Black	Unlisted	LC
Melierax canorus	Goshawk, Southern Pale Chanting	Unlisted	LC
Melierax gabar	Goshawk, Gabar	Unlisted	LC
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Merops hirundineus	Bee-eater, Swallow-tailed	Unlisted	LC
Merops nubicoides	Bee-eater, Southern Carmine	Unlisted	LC
Merops persicus	Bee-eater, Blue-cheeked	Unlisted	LC
Merops pusillus	Bee-eater, Little	Unlisted	LC
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted
Mirafra africana	Lark, Rufous-naped	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Muscicapa caerulescens	Flycatcher, Ashy	Unlisted	LC
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Myioparus plumbeus	Tit-flycatcher, Grey	Unlisted	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Neotis denhami	Bustard, Denham's	VU	NT
Netta erythrophthalma	Pochard, Southern	Unlisted	LC
Nilaus afer	Brubru	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Nycticorax nycticorax	Night-Heron, Black-crowned	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus morio	Starling, Red-winged	Unlisted	LC
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC
Oriolus oriolus	Oriole, Eurasian Golden	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Otus senegalensis	Scops-owl, African	Unlisted	LC
Parisoma subcaeruleum	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
Parus niger	Tit, Southern Black	Unlisted	Unlisted
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC
Passer motitensis	Sparrow, Great	Unlisted	LC

Peliperdix coqui	Francolin, Coqui	Unlisted	LC
Petronia superciliaris	Petronia, Yellow-throated	Unlisted	LC
Phalacrocorax africanus	Cormorant, Reed	Unlisted	LC
Phalacrocorax carbo	Cormorant, White-breasted	LC	LC
Philomachus pugnax	Ruff	Unlisted	LC
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phyllastrephus terrestris	Brownbul, Terrestrial	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Pinarocorys nigricans	Lark, Dusky	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus capensis	Weaver, Cape	Unlisted	LC
Ploceus cucullatus	Weaver, Village	Unlisted	LC
Ploceus intermedius	Masked-weaver, Lesser	Unlisted	LC
Ploceus ocularis	Weaver, Spectacled	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Pluvialis squatarola	Plover, Grey	Unlisted	LC
Podica senegalensis	Finfoot, African	VU	LC
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted	Unlisted	LC
Polemaetus bellicosus	Eagle, Martial	EN	VU
Polyboroides typus	Harrier-Hawk, African	Unlisted	LC
Prinia flavicans	Prinia, Black-chested	Unlisted	LC
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC
Prionops plumatus	Helmet-shrike, White-crested	Unlisted	LC
Prodotiscus regulus	Honeybird, Brown-backed	Unlisted	LC
Psophocichla litsipsirupa	Thrush, Groundscraper	Unlisted	Unlisted
Pternistis natalensis	Spurfowl, Natal	Unlisted	LC
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC
Pterocles bicinctus	Sandgrouse, Double-banded	Unlisted	LC
Ptilopsis granti	Scops-owl, Southern White-faced	Unlisted	Unlisted
Pycnonotus nigricans	Bulbul, African Red-eyed	Unlisted	LC
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted
Pytilia melba	Pytilia, Green-winged	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Recurvirostra avosetta	Avocet, Pied	Unlisted	LC
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC

Riparia riparia	Martin, Sand	Unlisted	LC
Sagittarius serpentarius	Secretarybird	VU	VU
Sarkidiornis melanotos	Duck, Comb	Unlisted	LC
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila shelleyi	Francolin, Shelley's	Unlisted	LC
Scopus umbretta	Hamerkop	Unlisted	LC
Sigelus silens	Flycatcher, Fiscal	Unlisted	LC
Spermestes cucullatus	Mannikin, Bronze	Unlisted	Unlisted
Sphenoeacus afer	Grassbird, Cape	Unlisted	LC
Sporopipes squamifrons	Finch, Scaly-feathered	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC
Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Tachymarptis melba	Swift, Alpine	Unlisted	LC
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC
Tchagra senegalus	Tchagra, Black-crowned	Unlisted	LC
Telophorus sulfureopectus	Bush-shrike, Orange-breasted	Unlisted	LC
Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC
Tockus nasutus	Hornbill, African Grey	Unlisted	LC
Tockus rufirostris	Hornbill, Southern Red-billed	Unlisted	Unlisted
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Treron calvus	Green-pigeon, African	Unlisted	LC
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Tringa stagnatilis	Sandpiper, Marsh	Unlisted	LC
Turdoides bicolor	Babbler, Southern Pied	Unlisted	LC
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC
Turdus libonyanus	Thrush, Kurrichane	Unlisted	Unlisted
Turdus smithi	Thrush, Karoo	Unlisted	LC
Turnix sylvaticus	Buttonquail, Kurrichane	Unlisted	LC
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC
Tyto alba	Owl, Barn	Unlisted	LC

Upupa africana	Hoopoe, African	Unlisted	LC
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Urolestes melanoleucus	Shrike, Magpie	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vanellus senegallus	Lapwing, African Wattled	Unlisted	LC
Vidua funerea	Indigobird, Dusky	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Vidua paradisaea	Paradise-whydah, Long-tailed	Unlisted	LC
Vidua purpurascens	Indigobird, Purple	Unlisted	LC
Vidua regia	Whydah, Shaft-tailed	Unlisted	LC
Zosterops virens	White-eye, Cape	Unlisted	LC

Appendix D Mammals expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acomys spinosissimus	Spiny Mouse	LC	LC
Aethomys chrysophilus	Red Veld Rat	LC	LC
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Chlorocebus pygerythrus	Vervet Monkey	LC	LC
Civettictis civetta	African Civet	LC	LC
Cloeotis percivali	Short-eared Trident Bat	EN	LC
Connochaetes taurinus	Blue Wildebeest	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura fuscomurina	Tiny Musk Shrew	LC	LC
Crocidura hirta	Lesser Red Musk Shrew	LC	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Crocuta crocuta	Spotted Hyaena	NT	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Dasymys incomtus	African Marsh rat	NT	LC
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Dendromus mystacalis	Chestnut Climbing Mouse	LC	LC
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Galago moholi	Southern Lesser Galago	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Graphiurus microtis	Large Savanna African Dormouse	LC	LC
Graphiurus platyops	Rock Dormouse	LC	LC
Helogale parvula	Dwarf Mongoose	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC

Hipposideros caffer	Sundevall's Leaf-nosed Bat	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Kobus ellipsiprymnus	Common Waterbuck	LC	LC
Laephotis botswanae	Botswanan long-eared bat	LC	LC
Lemniscomys rosalia	Single-striped Mouse	LC	LC
Leptailurus serval	Serval	NT	LC
Lepus saxatilis	Scrub Hare	LC	LC
Lepus victoriae	African Savanna Hare	LC	LC
Mastomys coucha	Multimammate Mouse	LC	LC
Mastomys natalensis	Natal Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Mus indutus	Desert Pygmy Mouse	LC	LC
Myotis tricolor	Temminck's Hairy Bat	LC	LC
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Oreotragus oreotragus	Klipspringer	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Otolemur crassicaudatus	Thick-tailed Bushbaby	LC	LC
Otomys angoniensis	Angoni Vlei Rat	LC	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Paraxerus cepapi	Tree Squirrel	LC	LC
Pedetes capensis	Springhare	LC	LC
Pelea capreolus	Grey Rhebok	NT	NT
Phacochoerus africanus	Common Warthog	LC	LC
Pipistrellus rusticus	Rusty Bat	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Potamochoerus larvatus	Bushpig	LC	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC
Redunca arundinum	Southern Reedbuck	LC	LC

Redunca fulvorufula	Mountain Reedbuck	EN	LC
Rhabdomys pumilio	Xeric Four-striped Mouse	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Thallomys paedulcus	Tree Rat	LC	LC
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Vulpes chama	Cape Fox	LC	LC

Appendix E Reptiles species expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acanthocercus atricollis	Southern Tree Agama	LC	LC
Acontias occidentalis	Savanna Legless Skink	LC	Unlisted
Acontias percivali	Percival's legless lizard	Unlisted	LC
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Amblyodipsas polylepis	Purple Gloss Snake	Unlisted	Unlisted
Amblyodipsas ventrimaculata	Kalahari purple-glossed snake	Unlisted	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Aspidelaps scutatus scutatus	Common Shield Snake	LC	Unlisted
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Causus defilippii	Snouted Night Adder	LC	Unlisted
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Chondrodactylus turneri	Turner's Gecko	LC	Unlisted
Cordylus jonesii	Jones' Girdled Lizard	LC	Unlisted
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crocodylus niloticus	Nile Crocodile	VU	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Dendroaspis polylepis	Black Mamba	LC	LC
Dispholidus typus	Boomslang	LC	Unlisted
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Gonionotophis capensis	Common File Snake	LC	LC
Gracililima nyassae	Black File Snake	LC	LC
Heliobolus lugubris	Bushveld Lizard	LC	Unlisted
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Hemirhagerrhis nototaenia	Eastern Bark Snake	LC	Unlisted
Homopholis wahlbergii	Wahlberg's Velvet Gecko	LC	LC
Ichnotropis capensis	Ornate Rough-scaled Lizard	LC	Unlisted
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	VU
Kinixys spekii	Speke's Hinged-Back Tortoise	LC	Unlisted
Lamprophis aurora	Aurora House Snake	LC	LC
Leptotyphlops incognitus	Incognito Thread Snake	LC	Unlisted

Leptotyphlops scutifrons	Peters' Thread Snake	LC	Unlisted
Limaformosa capensis	Common File Snake	LC	Unlisted
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lygodactylus capensis	Cape dwarf gecko	LC	LC
Lygodactylus waterbergensis	Waterberg Dwarf Gecko	NT	NT
Matobosaurus validus	Common Giant Plated Lizard	LC	Unlisted
Meroles squamulosus	Common Rough-scaled Lizard	LC	Unlisted
Mochlus sundevallii	Sundevall's Writhing Skink	LC	LC
Monopeltis capensis	Cape Worm Lizard	LC	LC
Naja annulifera	Snouted Cobra	LC	Unlisted
Naja mossambica	Mozambique Spitting Cobra	LC	Unlisted
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Nucras intertexta	Spotted Sandveld Lizard	LC	Unlisted
Pachydactylus affinis	Transvaal Gecko	LC	LC
Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC	Unlisted
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Pelusios sinuatus	Serrated Hinged Terrapin	LC	Unlisted
Philothamnus semivariegatus	Spotted Bush Snake	LC	Unlisted
Platysaurus guttatus	Dwarf Flat Lizard	LC	LC
Platysaurus minor	Waterberg Flat Lizard	LC	LC
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna bivittata	Two-Striped Shovel-Snout	LC	Unlisted
Psammobates oculifer	Serrated Tent Tortoise	LC	Unlisted
Psammophis angolensis	Dwarf Sand Snake	LC	Unlisted
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis jallae	Jalla's Sand Snake	LC	Unlisted
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC	LC
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Pseudocordylus transvaalensis	Nothern Crag Lizard	NT	NT
Python natalensis	Southern African Python	LC	Unlisted
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Scelotes limpopoensis limpopoensis	Limpopo Dwarf Burrowing Skink	LC	Unlisted
Smaug breyeri	Waterberg Dragon Lizard	LC	LC
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Telescopus semiannulatus semiannulatus	Eastern Tiger Snake	LC	Unlisted
Thelotornis capensis	Southern Twig Snake	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted

Trachylepis damarana	Damara skink	Unlisted	LC
Trachylepis margaritifera	Rainbow Skink	LC	LC
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis striata	Striped Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Varanus albigularis albigularis	Southern Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted
Xenocalamus bicolor australis	Waterberg Quill-snouted Snake	LC	Unlisted

Appendix F Amphibians expected in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Breviceps mossambicus	Mozambique Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Chiromantis xerampelina	Southern Foam Nest Frog	LC	LC
Hemisus marmoratus	Mottled Shovel-nosed Frog	LC	LC
Hildebrandtia ornata	Southern Ornate Frog	LC	LC
Hyperolius marmoratus	Painted Reed Frog	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Poyntonophrynus fenoulheti	Northern Pygmy Toad	LC	LC
Ptychadena anchietae	Plain Grass Frog	LC	LC
Ptychadena mossambica	Mozambique Ridged Frog	LC	LC
Ptychadena porosissima	Striped Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	LC	LC
Pyxicephalus edulis	African Bullfrog	LC	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys pusilla	Flatbacked Toad	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Strongylopus grayii	Clicking Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna krugerensis	Knocking Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC

APPENDIX D_2

HERITAGE IMPACT ASSESSMENT

heritage
management
consulting

SPOOR ENVIRONMENTAL SERVICES (PTY) LTD: THE PROPOSED JOE KLOPPER DAM DEVELOPMENT PROJECT, WATERBERG DISTRICT MUNICIPALITY, LIMPOPO PROVINCE

ARCHAEOLOGICAL IMPACT ASSESSMENT

Submitted subject to Section 38(3) and Section 38(8) of the NHRA

Prepared For:

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Project Code	Date	Version	Status
NH-R-20-001	22 October 2020	1.0	Draft
NH-R-20-001	28 October 2020	2.0	Final Draft

ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) ON A PORTION OF THE FARM DOORNSPRUIT 215KQ FOR THE PROPOSED JOE KLOPPER DAM DEVELOPMENT PROJECT IN THE WATERBERG DISTRICT MUNICIPALITY, LIMPOPO PROVINCE

SPECIALIST DECLARATION OF INDEPENDENCE

I, Nelius Kruger, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Joe Klopper Dam Development Project in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, including the relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980), the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment (SAHRA, EC-PHRA and the CRM section of ASAPA), regulations and any guidelines that have relevance to the proposed activity;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this declaration are true and correct.

Signature of specialist
Name: Nelius Kruger
Date: 20 October 2020

The Heritage Consultant promotes the conservation of sensitive archaeological and heritage resources and uncompromisingly adheres to relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980). In order to ensure best practices and ethics in the examination, conservation and mitigation of archaeological and heritage resources, The Heritage Consultant follows the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment as set out by the South African Heritage Resources Agency (SAHRA) and the CRM section of the Association for South African Professional Archaeologists (ASAPA).

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EXECUTIVE SUMMARY

This report details the results of an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Joe Klopper Dam Development Project on a Portion of the Farm Doornspruit 215KQ in the Waterberg District Municipality of the Limpopo Province. The project entails the construction of a catchment dam in the Sterkstroom River across approximately **3ha**. The report includes background information on the area's archaeology, its representation in Southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency (SAHRA) and recommendations contained in this document will be reviewed.

Project Title	Joe Klopper Dam Development Project
Project Type / Scope	Catchment Dam Development
Project Impact Footprint/s Area	**3ha**
Project Location	S24.197989° E27.959002°
1:50 000 Map Sheet	2427BB
Farm Portion / Parcel	A Portion of the Farm Doornspruit 215KQ
Magisterial District / Municipal Area	Waterberg District Municipality
Province	Limpopo Province

The history of the western Limpopo Province is reflected in a rich archaeological landscape. Sites, documenting Stone Age habitation occur in places, mostly in open air locales or in sediments alongside rivers or pans. Bantu-speaking groups moved into this area during the last millennia and these presumably Batswana groups occupied the landscape during the Late Iron Age times at around AD 1500-1800. Settlement by Iron Age communities occurred near rivers and close to rocky outcrops. European farmers, settling in the area since the middle of the 19th century, divided up the landscape into a number of farms. In recent years the Vaalwater region has seen intensive agriculture and tourism development. Similarly, large portions of the farm Doornspruit have been converted into agricultural fields but natural vegetation and landscape features remain relatively intact in some areas along the Sterkstroom River and the Mokolo River. A study of aerial photos indicate that parts of the site demarcated for the dam have been transformed for farming in previous decades. **This inference was confirmed during an archaeological site assessment during which no *in situ* archaeological or heritage remains were encountered**. The following recommendations are made based on general observations in the proposed Joe Klopper Dam Development Project in terms of heritage resources management:

- Even though no archeological sites, features or artefacts were noted in the project area, the location of the proposed new dam along the Sterkstroom River renders it prone to alluvial deposits that could bury potential Stone Age material and *in situ* Stone Age remains might occur in previously undetected contexts of the project area. As such, it is recommended that all development activities be closely monitored in order to avoid the destruction of previously undetected heritage remains and particularly Stone Age occurrences.
- It should be noted that the site survey for the Joe Klopper Dam Development Project AIA was – in places - constrained by dense vegetation in terms of free movement and surface visibility. As such, the possibility exists that individual sites could be missed and it recommended that the initial stages of the development be monitored to re-assess the presence of possible heritage resources in the project area.

- It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the project area along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development. Generally, the frequent monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.

This report details the methodology, limitations and recommendations relevant to these heritage areas, as well as areas of proposed development. It should be noted that recommendations and possible mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process).

NOTATIONS AND TERMS/TERMINOLOGY

Absolute dating: Absolute dating provides specific dates or range of dates expressed in years.

Archaeological record: The archaeological record minimally includes all the material remains documented by archaeologists. More comprehensive definitions also include the record of culture history and everything written about the past by archaeologists.

Artefact: Entities whose characteristics result or partially result from human activity. The shape and other characteristics of the artefact are not altered by removal of the surroundings in which they are discovered. In the Southern African context examples of artefacts include potsherds, iron objects, stone tools, beads and hut remains.

Assemblage: A group of artefacts recurring together at a particular time and place, and representing the sum of human activities.

Context: An artefact's context usually consists of its immediate *matrix*, its *provenience* and its *association* with other artefacts. When found in *primary context*, the original artefact or structure was undisturbed by natural or human factors until excavation and if in *secondary context,* disturbance or displacement by later ecological action or human activities occurred.

Cultural Heritage Resource: The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

Cultural landscape: A cultural landscape refers to a distinctive geographic area with cultural significance.

Cultural Resource Management (CRM): A system of measures for safeguarding the archaeological heritage of a given area, generally applied within the framework of legislation designed to safeguard the past.

Feature: Non-portable artefacts, in other words artefacts that cannot be removed from their surroundings without destroying or altering their original form. Hearths, roads, and storage pits are examples of archaeological features

Impact: A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Lithic: Stone tools or waste from stone tool manufacturing found on archaeological sites.

Matrix: The material in which an artefact is situated (sediments such as sand, ashy soil, mud, water, etcetera). The matrix may be of natural origin or human-made.

Midden: Refuse that accumulates in a concentrated heap.

Microlith: A small stone tool, typically knapped of flint or chert, usually about three centimetres long or less.

Monolith: A geological feature such as a large rock, consisting of a single massive stone or rock, or a single piece of rock placed as, or within, a monument or site.

Phase 1 CRM Assessment: An Impact Assessment which identifies archaeological and heritage sites, assesses their significance and comments on the impact of a given development on the sites. Recommendations for site mitigation or conservation are also made during this phase.

Phase 2 CRM Study: In-depth studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required. Mitigation / Rescue involves planning the protection of significant sites or sampling through excavation or collection (in terms of a permit) at sites that may be lost as a result of a given development.

Phase 3 CRM Measure: A Heritage Site Management Plan (for heritage conservation), is required in rare cases where the site is so important that development will not be allowed and sometimes developers are encouraged to enhance the value of the sites retained on their properties with appropriate interpretive material or displays.

Provenience: Provenience is the three-dimensional (horizontal and vertical) position in which artefacts are found. Fundamental to ascertaining the provenience of an artefact is *association,* the co-occurrence of an artefact with other archaeological remains; and *superposition,* the principle whereby artefacts in lower levels of a matrix were deposited before the artefacts found in the layers above them, and are therefore older.

Random Sampling: A probabilistic sampling strategy whereby randomly selected sample blocks in an area are surveyed. These are fixed by drawing coordinates of the sample blocks from a table of random numbers.

Scoping Assessment: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialist involvement.

Site (Archaeological): A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity. These include surface sites, caves and rock shelters, larger open-air sites, sealed sites (deposits) and river deposits. Common functions of archaeological sites include living or habitation sites, kill sites, ceremonial sites, burial sites, trading, quarry, and art sites,

Stratigraphy: This principle examines and describes the observable layers of sediments and the arrangement of strata in deposits

Systematic Sampling: A probabilistic sampling strategy whereby a grid of sample blocks is set up over the survey area and each of these blocks is equally spaced and searched.

Trigger: A particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an *issue* and/or potentially significant *impact* associated with that proposed development that may require specialist input. Legal requirements of existing and future legislation may also trigger the need for specialist involvement.

LIST OF ABBREVIATIONS

Abbreviation	Description
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
BCE	Before Common Era
BGG	Burial Grounds and Graves
CRM	Culture Resources Management
EIA	Early Iron Age (also Early Farmer Period)
EIA	Environmental Impact Assessment
EFP	Early Farmer Period (also Early Iron Age)
ESA	Earlier Stone Age
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
K2/Map	K2/Mapungubwe Period
LFP	Later Farmer Period (also Later Iron Age)
LIA	Later Iron Age (also Later Farmer Period)
LSA	Later Stone Age
MIA	Middle Iron Age (also Early later Farmer Period)
MRA	Mining Right Area
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
PFS	Pre-Feasibility Study
PHRA	Provincial Heritage Resources Authorities
SAFA	Society for Africanist Archaeologists
SAHRA	South African Heritage Resources Association
YCE	Years before Common Era (Present)

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1 BACKGROUND

1.1 Scope and Project Brief

SPOOR Environmental Services (PTY) Ltd has commissioned an Archaeological Impact Assessment (AIA) as part of an Environmental Basic Assessment (BA) process for the proposed establishment of a new dam on a Portion of the Farm Doornspruit 215KQ in the Limpopo Province (hereafter referred to as the "Joe Klopper Dam Development Project" or "the Project"). The rationale of the AIA is to determine the presence of heritage resources such as archaeological and historical sites and features, graves and places of religious and cultural significance in previously unstudied areas; to consider the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features.

The project entails the construction of a catchment dam in the Sterkstroom River, a tributary of the Mokolo River, across approximately **3ha** (refer to Figure 1-1).

1.2 Project Direction

Mr Neels Kruger acts as field director for the project; responsible for the assimilation of all information, the compilation of the final consolidated AIA report and recommendations in terms of heritage resources on the demarcated project areas. Mr Kruger is an accredited archaeologist and Culture Resources Management (CRM) practitioner with the Association of South African Professional Archaeologists (ASAPA), a member of the Society for Africanist Archaeologists (SAFA) and the Pan African Archaeological Association (PAA).

1.3 Project Terms of Reference

Heritage specialist input into the Environmental Impact Assessment (EIA) process is essential to ensure that, through the management of change, developments still conserve our heritage resources. It is also a legal requirement for certain development categories which may have an impact on heritage resources. Thus, EIAs should always include an assessment of heritage resources. The heritage component of the EIA is provided for in the **National Environmental Management Act, (Act 107 of 1998)** and endorsed by section 38 of the **National Heritage Resources Act (NHRA - Act 25 of 1999)**. In addition, the NHRA protects all structures and features older than 60 years, archaeological sites and material and graves as well as burial sites. The objective of this legislation is to ensure that developers implement measures to limit the potentially negative effects that the development could have on heritage resources.

Based hereon, this project **terms of reference for** heritage specialist input area**:**

- *Provide a detailed description of all archaeological artefacts, structures (including graves) and settlements which may be affected, if any.*
- *Assess the nature and degree of significance of such resources within the area.*
- *Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;*
- *Assess and rate any possible impact on the archaeological and historical remains within the area emanating from the proposed development activities.*
- *Propose possible heritage management measures provided that such action is necessitated by the development.*
- *Liaise and consult with the South African Heritage Resources Agency (SAHRA). A Notification of Intent to Develop (NID) will be submitted to SAHRA at the soonest opportunity*.

Figure 1-1: Aerial map indicating the extent of the Joe Klopper Dam Development Project.

2 LEGISLATIVE FRAMEWORK

2.1 CRM: Legislation, Conservation and Heritage Management

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

2.1.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and its provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act No 25 of 1999 (section 35) the following features are protected as cultural heritage resources:

a. Archaeological artefacts, structures and sites older than 100 years
b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography
c. Objects of decorative and visual arts
d. Military objects, structures and sites older than 75 years
e. Historical objects, structures and sites older than 60 years
f. Proclaimed heritage sites
g. Grave yards and graves older than 60 years
h. Meteorites and fossils
i. Objects, structures and sites of scientific or technological value.

In addition, the national estate includes the following:

a. Places, buildings, structures and equipment of cultural significance
b. Places to which oral traditions are attached or which are associated with living heritage
c. Historical settlements and townscapes
d. Landscapes and features of cultural significance
e. Geological sites of scientific or cultural importance
f. Archaeological and paleontological sites
g. Graves and burial grounds
h. Sites of significance relating to the history of slavery
i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves and burial grounds are commonly divided into the following subsets:

a. ancestral graves
b. royal graves and graves of traditional leaders
c. graves of victims of conflict
d. graves designated by the Minister
e. historical graves and cemeteries
f. human remains

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and Ordinance on Excavations (Ordinance no. 12 of 1980) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments.

c. National Heritage Resources Act No 25 of 1999, Section 35

This act (Act 107 of 1998) states that a survey and evaluation of cultural resources must be done in areas where development projects, that will change the face of the environment, will be undertaken. The impact of the development on these resources should be determined and proposals for the mitigation thereof are made. Environmental management should also take the cultural and social needs of people into account. Any disturbance of landscapes and sites that constitute the nation's cultural heritage should be avoided as far as possible and where this is not possible the disturbance should be minimized and remedied.

2.1.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact

assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

A detailed guideline of statutory terms and requirements is supplied in Addendum 1.

2.2 Rating of significance

The National Heritage Resources Act (Act no 25 of 1999) also stipulates the assessment criteria and grading of archaeological sites. The following categories are distinguished in Section 7 of the Act:

- *Grade I:* Heritage resources with qualities so exceptional that they are of special national significance;
- *Grade II:* Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region;
- *Grade III:* Other heritage resources worthy of conservation, and which prescribes heritage resources assessment criteria, as set out in section 3(3) of the act.

Significance is influenced by the context and state of the archaeological site. Six criteria were considered following Kruger (2019):

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

The categories of significance were based on the above criteria the above and the grading system outlined in NHRA and summarised below:

Significance	Rating Action
No significance: sites that do not require mitigation.	None
Low significance: sites, which may require mitigation.	2a. Recording and documentation (Phase 1) of site; no further action required 2b. Controlled sampling (shovel test pits, auguring), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium significance: sites, which require mitigation.	3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High significance: sites, where disturbance should be avoided.	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism
High significance: Graves and burial places	4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

3 REGIONAL CONTEXT

3.1 Area Location

The proposed Joe Klopper Dam Development Project occurs on a Portion of the Farm Doornspruit 215KQ along the banks of the Sterkstroom River in the Limpopo Province. The project area is situated approximately 20km northwest of the town of Vaalwater and 60km southeast of Lephalale. Access to the site is from the R517 from Vaalwater. The study areas appear on 1:50000 map sheet 2427BB (see Figure 2-1) and a key location point for the project is:

- **S24.197989° E27.959002°**

3.2 Area Description: Receiving Environment

The study area lies within the Savanna biome which is the largest biome in Southern Africa. It is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). Fire and grazing also keep the grassy layer dominant. The most recent classification of the area by Mucina & Rutherford shows that the site is classified as Central Sandy Bushveld. The project area is characterised by slightly undulating to flat plains with major drainage, specifically the Mokolo and Sterkstroom Rivers as well as the Blinkwaterspruit bisecting the area.

3.3 Site Description

The landscape on the farm Doornspruit is generally open land with undulating rolling hills in places. Existing infrastructure on the property comprises offices, farmsteads and workers buildings. The current land-use of the farm is intensive crop cultivation and neighbouring farms are being used for livestock grazing and cattle farming. As a result, large portions of land along the Sterkstroom and Mokolo Rivers as well as the Blinkwaterspruit have been converted into crop fields but natural riparian vegetation remain relatively intact in places. The proposed dam site occurs along the southern banks of the Sterkstroom River in an area that has seen surface transformation as a result of digging, quarrying and also refuse dumping - particularly to the west. The grassy eastern portion of the site is littered with large chucks of “Ouklip”, a honeycomb gravel rock which is an iron-rich lateritic conglomerate. An excavated water canal bisects the site from north to south.

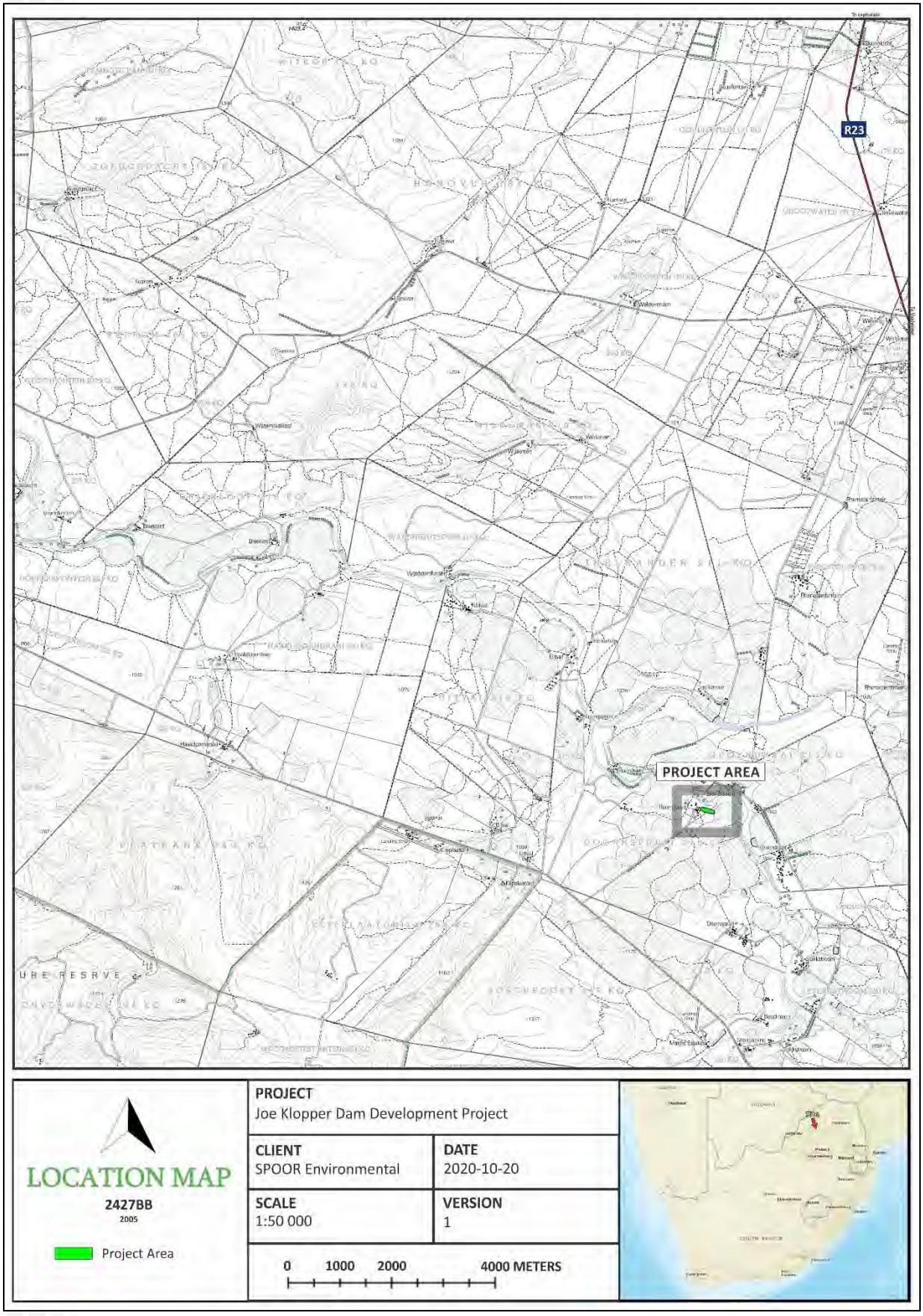

Figure 3-1: 1:50 00 Map representation of the location of the proposed Joe Klopper Dam Development Project (sheet 2427BB).

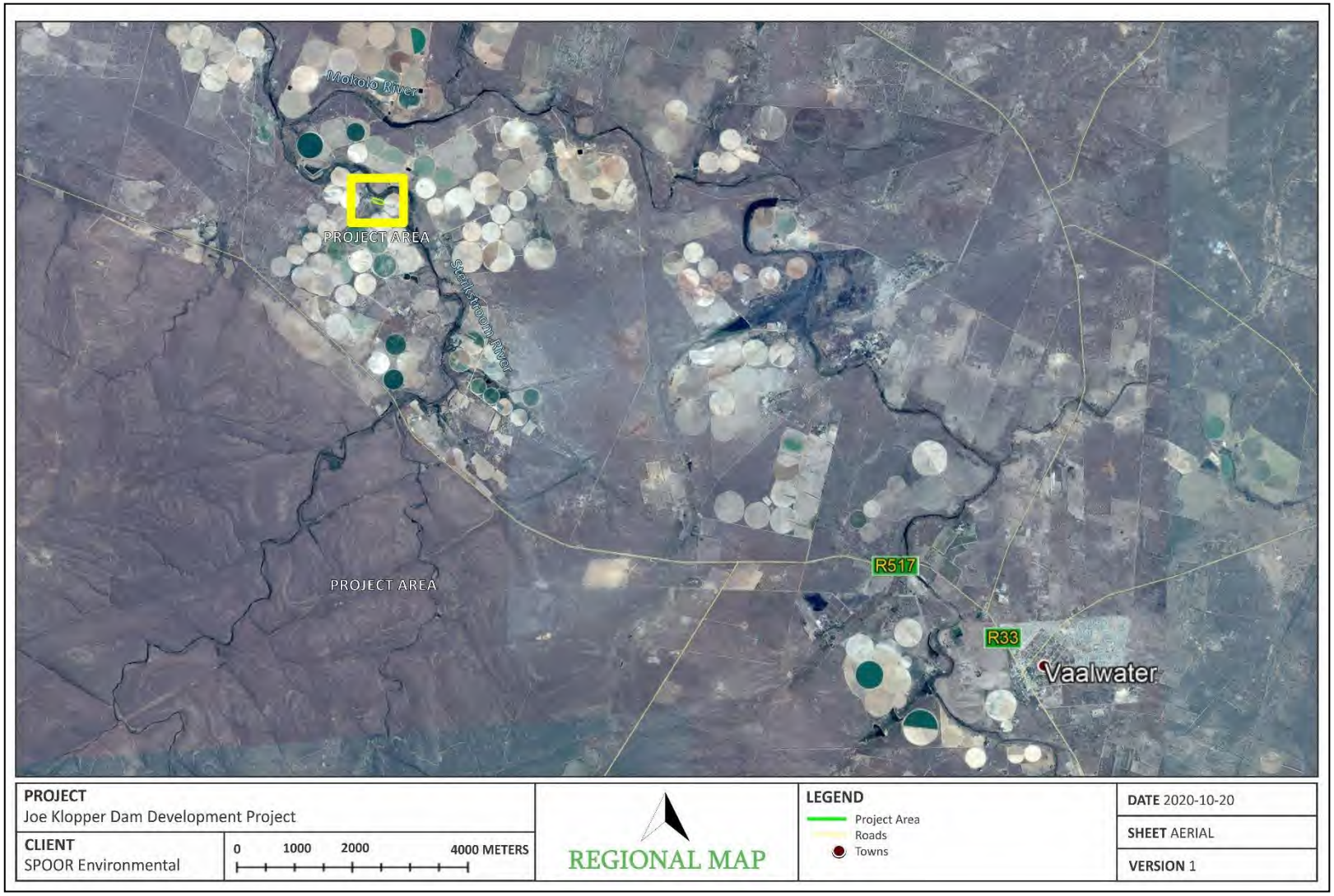

Figure 3-2: Aerial map providing a regional context for the proposed Joe Klopper Dam Development Project area.

4 METHOD OF ENQUIRY

4.1 Sources of Information

Data from detailed desktop, aerial and field studies were employed in order to sample surface areas systematically and to ensure a high probability of heritage site recording.

4.1.1 Desktop Study

The larger landscape around Vaalwater has been well documented in terms of its archaeology and history. A desktop study was prepared in order to contextualize the proposed project within a larger historical milieu. The study focused on relevant previous studies, archaeological and archival sources, aerial photographs, historical maps and local histories, all pertaining to the project area and the larger landscape of this section of the Limpopo Province. A number of Cultural Resources Management (CRM) projects have been conducted in the Vaalwater area and these include:

- Hutten, M. 2013c. HIA for the proposed solar park development on the farm Aapieskruil near Koedoeskop, Limpopo Province. Compiled for: Jonk Begin Omgewingsdienste.
- Fourie, W. 2012. Wachteenbietjesdraai 350 KQaAnd Kwaggashoek 345 KQ Heritage Impact Report on proposed mining activities of Project Phoenix. PGS Heritage Consultants
- Fourie, W. 2014. Proposed Development of the Steenbokpan Extension 3 Township on the Remainder and Portions 1, 2, 3 and 4 of the Farm Grootdoorn 292 LQ, Portions 20, 22 and 25 of the Farm Theunispan 293 LQ and Portion 3 of the Farm Steenbokpan 295 LQ at Steenbokpan, Lephalale Local Municipality, Waterberg District, Limpopo Province. Client: Flexilor Properties (Pty) Ltd . PGS Heritage Consultants
- Van Schalkwyk, J.A. 1994. A survey of archaeological and cultural historical resources in the Amandelbult mining lease area. Unpublished report 94KH03. Pretoria: National Cultural History Museum.
- Van Schalkwyk, J.A. 2001. A survey of cultural resources in two development areas, Amandelbult, Northern Province. Unpublished report 2001KH13. Pretoria: National Cultural History Museum.
- Van Schalkwyk, J.A. 2003. A survey of archaeological sites for the Amandelbult Platinum Mine Seismic exploration program. Unpublished report 2003KH16. Pretoria: National Cultural History Museum.
- Van Schalkwyk, J.A. 2004. Heritage impact report for the Amandelbult electricity sub-transmission lines, Amandelbult Platinum Mine, Limpopo Province. Unpublished report 2004KH32. Pretoria: National Cultural History Museum.
- Van Schalkwyk, J. 2007. Survey of heritage resources in the location of the proposed Merensky Mining Project, Amandelbult Section, Rustenburg Platinum Mine, Limpopo Province. Prepared For WSP Environmental.
- Van Vollenhoven, A. July 2013. A Report on a Cultural Heritage Impact Assessment for the Continental Limestone Mine, close to Thabazimbi, Limpopo Province.

4.1.2 Remote Sensing

Aerial photography is often employed to locate and study archaeological sites, particularly where larger scale area surveys are performed. The site assessment of the project area relied heavily on this method to assist the challenging foot site survey. Here, depressions, variation in vegetation, soil marks and landmarks were examined and specific attention was given to shadow sites (shadows of walls or earthworks which are visible early or late in the day), crop mark sites (crop mark sites are visible because disturbances beneath crops cause variations in their height, vigour and type) and soil marks (e.g. differently coloured or textured soil (soil marks) might indicate ploughed-out burial mounds). Attention was also given to moisture differences, as prolonged dampening of soil as a result of precipitation frequently occurs over walls or embankments. In

addition, historical aerial photos obtained during the archival search were scrutinized and features that were regarded as important in terms of heritage value were identified and if they were located within the boundaries of the project area they were physically visited in an effort to determine whether they still exist and in order to assess their current condition and significance. By superimposing high frequency aerial photographs with images generated with Google Earth as well as historical aerial imagery, potential sensitive areas were subsequently identified, geo-referenced and transferred to a handheld GPS device. These areas served as reference points from where further vehicular and pedestrian surveys were carried out.

4.1.3 Map Data

Similar to the aerial survey, the site assessment of the project area relied heavily on archive and more recent map renderings of the Vaalwater and the Sterkstroom River areas to assist the challenging foot site survey where historical and current maps of the project area were examined. By merging data obtained from the desktop study and the aerial survey, sites and areas of possible heritage potential were plotted on these maps of the larger region using GIS software. These maps were then superimposed on high definition aerial representations in order to graphically demonstrate the geographical locations and distribution of potentially sensitive landscapes.

4.1.4 Field Survey

Archaeological survey implies the systematic procedure of the identification of archaeological sites. An archaeological survey of the project area was conducted in September 2020. The process encompassed a random field survey in accordance with standard archaeological practice by which heritage resources are observed and documented. As portions of the project area is densely vegetated, particular focus was placed on GPS reference points identified during the aerial and mapping survey. Where possible, random spot checks were made and potentially sensitive heritage areas were investigated. Using a Garmin GPS, the survey was tracked and general surroundings were photographed with a Samsung Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible disturbed areas during the survey.

4.1.5 General Public Liaison

Consultation with the far owner of the property who is familiar with the area in question did not identify any heritage receptors in the project area.

4.2 Limitations

4.2.1 Access

The study area is accessed via a farm access road connecting to the R517 to Vaalwater. Access control is applied to the survey areas but no restrictions were encountered as access arrangements were made with the owner.

4.2.2 Visibility

The surrounding vegetation in the project area mostly comprised out of riparian vegetation, grasslands and farmlands with pockets of pioneering species and occasional trees. The general visibility at the time of the AIA survey (September 2020) ranged from high along the transformed areas to the west of the project area, to low in the more overgrown eastern areas. In single cases during the survey sub-surface inspection was possible. Where applied, this revealed no archaeological deposits.

Figure 4-1: View of general surroundings in the transformed western portion of the project area.

Figure 4-2: View of general surroundings in a cleared central portion of the project area.

Figure 4-3: An excavated water channel bisecting the project area.

Figure 4-4: View of cleared and excavated surfaces in of the project area.

Figure 4-5: View of a sparsely vegetated section of the project area.

Figure 4-6: View of soil/refuse dumping and digging in a portion of the project area.

Figure 4-7: An "Ouklip" exposure in the project area.

Figure 4-8: View of tree and grass cover in the project area.

Figure 4-9: View of the densely vegetated eastern portion of the project area.

Figure 4-10: View of crop fields (to the left) along the eastern periphery of the project area.

Figure 4-11: View of general surroundings along a western section of the project area, looking north towards the Sterkstroom River.

Figure 4-12: A stone heap / mound noted in the project area in transformed areas.

4.2.3 Summary: Limitations and Constraints

The site survey for the Joe Klopper Dam Development Project AIA proved to be constrained and the investigation primarily focused around areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the mapping and aerial survey) as well as areas of potential high human settlement catchment. In summary, the following constraints were encountered during the site survey:

- The general visibility at the time of the AIA survey (October 2020) ranged from moderate along the exiting footpaths to low in overgrown areas. As such, visibility proved to be a constraint during the site survey.
- In addition, dense vegetation restricted free movement in certain portions of the project area during the site assessment.

Cognisant of the constraints noted above, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

5 ARCHAEO-HISTORICAL CONTEXT

5.1 The archaeology of Southern Africa

Archaeology in Southern Africa is typically divided into two main fields of study, the **Stone Age** and the **Iron Age** or **Farmer Period**. The following table provides a concise outline of the chronological sequence of periods, events, cultural groups and material expressions in Southern African pre-history and history.

Table 1 Chronological Periods across Southern Africa

Period	Epoch	Associated cultural groups	Typical Material Expressions
Early Stone Age 2.5m – 250 000 YCE	Pleistocene	Early Hominins: *Australopithecines* *Homo habilis* *Homo erectus*	Typically large stone tools such as hand axes, choppers and cleavers.
Middle Stone Age 250 000 – 25 000 YCE	Pleistocene	First *Homo sapiens* species	Typically smaller stone tools such as scrapers, blades and points.
Late Stone Age 20 000 BC – present	Pleistocene / Holocene	*Homo sapiens sapiens* including San people	Typically small to minute stone tools such as arrow heads, points and bladelets.
Early Iron Age / Early Farmer Period 300 – 900 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	First Bantu-speaking groups	Typically distinct ceramics, bead ware, iron objects, grinding stones.
Middle Iron Age (Mapungubwe / K2) / early Later Farmer Period 900 – 1350 AD **(commonly restricted to the**	Holocene	Bantu-speaking groups, ancestors of present-day groups	Typically distinct ceramics, bead ware and iron / gold / copper objects, trade goods and grinding stones.

interior and north-east coastal areas of Southern Africa)			
Late Iron Age / Later Farmer Period 1400 AD -1850 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	Various Bantu-speaking groups including Venda, Thonga, Sotho-Tswana and Zulu	Distinct ceramics, grinding stones, iron objects, trade objects, remains of iron smelting activities including iron smelting furnace, iron slag and residue as well as iron ore.
Historical / Colonial Period ±1850 AD – present	Holocene	Various Bantu-speaking groups as well as European farmers, settlers and explorers	Remains of historical structures e.g. homesteads, missionary schools etc. as well as, glass, porcelain, metal and ceramics.

5.2 Discussion: The Waterberg and Western Limpopo: Specific Themes

The cultural landscape of the Waterberg encompasses a period of time that spans millions of years, covering human cultural development from the Stone Ages up to recent times. It depicts the interaction between the first humans and their adaptation and utilization to the environment, the migration of people, technological advances, warfare and contact and conflict. Resources, and in particular mineral resources, in what is now known as the Thabazimbi region have been extensively utilised by prehistoric and historic groups. The greater region has several important Stone Age localities with deep occupation deposits and importantly, a widespread occurrence of open-air sites. The shelter site of Olieboomspoort near Lephalale show a succession from the Earlier, Middle and Later Stone Ages (ESA, MSA and LSA) and up to historic times (van der Ryst 2006). Early Iron Age (EIA) localities such as Diamant are particular important. At this locality in the western Waterberg the EIA facies of Diamant was first identified at the eponymous locality (Huffman 1990). This site has also delivered the earliest evidence for glass trade beads and domesticated dogs in the Limpopo Province (van der Ryst 2006). The movement of African farmers into this region is documented by their ceramics and settlements (Huffman 2007b). The later occupations of agropastoralists groups are complex (Schapera 1942, 1965; Breutz 1953, 1989; Bergh 1998). The accounts of early travellers provide important data on the fauna, flora and inhabitants of the Waterberg. The observations of travellers, missionaries and hunters who traversed the region throughout the 18th and the 19th centuries constitute a source of implicit ethnography on the late presence of hunting and gathering groups, the African farmers and inmoving colonists (Baines 1872, 1877; Smith 1836; Schlömann 1896; Wallis [Baines] 1946; Burke [Mauch's journals] 1969). The region is also rich in rock art (Eastwood and Eastwood 2006).

5.2.1 Early History and the Stone Ages

According to archaeological research, the earliest ancestors of modern humans emerged some two to three million years ago. The remains of Australopithecine and *Homo habilis* have been found in dolomite caves and underground dwellings in the Bankeveld at places such as Sterkstroom and Swartkrans near Krugersdorp. Homo habilis, one of the Early Stone Age hominids, is associated with Oldowan artefacts, which include crude implements manufactured from large pebbles. The Acheulian industrial complex replaced the Oldowan industrial complex during the Early Stone Age. This phase of human existence was widely distributed across South Africa and is associated with *Homo erectus*, who manufactured hand axes and cleavers from as early as one and a half million years ago. Oldowan and Acheulian artefacts were also found four to five decades ago in some of the older gravels (ancient river beds and terraces) of the Vaal River and the Klip River in Vereeniging. The earliest ancestors of modern man may therefore have roamed the Vaal valley at the same time that their contemporaries occupied some of the dolomite caves near Krugersdorp. Middle Stone Age sites dating from as early as two hundred thousand years ago have been found all over South Africa. Middle Stone Age hunter-gatherer bands also lived and hunted in the Orange and Vaal River

valleys. These people, who probably looked like modern humans, occupied campsites near water but also used caves as dwellings. They manufactured a wide range of stone tools, including blades and point s that may have had long wooden sticks as hafts and were used as spears. The Late Stone Age commenced twenty thousand years ago or somewhat earlier. The various types of Later Stone Age industries scattered across the country are associated with the historical San and Khoi-Khoi people. The San were renowned as formidable hunter-gatherers, while the Khoi-Khoi herded cattle and small stock during the last two thousand years. Late Stone Age people manufactured tools that were small but highly effective, such as arrow heads and knivess.

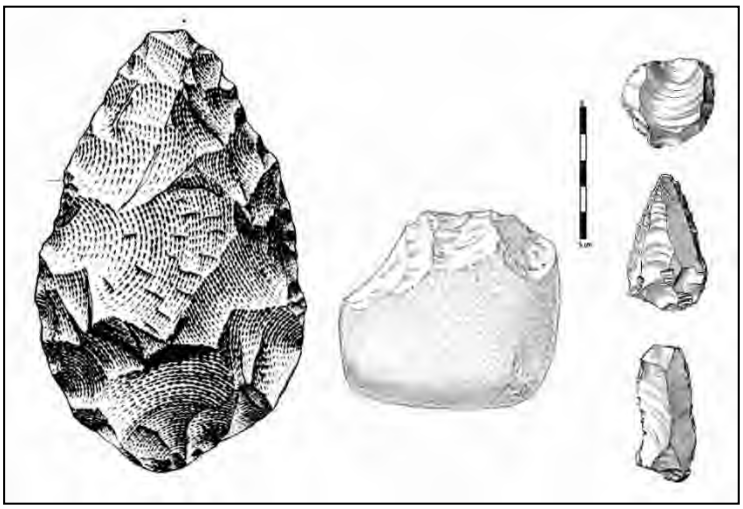

Figure 5-1: Typical ESA handaxe (left) and cleaver (center). To the right is a MSA scraper (right, top), point (right, middle) and blade (right, bottom).

The cultural historical landscape of the Waterberg area spans million years with evidence of hominin occupation, Stone Age traditions, Iron Age farmers and historical events. Makapansgat, a deep limestone cave near Mokopane has yielded remains of *Australopithecus africanus* that dates to more than 3 million years BP and also *Homo erectus*, dating to approximately 1 million years BP. However, Earlier Stone Age (ESA) material is scarce on the Waterberg plateau. The Middle Stone Age (MSA) is abundantly represented in the Waterberg area and archaeological excavations at sites such as the Olieboomspoort Shelter in the north-western part of the Waterberg have yielded rich MSA deposits which display a large degree of specialisation and skill in stone working (Van der Ryst 1996). These groups occupied open camps which were situated in the proximity of water sources such as pans, lakes or rivers. There is a noticeable gap in the Waterberg between MSA assemblages and material form the Later Stone Age (LSA), suggesting that the Waterberg may not have seen dense human occupation for a long period of time. However, Later Stone Age groups, including the San hunter gatherers and Khoi herders frequented the area in the last few millennia, and numerous LSA sites have been discovered and excavated. Similarly, LSA evidence such as stone implements, ceramics and a wealth of rock paintings and markings are scattered over the plateau.

5.2.2 Iron Age / Farmer Period

The beginnings of the Iron Age (Farmer Period) in Southern Africa are associated with the arrival of a new Bantu speaking population group at around the third century AD. These newcomers introduced a new way of life into areas that were occupied by Later Stone Age hunter-gatherers and Khoekhoe herders. Distinctive features of the Iron Age are a settled village life, food production (agriculture and animal husbandry), metallurgy (the mining, smelting and working of iron, copper and gold) and the manufacture of pottery. Iron Age people moved into Southern Africa by c. AD 200, entering the area either by moving down the coastal plains, or by using a more central route. From the coast they followed the various rivers inland. Being cultivators, they preferred rich alluvial soils. The Iron Age can be divided into three phases. The Early Iron Age includes the majority of the first millennium A.D. and is characterised by traditions such as Happy Rest and Silver Leaves. The Middle Iron Age spans the 10th to the 13th Centuries A.D. and includes such well known cultures as

those at K2 and Mapungubwe. The Late Iron Age is taken to stretch from the 14th Century up to the colonial period and includes traditions such as Icon and Letaba.

Early Sotho-Tswana History

Within a larger archaeological context, Iron Age settlement representations in the form of stone walling in the Waterberg can undoubtedly be traced back to ancestral Sotho-Tswana occupation and developments from the sixteenth century AD onwards. Diagnostic pottery assemblages are commonly used in the South African Iron Age to infer group identities and to trace movements across the landscape. Similarly, the migration of the Sotho-Tswana speakers in South Africa in the 16th century marked a new ceramic style, known as Moloko. The Moloko Tradition can be divided into two phases: an early phase (e.g. Icon) in which sites were usually located at the foot of hills and contained little or no stone walling; and a later phase characterised by extensive stone wall complexes which were often erected on hills. In the Waterberg area, this later phase manifested in the Madikwe ceramic facies with pottery typically displaying stab and fingernail impression decoration motives. At around the 17th century, Madikwe pottery developed into a tradition known as "Buispoort", sites of which display complex and elaborate stone walling. The stone walls were erected to construct stock byres and to demarcate residential units where pole-and-dagha (clay) huts were placed.

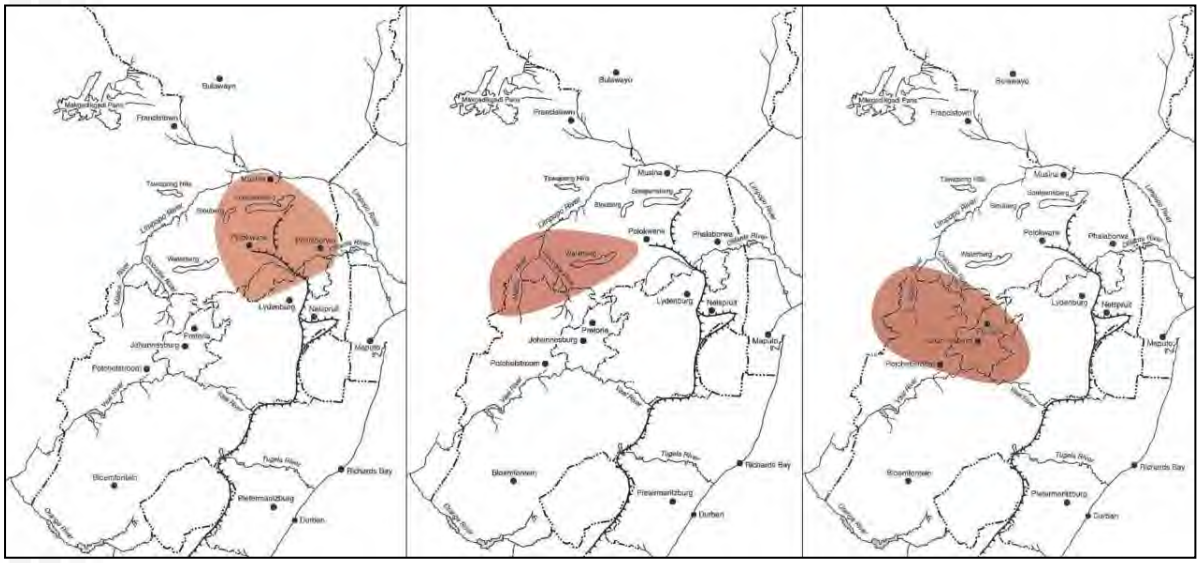

Figure 5-2: Map detailing the distribution of 16th century Maloko (left), 17th century Madikwe (centre) and 18th century Buispoort tradition sites (After Huffman 2007).

Figure 5-3: Ceramic decoration motives typical of 17th century Madikwe (left) and later Buispoort (right) facies (After Huffman 2007).

In addition, various Sotho-Tswana groups were found in the interior of the Highveld areas of South Africa by the end of the 18th century. These units occupied a large area, from present-day Botswana across large sections of the old Transvaal, the Free State Province into the Northern Cape. Based on Sotho-Tswana oral histories various groups acted as cores from which the Sotho-speaking communities sprouted

5.2.3 Rock Art of the Waterberg Landscape.

The Waterberg Plateau is rich in rock art and rock markings and many such sites are still to be described and studied. At many sites “refined” San paintings occur with cruder depictions in red or white paint (sometimes black), painted directly with fingers by later Farmer groups. Numerous paintings of people in trance positions, dance scenes of men and women, men with hunting equipment, a large variety of antelope and other animals, imaginary rain animals, handprints, and geometric designs form part of the contents of the rock art of the Waterberg (Van der Ryst 1998). Two traditions of Rock Art occur in the Waterberg. First the more "naturalised" form of fine-line art, including skilled depictions of animals and people, attributed to San Hunter Gatherers. The second tradition, often called “Late White” art, is characterised by more geometric, schematic illustrations which includes a large amount of finger painting. This tradition is associated with Iron Age farmers.

5.2.4 Pastoralism and the last 2000 years

Until 2000 years ago, hunter-gatherer communities traded, exchanged goods, encountered and interacted with other hunter-gatherer communities. From about 2000 years ago the social dynamics of the Southern African landscape started changing with the immigration of two 'other' groups of people, different in physique, political, economic and social systems, beliefs and rituals. One of these groups, the Khoekhoe pastoralists or herders entered Southern Africa with domestic animals, namely fat-tailed sheep and goats, travelling through the south towards the coast. They also introduced thin-walled pottery common in the interior and along the coastal regions of Southern Africa. Their economic systems were directed by the accumulation of wealth in domestic stock numbers and their political make-up was more hierarchical than that of the hunter-gatherers.

5.2.5 Later History: Reorganization, Colonial Contact and living heritage.

The Historical period in Southern Africa encompass the course of Europe's discovery of South Africa and the spreading of European settlements along the East Coast and subsequently into the interior. In addition, the formation stages of this period are marked by the large scale movements of various Bantu-speaking groups in the interior of South Africa, which profoundly influenced the course of European settlement. Finally, the final retreat of the San and Khoekhoen groups into their present-day living areas also occurred in the Historical period in Southern Africa.

The Waterberg was considered remote and inaccessible by early white migrants from the south and, with the exception of a few hunting and trading expeditions passing through, the area was one of the last regions in the former Transvaal to be permanently occupied by white farmers. Although the first Voortrekker farmers moved into the Waterberg during the 1850’s, the region has been increasingly occupied on a regular basis only since the early part of the twentieth century. The early historical period of the area is dominated by the siege of Makapansgat where in September 1854, Chief Makapane and over 1 500 of his people died of hunger, dehydration and injuries after being besieged in the cave by a Boer commando in retaliation for an attack on a Voortrekker settlement. The majority of farms in the Waterberg area were surveyed in the late 1860’s as part of the Transvaal government’s strategy to settle white farmers in the Waterberg region. At that time, access to the Waterberg plateau was circuitous and difficult with the shortest route extending via Sandrivierspoort near present-day Vaalwater. After a railway line to Vaalwater was completed in the 1920’s, maize became an economically viable crop but by the end of the 1960’s, slumps in maize prices resulted in many farmers abandoning crop farming in favour of cattle. Large scale iron ore mining has emerged to

become a primary economical enterprise in recent years. However, farming communities have settled in the landscape at the beginning of the 20th century.

The farms Groen Doornspruit 215KQ in the Waterberg District were established at the end of the 19th century.

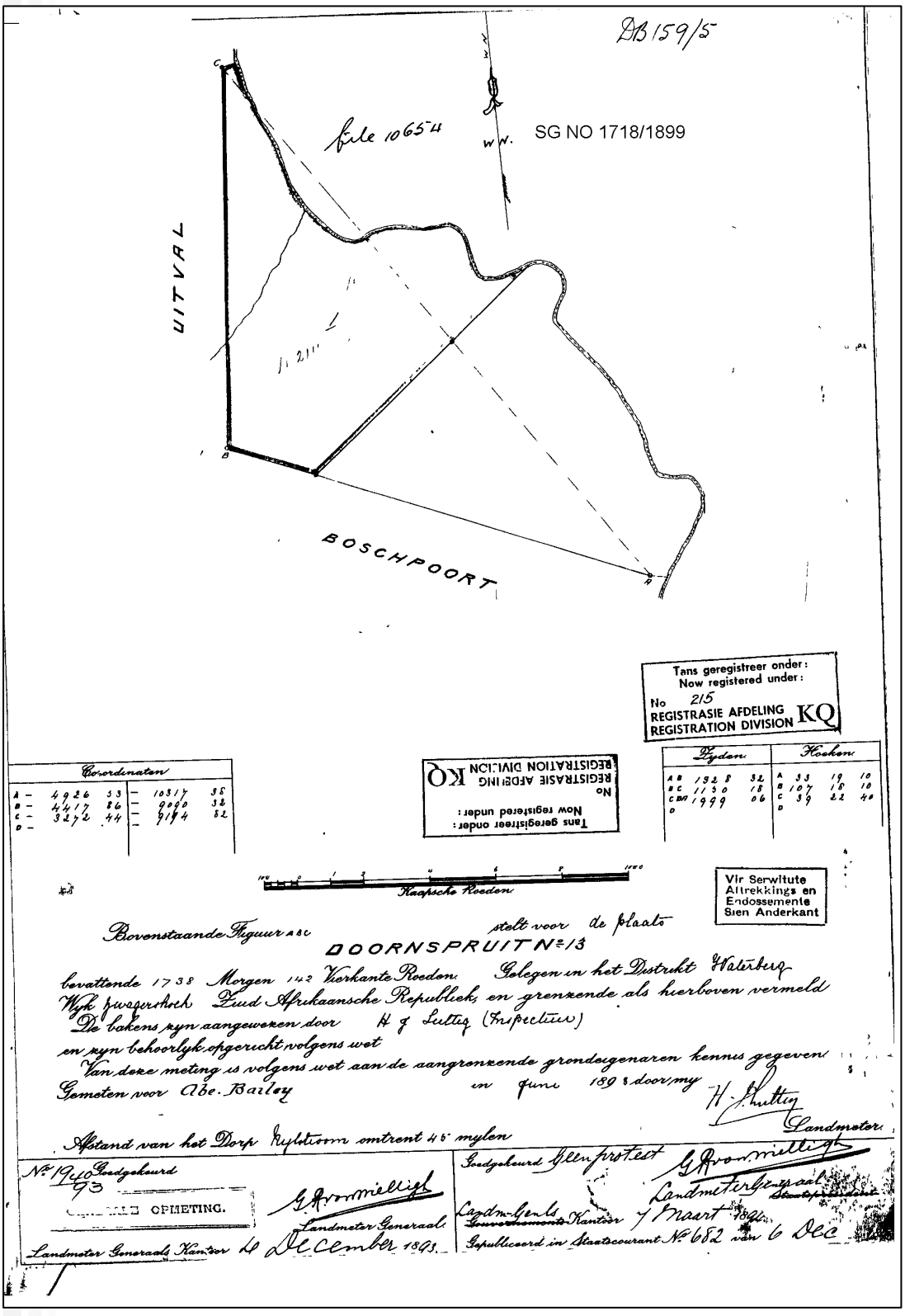

Figure 5-4: Title deed document for the farm Doornspruit dating to 1894.

6 RESULTS: ARCHAEOLOGICAL SURVEY

6.1 The Off-Site Desktop Survey

In terms of heritage resources, the landscape around Vaalwater is primarily well known for the occurrence of Iron Age Farmer and Colonial Period resources, primarily clustered in the vicinity of historical farms and settlements. However, the general landscape area has seen intensive agriculture development over the past century where portions of pristine areas have been altered largely sterilizing the area of heritage remains. An analysis of historical aerial imagery and archive maps reveals the following (see Figure 6-1 to Figure 6-5):

- The farm Doornspruit is indicated on an early map of the Transvaal dating to 1899 (Jeppe).
- No man-made features are indicated within the project area on 1969 and 1981 topographic maps of the area. These maps indicate cultivated fields in the project area and across the region.
- In his "Preliminary Survey of Bantu Tribes of South Africa", Van Warmelo (1935) indicates that the project area was sparsely populated by Sotho groups during the first part of the 20th century. Settlement of these groups in the area probably represent farm workers resident on local farms.
- Aerial imagery dating to 1957 indicate that portions of the landscape and particularly areas subject to this assessment have been altered by historical farming and agriculture along the Sterkstroom River.

6.2 The Archaeological Site Survey

An analysis of historical aerial imagery and archive maps of areas subject to this assessment suggests a landscape which has been subjected to historical farming activities possibly sterilising the area of heritage remains. **This inference was confirmed during an archaeological site assessment during which no *in situ* archaeological or heritage remains were encountered.**

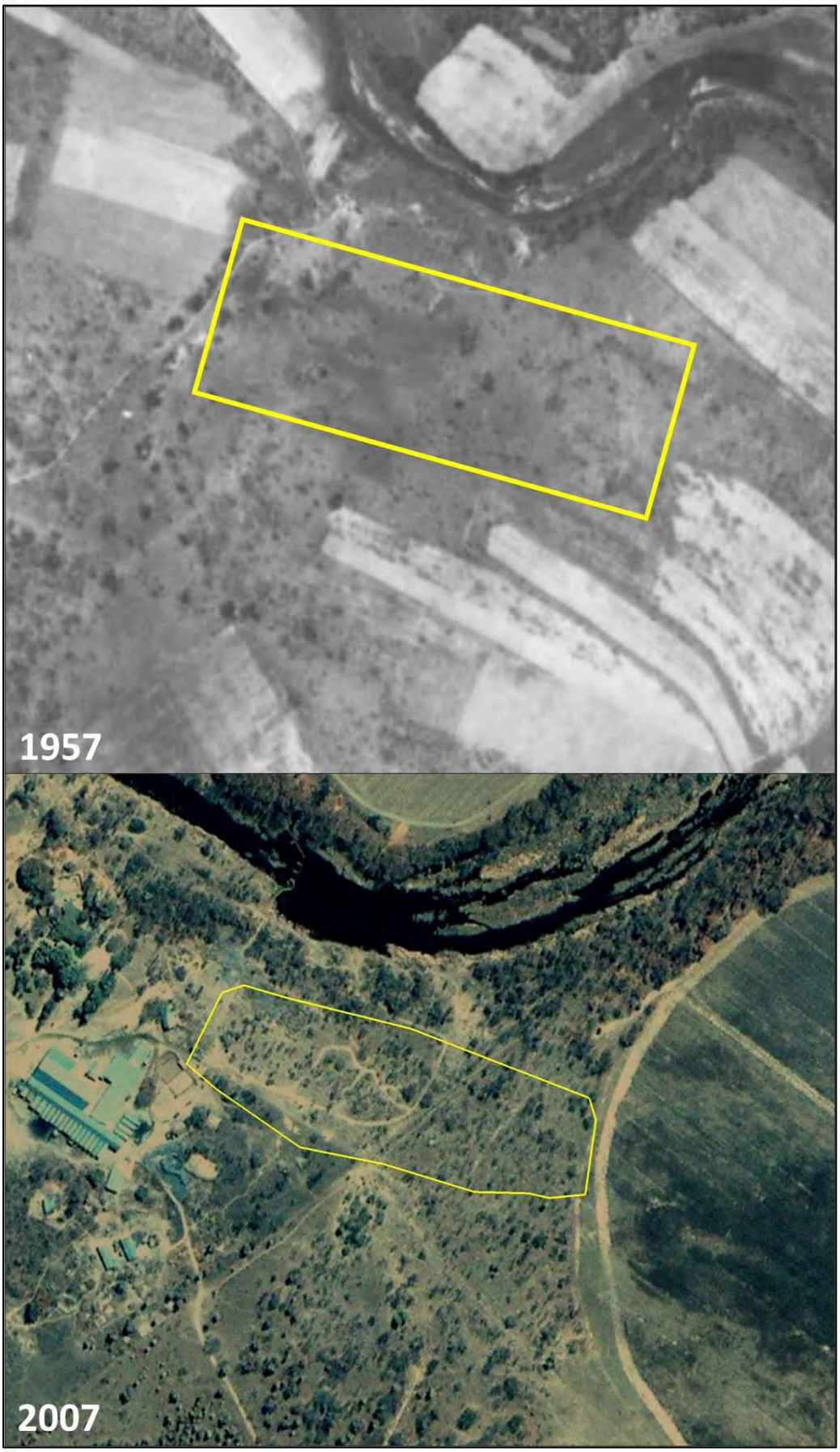

Figure 6-1: Historical aerial image dating to 1957 (top) and more recent imagery (bottom) indicating the dam location within the historical landscape.

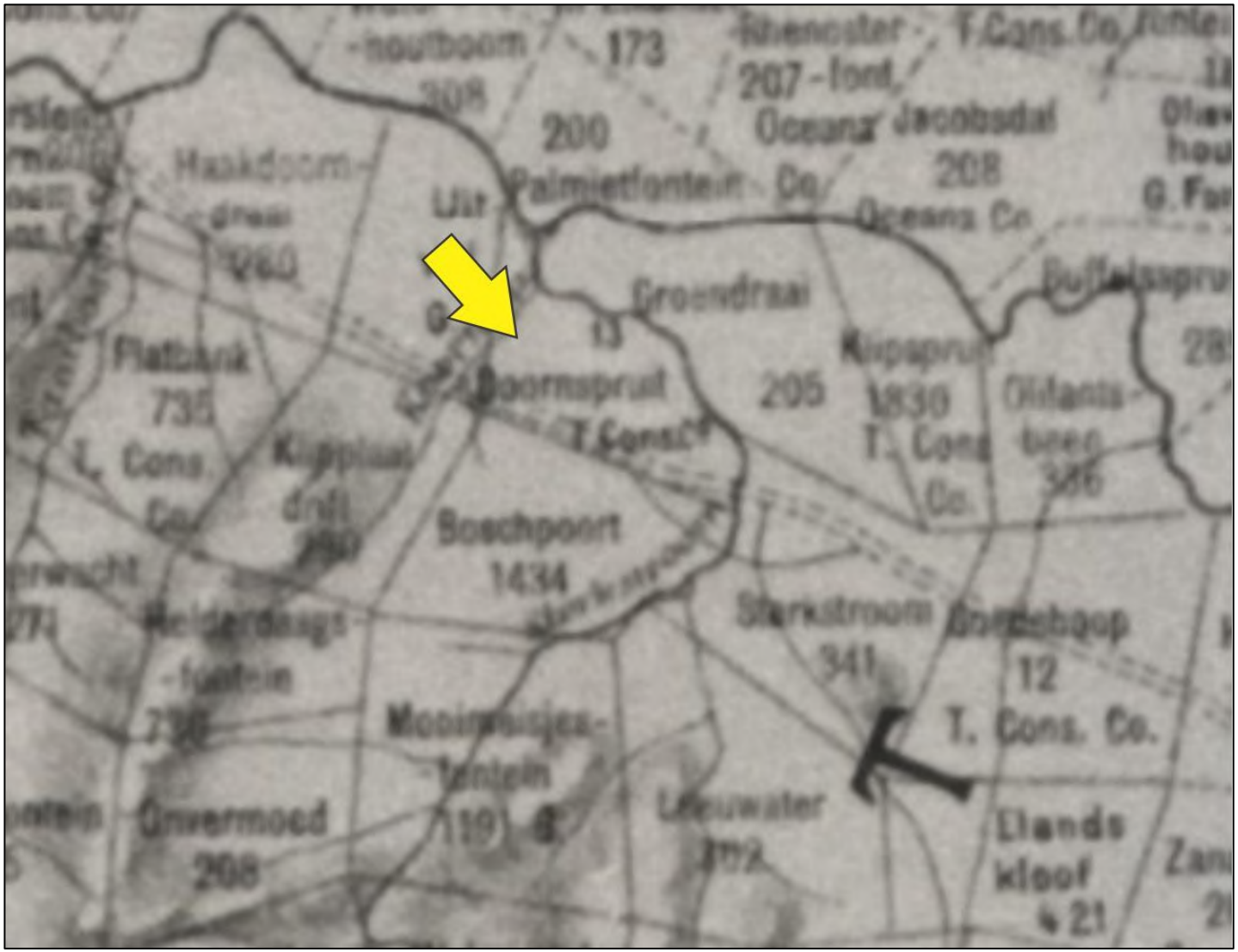

Figure 6-2: Historical map of the Transvaal dating to 1899 (Jeppe) indicating the presence of the farm Doornspruit.

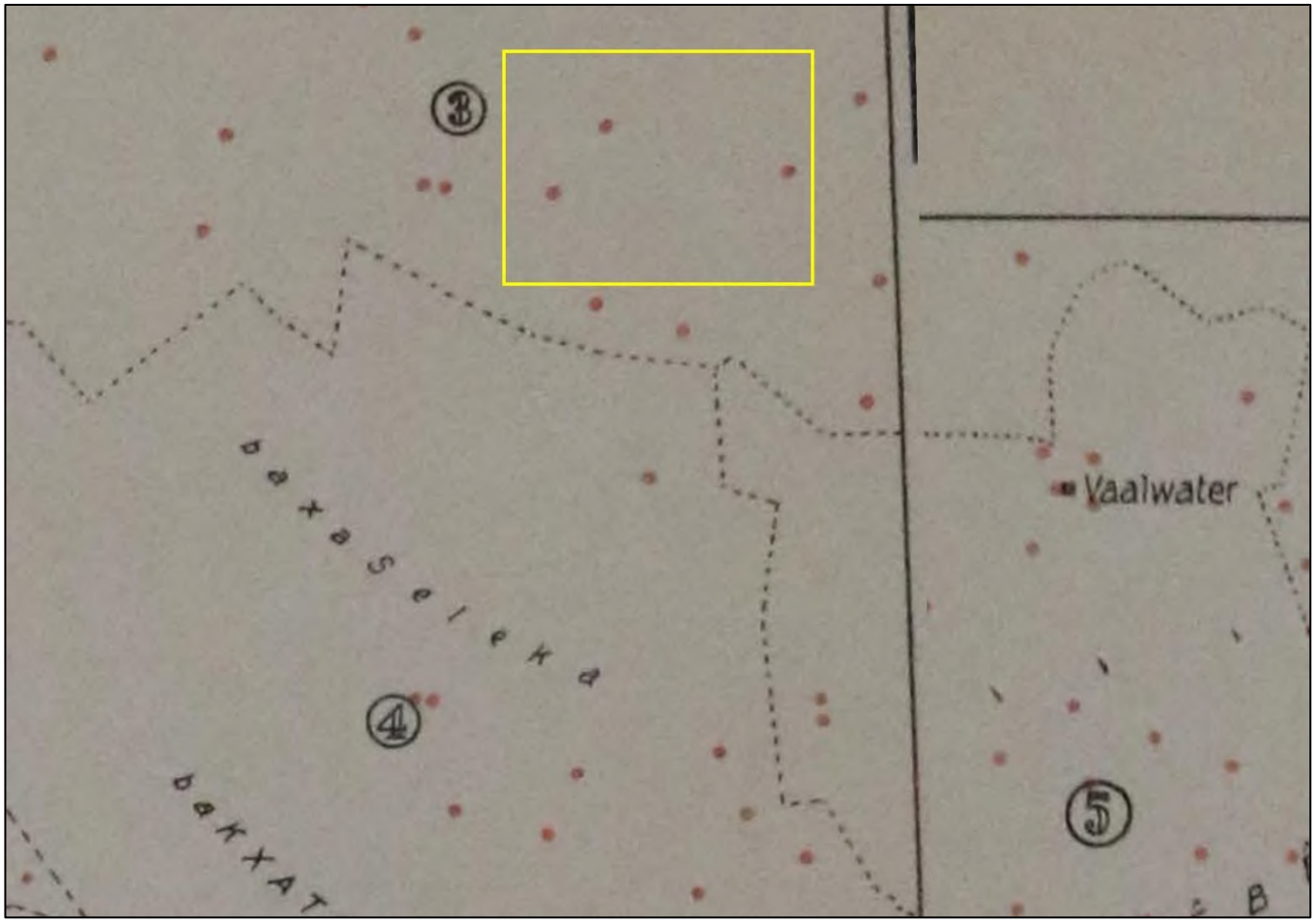

Figure 6-3: An excerpt of Van Warmelo's Map of the project landscape dating to 1935. Each red dot represents "10 taxpayers". Note that the project area was relatively sparsely populated by Sotho groups and settlement of these groups in the area probably represent farm workers resident on local farms.

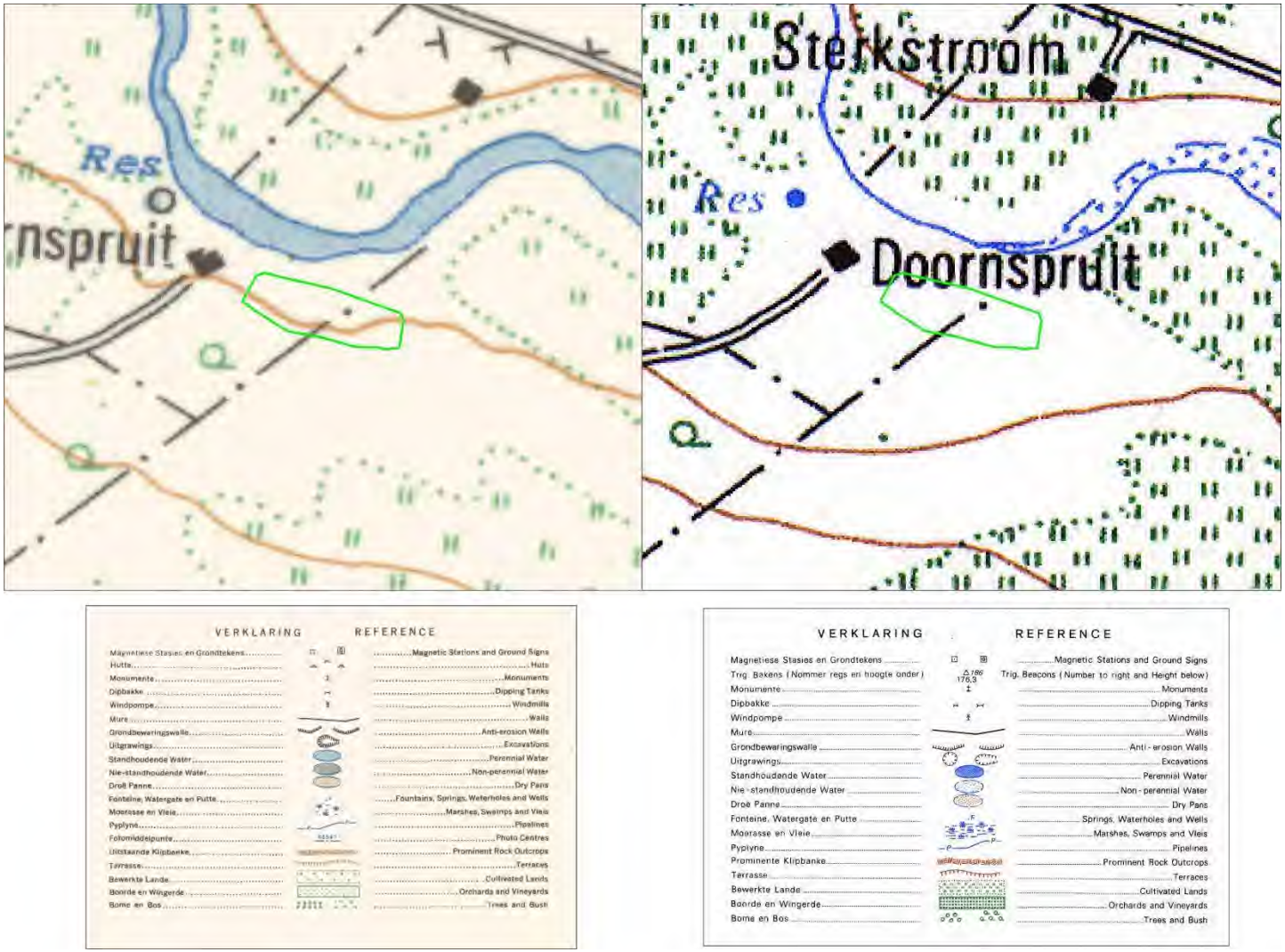

Figure 6-4: Historical topographic maps of the project area dating to 1969 (left) and 1981 (right) in the past decades. Note the the general absence of man-made features indicated in the project area on these maps.

7 STATEMENT OF SIGNIFICANCE AND IMPACT RATING

The following section provides a background to the identification and assessment of possible impacts and alternatives, as well as a range of risk situations and scenarios commonly associated with heritage resources management. A guideline for the rating of impacts and recommendation of management actions for areas of heritage potential within the study area is supplied in Section 10.2 of Addendum 3.

7.1 General assessment of impacts on resources[1]

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts.

7.1.1 Direct, indirect and cumulative effects

Direct or primary effects on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work. **Indirect effects or secondary effects** on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access (refer to Section 10.3 in the Addendum for an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected).

7.2 Direct Impact Rating Criteria

7.2.1 Extent

Local	extend only as far as the footprint of the proposed activity/development
Site	Impact extends beyond the site footprint to immediate surrounds
Regional	within which development takes place, i.e. farm, suburb, town, community
National	Impact is on a national level

7.2.2 Duration

Short term	The impact will disappear with through mitigation or through natural processes
Medium term	The impact will last up to the end of the phases, where after it will be negated
Long term	impact will persist indefinitely, possibly beyond the operational life of the activity, either because of natural processes or by human intervention
Permanent	Permanent where mitigation either by natural process of by human intervention will not occur in such a way or in such a time span that the impact can be considered transient

7.2.3 Magnitude severity

Low	where the impact affects the resource in such a way that its heritage value is not affected
Medium	where the affected resource is altered but its heritage value continues to exist albeit in a modified way
High	where heritage value is altered to the extent that it will temporarily or permanently be damaged or destroyed

7.2.4 Probability

Improbable	where the possibility of the impact to materialize is very low either because of design or historic experience;

[1] Based on: W inter, S. & Baumann, N. 2005. *Guideline for involving heritage specialists in EIA processes: Edition 1.*

Probable	where there is a distinct possibility that the impact will occur
Highly	probable, where it is most likely that the impact will occur; or
Definite	where the impact will definitely occur regardless of any mitigation measures.

7.2.5 Impact Significance

Low	negligible effect on heritage – no effect on decision
Medium	where it would have a moderate effect on heritage and – influences the decision
High	high risk of, a big effect on heritage. Impacts of high significance should have a major influence on the decision
Very high	high risk of, an irreversible and possibly irreplaceable impact on heritage – central factor in decision-making

7.3 Weighting matrix

Aspect	Description	Weight
Extent		
	Local	1
	Site	2
	Regional	3
Duration		
	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Magnitude/Severity		
	Low	2
	Medium	6
	High	8
Probability		
	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Significance	**Sum (Duration, Scale, Magnitude) x Probability**	
Negligible		<20
Low		<40
Moderate		<60
High		>60

The following table summarizes impacts to the general heritage landscape of the project area:

Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance		Mitigtion Measures	Mitigation Effect	Residual Impact
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude			
Heritage Impact Assessment															
Planning Phase															
The Local Heritage Landscape	**WOM**	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible	No mitigation.	N/A	No
	WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible			No
Construction Phase															
The Local Heritage Landscape	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	No mitigation. General site monitoring by informed ECO.	N/A	No
	WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible			No
Operational Phase															
The Local Heritage Landscape	**WOM**	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	No mitigation. General site monitoring by informed ECO.	N/A	No
	WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible			No
Decommissioning / Rehabilitation Phase															
The Local Heritage Landscape	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	No mitigation. General site monitoring by informed ECO.	N/A	No
	WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible			No

7.4 Evaluation of Impact: The Project

7.4.1 Archaeology

No archeological sites, features or artefacts were noted in the project area but the location of the proposed new dam along the Sterkstroom River renders it is prone to alluvial deposits that could bury potential Stone Age material and *in situ* Stone Age remains might occur in previously undetected contexts of the project area.

7.4.2 Built Environment

The study has not identified any buildings or structures which will be impacted by the proposed project. This is confirmed by an examination of aerial photographs of the area. No impact on built environment sites is therefore anticipated. For the rest of the project area, the general landscape holds varied significance in terms of the built environment as the area comprises historical farming remnants and relatively newly established settlement areas.

7.4.3 Cultural Landscape

Generally, the proposed project area and its surrounds are characterized by rural farmlands and dense riparian and vegetation. Further away from the project area, the landscape displays undulating hills with flatter plains in-between. This landscape stretches over many kilometres and the proposed project is unlikely to result in a significant impact on the or the landscape sense of place.

7.4.4 Graves / Human Burials Sites

No human burials were documented in the project area. In the rural areas of the Limpopo Province, graves and cemeteries often occur around farmsteads in family burial grounds but they are also randomly scattered around archaeological and historical settlements. The probability of informal human burials encountered during development should thus not be excluded. In addition, human remains and burials are commonly found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface. Human remains are usually observed when they are exposed through erosion. In some instances packed stones or rocks may indicate the presence of informal pre-colonial burials. If any human bones are found during the course of construction work then they should be reported to an archaeologist and work in the immediate vicinity should cease until the appropriate actions have been carried out by the archaeologist. Where human remains are part of a burial they would need to be exhumed under a permit from either SAHRA (for pre-colonial burials as well as burials later than about AD 1500). Should any unmarked human burials/remains be found during the course of construction, work in the immediate vicinity should cease and the find must immediately be reported to the archaeologist, or the South African Heritage Resources Agency (SAHRA). Under no circumstances may burials be disturbed or removed until such time as necessary statutory procedures required for grave relocation have been met.

In summary, no sensitive heritage receptors were found in the project area and no potential impact to heritage resources is foreseen.

7.5 Management actions

Recommendations for relevant heritage resource management actions are vital to the conservation of heritage resources. The AIA did not identify heritage resources within of in close proximity to the proposed Joe Klopper Dam Development alignment and no direct or peripheral impacts are envisaged on heritage resources. Therefore, it is the opinion of this author that the Joe Klopper Dam Development Project may proceed from a culture resources management perspective on the condition that mitigation measures are implemented where

applicable, and provided that no subsurface heritage remains are encountered during construction. The following management measures should be considered during implementation of the proposed Joe Klopper Dam Development Project. A general guideline for recommended management actions is included in Section 10.4 of Addendum 3.

PROJECT COMPONENT/S	All phases of construction and operation.		
POTENTIAL IMPACT	Damage/destruction of sites.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.		
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**TIMEFRAME**
Fixed Mitigation Procedure (**required**)			
Site Monitoring: Regular examination of trenches and excavations.		ECO	Monitor as frequently as practically possible.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		
MONITORING	Successful location of sites by person/s monitoring.		

8 RECOMMENDATIONS

The larger landscape around the project area indicate a rich heritage horizon where Iron Age Farmer and Colonial Period resources are known to be ample, primarily clustered in the vicinity of old farmstead and settlements. Locally, the project area has seen transformation by agriculture activities potentially sterilizing surface and subsurface of heritage remains, especially those dating to pre-colonial and prehistorical times. Cognisance should nonetheless be taken of archaeological material that might be present in surface and sub-surface deposits along drainage lines and in pristine areas. The following recommendations are made based on general observations in the proposed Joe Klopper Dam Development Project area:

- Even though no archeological sites, features or artefacts were noted in the project area, the location of the proposed new along the Sterkstroom River renders it prone to alluvial deposits that could bury potential Stone Age material and *in situ* Stone Age remains might occur in previously undetected contexts of the project area. As such, it is recommended that all development activities be closely monitored in order to avoid the destruction of previously undetected heritage remains and particularly Stone Age occurrences.
- It should be noted that the site survey for the Joe Klopper Dam Development Project AIA was – in places - constrained by dense vegetation in terms of free movement and surface visibility. As such, the possibility exists that individual sites could be missed and it recommended that the initial stages of the development be monitored to re-assess the presence of possible heritage resources in the project area.
- It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the project area along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development. Generally, the frequent monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.

9 GENERAL COMMENTS AND CONDITIONS

This AIA report serves to confirm the extent and significance of the heritage landscape of the proposed Joe Klopper Dam Development Project area. The larger heritage horizon encompasses rich and diverse archaeological landscapes and cognisance should be taken of heritage resources and archaeological material that might be present in surface and sub-surface deposits. If, during construction, any possible archaeological material culture discoveries are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find. Such material culture might include:

- Formal Earlier Stone Age stone tools.
- Formal MSA stone tools.
- Formal LSA stone tools.
- Potsherds
- Iron objects.
- Beads made from ostrich eggshell and glass.
- Ash middens and cattle dung deposits and accumulations.
- Faunal remains.
- Human remains/graves.
- Stone walling or any sub-surface structures.
- Historical glass, tin or ceramics.
- Fossils.

If such sites were to be encountered or impacted by any proposed developments, recommendations contained in this report, as well as endorsement of mitigation measures as set out by AMAFA, SAHRA, the National Resources Act and the CRM section of ASAPA will be required. It must be emphasised that the conclusions and recommendations expressed in this archaeological heritage sensitivity investigation are based on the visibility of archaeological sites/features and may not therefore, represent the area's complete archaeological legacy. Many sites/features may be covered by soil and vegetation and might only be located during sub-surface investigations. If subsurface archaeological deposits, artefacts or skeletal material were to be recovered in the area during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately **(*cf*. NHRA (Act No. 25 of 1999)**, Section 36 (6)). It must also be clear that Archaeological Specialist Reports will be assessed by the relevant heritage resources authority (SAHRA).

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11 ADDENDUM 1: HERITAGE LEGISLATION BACKGROUND

11.1 CRM: Legislation, Conservation and Heritage Management

The broad generic term Cultural Heritage Resources refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

11.1.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and their provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

d. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act of 1999 a historical site is any identifiable building or part thereof, marker, milestone, gravestone, landmark or tell older than 60 years. This clause is commonly known as the "60-years clause". Buildings are amongst the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Iron Age settlements. "Tell" refers to the evidence of human existence which is no longer above ground level, such as building foundations and buried remains of settlements (including artefacts).

The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects, meteorites and rare geological specimens
- visual art objects
- military objects
- numismatic objects
- objects of cultural and historical significance
- objects to which oral traditions are attached and which are associated with living heritage
- objects of scientific or technological interest
- any other prescribed category

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(d) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(e) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(f) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(g) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(h) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(i) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(j) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

e. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and the Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities.

11.1.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

The National Heritage Resources Act (Act No. 25 of 1999, section 38) provides guidelines for Cultural Resources Management and prospective developments:

"38. *(1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:*

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site:

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

And:

"The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): Provided that the following must be included:

(k) The identification and mapping of all heritage resources in the area affected;

(l) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;

(m) an assessment of the impact of the development on such heritage resources;

(n) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(o) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(p) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(q) plans for mitigation of any adverse effects during and after the completion of the proposed development (38. [3] 1999:64)."

Consequently, section 35 of the Act requires Heritage Impact Assessments (HIAs) or Archaeological Impact Assessments (AIAs) to be done for such developments in order for all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic or technological value or significance to be protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects. Heritage resources management and conservation.

11.2 Assessing the Significance of Heritage Resources

Archaeological sites, as previously defined in the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people have lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people

of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities. Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and *non-renewable.* Many such sites are unfortunately lost on a daily basis through development for housing, roads and infrastructure and once archaeological sites are damaged, they cannot be re-created as site integrity and authenticity is permanently lost. Archaeological sites have the potential to contribute to our understanding of the history of the region and of our country and continent. By preserving links with our past, we may not be able to revive lost cultural traditions, but it enables us to appreciate the role they have played in the history of our country.

- Categories of significance

Rating the significance of archaeological sites, and consequently grading the potential impact on the resources is linked to the significance of the site itself. The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences. The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3 are used when determining the cultural significance or other special value of archaeological or historical sites. In addition, ICOMOS (the Australian Committee of the International Council on Monuments and Sites) highlights four cultural attributes, which are valuable to any given culture:

- *Aesthetic value:*

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria include consideration of the form, scale, colour, texture and material of the fabric, the general atmosphere associated with the place and its uses and also the aesthetic values commonly assessed in the analysis of landscapes and townscape.

- *Historic value:*

Historic value encompasses the history of aesthetics, science and society and therefore to a large extent underlies all of the attributes discussed here. Usually a place has historical value because of some kind of influence by an event, person, phase or activity.

- *Scientific value:*

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality and on the degree to which the place may contribute further substantial information.

- *Social value:*

Social value includes the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a certain group.

It is important for heritage specialist input in the EIA process to take into account the heritage management structure set up by the NHR Act. It makes provision for a 3-tier system of management including the South Africa Heritage Resources Agency (SAHRA) at a national level, Provincial Heritage Resources Authorities (PHRAs) at a provincial and the local authority. The Act makes provision for two types or forms of protection of heritage resources; i.e. formally protected and generally protected sites:

Formally protected sites:

- Grade 1 or national heritage sites, which are managed by SAHRA
- Grade 2 or provincial heritage sites, which are managed by the provincial HRA (MP-PHRA).
- Grade 3 or local heritage sites.

Generally protected sites:

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 60 years.
- Structures older than 60 years.

With reference to the evaluation of sites, the certainty of prediction is definite, unless stated otherwise and if the significance of the site is rated high, the significance of the impact will also result in a high rating. The same rule applies if the significance rating of the site is low. The significance of archaeological sites is generally ranked into the following categories.

Significance	Rating Action
No significance: sites that do not require mitigation.	None
Low significance: sites, which may require mitigation.	2a. Recording and documentation (Phase 1) of site; no further action required 2b. Controlled sampling (shovel test pits, auguring), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium significance: sites, which require mitigation.	3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High significance: sites, where disturbance should be avoided.	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism
High significance: Graves and burial places	4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

Furthermore, the significance of archaeological sites was based on six main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

12 ADDENDUM 2: CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE

12.1 Site Significance Matrix

According to the NHRA, Section 2(vi) the **significance** of heritage sites and artefacts is determined by it aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these. The following matrix is used for assessing the significance of each identified site/feature.

2. SITE EVALUATION			
2.1 Heritage Value (NHRA, section 2 [3])	High	Medium	Low
It has importance to the community or pattern of South Africa's history or pre-colonial history.			
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.			
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.			
It is of importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.			
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.			
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.			
It has marked or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).			
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.			
It has significance through contributing towards the promotion of a local sociocultural identity and can be developed as a tourist destination.			
It has significance relating to the history of slavery in South Africa.			
It has importance to the wider understanding of temporal changes within cultural landscapes, settlement patterns and human occupation.			
2.2 Field Register Rating			
National/Grade 1 [should be registered, retained]			
Provincial/Grade 2 [should be registered, retained]			
Local/Grade 3A [should be registered, mitigation not advised]			
Local/Grade 3B [High significance; mitigation, partly retained]			
Generally Protected A [High/Medium significance, mitigation]			
Generally protected B [Medium significance, to be recorded]			
Generally Protected C [Low significance, no further action]			
2.3 Sphere of Significance	High	Medium	Low
International			
National			
Provincial			
Local			
Specific community			

12.2 Impact Assessment Criteria

The following table provides a guideline for the rating of impacts and recommendation of management actions for sites of heritage potential.

Significance of the heritage resource

This is a statement of the nature and degree of significance of the heritage resource being affected by the activity. From a heritage management perspective, it is useful to distinguish between whether the significance is embedded in the physical fabric or in associations with events or persons or in the experience of a place; i.e. its visual and non-visual qualities. This statement is a primary informant to the nature and degree of significance of an impact and thus needs to be thoroughly considered. Consideration needs to be given to the significance of a heritage resource at different scales (i.e. site-specific, local, regional, national or international) and the relationship between the heritage resource, its setting and its associations.

Nature of the impact

This is an assessment of the nature of the impact of the activity on a heritage resource, with some indication of its positive and/or negative effect/s. It is strongly informed by the statement of resource significance. In other words, the nature of the impact may be historical, aesthetic, social, scientific, linguistic or architectural, intrinsic, associational or contextual (visual or non-visual). In many cases, the nature of the impact will include more than one value.

Extent

Here it should be indicated whether the impact will be experienced:

- On a site scale, i.e. extend only as far as the activity;
- Within the immediate context of a heritage resource;
- On a local scale, e.g. town or suburb
- On a metropolitan or regional scale; or
- On a national/international scale.

Duration

Here it should be indicated whether the lifespan of the impact will be:

- Short term, (needs to be defined in context)
- Medium term, (needs to be defined in context)
- Long term where the impact will persist indefinitely, possibly beyond the operational life of the activity, either because of natural processes or by human intervention; or
- Permanent where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Of relevance to the duration of an impact are the following considerations:

- Reversibility of the impact; and
- Renewability of the heritage resource.

Intensity

Here it should be established whether the impact should be indicated as:

- Low, where the impact affects the resource in such a way that its heritage value is not affected;
- Medium, where the affected resource is altered but its heritage value continues to exist albeit in a modified way; and
- High, where heritage value is altered to the extent that it will temporarily or permanently be damaged or destroyed.

Probability

This should describe the likelihood of the impact actually occurring indicated as:

- Improbable, where the possibility of the impact to materialize is very low either because of design or historic experience;
- Probable, where there is a distinct possibility that the impact will occur;
- Highly probable, where it is most likely that the impact will occur; or
- Definite, where the impact will definitely occur regardless of any mitigation measures

Confidence

This should relate to the level of confidence that the specialist has in establishing the nature and degree of impacts. It relates to the level and reliability of information, the nature and degree of consultation with I&AP's and the dynamic of the broader socio-political context.

- High, where the information is comprehensive and accurate, where there has been a high degree of consultation and the socio-political context is relatively stable.
- Medium, where the information is sufficient but is based mainly on secondary sources, where there has been a limited targeted consultation and socio-political context is fluid.
- Low, where the information is poor, a high degree of contestation is evident and there is a state of socio-political flux.

Impact Significance

The significance of impacts can be determined through a synthesis of the aspects produced in terms of the nature and degree of heritage significance and the nature, duration, intensity, extent, probability and confidence of impacts and can be described as:

- Low; where it would have a negligible effect on heritage and on the decision
- Medium, where it would have a moderate effect on heritage and should influence the decision.
- High, where it would have, or there would be a high risk of, a big effect on heritage. Impacts of high significance should have a major influence on the decision;
- Very high, where it would have, or there would be high risk of, an irreversible and possibly irreplaceable negative impact on heritage. Impacts of very high significance should be a central factor in decision-making.

12.3 Direct Impact Assessment Criteria

The following table provides an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected

	TYPE OF DEVELOPMENT			
HERITAGE CONTEXT	**CATEGORY A**	**CATEGORY B**	**CATEGORY C**	**CATEGORY D**
CONTEXT 1 High heritage Value	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected	Very high heritage impact expected
CONTEXT 2 Medium to high heritage value	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected
CONTEXT 3 Medium to low heritage value	Little or no heritage impact expected	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected
CONTEXT 4 Low to no heritage value	Little or no heritage impact expected	Little or no heritage impact expected	Minimal heritage value expected	Moderate heritage impact expected

NOTE: A DEFAULT "LITTLE OR NO HERITAGE IMPACT EXPECTED" VALUE APPLIES WHERE A HERITAGE RESOURCE OCCURS OUTSIDE THE IMPACT ZONE OF THE DEVELOPMENT.

HERITAGE CONTEXTS	**CATEGORIES OF DEVELOPMENT**
Context 1: Of high intrinsic, associational and contextual heritage value within a national, provincial and local context, i.e. formally declared or potential Grade 1, 2 or 3A heritage resources **Context 2:** Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources. **Context 3:** Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources **Context 4:** Of little or no intrinsic, associational or contextual heritage value due to disturbed, degraded conditions or extent of irreversible damage.	**Category A: Minimal intensity development** - No rezoning involved; within existing use rights. - No subdivision involved. - Upgrading of existing infrastructure within existing envelopes - Minor internal changes to existing structures - New building footprints limited to less than 1000m2. **Category B: Low-key intensity development** - Spot rezoning with no change to overall zoning of a site. - Linear development less than 100m - Building footprints between 1000m2-2000m2 - Minor changes to external envelop of existing structures (less than 25%) - Minor changes in relation to bulk and height of immediately adjacent structures (less than 25%). **Category C: Moderate intensity development** - Rezoning of a site between 5000m2-10 000m2. - Linear development between 100m and 300m. - Building footprints between 2000m2 and 5000m2 - Substantial changes to external envelop of existing structures (more than 50%) - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 50%) **Category D: High intensity development** - Rezoning of a site in excess of 10 000m2

	- Linear development in excess of 300m. - Any development changing the character of a site exceeding 5000m2 or involving the subdivision of a site into three or more erven. - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 100%)

12.4 Management and Mitigation Actions

The following table provides a guideline of relevant heritage resources management actions is vital to the conservation of heritage resources.

No further action / Monitoring

Where no heritage resources have been documented, heritage resources occur well outside the impact zone of any development or the primary context of the surroundings at a development footprint has been largely destroyed or altered, no further immediate action is required. Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation in order to ensure that no undetected heritage\ remains are destroyed.

Avoidance

This is appropriate where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. Mitigation is not acceptable or not possible. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.

Mitigation

This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated to a degree of medium to low significance, e.g. the high to medium impact of a development on an archaeological site could be mitigated through sampling/excavation of the remains. Not all negative impacts can be mitigated.

Compensation

Compensation is generally not an appropriate heritage management action. The main function of management actions should be to conserve the resource for the benefit of future generations. Once lost it cannot be renewed. The circumstances around the potential public or heritage benefits would need to be exceptional to warrant this type of action, especially in the case of where the impact was high.

Rehabilitation

Rehabilitation is considered in heritage management terms as a intervention typically involving the adding of a new heritage layer to enable a new sustainable use. It is not appropriate when the process necessitates the removal of previous historical layers, i.e. restoration of a building or place to the previous state/period. It is an appropriate heritage management action in the following cases:

- The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.
- Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal loss of historical fabric.
- Where the rehabilitation process will not result in a negative impact on the intrinsic value of the resource

APPENDIX D_3

DAM DESIGN REPORT

CONCEPT DESIGN REPORT

DAM NO. 7
(PROPOSED EARTHFILL DAM)

PREPARED FOR

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APRIL 2020

Project No: 074/2019

DRAFT REPORT

DOCUMENT CONTROL SHEET

Compiled by:	 Francois Joubert (Pr Tech Eng)	**17/04/2020** **Date**
Designed and approved by:	 Francois Joubert (Pr Tech Eng) APP	**17/04/2020** **Date**
Accepted by:	On behalf of Client	**Date**

Revision	Description	Date issued	Revision by:

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CONCEPT DESIGN REPORT FOR THE CONSTRUCTION OF DAM NO. 7

CONTENTS

1 LIST OF ABBREVIATIONS

APP	Approved Professional Person
CL	Contour Level
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EPP	Emergency Preparedness Plan
EWR	Ecological Water Reserve
FSL	Full Supply Level
HRU	Hydrological Research Unit
IFR	Instream Flow Requirements
Ke	Regional coefficient
MAP	Mean annual precipitation
MAR	Mean sea run-off
masl	Meters above sea level
NOC	Non-overspill crest
NWA	National Water Act
OMM	Operation and maintenance manual
PMF	Probable maximum flood
PMP	Probable maximum precipitation
RDD	Recommended design discharge
RDF	Recommended design flood
RI	Recurrence interval
RL	Relative level
RMF	Regional maximum flood
SANCOLD	South African National Committee on Large Dams
SCS	Soil Conservation Service
SED	Safety evaluation discharge
SEF	Safety evaluation flood

2 INTRODUCTION

2.1 General

The proposed Dam No. 7 will be constructed as an off-channel earthfill embankment dam, equipped with a service spillway across the embankment crest. The dam will be utilised for irrigation and are located on the farm Doornspruit 215 KQ, approximately 19 kilometres north-west of the town Vaalwater in the Waterberg District of the Limpopo Province. The dam will mainly be fed by authorized water pumped from the Sterkfontein River. A small percentage of natural catchment run off, which is diverted by two stormwater canals, will contribute to the storage. Refer to Figure 6-2-1 for illustration purposes.

The centre co-ordinates of the proposed dam wall are Latitude **24º 11' 52.55" S** and Longitude **27º 57' 31.88" E**. Refer to map image below as well as ***Appendix A*** (Google image) for the location of the dam.

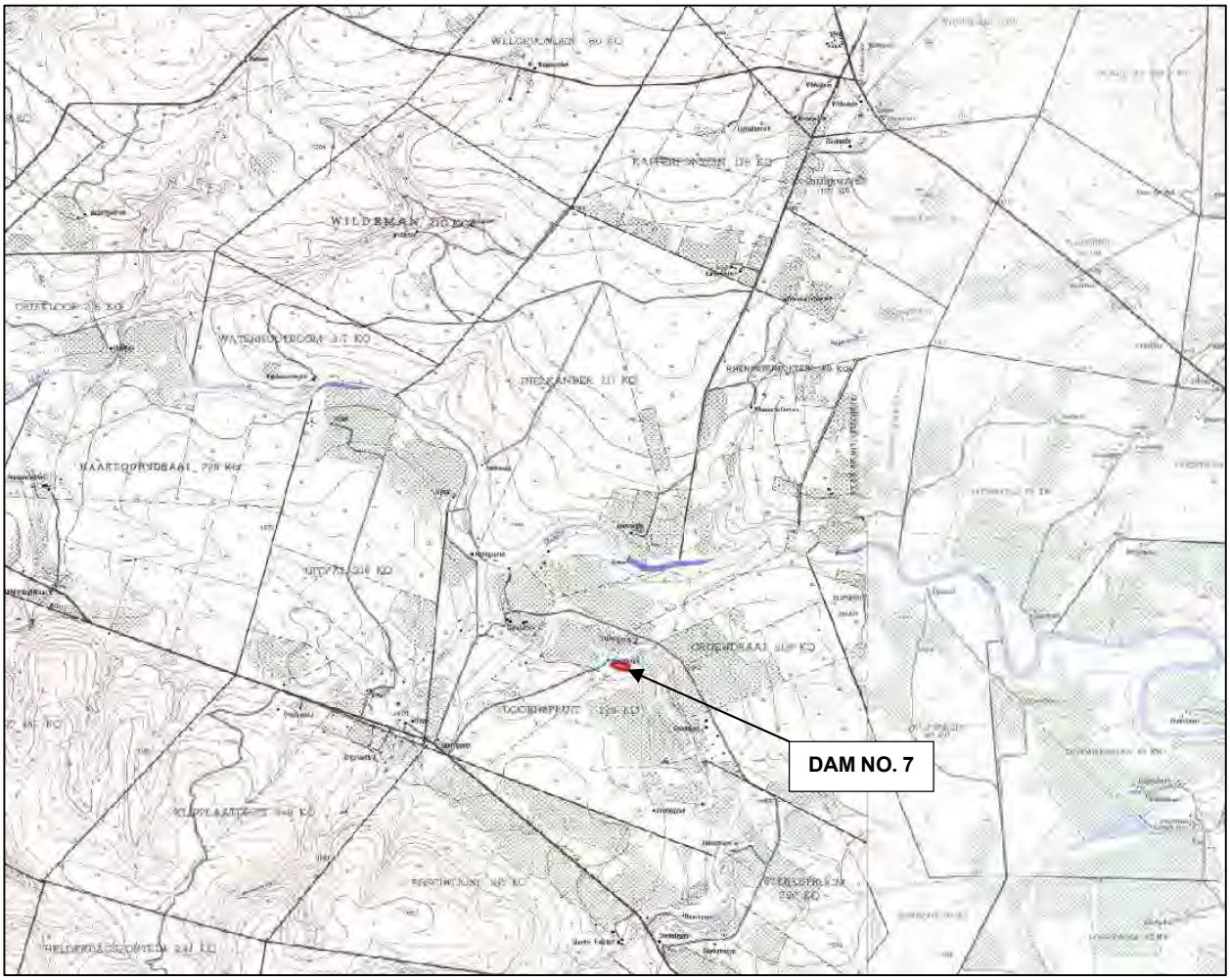


Figure 2-1-1: Topographical Map Image (showing proposed dam position)

2.2 Purpose of report

The purpose of this report is:

- To serve as a design document for the construction of the proposed Dam No. 7.
- To realistically estimate the quantities and costs of the proposed works.
- To make further decisions in this regard.
- To apply for approvals from DWS and LEDET in terms of the required licenses / authorizations.

2.3 Main features of the proposed dam

Gross storage capacity	**52 000m³**
Water surface area at FSL	**1.725ha**
Crest Level of non-overspill	**CL 1059.50 masl**
Full supply level	**CL 1059.00 masl**
Downstream lowest ground level (as surveyed)	**CL 1054.77 masl**
Maximum wall height	**4.73m**
NOC crest width	**4.0m**
Embankment length (including spillway)	**354m**
Upstream slope	**1(V):3.0(H)**
Downstream slope	**1(V):2.0(H)**
Type of spillway	**Service spillway on crest**
Total Freeboard	**0.5m**
Spillway control section widths	**3m** (service spillway)
Outlet works	**Single 200mm dia Class 9 uPVC pipe encased in concrete**

NOTE: The design of the dam aimed to try and balance the cut and embankment fill volumes in order to avoid access spoil of material as far as possible. However, in this case, to achieve a storage volume of approximately 52 000m³, the cut volume will be approximately 4 500m³ more than the expected embankment fill volume.

2.4 Area/Capacity/Stage curves

See graphs on next page.

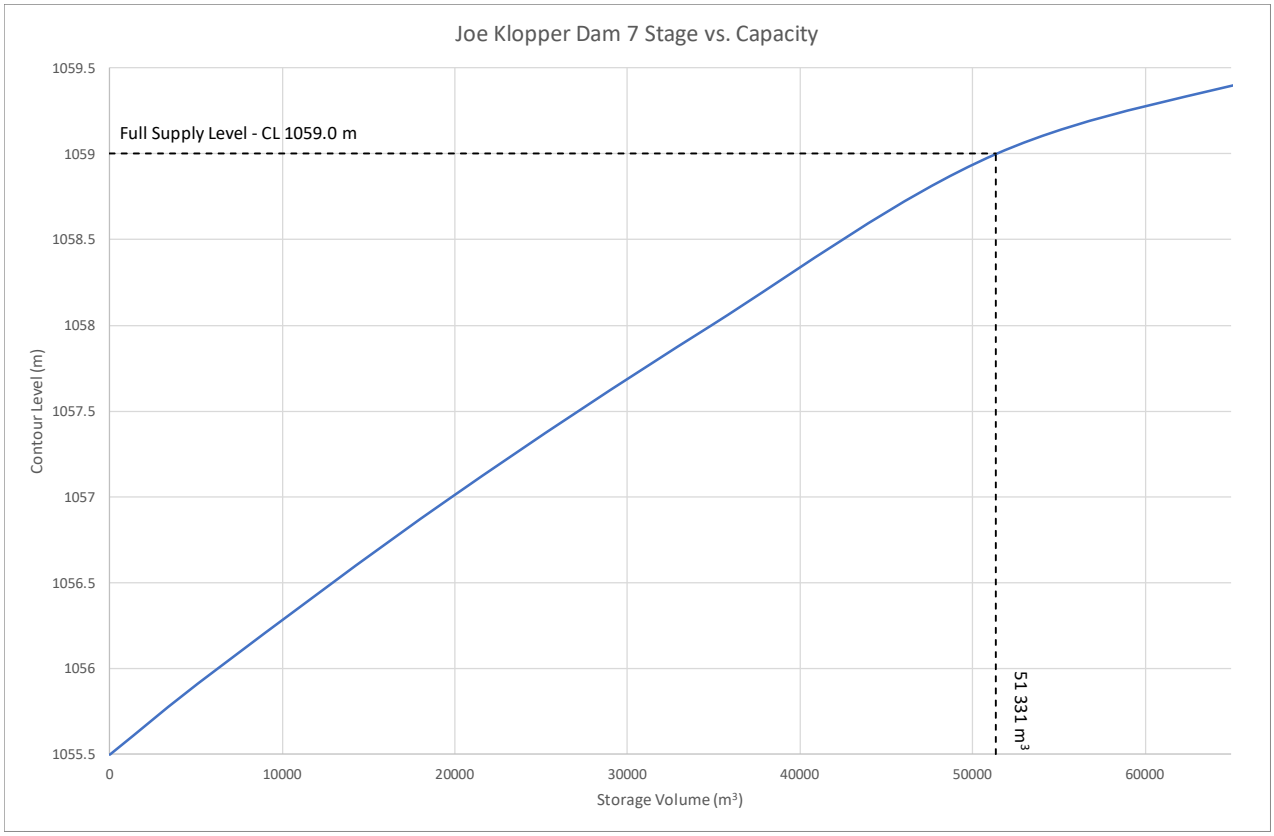


Figure 2-2 : Stage/Capacity Curve

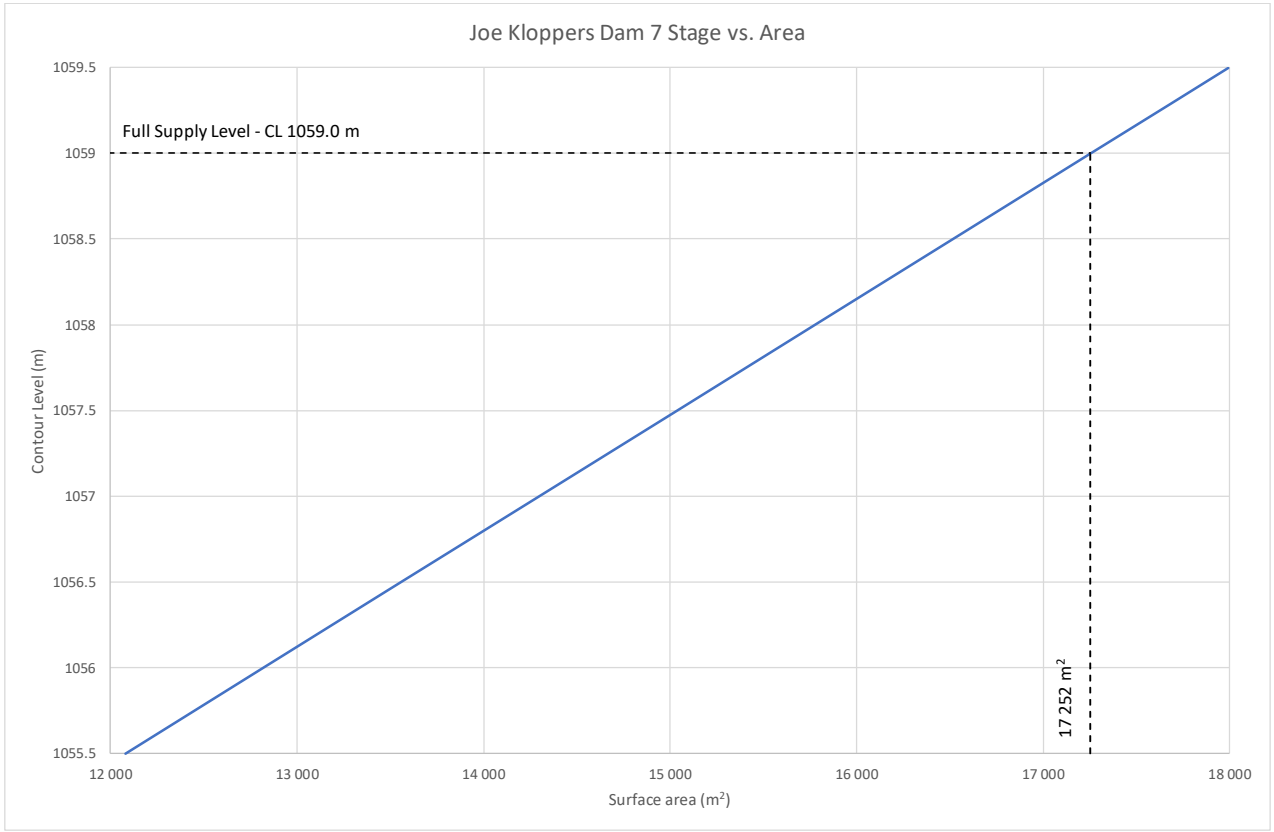


Figure 2-3 : Stage/Area Curve

3 SCOPE OF WORKS

The scope of work for the construction of the proposed Dam No. 7 will consist briefly of the following.

a) Clearing and grubbing of entire dam solum (footprint).
b) Excavation and preparation of cut-off trench along the embankment centre line.
c) Excavation and foundation preparation for concrete encased outlet pipe.
d) Construction and forming new homogeneous earthfill embankment.
e) Construction of service spillway on embankment crest and downstream slope.
f) Installation of 200mm diameter HDPE outlet pipe, encased in reinforced concrete, and equipped with a closing mechanism on the downstream side.
g) Installation of headwall protection structure at outlet pipe exit.
h) Grass establishment (hydro-seeding) on entire embankment after construction.

4 TERMS OF REFERENCE

Mr. M.F. Joubert (Pr Tech Eng), an approved professional person (APP) on DWS's database, of the firm PG Consulting (Pty) Ltd, was appointed by J. Kloppers Boerdery (Pty) Ltd (Mr. Joe Kloppers), to assist them with the design for the construction of an off-channel water storage dam on their property. Mr. Joubert will also be responsible for part-time construction supervision and quality control.

A contractor shall be appointed by the owner(s), following a tender process, once the required construction licenses have been issued.

A site investigation with topographical survey and basic geotechnical assessment were conducted by PG Consulting Engineers on 18 February 2020.

Prior to detail design, it is recommended to conduct a proper geotechnical investigation with associated material testing.

5 WATER / ENVIRONMENTAL ACT REQUIREMENTS

There are water and environmental regulatory requirements which every dam needs to adhere to. The specific legal requirements are mandatory and are presented in Figure 5-1 below. A Water Use Licence (WULA), Environmental Assessment (Environmental Impact Assessment/ Basic Assessment) and Dam Safety Classification, along with the Licence to Construct are required.

The construction of a dam can only commence once these inputs have been submitted and approved by the necessary regulatory bodies. The processes to be undertaken and entities that are responsible for the applications and the approvals are discussed hereafter.

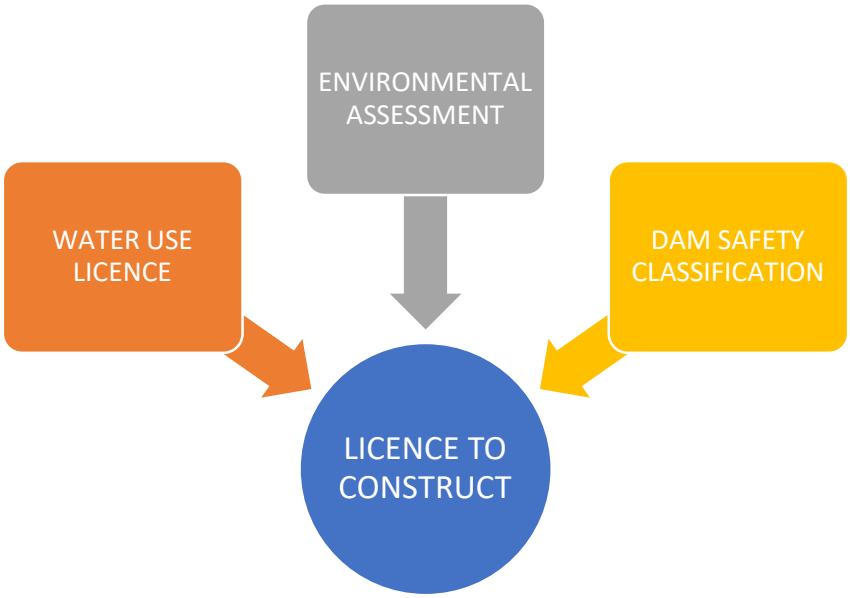


Figure 5-1: Requirements in the construction of a proposed dam

5.1 Water Use Entitlement

As the proposed Dam No. 7 will be built under the new National Water Act (Act 36 of 1998), the water to be stored in these dams should be formally licensed by the Department of Water and Sanitation. It however remains the owner's responsibility to obtain the necessary license(s) for this water use(s) in terms of section 21 of the National Water Act, by applying at the Department of Water and Sanitation (Limpopo regional office - Polokwane). In view of the above, the Client had appointed Mr. J.C. van Rooyen (Spoor Environmental Consultants) to conduct a formal EIA and to obtain all the necessary environmental authorizations.

5.2 Dam Safety Regulations

In terms of the Dam Safety Regulations, Chapter 12, Section 120 of the new National Water Act (Act 36 of 1998), a dam with a maximum wall height of more than 5 (five) meters and a capacity which exceeds 50 000 cubic meters, is defined as a dam with a safety hazard. Such a dam must be formally classified and registered for Dam Safety purposes with the Department of Water and Sanitation (Dam Safety Office - Pretoria).

Considering the above, as well as the characteristics mentioned in Section 2.3, it is expected that the dam can be regarded as a **Category "0-dam"** (i.e. a dam without a safety risk) due to the maximum wall height which is less than 5m.

5.3 Environmental Impact Assessment (EIA)

Prior to any construction works, authorization should be received from the relevant Environmental Authority. This is to comply with the legislation promulgated in terms of Section 24G, read with Section 7 (Transitional provision) of the National Environmental Management Act (NEMA), 1989 (Act 8 of 2004) regarding the control over activities, which may have a detrimental effect on the environment.

In view of the above, the Client had appointed Mr. J.C. van Rooyen (Spoor Environmental Consultants) to conduct a formal EIA and to obtain all the necessary environmental authorizations.

6 FLOOD HYDROLOGY CALCULATIONS

6.1 Methods used for Calculations

Not applicable / applied as the proposed dam will be an off-channel storage dam mainly fed by water pumped from the Sterkfontein River.

6.2 Catchment Parameters

As the proposed dam will be an off-channel storage dam (not build within a defined stream or watercourse), there is no specific catchment identified and delineated for the proposed dam. However, some surface run-off water, captured and diverted via two stormwater canals, will contribute in augmenting the storage volume of the dam during the rainy seasons. (Refer to Google image below for position of stormwater canals, Figure 6-2-1).

The dam will be situated within quaternary catchment **A42E**.

The mean annual rainfall of the catchment, based on the nearest rainfall station (0631823W), is given as **601mm**. The MAP for the quaternary catchment is given as **605mm**.

Figure 6-2-1 : Google Image showing the position of the stormwater diversion canals

6.3 Summary of Hydrology and Spillway Capacity Design

As described in the previous Section, flood hydrology calculations were omitted during this conceptual design.

However, in order to allow for some degree of emergency discharge capacity and capability, the following spillway dimensions and characteristics are recommended and proposed.

Service spillway (on embankment - northwest)

Spillway control section width (at FSL)	**3m**
Difference between NOC and FSL	**0.5m**
Channel side slopes geometry	**Refer to drawings**
Contour level of NOC (recommended)	**CL 1059.50**
Contour level of FSL (recommended)	**CL 1059.00**
Maximum discharge capacity of flood spillway	**1.70m³/s**
Average discharge velocity before overtopping	**1.13m/s**
(c – value applied)	**1.60**

Refer to calculations ***Appendix B***.

6.4 Mean Annual Runoff & Ecological Reserve Determination

Not applicable as this will be an off-channel storage dam.

7 GEOLOGY / FOUNDATION CONDITIONS

With reference to the RSA Geology map, the proposed dam site can be described as fine to medium-grained, feldspathic sandstone, siltstone and shale which is part of the Vaalwater Formation of the Kransberg Sub-group of the Waterberg Group (Code “Mv”). The integrity and quality of the base / bedrock must still be further assessed during construction, when the core trench have been opened.

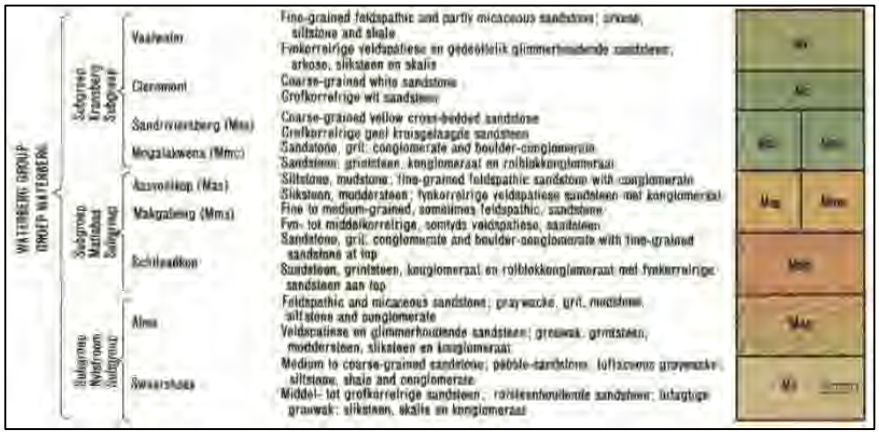


Figure 7-1-1 : Insert of RSA Geology description / legend (Mv)

Figure 7-1-2 : Insert of RSA Geology map and dam location in red circle

8 EMBANKMENT AND MATERIAL PARAMETERS

8.1 Materials

To determine the properties of the material and its suitability for earthfill, soil samples need to be taken for testing from the proposed borrow areas. The samples should be sent to a reputable engineering laboratory for foundation indicator testing, constant head permeability testing and Proctor density testing.

Visual inspection of the basin area indicates that favourable material for dam construction may be found in the vicinity. The ideal will be to source all earthfill material from within the new dam basin. However, due to the variable nature of soils, investigations need to be undertaken to confirm the suitability of the proposed material. This will be done during the detailed design stage / prior to construction.

The following table, however, gives the ideal acceptable parameters for suitable fill material.

SOIL PROPERTIES	EMBANKMENT ZONES	
	CORE / INNER	OUTER / SHELL
Grading	More than 60% through 0,425mm sieve	More than 40% through 0,425mm sieve
Clay content (%) < 0,002mm	10 - 30	< 10
Plasticity Index (PI) (%)	12 - 24	4 - 12,5
Liquid Limit (LL) (%)	30 - 60	< 30
Maximum Dry Density (MDD) (kg/m³) *	1590 – 1830	1750 - 1990
Linear Shrinkage (%)	4 - 10	0 - 5
Optimum Moisture Content (W) (%) *	14 - 22	10 - 16
Shear Strength: (i) Ø (º) (ii) Cohesion (kN/m²) (kPa)	 18 - 30 12 - 24	 28 – 38 ≤ 12
Permeability (cm/s)	≤ 1 x 10^{-4}	≥ 1 x 10^{-4}
MDD / (PI)(W)	2 - 11	13 - 28

* *Standard Proctor Values*

8.2 Embankment

Before construction of the homogeneous embankment commence, all surfaces of the dam solum (dam wall footprint) shall be cleared, grubbed and wetted in order to achieve proper compaction conditions at the merging zones. The footprint area to be cleared equates to approximately **8 500m²**.

The expected volume of earthfill required for the forming of the new embankment is estimated at approximately **16 400m³** (excluding cut-off trench).

8.3 Cut-off trench

It is recommended to construct a cut-off trench at the proposed dam wall centre line in order to provide proper founding conditions for the new embankment as well as to limit seepage through the dam wall. The assumed excavation depth is approximately **1.5m-2m**. Actual depth and extent of cut-off trench to be established on site once excavations had begun and to be approved by the Engineer.

Backfilling of the excavated trench section should be done with earthfill material having properties which meet the recommended criteria as provided in the table above.

The expected volume of the cut-off trench section is preliminary estimated at approximately **2 400m³**.

8.4 Filters and drains

Because of the size and height of the proposed dam (i.e. <5m) no internal filter or drainage systems are specified.

8.5 Compaction

The embankment must be compacted to an overall average minimum of 98% standard Proctor density at 2% wet of optimum moisture content (OMC). The thickness of the layers which are to be compacted should not exceed 200mm on placing. It is further suggested that a pad-foot roller be used during construction.

8.6 Slope stability / analysis

Slope stability analysis will be conducted during construction, once the final embankment material properties have been determined and samples tested for internal friction angles and cohesion, and consolidated drained (CD) tri-axial testing has been conducted. It is not expected that the results of the analysis will have a significant impact on the designed slope gradients.

8.7 Slope Protection

It is highly recommended that after the proposed construction works, the entire embankment shall be protected with a suitable indigenous grass cover, on both the upstream and downstream slopes (hydro-seeding can be applied).

9 SPILLWAY

It is required that the dam shall be equipped with a service spillway, on the embankment crest section, in order to provide for human and mechanical error (i.e. pumps not controlled and switched off in time or closing mechanisms malfunctioning).

A brick masonry and concrete rectangular box spillway on the embankment crest, with a chute constructed against the downstream slope section is proposed. The dimensions of the spillway are as indicated on the drawings attached under ***Appendix C*** and will consist of an overflow base width of **3m** with an available freeboard of **0.5m**. See Figure 9-1 below for a typical example.

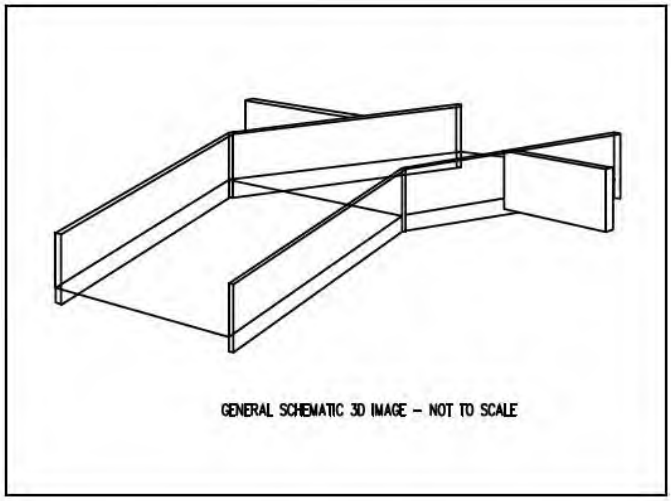


Figure 9-1 : Schematic of proposed service spillway

10 OUTLET WORKS (PIPES)

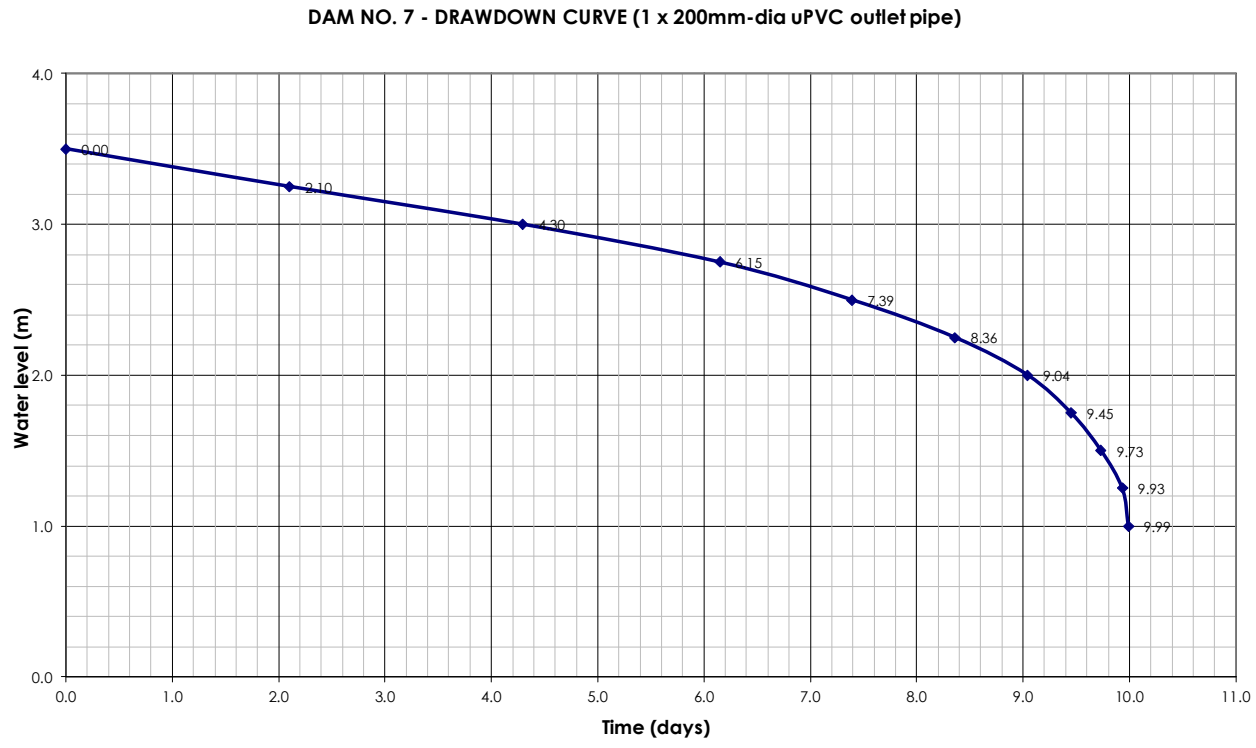
The proposed dam will be equipped with a 200mm diameter HDPE (Class 8) outlet pipe, encased in reinforced concrete. The outlet pipe will be equipped with a similar sized downstream gate valve closing mechanism. This will enable the release of water for irrigation as well as scouring purposes and to allow for emergency drawdown.

The exact position and invert level of the pipe will be specified by the Engineer during construction and will be included in the “as-built” drawings. The pipe is expected to be positioned in the northwest corner of the embankment, approximately 1,0m above the dam’s basin level (Refer to drawing D-002, ***Appendix C***). The outlet pipe exit, and valve will be protected by means of a brick masonry structure, as per detail drawings attached.

The outlet pipe of Dam No. 7 will have a total length of approximately **28m** and will be encased in reinforced concrete, as per drawing details.

Anticipated time to draw down the dam to different percentages of water depth between FSL and the pipe intake level (may change depending on final pipe position and level) are as follows.

Level	Days
90%	2.10
80%	4.30
60%	7.39
10%	9.93



11 QUALITY CONTROL

Quality control measures during the construction period will include the analysis of soil samples and compaction control tests, as well as concrete cube testing at the outlet works.

The APP will visit the site at least twice per month to evaluate the following.

- Core trench foundation
- Spillway position
- Compaction and materials

The following standardised specifications are applicable to small dam construction.

- SABS 1200 AD General (small dams)
- SABS 1200 C Site Clearance
- SABS 1200 DE Small Earth Dams
- SABS 1200 DK Stone pitching / Gabions and Reno Mattresses
- SABS 1200 GA Concrete (small works)
- SABS 1200 L Medium Pressure Pipelines

12 SCHEDULE OF QUANTITIES / PRELIMINARY COST ESTIMATE

Based on a detailed Schedule of Quantities and market related rates, the estimated cost for the construction of the proposed Dam No. 7 is summarized as follows.

SCHEDULE OF QUANTITIES: SUMMARY			
CONSTRUCTION COSTS OF PROPOSED DAM NO. 7			
SECTION A:	GENERAL SMALL DAMS (AD)	R	154 965.10
SECTION B:	SMALL EARTH DAMS (DE)	R	1 118 040.00
SECTION C:	CONCRTE (SMALL WORKS) (GA)	R	44 960.00
SECTION E:	MEDIUM PRESSURE PIPE LINES (L)	R	81 901.00
SECTION F:	MISCELLANEOUS	R	54 750.00
SUB-TOTAL FOR PRICED ITEMS		R	1 454 616.10
10% CONTINGENCIES		R	145 461.61
SUB TOTAL		R	1 730 042.81
15% VAT		R	259 506.42
CARRIED FORWARD		R	1 989 549.23

See ***Appendix D*** for a detailed priced schedule of quantities by the Engineer. A copy of this, without rates, will be included in the Tender Document to be priced by potential Contractors.

13 SAFETY OF EXISTING DEVELOPMENT DOWNSTREAM

A search of recent topographical maps as well as satellite imagery (as supplied by Google Earth) indicates that there are no infrastructure or development within the prescribed downstream flood zone which will be affected by a dambreak flood. The dam will be constructed (off-channel) near the left bank of the Sterkfontein River and will have a maximum wall height of lower than 5m.

Hence, it is recommended that the dam be regarded as a dam without any safety risk.

14 CONCLUSIONS AND RECOMMENDATIONS

- It is the intention of the owner to construct an off-channel storage dam for irrigation purposes.

- A site visit with topographical survey and basic geotechnical assessment was conducted on 19 February 2020 by Mr. M.F. Joubert (APP) of the firm PG Consulting Engineers.

- Prior to construction, it is recommended to conduct a proper geotechnical investigation with material testing.

- It will be technically feasible to construct an earthfill dam of roughly **52 000m^3** storage capacity with a wall height of approximately **4.8m** at the identified site. The dam embankment is estimated to be **354m** in length.

- The scope of work for the construction of the proposed Dam No. 7 will consist briefly of the following.

    - Clearing and grubbing of entire dam solum (footprint).
    - Excavation and preparation of cut-off trench along the embankment centre line.
    - Excavation and foundation preparation for concrete encased outlet pipe.
    - Construction and forming new homogeneous earthfill embankment.
    - Construction of service spillway on embankment crest and downstream slope.
    - Installation of 200mm diameter HDPE outlet pipe, encased in reinforced concrete, and equipped with a closing mechanism on the downstream side.
    - Installation of headwall protection structure at outlet pipe exit.
    - Grass establishment (hydro-seeding) on entire embankment after construction.

- This report is also to be used as a tool to support all applicable and required license applications in terms of the Water and Environmental Acts.

- The estimated cost for the construction of the proposed Dam No. 7 as described in the report is approximately **R1.99 million (including 10% contingencies and 15% VAT but excluding Engineering fees)**. The cost estimate is based on market related rates of similar projects in the Limpopo Province.

- With reference to the above, the cost per cubic meter of water stored in the dam, based on the construction cost, versus effective storage, can be given as **R38-26/m³**.

- Once construction has started, the foundation conditions and extend of the core trench will be re-evaluated.

- On commencement of construction, additional materials testing will be conducted in order to ensure continued quality control and to confirm material suitability and availability.

- A slope stability analysis will be conducted, based on the final sourced material properties. This will be forwarded to the Dam Safety Office for record purposes.

- There is no infrastructure or development within the prescribed downstream flood zone which will be affected by a dambreak flood. The dam will be constructed (off-channel) near the left bank of the Sterkfontein River and will have a maximum wall height of lower than 5m. Hence, it is recommended that the dam be regarded as a dam without any safety risk.

- All relevant authorizations, approvals and licenses from DWS and LEDET in terms of the various Acts are still required.

LIST OF APPENDICES

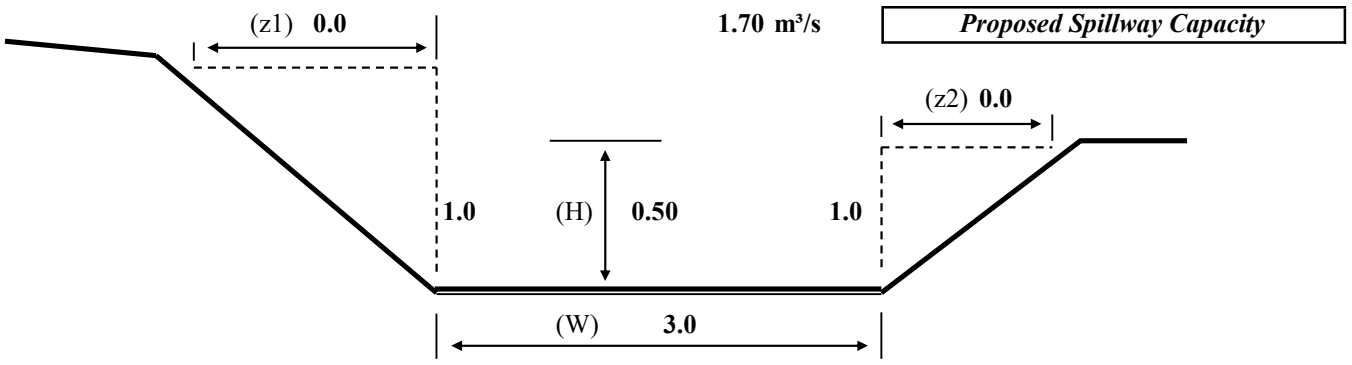
APPENDIX A: GOOGLE AERIAL IMAGE
APPENDIX B: CALCULATION SHEETS
APPENDIX C: CONSTRUCTION DRAWINGS (x3)
APPENDIX D: SCHEDULE OF QUANTITIES

APPENDIX A


Dam No. 7
R33
Vaalwater
Google Earth
Image © 2020 CNES / Airbus
© 2020 AfriGIS (Pty) Ltd.
© 2020 Google
N
8 km

APPENDIX B

CALCULATION OF THE MAXIMUM DISCHARGE CAPACITY OF DAM NO. 7 SPILLWAY IN m³/s (On crest) (USING THREE (3) METHODS)



MEASUREMENTS:

z1 - side slope to 1	0.00	Section area (m²)	1.5
z2 - side slope to 1	0.00	Velocity (m/s)	**1.13**
H - total freeboard available (m)	**0.50**		
W - width of spillway control point (m)	3.0		

Q - CALCULATIONS:

equation: Q1 = 4.43k (h^0.5) (H - h) ((B + z (H - h)) *where k = 0.90*

equation: h = (3 (2zH + B) - (16z^2.H^2 + 16zBH + 9B^2)^0.5) / 10z

with: h (in meter) =

with: **Q1** (in cub.m./sec.) =

equation: Q2 = a.L.H^1.5 + 1.35z.H^2.5 *where a = 1.60*

with: **Q2** (in cub.m./sec.) = **1.70**

equation: Q3 = C.Le.H^1.5 *where Le = L + 0.9zH* *and C = 1.60*

with: **Q3** (in cub.m./sec.) = **1.70**

Average Q ((Q1+Q2+Q3)/3) in cub.m./sec. = **1.70**

APPENDIX C

LOCAL SURVEY BY PG CONSULTING ENGINEERS

SERVICE SPILLWAY POSITION - SEE DETAILS ON DRW 003

OUTLET PIPE POSITION

MOKOLO RIVER 30m BUFFER ZONE

MOKOLO RIVER 1:100-YEAR FLOOD EXTENT

DAM BASIN
NOC LEVEL - 1059.5 m
FSL - 1059.0 m
GROSS STORAGE CAPACITY - 51 331m^3
FULL SUPPLY AREA - 17 252 m^2
CUT/FILL VOLUME - 16 400 m^3

ORIGINAL SIZE A3

AMENDMENTS

NR.	DATE	APPROVED	DESCRIPTION	PAR.

NOTES:

GENERAL NOTES:
1. ALL WORK MUST COMPLY WITH THE BY-LAWS AND "SPECIFICATIONS" OF THE LOCAL AUTHORITY, NATIONAL" BUILDING REGULATIONS AND SABS 1200.
2. ALL DIMENSIONS AND LEVELS SHALL BE CHECKED ON SITE BEFORE WORK COMMENCES AND ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IN WRITING.
3. THE ENGINEER WILL ASSIST THE CONTRACTOR IN "STAKING LINES, WHERE AFTER THE CONTRACTOR" SHALL TAKE OVER ALL SETTING OUT PEGS AND SURVEY BEACONS AND MAINTAIN THEM DURING THE CONSTRUCTION PERIOD.

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PASSIONATE ABOUT DAMS

DESIGNED	DRAWING CHECKED
MS MULDER	MF JOUBERT
CHECKED	DRAWN
MF JOUBERT	MS MULDER
APPROVED	SIGNATURE
MF JOUBERT	

Pr. No. 201670207

JOE KLOPPERS - DAM 7

Project

PLAN LAYOUT

Plan Description

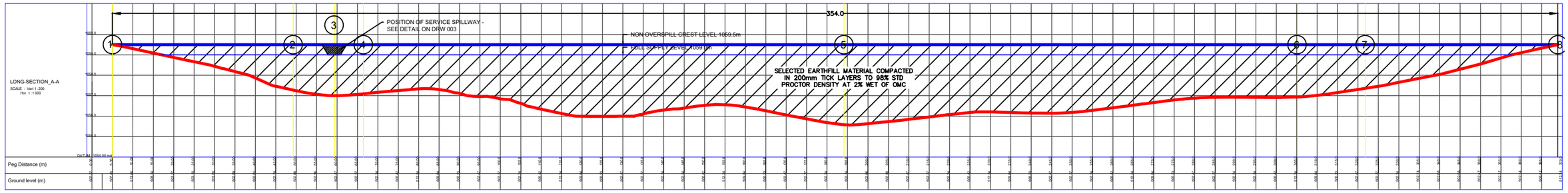
DATE	SCALE
16/04/2020	1:1 000

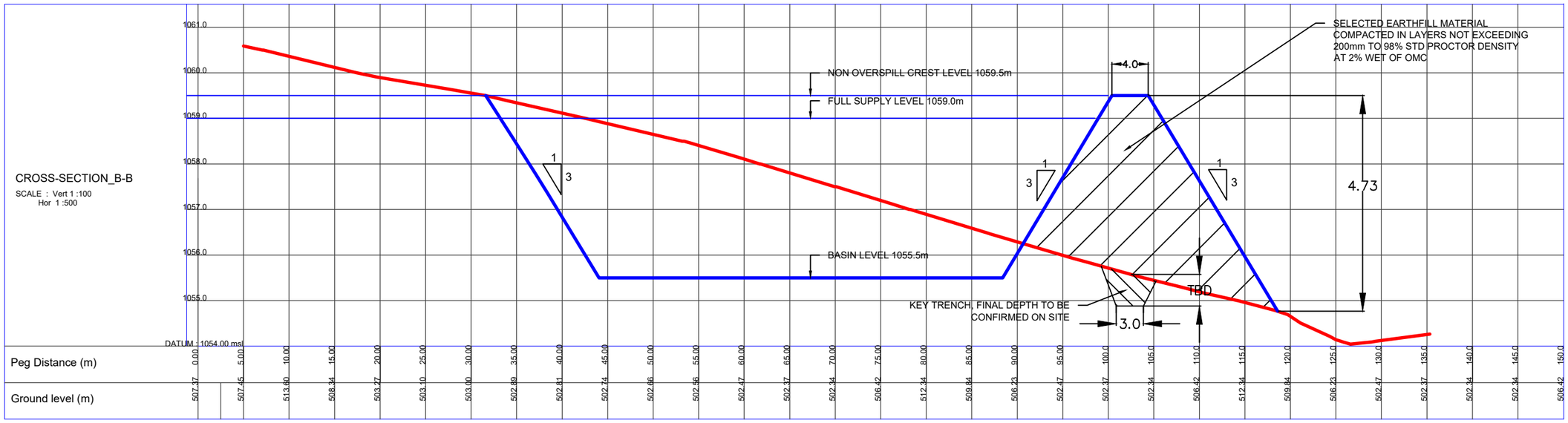
DRAWING NUMBER: D-001

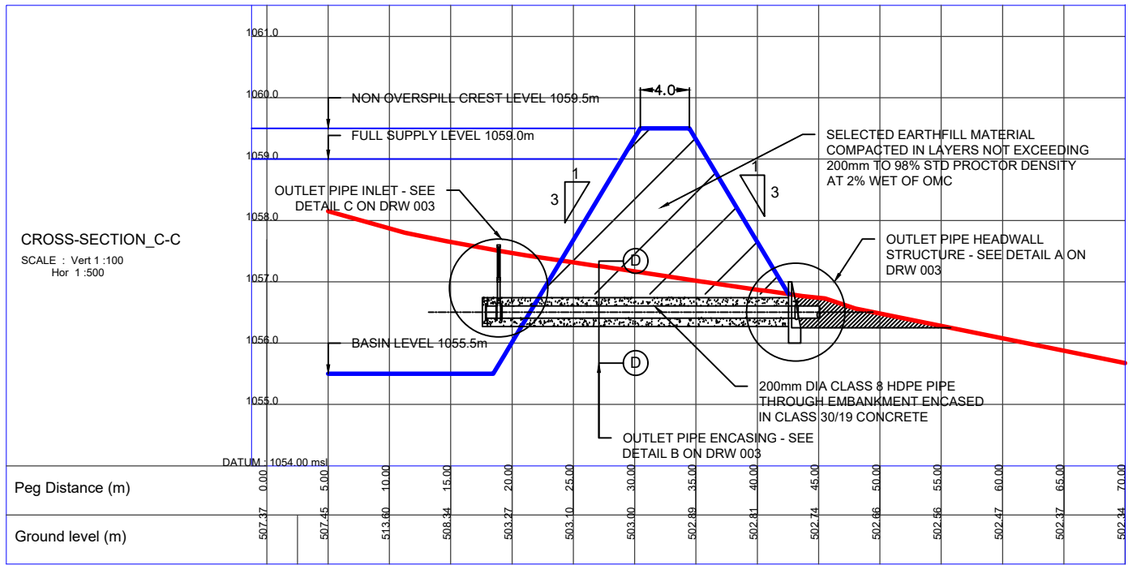
REVISION NO: A

PROJECT NUMBER: 074

LOCAL SURVEY BY PG CONSULTING ENGINEERS







0 5 10 15 20 30 50mm

ORIGINAL SIZE A3

AMENDMENTS				
NR.	DATE	APPROVED	DESCRIPTION	PAR.

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CHECKED	DRAWN
MF JOUBERT	MS MULDER
APPROVED	SIGNATURE
MF JOUBERT	
Pr. No. 201670207	

JOE KLOPPERS - DAM 7

Project

SECTIONS

Plan Description

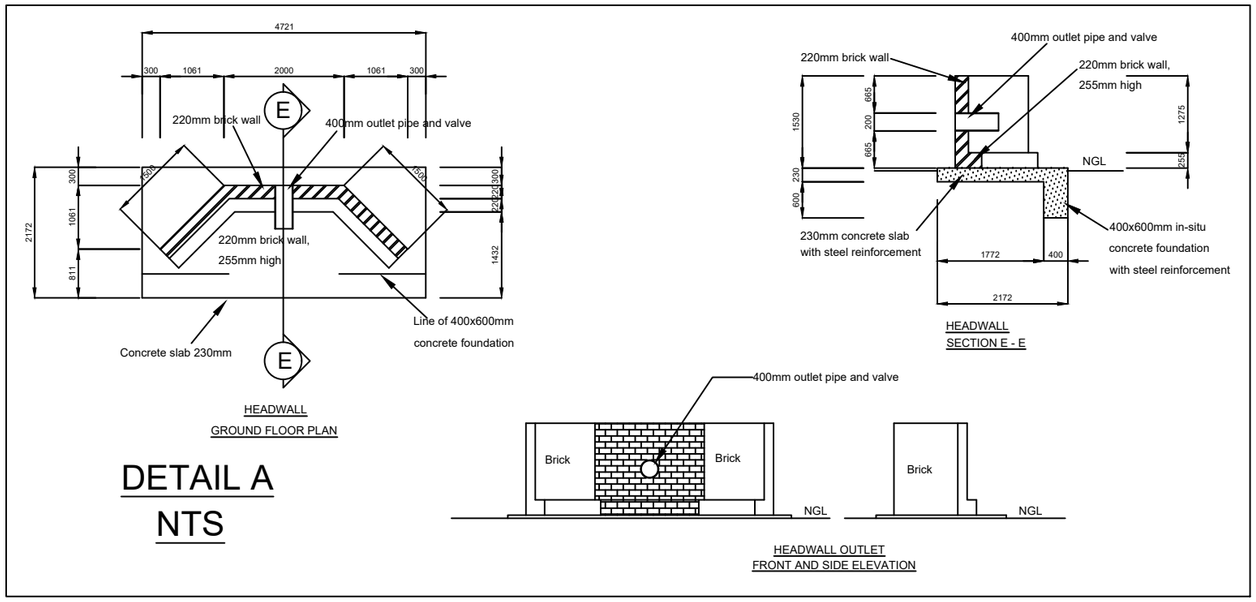
DATE	SCALE
16/04/2020	AS SHOWN

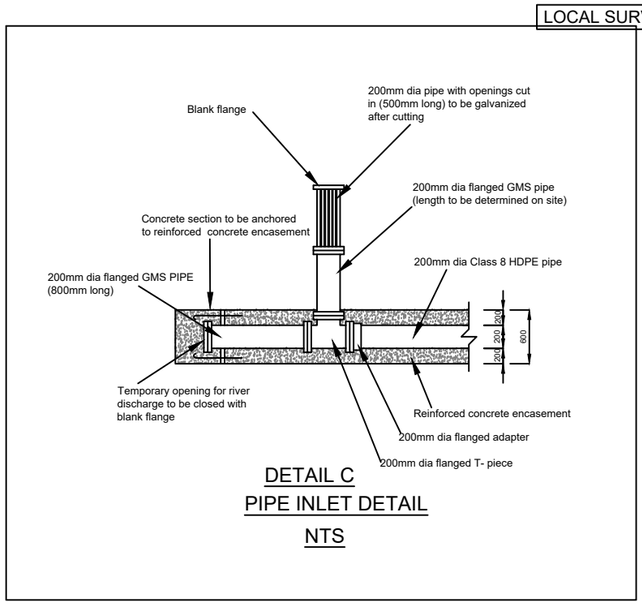
DRAWING NUMBER: D-002

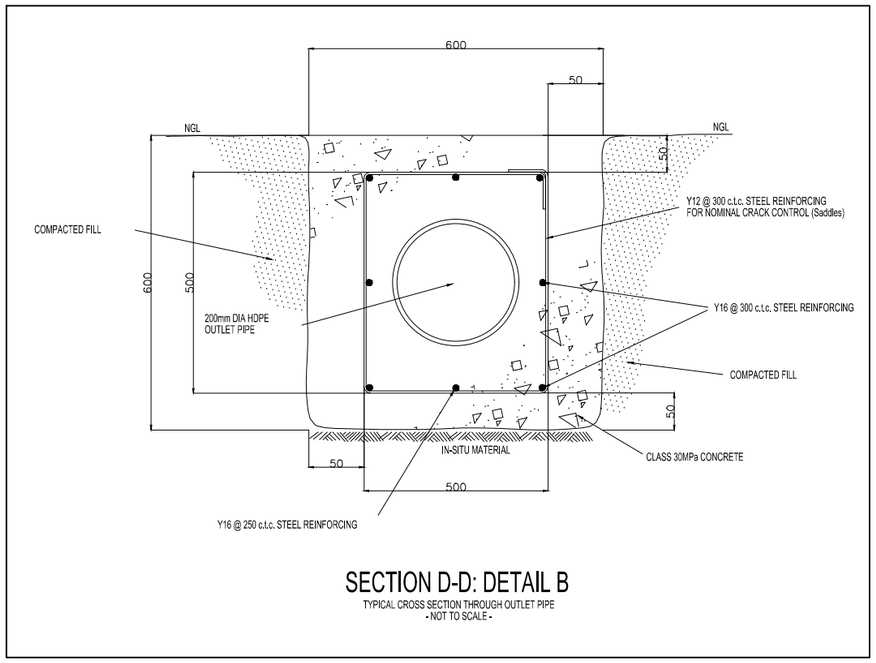
REVISION NO: A

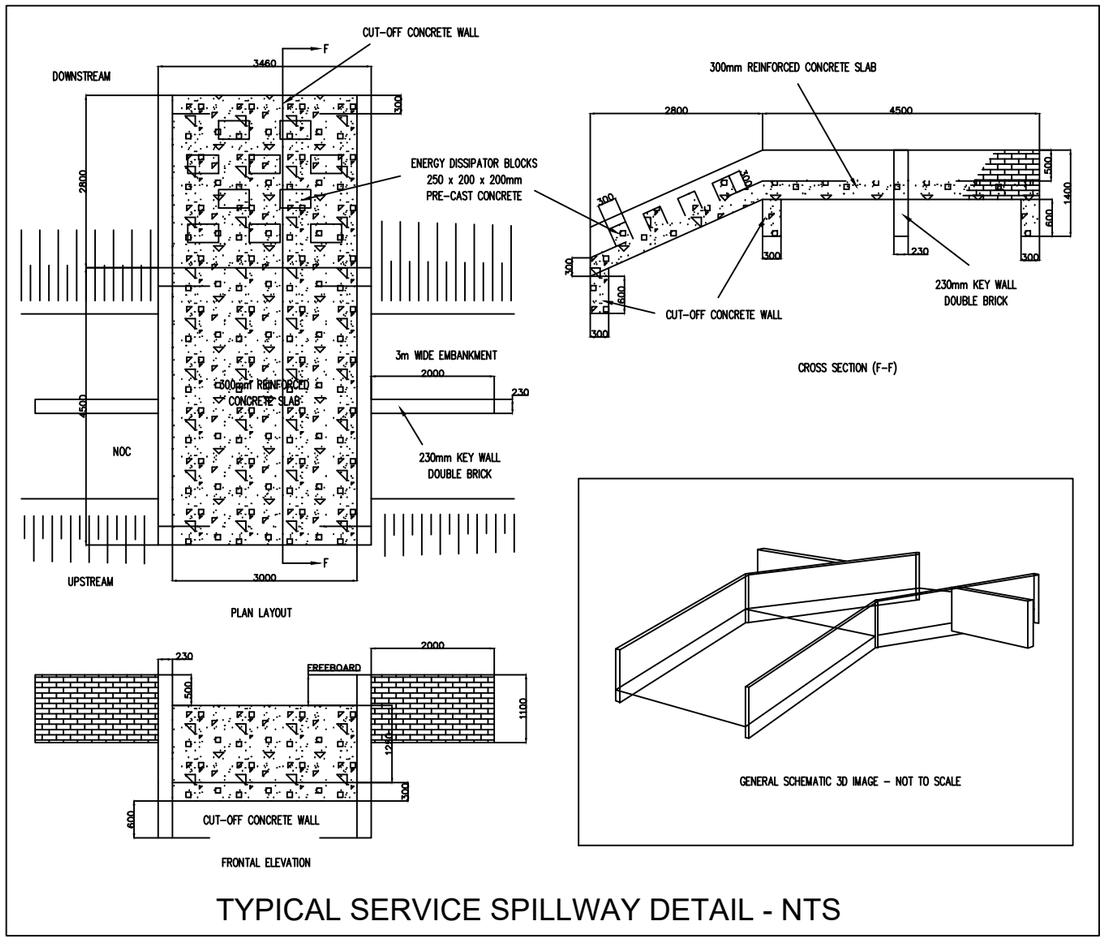
PROJECT NUMBER: 074

LOCAL SURVEY BY PG CONSULTING ENGINEERS









0 5 10 15 20 30 50mm

ORIGINAL SIZE A3

AMENDMENTS				
NR.	DATE	APPROVED	DESCRIPTION	PAR.

NOTES:

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CHECKED	DRAWN
MF JOUBERT	MS MULDER
APPROVED	SIGNATURE
MF JOUBERT	
Pr. No. 201670207	

JOE KLOPPERS - DAM 7

Project

SECTIONS

Plan Description

DATE	SCALE
16/04/2020	N.T.S
DRAWING NUMBER	
D-003	
REVISION NO:	A
PROJECT NUMBER	074

APPENDIX D

SANS SCHEDULE OF QUANTITIES

COMPILED: 16 APRIL 2020

CONSTRUCTION OF PROPOSED DAM NO. 7

Special Note:

Item No.	Payments Refers	Short Description	Unit	Quantity	Rate	Amount
		SECTION A: PRELIMINARY AND GENERAL				
A 1	SABS 1200AD	**GENERAL (SMALL WORKS)**				
A 1.1	8.3	**FIXED CHARGE ITEMS**				
A 1.1.1	8.3.1	1. Contractual Requirements other than Contract Insurance's	Sum	1		
		2. Contract Insurances	Sum	1		
A 1.1.2	8.3.2	Establish Facilities on Site				
A 1.1.2.1	8.3.2	Facilities for Contractor (SABS 1200 AB)				
		a. Office and storage sheds	Sum	1		
		b. Living accommodation	Sum	1		
		c. Ablution and latrine facilities	Sum	1		
		d. Tools and equipment	Sum	1		
		e. Water supplies, electrical power and communication	Sum	1		
		f. Control of water on site (sub-surface, surface and river flow)	Sum	1		
		g. Access	Sum	1		
		h. Plant	Sum	1		
		(i) Earthmoving and compacting plant	Sum	1		
		(ii) Other Plant. (The Contractor shall state the type of plant)	Sum	1		
A 1.1.3	8.3.3	Other Fixed Charge Obligations	Sum			
A 1.1.4	8.3.4	Remove Engineer's and Contractor's Site Establishment on completion	Sum			
A 1.1.5	PAR SPEC	Health and Safety Requirements (Including all safety gear for the contract period)	Sum			

Item No.	Payments Refers	Short Description	Unit	Quantity	Rate	Amount
A 1.2	8.4	**TIME RELATED ITEMS**				
A 1.2.1	8.4.1	1. Contractual Requirements other than Contract Insurance's	Sum	1		
		2. Contract Insurance's	Sum	1		
A 1.2.2	8.4.2.1	Operate and Maintain Facilities on the Site (SABS 1200AB)				
A 1.2.2	8.4.2.2	Facilities for Contractor for duration of Construction				
		a. Office and storage sheds	Sum	1		
		b. Living accommodation	Sum	1		
		c. Ablution and latrine facilities	Sum	1		
		d. Tools and equipment	Sum	1		
		e. Water supplies, electrical power and communication	Sum	1		
		f. Control of water on site (sub-surface, surface and river flow)	Sum	1		
		g. Access	Sum	1		
		h. Plant	Sum	1		
		(i) Earthmoving and compacting plant	Sum	1		
		(ii) Other Plant (The Contractor shall state the type of plant)	Sum	1		
A 1.2.3	8.4.3	Supervision	Sum	1		
A 1.2.4	8.4.4	Company and Head Office Overhead Costs	Sum	1		
A 1.2.5	8.4.5	Other time related obligations	Sum	1		
A 1.3	PAR SPEC	HEALTH AND SAFETY				
A 1.3.1	7.2	Construction Safety Officer	No	1		
A 1.3.2		Health & Safety Plan	Sum	1		
A 1.3.3		Personal Protective Equipment (PPE) *for duration of the contract*	Sum	1		

Item No.	Payments Refers	Short Description	Unit	Quantity	Rate	Amount
A 1.4	SABS 1200AD	**SUMS STATED PROVISIONALLY BY ENGINEER (Included in P&G)**				
A 1.4.1		For work to be done by other concerns;				
		Miscellaneous				
A 1.4.1.1		a. Testing of materials by nominated laboratory - only where directed by Engineer (Provisional). Note that this item does not relieve the Contractor of his general obligations as regards testing as required by the specifications.	Sum	1	R 5 000.00	R5 000.00
A 1.4.1.2		b. Contractor's overheads, charges and profit on Item above	%			
A 1.4.2		For work to be done by Engineer;				
A 1.4.2.1		a. Compilation of Construction Completion Report with Certificate	Sum	1	R 10 000.00	R10 000.00
A 1.5	8.8.5	**SURVEY COSTS**				
A 1.5.1		a. "As built" survey (as directed by the engineer, provisional)	Sum	1	R 10 000.00	R10 000.00

Item No.	Payments Refers	Short Description	Unit	Quantity	Rate	Amount
B 1	SABS 1200 PSDE	**SECTION B: SMALL EARTH DAMS (DE)**				
B 1.1	8.3.1	**SITE CLEARANCE AND PREPARATION**				
B 1.1.1	8.3.1.1	Clear and strip area to be covered by:				
		a. Dam solumn	m²	8 500	R 7.50	R63 750.00
		b. Borrow areas	m²	13 600	R 7.50	R102 000.00
B 1.1.2	8.3.4	Preparation of exposed surfaces to be covered by;				
		a. Cut-off trench	m²	1 062	R 15.00	R15 930.00
B 2.1		**EXCAVATION**				
B 2.1.1	8.3.3(b)	Material suitable for embankment From essential excavation and place in embankment, material from:				
		a. Cut-off trench;				
		- soft excavation	m³	2 400	R 20.00	R48 000.00
		- hard rock excavation / boulder removal	m³	Rate only		
		b. Outlet works (pipe trench)				
		- intermediate excavation	m³	12	R 30.00	R360.00
		c. Borrow area (soft excavation) (cut)	m³	16 400	R 20.00	R328 000.00
		-intermediate excavation	m³	Rate only		
	8.3.3(c)	Material not suitable for embankment From essential excavation and place in stockpile or spoil, material from:				
		d. Borrow area (soft excavation) (cut)				
		-soft excavation	m³	4 500	R 20.00	R90 000.00
		-intermediate excavation	m³	Rate only		
B 2.2	8.1.2 (a)	**EMBANKMENT (FORMING)**				
	8.3.5	Form embankment and level embankment crest to join with spillway structure				
B 2.2.1		Using material from designated borrow area / stock piles (inclusive of core zone) (fill) *All material to be compacted to 98 % Proctor Density @ 2% wet of OMC*	m³	16 400	R 25.00	R410 000.00
B 2.2.2		Compacted Backfill (Core Trench)	m³	2 400	R 25.00	R60 000.00
C 1	SABS 1200 PSGA	**SECTION C: CONCRETE SMALL WORKS (GA)**				
C 1.1		Concrete encasing for outlet pipe Class 30/19 concrete , inclusive of shuttering	m³	10.8	R 3 200.00	R34 560.00
C 1.2		Reinforcing				
		a) Outlet works (outlet pipe) - 12mm to 16mm	ton	0.65	R 16 000.00	R10 400.00

Item No.	Payments Refers	Short Description	Unit	Quantity	Rate	Amount
D 1	SABS 1200 L	**SECTION D: MEDIUM PRESSURE PIPE LINES (VALVES, OUTLET PIPES, ETC)**				
D 1.1	8.2.1	Supply, install and test of the following pipes;				
D 1.1.1		a) 315mm dia uPVC Class 9	m	28	R 442.00	R12 376.00
D 1.2	8.2.2	Supply, install and test of the following fittings and pipe specials;				
D 1.2.1		a) 315mm dia flange adapter	No	2	R 4 425.00	R8 850.00
D 1.2.2		b) 315mm dia gate valve	No	1	R 24 750.00	R24 750.00
D 1.2.3		c) 315mm dia x 500mm flanged pipe *	No	2	R 5 550.00	R11 100.00
		** One to be groove cutted and galvanized for intake*				
D 1.2.4		d) 315mm dia x 315mm flanged pipe	No	2	R 5 550.00	R11 100.00
D 1.2.5		e) 315mm dia T-piece	No	1	R 7 125.00	R7 125.00
D 1.2.6		f) 315mm dia blank flange	No	2	R 3 300.00	R6 600.00
E 1		**SECTION E: MISCELLANEOUS**				
E 1.1		Construction of pipe outlet structure				
		- Erect complete 230mm brick wall outlet structure *(refer to drawings)*	Sum	1	R 5 000.00	R 5 000.00
E 1.2		Construction of service spillway structure				
		- Construct complete brick masonry and concrete service spillway Inclusive of excavation, preparation and slab reinforcement *(refer to drawings for detail)*	Sum	1	R 15 000.00	R 15 000.00
E 1.3		Landscaping				
		Landscaping of areas around newly formed dam	Sum	1	R 5 000.00	R 5 000.00
E 1.4		Grass Protection				
		Hydroseeding of embankment downstream slope	m²	3 500	R 8.50	R 29 750.00
E 1.5		Water diversion works (If applicable)	Sum		N/A	

CONTRACT NO:

SCHEDULE OF QUANTITIES: SUMMARY

CONSTRUCTION COSTS OF PROPOSED DAM NO. 7

SECTION A:	GENERAL SMALL DAMS (AD)	R	154 965.10
SECTION B:	SMALL EARTH DAMS (DE)	R	1 118 040.00
SECTION C:	CONCRTE (SMALL WORKS) (GA)	R	44 960.00
SECTION E:	MEDIUM PRESSURE PIPE LINES (L)	R	81 901.00
SECTION F:	MISCELLANEOUS	R	54 750.00
SUB-TOTAL FOR PRICED ITEMS		R	1 454 616.10
10% CONTINGENCIES		R	145 461.61
SUB TOTAL		R	1 730 042.81
15% VAT		R	259 506.42
CARRIED FORWARD		R	1 989 549.23

APPENDIX D_4

STRUCTURAL MAINTENANCE PLAN

STRUCTURAL MAINTENANCE PLAN

JOE KLOPPERS DAMS (VAALWATER)

PREPARED FOR

PREPARED BY

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Project No: 074/2019

APRIL 2020

DOCUMENT CONTROL SHEET

Compiled and approved by:	 Francois Joubert (Pr Tech Eng) APP	**2020/04/24** Date
Accepted by:	On behalf of Client	Date

Revision	Description	Date Issued	Revision by:

DISTRIBUTION LIST

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Structural Maintenance Plan for Joe Kloppers Dams (Vaalwater)

CONTENTS

LIST OF ABBREVIATIONS

APP	Approver Professional Person (Dam Engineer)
EIA	Environmental Impact Assessment
FSL	Full supply level
masl	Meters above sea level
NOC	Non-overspill crest
NWA	National Water Act, Act 36 of 1998
WULA	Water Use Licence Application

1. OBJECTIVES OF THIS REPORT / PLAN

The objectives of this structural maintenance plan are to:

- Provide guidelines to the owner for the maintenance of a dam to ensure the safe usage thereof during its full lifespan.

- It gives an overview of routine inspections to be carried out and records which should be kept.

- Make recommendations to the monitoring of a dam.

It should be stressed that regular inspections and regular maintenance are considered essential for the successful operation of a dam.

The Structural Maintenance Plan should be updated when and as required. Revisions should be done during any changes of information and or events at a dam. The revision information should be noted on the second page of this report.

It is the sole responsibility of the owner to keep the Plan up to date. All changes to the Plan should have the owner's and APP's authorisation.

It should be stressed that regular inspections and regular maintenance are considered essential for the success of this Structural Maintenance Plan.

2. INTRODUCTION

This Structural Maintenance Plan covers the dams on the properties of Joe Kloppers. The properties involved are Boschpoort 249 KQ and Doornspruit 215 KQ. These farms are situated approximately 18km northwest of the town of Vaalwater, in the Waterberg District of the Limpopo Province. The dams are used as balancing dams for storing water for irrigation purposes. The table below gives a summary of the seven (7) dams belonging to Joe Kloppers. Dam No. 7 is a proposed new dam. The aerial image below the table shows the dam locations. Also refer to Appendix A in this regard.

Vaalwater Dams - Joe Kloppers						
No.	**Dam ID**	**Farm name**	**Date Built**	**Volume**	**Size**	**Coordinate**
1	Dam 1 Boschpoort	Boschpoort 249 KQ Ptn 3	2015	75 000m³	20 496m²	S 27.956499° E -24.229179°
2	Dam 2 Doornspruit A	Doornspruit 215 KQ Remainder (Ptn 0)	2017	55 000m³	15 100m²	S 27.955223° E -24.207992°
3	Dam 3 Interfokus	Doornspruit 215 KQ Remainder (Ptn 0)	2017	110 000m³	37 801m²	S 27.950390° E -24.205807°
4	Dam 4 Doornspruit A	Doornspruit 215 KQ Remainder (Ptn 0)	2013 / 2017	10 000m³	5 848m²	S 27.964083° E -24.214462°
5	Dam 5 Doornspruit B	Doornspruit 215 KQ Remainder (Ptn 0)	2010	110 000m³	30 945m²	S 27.965514° E -24.214364°
6	Dam 6 Doornspruit C	Doornspruit 215 KQ Remainder (Ptn 0)	2011	50 000m³	24 098m²	S 27.967714° E -24.214592°
7	Dam 7	Doornspruit 215 KQ Ptn 2	New proposed	52 000m³	17 250m²	S 27.958751° E -24.197824°

Figure 1-1: Google Aerial Image (showing dam locations)

3. LEGISLATION

In terms of the dam safety regulations (Government Notice R.139 of 24 February 2012), as promulgated by the Minister of Water and Sanitation, read in conjunction with Chapter 12 Section 123 of the new National Water Act, 1998 (Act 36 of 1998), the owner of a dam with a safety risk is required to operate and maintain the dam in a safe and responsible manner.

The purpose of this Plan is to provide guidelines to the owner for the general operation and maintenance of a dam to ensure the safe usage thereof during its full lifespan. It gives an overview of routine inspections to be carried out and records which should be kept (refer to Appendix B).

It should be stressed that regular inspections and regular maintenance are considered essential for the successful operation of a dam.

4. MAINTENANCE WORK AND UPKEEP OF A DAM

It is good practice to reserve a certain month of the year to carry out maintenance work on the dam. Serious problems should however receive immediate attention. Work which is of a critical nature should be done under the supervision of an approved professional person (APP) or according to his instructions.

It is recommended that the month of June is earmarked for maintenance work.

Dam wall / embankment

It may be necessary to moderately raise and fill in low spots on the non-overspill crest from time to time, so as to maintain the freeboard of the dam. Low points should also be filled to prevent rainwater from accumulating in pools or vehicle tracks on the wall crest. Filling should be carried out using suitable material, compacted in thin layers.

The dam wall as well as a 10m-wide strip downstream of the toe should be cleared from trees, shrubs, undergrowth and weeds. Trees with a trunk diameter of more than one hundred millimetres should only be removed under supervision of the APP.

The dam wall should be cleared from all ant nests and rodents (moles, mice, meercats, iguanas, etc).

Open cracks, sinkholes and pipe tunnels on the crest and the upper half of the dam wall should be filled with a liquid bentonite mixture under the supervision of the APP. Holes and pipe tunnels on the lower half of the downstream slope should be filled with a sand/gravel mixture. However, if there is a presence of flowing water (strong seepage) from the holes, a filter and drainage system should be installed under the supervision of the APP.

Slope protection must be maintained. It may be necessary to establish grass on the downstream slope and to cut, fertilise and irrigate frequently. Runner type grass like Couch or Kikuyu is better than tuft for this purpose. Erosion should be repaired as soon as possible

before it becomes a problem. On the upstream slope it may be necessary to repair erosion or subsidence of rip-rap.

Concrete and masonry structures

Undercutting or erosion at the toe of these structures should be repaired before the stability of the structure is impaired. The repair work should be done using good quality concrete.

Damage of concrete surfaces should be repaired before serious erosion occurs.

Pressure relief holes should be kept in a working condition by knocking off calcite deposits with a steel rod. Care should be taken not to compact the deposits in the hole and where possible loose material should be blown out by air or water.

Where necessary grouting or filling of cracks should be considered in consultation with the APP. When possible sealing of leakage should be carried out using a suitable sealant on the upstream side. Contraction joints should be filled with an approved compressible sealant where necessary in order to prevent ingress of water and impurities. The above work is considered to be of a specialised nature and should be done under supervision of an APP.

The interface between concrete and earthfill structures deserves special mentioning. Gaps between the earthfill and the concrete structure should be filled with a suitable material, under the supervision of the APP. Cracks in the concrete structure through which water and earthfill material can migrate, should also be repaired according to the APP's instructions.

Spillway

Plant growth such as trees, shrubs and reeds, which obstruct and decrease the spillway capacity, should be cleared from the spillway channel.

Where pipes are used as spillways, they should be rodded and cleared on a regular basis to keep them unblocked.

Erosion of the spillway channel should be repaired as soon as possible by backfilling with a suitable earthfill material, which should be, compacted in thin layers (in the case of by-wash earth spillways), concrete or rip-rap depending on circumstances. Where necessary cultivation of grass should be maintained by replanting, regular cutting and irrigation. Undercutting or damage to concrete or masonry structures should be repaired as soon as possible. An APP should be consulted if the damage is serious.

Downstream toe

Plant growth should be kept short in a strip with a minimum width of 10m downstream of the toe of the wall for access and to enable observation of any leakage or unusual conditions. Flow measuring points and manholes should be kept clean (where applicable). Measuring boxes and V-notch plates should be waterproofed in order to ensure that seepage could be accurately measured (if applicable).

Outlet works

Valves should be opened and shut at least four times per year (during routine inspections). Maintenance work such as painting of pipes, and servicing and lubrication of valves should be done regularly. These simple measures will prevent expensive repairs at a later stage. When the dam is empty and the intake structure is exposed, it should be cleaned and repaired if necessary.

HDPE liner

The HDPE liner should be inspected on a regular basis for signs of deterioration and damage. Damaged areas and cuts should be repaired by applying a HDPE patch and approved glue.

5. ROUTINE INSPECTIONS

Extent and inspection route

Routine inspections should be carried out every three (3) months by the dam owner or a competent person appointed by him. The required qualification for such a person is that he should be well acquainted with the contents of this Plan. Furthermore, this person should be alert and be endowed with sound judgement so that he/she will know when to call for assistance.

A routine inspection form (check sheet), which should be completed during each routine inspection, is enclosed in Appendix B2. If the space for detailed comments is inadequate, a separate sheet of paper should be used. The inspection form must then be signed by the observer and the owner or the person in control of the dam. Any changes in circumstances should be recorded, monitored and rectified, if necessary.

The inspection route to be followed should include the following.

The full length of the wall crest and toe, observation of upstream and downstream slopes, spillway crest and downstream spillway channel, outlet works as well as the area downstream of the dam wall. The different components of the dam to be inspected are discussed in more details below.

Dam wall / embankment

The slopes of the dam wall should be inspected for any sign of seepage, cracks, movement, erosion, ant nests and burrows by animals or reptiles. Plant growth on embankment slopes should be kept short in order to carry out a meaningful inspection.

The extent of wet patches, which appear on the downstream slope of the wall, should be marked with 700mm deep pegs in order to observe and note any changes, which may occur. The presence of seepage water should be watched, and the clarity observed for the presence of soil particles. The position relative to the crest and the distance along the crest should be

recorded. It is recommended that fixed reference beacons be installed along the wall crest for inspection purposes.

The position, width and length of significant cracks at any place on the dam wall should be marked and recorded. Longitudinal cracks (that is parallel to the centreline of the wall) less than 3,0m in length and not wider than 0,5cm are usually not of a serious nature. Transverse or diagonal cracks running from upstream to downstream or any rapid changing cracks should always be viewed with suspicion. The appearance, location and extent of any movement, erosion and caving should be observed and recorded. If survey beacons are disturbed, it should be mentioned.

Concrete and/or masonry dam wall or structures

The position, width and length of significant cracks should be marked with paint and changes be recorded. Relative movement at joints or cracks should be marked, measured and recorded. Sudden changes in the above regard can point at a serious condition and should be reported. Crumbling or unusual erosion of the concrete structures and earthfill should be inspected very carefully for cavities and cracks. Undercutting or erosion of the foundations of concrete structures can be critical to the stability and should be recorded and reported if of a significant extent.

Spillway

The whole spillway structure / pipes, spillway channel and sides up to where it joins the river should be inspected. Undesirable plant growth such as trees and shrubs should be recorded and removed. Erosion of the spillway channel and undercutting of concrete or brickwork structures should be recorded and reported if of a serious nature.

Downstream Area

A strip with a width equal to twice or three times the wall height, measured from the toe of the dam should be inspected. The presence of seepage water, swamps, pools, cracks or any displacement and its position should be observed and recorded. Where necessary seepage water should be channelled to be gauged. The presence of trees and shrubs within 5m wide strip downstream of the toe of the wall should be recorded.

Outlet Works

The condition of the outlet pipes and valves should be inspected for signs of leakage and corrosion. Leakage within or outside the outlet works should be measured when the valve has been shut for at least a week and if no rain has fallen since the previous week. Valves should be opened and shut with each inspection to determine whether they function correctly. Also observe the vertical cracks in ancillary concrete structures. Erosion downstream of the outlet works should be recorded.

6. OPERATING PROCEDURES

The three-monthly routine inspections as described under Section 5, and the upkeep of records (see Appendices B1 and B2), constitute the first operating rule for a dam. There are, however, circumstances when the dam wall should be inspected daily or weekly.

At first filling as well as during the refilling of an empty dam after a drought period, the water level should preferably rise at a rate of no more than 1 000mm per day. If this is not possible, a record should be kept of the daily rise in the water level. During this period the dam wall should also be inspected visually once a day. Attention should be given to signs of leakage, movement of the wall and instability. The water level, at which leakage suddenly increases, should be recorded. The emergency plan should be consulted for a description of emergency situations and emergency procedures.

When the dam spills strongly, the spillway and outlet channel should be inspected daily for signs of significant erosion in the outlet channel and for possible undercutting of the toe of the wall.

It is good practice to visit the dam regularly (e.g. weekly) between routine inspections and carry out a brief visual inspection.

The regular flow of water through the spillway should be avoided if possible.

Compulsory releases for users downstream (where applicable) should be done as prescribed or necessary. If it becomes necessary to lower the water level during conditions affecting the safety of the dam, outlet valves should be opened fully, or pumps switched on and valves opened to achieve maximum rate.

For instream dams, when the dam overflows, it is good practice to open the outlet valves fully to remove some of the anaerobic water which accumulates at the deepest part of the dam basin.

7. ESSENTIAL MAINTENANCE PROCEDURES

A list of essential maintenance procedures is given below. These actions should be carried out on a monthly basis or as necessary.

- Grass and vegetation must be cut on a regular basis.
- Trees and scrubs must be removed from the embankment and spillway channels.
- Ant and rodent activities should be exterminated, and the nests and holes excavated and repaired on an ongoing basis.

8. DIRECTIONS FOR COMPLETION OF ROUTINE INSPECTION FORM

A competent person, who should be well acquainted with the contents of this Plan, should be appointed to carry out the routine inspections on a quarterly basis. A supply of blank routine inspection forms (check sheets) should always be available at the dam site. Fill in “yes”, “no”, “slightly”, “none”, “n/a”, “unchanged” etc where applicable on the form. Do not leave blank spaces.

Where unfavourable conditions exist, more particulars / detail should be furnished on the reverse side of the form or on separate pages, for example.

(i) **Cracks:** State cracks width, length and position.

(ii) **Hollows, subsidence and erosion:** Record extent, depth and position.

(iii) **Wet patches:** Record size and position.

The position should be indicated in chainage / distance with the aid of reference beacons or as the distance from a fixed point such as the spillway wall / outlet pipe etc. The distance upstream or downstream from the centreline of the wall should also be indicated. The description should be clear enough to determine the degree of change between subsequent inspections. Specific problems can be photo graphed.

The inspection route should cover the full crest length of the wall, toe of wall, spillway area and slopes. Observations should not merely be made from a distance. The downstream area includes a strip with a width equal to the wall height downstream of the toe of the wall. Valves should physically be opened and closed to see if they are in good working condition.

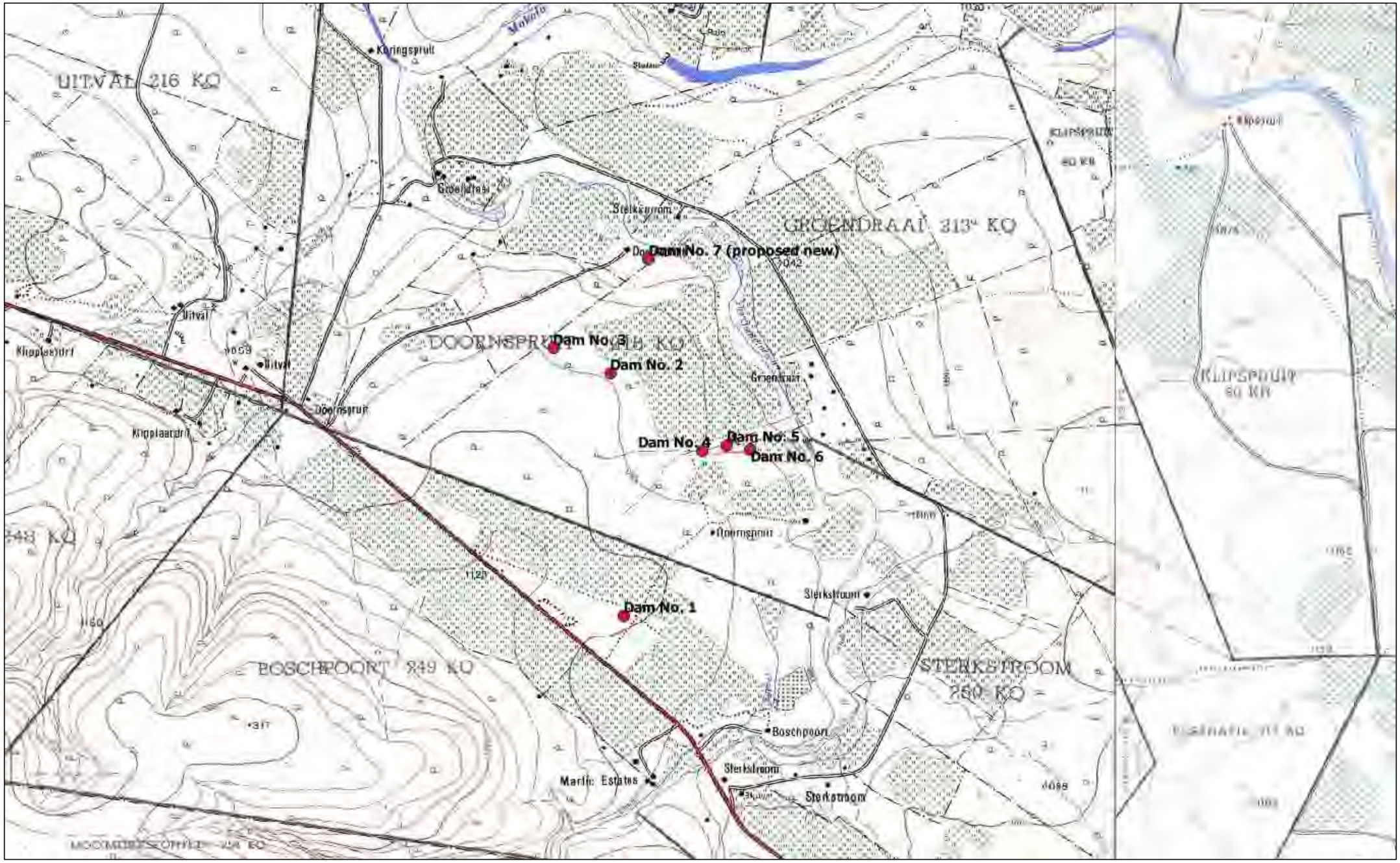
Completed inspection forms should be kept for record purposes and be shown (together with the record book) to the approved professional person during the five-yearly inspections.

A record book should also be kept for recording the items listed below. The list of items and frequencies suggested should be chosen to suit this specific dam.

Item	Frequency
Rainfall	Daily
Water level in dam	Weekly
Water level in dam during floods	Daily/hourly
Leakage or seepage (flow rate)	Weekly
Flow released by outlet works	Weekly/daily
Height of settlement beacons	Yearly
Repair works (Details of important repair work including the date should be recorded in the record book)	Ad hoc

APPENDIX A1:
1:50 000 Topographical Map

Appendix A1 – 1:50 000 Topographical Map



APPENDIX A2:

Google Aerial Image

Appendix A2 – Google Aerial Image

APPENDIX B1:

Inspection / Maintenance Frequency Schedule

APPENDIX B1 – INSPECTION / MAINTENANCE FREQUENCY SCHEDULE

	No	Component	Action	Frequency
A1. Upstream Slope	A1.1	Slope Protection	Report disruptions to design engineer.	3 Monthly
	A1.2	HDPE liner	Repair the damaged areas and cuts.	Monthly
	A1.3	Erosion	Repair as far as possible and institute preventative measures.	Monthly
	A1.4	Vegetation	Remove unwanted vegetation. Consult engineer before removing large trees.	3 Monthly
	A1.5	Signs of Movement, Settlement/Bulging	Mark area concerned and consult engineer. Monitor for any changes.	3 Monthly
	A1.6	Animal Burrows	Repair the workings. Consult engineer.	3 Monthly
	A1.7	Dispersive Soils	Report signs to engineer.	3 Monthly
	A1.8	Termites	Eradicate nests. Backfill old nests with bentonite/soil mixture.	3 Monthly
	A1.9	Cracks	Mark crack and report appearance to engineer. Monitor for changes.	3 Monthly
A2. Downstream Slope	A2.1	Slope Protection	As for A1.1	3 Monthly
	A2.2	Erosion	As for A1.3	Monthly
	A2.3	Vegetation	As for A1.4	3 Monthly
	A2.4	Signs of Movement, Settlement/Bulging	As for A1.5	3 Monthly
	A2.5	Animal Burrows	As for A1.6	3 Monthly
	A2.6	Dispersive Soils	As for A1.7	3 Monthly
	A2.7	Termites	As for A1.8	3 Monthly
	A2.8	Cracks	As for A1.9	3 Monthly
	A2.9	Seepage or Wet Area	Mark area concerned and report to engineer. Note the colour of any changes.	Weekly
	A2.10	Surface Drainage	Keep drainage channels free of obstructions.	Monthly
A3. Crest	A3.1	Erosion	As for A1.3	Monthly
	A3.2	Vegetation	As for A1.4	3 Monthly
	A3.3	Signs of Settlement	As for A1.5	3 Monthly

	A3.4	Animal Burrows	As for A1.6	3 Monthly
	A3.5	Dispersive Soils	As for A1.7	3 Monthly
	A3.6	Cracks	As for A1.9	3 Monthly
A4. Abutments and Toe Area	A4.1	Erosion	As for A1.3	Monthly
	A4.2	Vegetation	As for A1.4 – Keep 10m wide strip clear of all vegetation.	Monthly
	A4.3	Signs of Movement	As for A1.5	Monthly
	A4.4	Animal Burrows	As for A1.6	3 Monthly
	A4.5	Dispersive Soils	As for A1.7	3 Monthly
	A4.6	Cracks	As for A1.9	Monthly
	A4.7	Seepage	As for A2.9	Weekly
A5. Spillway and Channel	A5.1	Erosion	Monitor for signs of erosion. Report any sudden changes.	3 Monthly
	A5.2	Obstructions/Debris	Ensure that flow is unhindered / pipes unblocked.	Weekly

APPENDIX B2:

Example of Routine Inspection Form (Check Sheet)

APPENDIX B2 – EXAMPLE OF ROUTINE INSPECTION FORM (CHECK SHEET)

Dam name:											
Ref.	**Date**										
	Dam water level										
A1. Upstream Slope											
A1.1	Slope Protection										
A1.2	HDPE Liner										
A1.3	Erosion										
A1.4	Vegetation										
A1.5	Signs of Movement, Settlement/Bulging										
A1.6	Animal Burrows										
A1.7	Dispersive Soils										
A1.8	Termites										
A1.9	Cracks										
A2. Downstream Slope											
A2.1	Slope Protection										
A2.2	Erosion										
A2.3	Vegetation										
A2.4	Signs of Movement, Settlement/Bulging										
A2.5	Animal Burrows										
A2.6	Dispersive Soils										
A2.7	Termites										
A2.8	Cracks										
A2.9	Seepage or Wet Area										
A2.10	Surface Drainage										

A3. Crest											
A3.1	Erosion										
A3.2	Vegetation										
A3.3	Signs of Settlement										
A3.4	Animal Burrows										
A3.5	Dispersive Soils										
A3.6	Cracks										
A4. Abutments and Toe Area											
A4.1	Erosion										
A4.2	Vegetation										
A4.3	Signs of Movement										
A4.4	Animal Burrows										
A4.5	Dispersive Soils										
A4.6	Cracks										
A4.7	Seepage										
A5. Spillway and Channel											
A5.1	Erosion										
A5.2	Obstructions/Debris										
	Initials										

APPENDIX D_5

HYDROLOGICAL STUDY

Quantification of the Irrigation Water Requirements and Assessment of the Ecological Water Requirements for Mr Joe Kloppers, Vaalwater, Limpopo Province

Project Number:

SES001

Prepared for:

SPOOR Environmental Services (Pty) Ltd

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Report Type	Hydrological Study
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Project Number	SES001
Report Number	02
Report Status	Final
Submission Date	26 September 2019
Author	Andy Pirie (Hydrologist, *M.Sc. Pr.Sci.Nat.*)
Author Signature	

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ACRONYMS AND ABBREVIATIONS

DWS	Department of Water and Sanitation
EWR	Ecological Water Requirements
ha	Hectares
km	Kilometres
MAR	Mean Annual Runoff
m	Metres
m^3	Cubic metres
mm	Millimetres
S-Pan	Symon's Pan
WMA	Water Management Area
WR2012	Water Resources of South Africa, 2012 Study

1 INTRODUCTION AND BACKGROUND

1.1 Terms of Reference and Study Objectives

Hydrospatial (Pty) Ltd was appointed by SPOOR Environmental Services (Pty) Ltd (hereafter referred to as SPOOR), to calculate the irrigation water requirements for crops grown by Mr Joe Kloppers, who predominantly farms with tobacco, potatoes, peanuts, flowers and watermelons, near Vaalwater in the Limpopo Province. In addition, SPOOR requested that the runoff of the reach of the Sterkstroom River, from which Mr Joe Kloppers abstracts water for irrigation, is assessed, to determine whether the Ecological Water Requirements (EWR) are being met. Based on the above, the following were study objectives:

- Calculate the irrigation water requirements; and
- Assess whether the EWRs are being met.

This report details the study undertaken to meet the above objectives.

1.2 Study Location

The farms on which agricultural production takes places (hereafter referred to as the study area), are located approximately 18 kilometres (km) north-west of the town of Vaalwater in the Limpopo Province (Figure 1-1). The farms include the following:

- Portion 3 of the farm Boschpoort 249 KQ;
- Remainder of the farm Doornspruit 215 KQ; and
- Portion 2 of the farm Doornspruit 215 KQ.

The Department of Water and Sanitation (DWS) have divided South Africa into Water Management Areas (WMAs) and quaternary catchments for management purposes. The study area falls within the Limpopo WMA, predominantly in quaternary catchments A42D and and A42E.

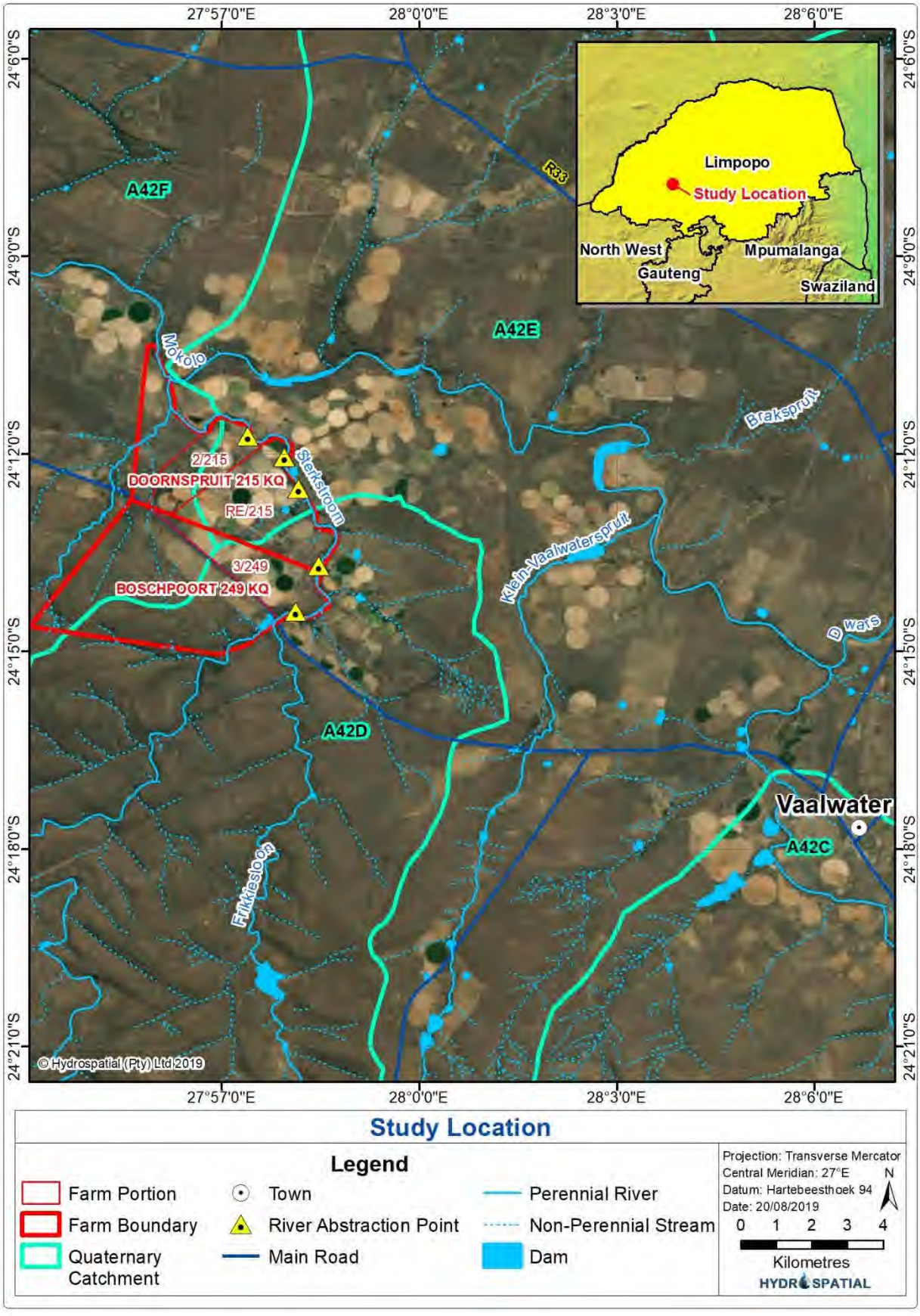


Figure 1-1: Study Location

1.3 Agricultural Crop Details

Details of the crops grown and irrigated by Mr Joe Kloppers were provided by SPOOR and are summarised in Table 1-1.

Table 1-1: Crop details

Farm	Irrigation Source	Crop	Area Planted (ha)	Planted	Harvested	Crop Growth (days)
Portion 3 of Boschpoort 249 KQ	100 % Sterkstroom River	Tobacco	37	September/ October	March/ April	160-210
	100 % Sterkstroom River	Potatoes	17	July	November/ December	100-150
	100 % Sterkstroom River	Peanuts	40	December	November/ December	120-150
	100 % Sterkstroom River	Flowers (Hadeco Amaryllis bulbs)	17	September	July	300
Remainder of Doornspruit 215 KQ	100 % Sterkstroom River	Tobacco	50	September/ October	March/ April	160-210
	100 % Sterkstroom River	Potatoes	30	July	November/ December	100-150
	100 % Sterkstroom River	Peanuts	55	December	November/ December	120-150
	100 % Sterkstroom River	Flowers (Hadeco Amaryllis bulbs)	19	September	July	300
	100 % Sterkstroom River	Watermelons	20	July	December	150
Portion 2 of Doornspruit 215 KQ	100 % Sterkstroom River	Tobacco	30	September/ October	March/ April	160-210
	100 % Sterkstroom River	Potatoes	15	July	November/ December	100-150
	100 % Sterkstroom River	Peanuts	15	December	November/ December	120-150
	100 % Sterkstroom River	Watermelons	15	July	December	150

1.4 Registered Water Use

The lawful irrigation water use for the farms owned by Mr Kloppers is summarised in Table 1-2.

Table 1-2: Lawful irrigation water use

Farm	Irrigation Volume (m^3/year)	Source
Portion 3 of Boschpoort 249 KQ	488 800	Sterkstroom River
Remainder of Doornspruit 215 KQ	940 620	Sterkstroom River
Portion 2 of Doornspruit 215 KQ	320 159	Sterkstroom River

1.5 Ecological Water Requirements

The EWR has been defined by the DWS for the Sterkstroom River in the document: Proposed classes of water resource and resource quality objectives for Mokolo, Matlabas, Crocodile (west) and Marico catchments (Government Gazette No. 41310, 8 December 2017) (DWS, 2017). The EWR relevant to the river reach where abstraction is taking place is summarised in Table 1-3.

Table 1-3: EWR relevant to the study

Quaternary Catchment	River Reach	Natural Mean Annual Runoff (million m^3/year)	EWR as % of Natural Mean Annual Runoff	EWR Annual Runoff (million m^3/year)
A42D	Sterkstroom (source) to confluence with Mokolo,	43.45	52.63 %	22.87

1.6 Climate

Monthly rainfall and evaporation data for the region was obtained from the WR2012 study. The average monthly rainfall is indicated in Figure 1-2, whilst the average Symon's Pan (S-Pan) evaporation is indicated in Figure 1-3. The area has an average annual rainfall of 600 mm, with rainfall mostly occurring over the months of October through to March. The average annual S-Pan evaporation is 1 701 mm, with evaporation being the highest over the months of September through to March.

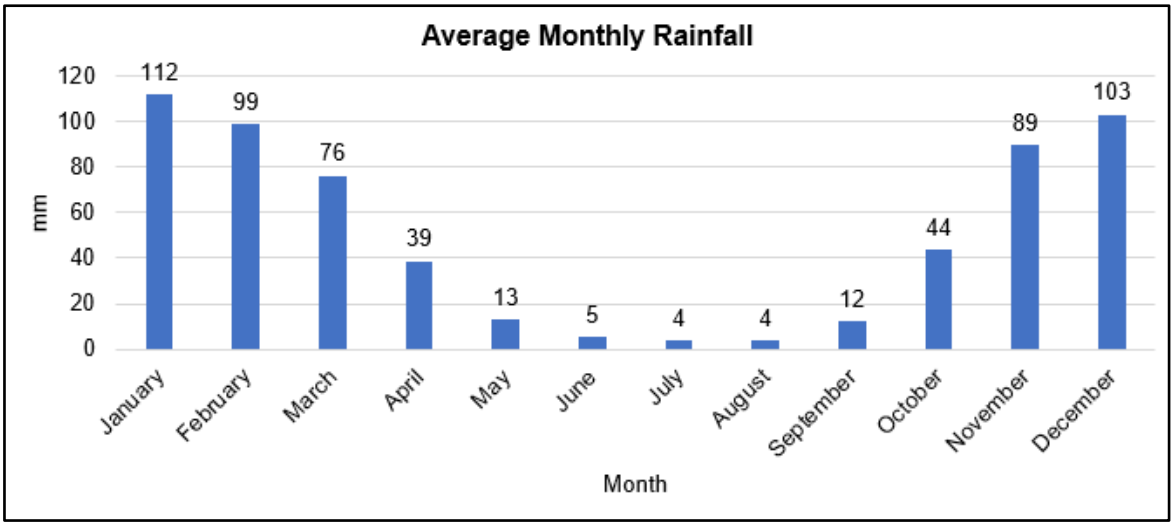


Figure 1-2: Average monthly rainfall

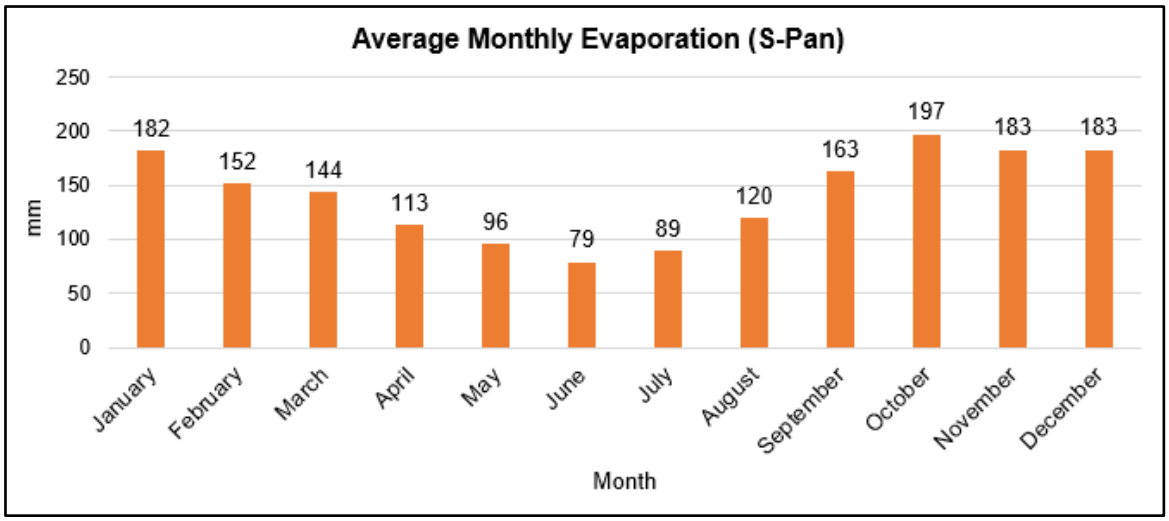


Figure 1-3: Average monthly evaporation

2 METHODOLOGY

The WRSM/Pitman model was used to calculate the required irrigation water requirements, as well as to simulate the monthly runoff for the Mokolo and Sterkstroom Rivers. The monthly runoff was converted to annual runoff for comparison with the annual EWRs specified by the DWS.

WRSM/Pitman is a mathematical model that simulates the movement of water through an interlinked system of catchments, river reaches, reservoirs, irrigation areas and mines. The model consists of five different types of modules (runoff, reservoir, irrigation, channel and mining) linked by means of routes. The routes represent lines along which water flows, such as river reaches. WRSM/Pitman has been used to analyse the hydrology on a monthly time step, for a number of diverse applications, ranging from very small to very large catchments, varying in complexity from being totally undeveloped to highly developed. The model has been

used throughout South Africa, SADC countries and in certain overseas countries. More details on the model can be obtained from the user manual (Pitman, Kakebeeke and Bailey, 2015).

WRSM/Pitman has been setup to simulate the monthly runoff for the Sterkstroom River, for the period of October 1920 to September 2010, as part of the Water Resources of South Africa, 2012 Study (WR2012) (Bailey and Pitman, 2015). The model has been calibrated on river flow gauge A4H008 on the Sterkstroom River in the vicinity of the study area.

The irrigation module within WRSM/Pitman, was used to calculate the irrigation requirements for the crops, based on the information provided in Table 1-1, and the recommended crop factors from the WR90 study (Midgley, Pitman and Middleton, 1994). The irrigation requirements were simulated using climatic data for the area over the period of 1950 to 2009.

The simulated monthly runoff was extracted from WRSM/Pitman, to assess whether the runoff in the Sterkstroom River meets the annual EWR specified by the DWS.

3 ASSUMPTIONS AND LIMITATIONS

The following are assumptions and limitations for the study:

- The annual runoff was compared to the annual EWRs in this study, as the WRSM/Pitman model simulates monthly runoff, which is easily converted to annual runoff;
- The WRSM/Pitman model has been setup for the Sterkstroom River for period of October 1920 to September 2010. Simulated river flows were therefore only available for this period.

4 IRRIGATION REQUIREMENTS

The simulated yearly irrigation requirements for the crops specified under Table 1-1, are indicated in Figure 4-1 to Figure 4-3. The minimum, average and maximum irrigation requirements over the simulation period (1950 – 2009), as well as the lawful irrigation volumes are summarised in Table 4-1.

Table 4-1: Summary of the minimum, average and maximum irrigation requirements over the simulation period

Farm	Lawful Irrigation Volumes (m^3/year)	Simulated Minimum Irrigation Requirements (m^3/year)	Simulated Average Irrigation Requirements (m^3/year)	Simulated Maximum Irrigation Requirements (m^3/year)
Portion 3 of Boschpoort 249 KQ	488 800	351 000	485 833	658 000
Remainder of Doornspruit 215 KQ	940 620	625 000	784 333	1 023 000
Portion 2 of Doornspruit 215 KQ	320 159	255 000	307 333	392 000

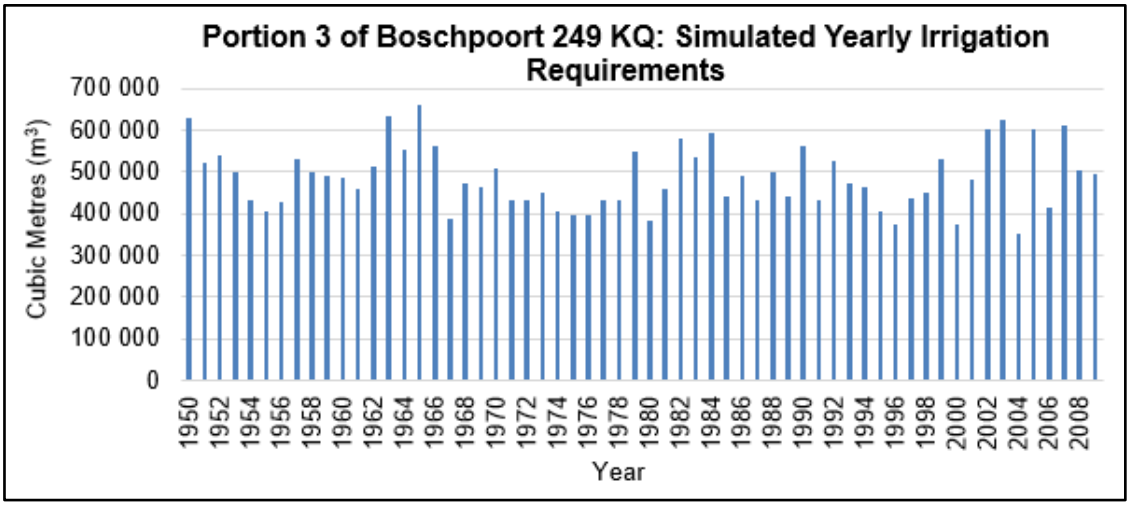


Figure 4-1: Simulated yearly irrigation requirements for Portion 3 of Boschpoort 249 KQ

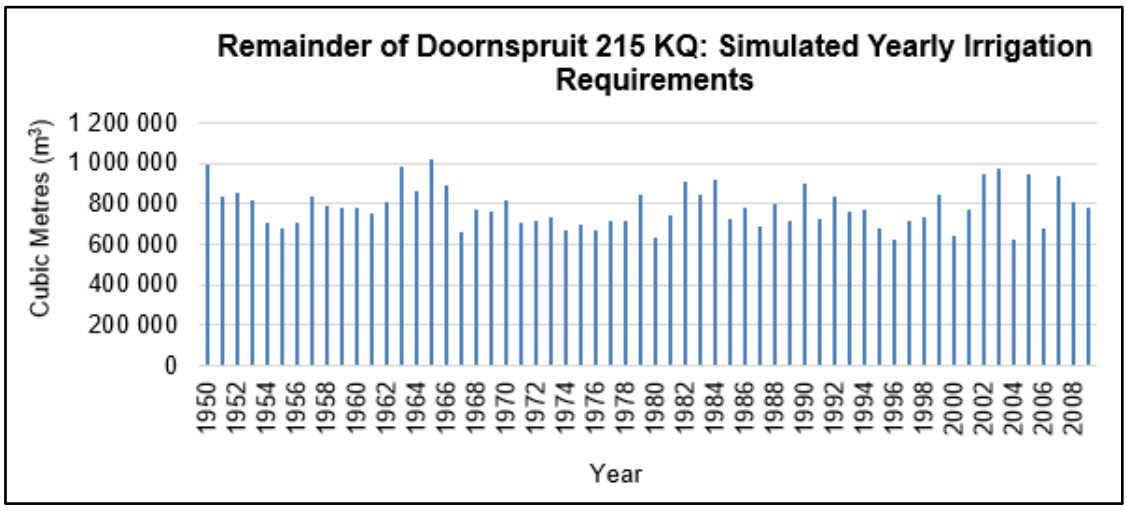


Figure 4-2: Simulated yearly irrigation requirements for the Remainder of Doornspruit 215 KQ

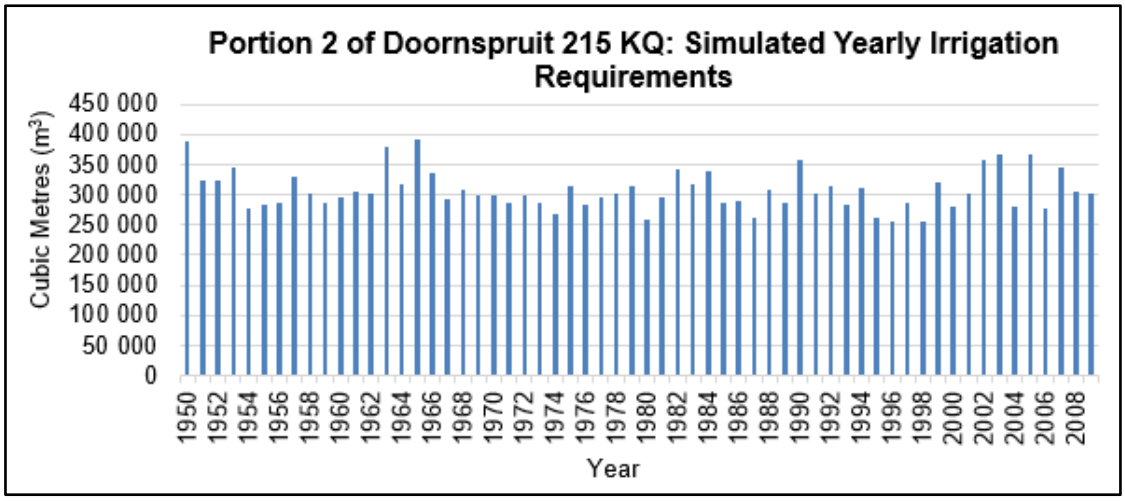


Figure 4-3: Simulated yearly irrigation requirements for Portion 2 of Doornspruit 215 KQ

5 ECOLOGICAL WATER REQUIREMENTS

The annual runoff for the Sterkstroom River in comparison to the required annual EWR, is indicated in Table 5-1. Drought years are highlighted in yellow, whilst runoff below the required EWR is highlighted in red. A drought year was assumed to be a year where rainfall of less than 25 % of the annual average of 600 mm occurs. A drought year would therefore be a year where less than 450 mm of rainfall is received.

Table 5-1: Annual runoff for the Sterkstroom River compared to the required annual EWR

Year	Annual Rainfall (mm)	Required Annual EWR (million m³)	Sterkstroom Annual Runoff (million m³)
1921	889	22.87	96.01
1922	555	22.87	27.56
1923	597	22.87	82.26
1924	686	22.87	43.30
1925	698	22.87	79.45
1926	467	22.87	13.10
1927	569	22.87	30.82
1928	566	22.87	38.05
1929	719	22.87	39.18
1930	498	22.87	25.77
1931	676	22.87	42.74
1932	449	22.87	9.77
1933	485	22.87	9.41
1934	519	22.87	17.30
1935	308	22.87	3.56
1936	755	22.87	56.26
1937	736	22.87	83.19
1938	445	22.87	34.23
1939	731	22.87	61.52

Year	Annual Rainfall (mm)	Required Annual EWR (million m³)	Sterkstroom Annual Runoff (million m³)
1966	473	22.87	7.58
1967	816	22.87	114.81
1968	609	22.87	18.69
1969	590	22.87	33.61
1970	544	22.87	33.14
1971	654	22.87	72.69
1972	688	22.87	68.49
1973	618	22.87	21.60
1974	690	22.87	43.84
1975	856	22.87	141.03
1976	775	22.87	93.68
1977	721	22.87	53.55
1978	641	22.87	59.52
1979	515	22.87	14.59
1980	751	22.87	78.96
1981	625	22.87	41.55
1982	432	22.87	5.69
1983	521	22.87	8.47
1984	460	22.87	6.94

Year	Annual Rainfall (mm)	Required Annual EWR (million m³)	Sterkstroom Annual Runoff (million m³)
1940	757	22.87	42.07
1941	419	22.87	42.08
1942	678	22.87	35.48
1943	704	22.87	40.05
1944	708	22.87	77.49
1945	357	22.87	6.31
1946	682	22.87	90.97
1947	554	22.87	12.38
1948	594	22.87	26.11
1949	613	22.87	36.44
1950	373	22.87	8.13
1951	605	22.87	26.05
1952	506	22.87	8.62
1953	666	22.87	83.17
1954	624	22.87	39.79
1955	804	22.87	119.90
1956	716	22.87	64.73
1957	627	22.87	35.78
1958	558	22.87	21.26
1959	573	22.87	24.37
1960	594	22.87	42.77
1961	649	22.87	53.94
1962	537	22.87	21.15
1963	433	22.87	9.64
1964	477	22.87	16.26
1965	348	22.87	4.61

Year	Annual Rainfall (mm)	Required Annual EWR (million m³)	Sterkstroom Annual Runoff (million m³)
1985	606	22.87	25.08
1986	561	22.87	10.25
1987	660	22.87	16.34
1988	555	22.87	19.64
1989	623	22.87	20.83
1990	471	22.87	11.50
1991	614	22.87	32.85
1992	495	22.87	10.36
1993	568	22.87	13.35
1994	553	22.87	37.94
1995	702	22.87	24.34
1996	894	22.87	155.31
1997	700	22.87	47.53
1998	597	22.87	32.40
1999	510	22.87	26.18
2000	886	22.87	137.52
2001	610	22.87	51.34
2002	418	22.87	8.86
2003	383	22.87	4.64
2004	826	22.87	103.40
2005	410	22.87	18.89
2006	729	22.87	72.06
2007	422	22.87	7.91
2008	535	22.87	24.32
2009	595	22.87	20.78

From the above, it is apparent that the EWRs are not met on a number of occasions, going back as far as the 1930s, when abstractions from the river are expected to be low. This is the case even during normal rainfall years. The high EWR specified by the DWS for the Sterkstroom River (52.63 % of the natural mean annual runoff), appears to be unrealistic. A separate assessment indicated that the naturalised annual runoff (virgin catchment runoff i.e. no river abstractions or other human influences) for the Sterkstroom, was below the EWR on 28 occasions out of 90, between 1920 – 2009. A comparison between the annual runoff and EWR can therefore not be taken seriously, until the EWR is recalculated.

6 CONCLUSION AND RECOMMENDATIONS

In conclusion, the calculated irrigation requirements have been summarized in Table 4-1. On average, the simulated irrigation requirements do not exceed the existing lawful irrigation volumes. The annual EWR has not been met on a regular basis, going back as far as the 1930s. The EWR specified for the Sterkstroom River appears to be high and unrealistic and should be reassessed.

The following is recommended:

- A catchment level study is undertaken to accurately determine the abstraction volumes from the Sterkstroom River. This should involve a process whereby the crops and irrigation sources (river or borehole) for each farmer in the catchment is verified. If the abstraction volumes are monitored by the farmers, then these records should be obtained. The irrigation requirements can then be calculated and compared to the registered allocated volumes, to determine the lawful water use for each farmer. The WRSM/Pitman model should then be updated, to assess the impact of abstractions on river flows and the EWR;
- It is recommended that the pumps are metred and regularly monitored, to verify the volumes of water abstracted for irrigation from the river and any boreholes; and
- It is recommended that a desktop reserve study is undertaken for the Sterkstroom River, as the current EWR set by the DWS is unrealistic.

7 REFERENCES

Pitman W.V., Kakebeeke J.P. and Bailey A.K. 2015. WRSM/Pitman Water Resources Simulation Model for Windows: User's Manual.

Bailey A.K. and Pitman W.V. 2015. Water Resources of South Africa, 2012 Study: Executive Summary. WRC Report K5/2143/1.

DWS. 2017. Proposed classes of water resource and resource quality objectives for Mokolo, Matlabas, Crocodile (west) and Marico catchments. Government Gazette No. 41310. 8 December 2017.

Midgley D.C., Pitman W.V. and Middleton B.J. 1994. Surface Water Resources of South Africa 1990. WRC Report No. 298/1/94 to 298/6.2/94. Water Research Commission, Pretoria, South Africa.

APPENDIX E

PUBLIC PARTICIPATION INFORMATION

APPENDIX E_1

SITE NOTICES

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Notice is given in terms of Regulations 39-44 of the Regulations published in Government Notice No. R982 of the 4th of December 2014 (as amended) and under section 24(5), read with section 44 of the National Environmental Management Act (NEMA) 1998 (Act No. 107 of 1998), of the intent to submit a Basic Assessment application for the proposed **Construction of a Dam for the Storage of Water** on Portion 2 of the Farm Doornspruit 215 KQ. The proposed dam is situated on the eastern border of the Lephalale Local Municipality in the Vaalwater Area, Limpopo Province. The application will be submitted to the Polokwane office of the Limpopo Department of Economic Development, Environment and Tourism (LDEDET). A Basic Assessment Report will be submitted to the same in due course. In addition, a Water Use Licence Application (WULA) has been lodged in terms of Section 21 and 22 of the National Water Act (NWA) (Act 36 of 1998). The activity includes;

THE PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER, PORTION 2 OF THE FARM DOORNSPRUIT 215 KQ VAALWATER AREA, LEPHALALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

Description of proposed activity:

Mr Joe Kloppers is applying for environmental authorization as required for the storing of water in a dam. The said farm portion is owned and farmed by Mr Joe Klopper- the Applicant. The application constitute the storing of the existing lawful water allocation in a dam purposes of agricultural irrigation. The proposed infrastructure includes;

- Dam with a capacity of 52 000m³;
- Dam area of 1, 725 hectares;
- Maximum dam wall height of 4,73m;
- Service spillway on the dam crest and associated outlet infrastructure.

Location:

The application site is located 18km's to the west of Vaalwater in the Lephalale Local Municipality, Limpopo Province. The dam is situated on portion 2 of the farm Doornspruit 215- KQ.

Name of Applicant:

Mr Joe Kloppers
PO Box 103, Vaalwater, 0530

Name of Environmental Assessment Practitioner:

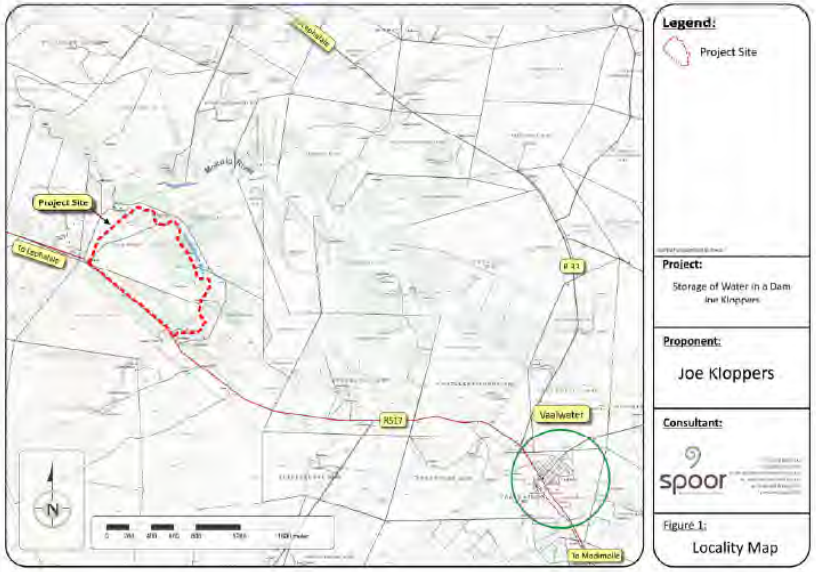
SPOOR Environmental Services (PTY) Ltd.
J.C. van Rooyen
Postnet Suite 448
Private Bag X025
Lynnwood Ridge
0040

Tel.: (012) 804 1181
Fax.: (086) 763 5635
E Mail: jcvr@spoorenvironmental.co.za

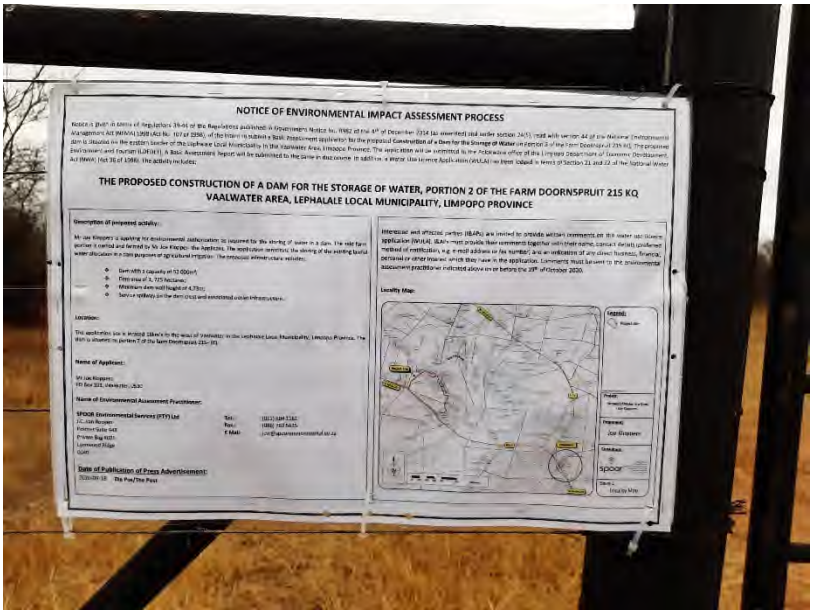
Date of Publication of Press Advertisement:
2020-09-18 **Die Pos/The Post**

Interested and affected parties (I&APs) are invited to provide written comments on the water use licence application (WULA). I&APs must provide their comments together with their name, contact details (preferred method of notification, e.g. e-mail address or fax number) and an indication of any direct business, financial, personal or other interest which they have in the application. Comments must be sent to the environmental assessment practitioner indicated above on or before the 19th of October 2020.

Locality Map:



Site Notice on Portion 2 of the Farm Doornspruit 215 KQ Fence



APPENDIX E_2

PROOF OF NEWSPAPER ADVERTISEMENT

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NOTICE OF ENVIRONMENTAL IMPACT MANAGEMENT PROCESS

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- Rekenaarvaardigheid: *Outlook, Word, Excel, Pastel*

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- Hardwerkend en kan onafhanklik werk
- Self Gemotiveerd
- Energiek

Stuur CV na: Ln.auto@yahoo.com

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Die Van Heerden Aptiek Groep het 'n pragtige beskikbaar vir 'n voorwinkel assistent / kassiere. Die geskikte kandidaat sal beskik oor soorge ondervinding in 'n Aptiek of verkope en kleinhandel omgewing. Minimum kwalifikasie sluit in matriek. Goeie kommunikasie vaardighede (*Afrikaans & Engels*) en mense verhoudinge word vereis.

Epos: hroffice@vhadmin.co.za
Faks: 086 619 0849

APPENDIX E_3

WRITTEN NOTICES ISSUED TO

I&APs

ADJACENT LANDOWNERS

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

1 message

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 3:36 PM
To: Mr A Kruger <kbs@ctecg.co.za>

Dear Interested and/or Affected Party,

Attached, please find the Background Information Document (BID) regarding the proposed Construction of A Dam for the Storage of Water for Irrigation, in terms of Section 24(G) and 24(F) of the National Environmental Management Amendment Act (NEMA) (as amended). The purpose of this BID is to notify potential Interested and/or Affected Parties (I&APs) of the proposed project and to provide an opportunity to participate in the process. Please note that the proposed project is in the Notification stage and that more detail in terms of the project will be provided in the Draft Basic Assessment Report that will be made available for review and comment.

Kindly confirm receipt of the BID and your intention to register as an interested and/or affected party (I&AP) by filling out the Registration and Comment sheet attached to the BID. Also contact us for any additional information that you may require.

Kind regards

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

c: +27 (0)83 280 5932 e: jcvr@spoorenvironmental.co.za
t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

7. J Kloppers Dam BA BID_Ptn 1 Doornspruit.pdf
1776K

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

1 message

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 3:34 PM
To: mario@parnis.co.za

Dear Interested and/or Affected Party,

Attached, please find the Background Information Document (BID) regarding the proposed Construction of A Dam for the Storage of Water for Irrigation, in terms of Section 24(G) and 24(F) of the National Environmental Management Amendment Act (NEMA) (as amended). The purpose of this BID is to notify potential Interested and/or Affected Parties (I&APs) of the proposed project and to provide an opportunity to participate in the process. Please note that the proposed project is in the Notification stage and that more detail in terms of the project will be provided in the Draft Basic Assessment Report that will be made available for review and comment.

Kindly confirm receipt of the BID and your intention to register as an interested and/or affected party (I&AP) by filling out the Registration and Comment sheet attached to the BID. Also contact us for any additional information that you may require.

Kind regards.

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

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a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

6. J Kloppers Dam BA BID_Ptn 0 & 4 Boschpoort.pdf
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Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

1 message

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 3:29 PM
To: Ontvangs <ontvangs@thinusmaritz.co.za>

Dear Interested and/or Affected Party,

Attached, please find the Background Information Document (BID) regarding the proposed Construction of A Dam for the Storage of Water for Irrigation, in terms of Section 24(G) and 24(F) of the National Environmental Management Amendment Act (NEMA) (as amended). The purpose of this BID is to notify potential Interested and/or Affected Parties (I&APs) of the proposed project and to provide an opportunity to participate in the process. Please note that the proposed project is in the Notification stage and that more detail in terms of the project will be provided in the Draft Basic Assessment Report that will be made available for review and comment.

Kindly confirm receipt of the BID and your intention to register as an interested and/or affected party (I&AP) by filling out the Registration and Comment sheet attached to the BID. Also contact us for any additional information that you may require.

Kind regards.

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

c: +27 (0)83 280 5932 e: jcvr@spoorenvironmental.co.za
t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

1. J Kloppers Dam BA BID_T Maritz.pdf
1777K

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

1 message

JC van Rooyen <jcvr@spoorenvironmental.co.za> Wed, Sep 23, 2020 at 1:06 PM
To: radie@elseraffie.co.za

Dear Sir,

Attached, please find the Background Information Document (BID) regarding the proposed Construction of A Dam for the Storage of Water for Irrigation, in terms of Section 24(G) and 24(F) of the National Environmental Management Amendment Act (NEMA) (as amended). The purpose of this BID is to notify potential Interested and/or Affected Parties (I&APs) of the proposed project and to provide an opportunity to participate in the process. Please note that the proposed project is in the Notification stage and that more detail in terms of the project will be provided in the Draft Basic Assessment Report that will be made available for review and comment.

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Kind regards.

spoor environmental services

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Pr LA Techno M.Sc (Env Soc) SACLAP

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t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

2. J Kloppers Dam BA BID_R van Wyk_Elserafie.pdf
1777K

List of REGISTERED LETTERS
Lys van GEREGISTREERDE BRIEWE
(with an insurance option/met 'n versekeringsopsie)

Full tracking and tracing/Volledige volg en spoor

Post Office

Enquiries/Navrae Sharecall number/nommer
0860 111 502
www.postoffice.co.za

Name and address of sender:
Naam en adres van afsender: SPOOR ENVIRONMENTAL SERVICES
POSTNET SUITE 448, PRIVATE BAG X025
LYNNWOOD RIDGE 0040

No	Name and address of addressee Naam en adres van geadreseerde	Insured amount Versekerde bedrag	Insurance fee Versekeringsgeld	Postage Posgeld	Service fee Diensgeld	Affix Track and Trace customer copy Plak Volg-en-Spoor-Kliëntafskrif
1	VENEMA BROERS CC PO BOX 176, BRITS, 0250					REGISTERED LETTER (with a domestic insurance option) RC282577455ZA A BOOK COPY
2	HENJON STERKSTROOM BOERDERY CC PO BOX 3411 NYLSTROOM 0510					REGISTERED LETTER (with a domestic insurance option) RC282577464ZA A BOOK COPY
3	MR. BD MOSTERT PO BOX 256 NYLSTROOM 0510					REGISTERED LETTER (with a domestic insurance option) RC282577478ZA A BOOK COPY
4						
5						
6						
7						
8						
9						
10						
	Total Totaal	R	R	R	R	

Number of letters posted
Getal briewe gepos 3

Signature of client
Handtekening van kliënt

Signature of accepting officer
Handtekening van aanneembeampte

Date stamp
MENLO PARK
21 SEP 2020
8
0102
Datumstempel

The value of the contents of these letters is as indicated and compensation is not payable for a letter received unconditionally. Compensation is limited to R100.00. No compensation is payable without documentary proof.
Optional insurance of up to R200.00 is available and applies to domestic registered letters only.

Die waarde van die inhoud van hierdie briewe is soos aangedui en vergoeding sal nie betaal word vir 'n brief wat sonder voorbehoud ontvang word nie. Vergoeding is beperk tot R100.00. Geen vergoeding is sonder dokumentêre bewys betaalbaar nie. Opsionele versekering van tot R2 000.00 is beskikbaar en is slegs binnelandse geregistreerde briewe van toepassing.

701248

LOCAL AUTHORITY

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 3:55 PM
To: Edith Tukakgomo <Edith.Thukakgomo@lephalalw.gov.za>, Nozi Molteno <Nmolteno@waterberg.gov.za>, Station Manager <Lim.vaalwater.unif@saps.gov.za>, K Mogohloana <Mogohloana@gmail.com>, munic@lephalale.gov.za

Dear Interested and/or Affected Party,

Attached, please find the Background Information Document (BID) regarding the proposed Construction of A Dam for the Storage of Water for Irrigation, in terms of Section 24(G) and 24(F) of the National Environmental Management Amendment Act (NEMA) (as amended). The purpose of this BID is to notify potential Interested and/or Affected Parties (I&APs) of the proposed project and to provide an opportunity to participate in the process. Please note that the proposed project is in the Notification stage and that more detail in terms of the project will be provided in the Draft Basic Assessment Report that will be made available for review and comment.

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Kind regards.

spoor environmental services

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t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

2020-09-17 BID J Kloppers Dam.pdf
1776K

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 4:30 PM
To: mariacocquyt720@gmail.com, Riekie.coetzee@lephalale.gov.za, Thomas.Tshivhandekano@lephalale.gov.za, Rudzani.Ngobeli@lephalale.gov.za

Dear Interested and/or Affected Party,

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Kind regards.

spoor environmental services

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a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

2020-09-17 BID J Kloppers Dam.pdf
1776K

STATE DEPARTMENTS

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 4:00 PM
To: Jackie Phosa <phosamj@gmail.com>, Love Hlekane <HlekaneL@dws.gov.za>, Ms Maphuti Ramalla <newsroom@dpw.gov.za>, Nokukhangya Khumalo <nkhumalo@sahra.org.za>, PP Mokgadi <Malulekeev@ledet.gov.za>, Pulane Matswi <MatswiP@dws.gov.za>

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Kind regards.

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

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t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

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1776K

SERVICES PROVIDERS

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 4:04 PM
To: marellem@eskom.co.za

Dear Interested and/or Affected Party,

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Kind regards.

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

c: +27 (0)83 280 5932 e: jcvr@spoorenvironmental.co.za
t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

2020-09-17 BID J Kloppers Dam.pdf
1776K

NGO'S, CBO'S, CONSERVANCIES, RESIDENT ASSOCIATIONS ETC.

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Sep 18, 2020 at 3:45 PM
To: info@welgevonden.org, Ben Mostert <benmostert@gmail.com>, Dr Rupert Baber <rupertbaber@yebo.co.za>, Francois van der Berg <mogbes@xsinet.co.za>, Ian van der Merwe <ianjvdm@gmail.com>

Dear Interested and/or Affected Party,

Attached, please find the Background Information Document (BID) regarding the proposed Construction of A Dam for the Storage of Water for Irrigation, in terms of Section 24(G) and 24(F) of the National Environmental Management Amendment Act (NEMA) (as amended). The purpose of this BID is to notify potential Interested and/or Affected Parties (I&APs) of the proposed project and to provide an opportunity to participate in the process. Please note that the proposed project is in the Notification stage and that more detail in terms of the project will be provided in the Draft Basic Assessment Report that will be made available for review and comment.

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Kind regards

spoor environmental services

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Pr LA Techno M.Sc (Env Soc) SACLAP

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t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

2020-09-17 BID J Kloppers Dam.pdf
1776K

APPENDIX E_4

COMMUNICATIONS TO AND FROM I&APs

ADJACENT LANDOWNERS

REGISTRATION AND COMMENT SHEET

INVITATION TO PARTICIPATE:
Basic Assessment Process as per the National Environmental Management Act, Act 107 of 1998

THE PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER, PORTION 2 OF THE FARM DOORNSPRUIT 215 KQ VAALWATER AREA, LEPHALALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

September 2020

spoor environmental services

t: +27 (0)12 804 1181 f: +27 (0)86 763 5635
e: info@spoorenvironmental.co.za w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025
Lynnwood Ridge, 0040, Pretoria, South Africa

Environmental Assessment Practitioner
Contact Person: Mr. JC van Rooyen
E mail: jcvr@spoorenvironmental.co.za

TITLE	Mr.	**FIRST NAME**	COENRAAD
INITIALS	CC.	**SURNAME**	VAN WYK.
ORGANISATION			
POSTAL ADDRESS	P.O. Box 1157. VAALWATER		
		POSTAL CODE	0530
LAND LINE TEL NO	087 802 8298	**CELL NO**	0824695265
FAX NO		**EMAIL**	RADGE@ELSEMAFRICA.CO.ZA

Please formally register me as an interested and affected party (I&AP) during this BA process.			YES X	NO
I would like my notifications and documents for comment as follows:				
LETTER (MAIL)	E-MAIL X	FAX	ON CD	INTERNET

In terms of this Public Participation process I disclose below any direct business, financial, personal, or other interest that I may have in the approval or refusal of the application:

.....

.....

COMMENTS (please use separate sheets to add additional information)
I suggest that the following issues of concern be investigated:

.....

I suggest the following for the public participation process:

.....

Any other comments:
I FULLY SUPPORT THIS INITIATIVE.

I/we request the following person/s also to be contacted as I&APs for this process (please include sufficient contact details i.e. email address, telephone number, postal address, etc.):

.....

.....

Signature

23/9/2020
Date

LOCAL AUTHORITY

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

Nozi Molteno <nMolteno@waterberg.gov.za> Thu, Oct 8, 2020 at 3:27 PM
To: "jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>

-------- Forwarded message ---------
From: Nozi Molteno <nMolteno@waterberg.gov.za>
To: "jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>
Cc:
Bcc:
Date: Thu, 8 Oct 2020 15:27:41 +0200
Subject: Read: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

winmail.dat
5K

Original Message

Message ID	<4373833ccac74c8cae04d43f97817834@V13-09461MAI10.saps.gov.za>
Created at:	Mon, Sep 21, 2020 at 12:04 PM (Delivered after 22 seconds)
From:	"LIM:Vaalwater-Uniform" <lim.vaalwater.unif@saps.gov.za>
To:	"jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>
Subject:	Read: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS
SPF:	NEUTRAL with IP 196.35.198.37 Learn more

Download Original

Copy to clipboard


```
Delivered-To: jcvr@spoorenvironmental.co.za
Received: by 2002:a5d:4c83:0:0:0:0:0 with SMTP id z3csp3424138wrs;
        Mon, 21 Sep 2020 03:04:59 -0700 (PDT)
X-Google-Smtp-Source:
ABdhPJwwgmIaxkV0tmkaUDEFjAgwU9IIwCJWUGSGO7Fsk8sVkEk6C3lfthbt86iaEZ
0j0PGb1y+G
X-Received: by 2002:a1c:3b09:: with SMTP id
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        Mon, 21 Sep 2020 03:04:59 -0700 (PDT)
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mz

FXtfKldkMjE77rLWSHMEC/GQ4rJaK0WOl67BU5EcHIKnrvzbNEpEPakBXz1mRG2kur
L1
         Rczw==
```

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

Bertie van Zyl <munic@lephalale.gov.za> Wed, Sep 23, 2020 at 8:04 AM
To: "jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>

-------- Forwarded message ---------
From: Bertie van Zyl <munic@lephalale.gov.za>
To: "jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>
Cc:
Bcc:
Date: Wed, 23 Sep 2020 08:04:37 +0200
Subject: Read: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS
Your message was read on Wednesday, September 23, 2020 8:04:37 AM (GMT+02:00) Harare, Pretoria.

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

Thomas Tshivhandekano <Thomas.Tshivhandekano@lephalale.gov.za> Wed, Oct 7, 2020 at 8:12 AM
To: "jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>

-------- Forwarded message ---------
From: Thomas Tshivhandekano <Thomas.Tshivhandekano@lephalale.gov.za>
To: "jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>
Cc:
Bcc:
Date: Wed, 7 Oct 2020 08:12:35 +0200
Subject: Read: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS
Your message was read on Wednesday, October 07, 2020 8:12:35 AM (GMT+02:00) Harare, Pretoria.

STATE DEPARTMENTS

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

Nokukhanya Khumalo <nkhumalo@sahra.org.za> Mon, Sep 21, 2020 at 9:11 AM
To: JC van Rooyen <jcvr@spoorenvironmental.co.za>, Jackie Phosa <phosamj@gmail.com>, Love Hlekane <HlekaneL@dws.gov.za>, Ms Maphuti Ramalla <newsroom@dpw.gov.za>, PP Mokgadi <Malulekeev@ledet.gov.za>, Pulane Matswi <MatswiP@dws.gov.za>

Good Morning

Thank you for notifying SAHRA of the proposed development, SAHRA does not accepted mailed or emailed applications for comment or decision making since 2013. In order to receive comments from SAHRA, please create a case on our online platform called SAHRIS: https://sahris.sahra.org.za/. Here, you can then submit all relevant documentation related to an EA application (for comments in terms of section 38(8)) or for decision in terms of section 38(1) application.

Kind Regards,

Nokukhanya Khumalo

I will be working from home until further notice. Please contact me via email primarily or call me on 0839879817 during business hours.

From: JC van Rooyen <jcvr@spoorenvironmental.co.za>
Sent: Friday, 18 September 2020 16:01
To: Jackie Phosa <phosamj@gmail.com>; Love Hlekane <HlekaneL@dws.gov.za>; Ms Maphuti Ramalla <newsroom@dpw.gov.za>; Nokukhanya Khumalo <nkhumalo@sahra.org.za>; PP Mokgadi <Malulekeev@ledet.gov.za>; Pulane Matswi <MatswiP@dws.gov.za>
Subject: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

Dear Interested and/or Affected Party,

[Quoted text hidden]
[Quoted text hidden]

Nokukhanya Khumalo
Heritage Officer: Archaeology, Palaeontology & Meteorites Unit

South African Heritage Resources Agency
- A nation united through heritage -

T: +27 21 462 4502/ 8654| C:| F:+27 21 4624509
E: NKhumalo@sahra.org.za | 111 Harrington Street | Cape Town |

www.sahra.org.za
SAHRA Logo SAHRA Values

SERVICE PROVIDERS

NGO'S, CBO'S, CONSERVANCIES, RESIDENT ASSOCIATIONS ETC.

Original Message

Message ID	<003001d68fd7$a3a66520$eaf32f60$@xsinet.co.za>
Created at:	Mon, Sep 21, 2020 at 7:25 AM (Delivered after 11 seconds)
From:	Mokolo WGV <mogbes@xsinet.co.za> Using Microsoft Outlook 16.0
To:	jcvr@spoorenvironmental.co.za
Subject:	Read: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS
SPF:	PASS with IP 103.2.142.104 Learn more
DKIM:	'PASS' with domain smtpservice.net Learn more

Download Original

Copy to clipboard

```
Delivered-To: jcvr@spoorenvironmental.co.za
Received: by 2002:a5d:4c83:0:0:0:0:0 with SMTP id z3csp3287064wrs;
        Sun, 20 Sep 2020 22:25:43 -0700 (PDT)
X-Google-Smtp-Source:
ABdhPJy8y7vr87MlBbhbXRulrC+Y7+W4n1DkS889fG8FkbodVOD0P0tEyR1WhucBi7
71fySygBPR
X-Received: by 2002:a17:906:f9d8:: with SMTP id
lj24mr49333837ejb.379.1600665943203;
        Sun, 20 Sep 2020 22:25:43 -0700 (PDT)
ARC-Seal: i=1; a=rsa-sha256; t=1600665943; cv=none;
        d=google.com; s=arc-20160816;

b=RKY+Zb4J/gQt62Sg4P1ecn1+JXizQOWtXDdR6RBFykLON6/wqPV4+YQniFNozcvc
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Yn

57hSjwDLsUj067NtHnbk6wpL+0EicMiLGUvQys6y1cbySeXxDgvzTJRumEoCEmPaXv
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Us

cbnvudEVLPcB8IcZ7tnoTR1m4q+2xhoCQK7q+qoZcN+olgaIhoCJjOtQ5GRPhyNt4U
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Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

Registration of Welgevonden GR as an I&AP - NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

André Burger <andre@welgevonden.org> Tue, Sep 29, 2020 at 10:26 AM
To: "jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>

Dear Mr van Rooyen

Please see the attached documentation for registration as an Interested and Affected Party by myself representing the Welgevonden Game Reserve. Currently we have no serious concerns but the information we have is lacking in any detail which I am sure will be made available as the process develops. If there is more detailed information available please share with us.

Kind regards

André

André Burger

Chief Operating Officer

WELGEVONDEN GAME RESERVE

Telephone: 014 161 0800

Pvt Cell: 082 21 00 649

Web: www.welgevonden.org

From: Welgevonden Info <Info@welgevonden.org>
Sent: Friday, 18 September 2020 16:08
To: André Burger <andre@welgevonden.org>
Subject: FW: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS
Importance: High

REGISTRATION AND COMMENT SHEET

INVITATION TO PARTICIPATE:
Basic Assessment Process as per the National Environmental Management Act, Act 107 of 1998

THE PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER, PORTION 2 OF THE FARM DOORNSPRUIT 215 KQ VAALWATER AREA, LEPHALALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

September 2020

t: +27 (0)12 804 1181 f: +27 (0)86 763 5635
e: info@spoorenvironmental.co.za w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025
Lynnwood Ridge, 0040, Pretoria, South Africa

Environmental Assessment Practitioner
Contact Person: Mr. JC van Rooyen
E mail: jcvr@spoorenvironmental.co.za

TITLE	Mr	**FIRST NAME**	André
INITIALS	A	**SURNAME**	Burger
ORGANISATION	Welgevonden Game Reserve		
POSTAL ADDRESS	P.O. Box 433,		
	Vaalwater	**POSTAL CODE**	0530
LAND LINE TEL NO	087 813 0501	**CELL NO**	082 21 00 469
FAX NO		**EMAIL**	andre@welgevonden.org

Please formally register me as an interested and affected party (I&AP) during this BA process.	X YES	NO

I would like my notifications and documents for comment as follows:

LETTER (MAIL)	E-MAIL X	FAX	ON CD	INTERNET

In terms of this Public Participation process I disclose below any direct business, financial, personal, or other interest that I may have in the approval or refusal of the application:

.....

.....

COMMENTS (please use separate sheets to add additional information)
I suggest that the following issues of concern be investigated:

.....

I suggest the following for the public participation process:

.....

Any other comments:
On behalf of the Welgevonden Game Reserve to keep abreast of developments in the area.

I/we request the following person/s also to be contacted as I&APs for this process (please include sufficient contact details i.e. email address, telephone number, postal address, etc.):

.....

.....

Signature

29 September 2020
Date

Registration of Welgevonden GR as an I&AP - NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: STORAGE OF WATER IN A DAM - JOE KLOPPERS

JC van Rooyen <jcvr@spoorenvironmental.co.za> Fri, Oct 2, 2020 at 9:49 AM
To: André Burger <andre@welgevonden.org>

Good day Sir,

Thank you for the interest shown. We will keep you abreast of any developments on the matter.

Kind regards.

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

c: +27 (0)83 280 5932 e: jcvr@spoorenvironmental.co.za
t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

[Quoted text hidden]

APPENDIX E_5

NOTICES, COMMENTS AND RESPONSES IN TERMS OF THE

FINAL BASIC ASSESSMENT REPORT

LOCAL AUTHORITY

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER - JOE KLOPPERS, VAALWATER, LEPHALALE LOCAL MUNICIPALITY - DRAFT BASIC ASSESSMENT REPORT AVAILABLE FOR COMMENT

JC van Rooyen <jcvr@spoorenvironmental.co.za> Tue, Jan 5, 2021 at 8:00 AM
To: Edith Tukakgomo <Edith.Thukakgomo@lephalale.gov.za>, Nozi Molteno <Nmolteno@waterberg.gov.za>, Station Manager <Lim.vaalwater.unif@saps.gov.za>, munic@lephalale.gov.za, mariacocquyt720@gmail.com, Riekie.coetzee@lephalale.gov.za, Thomas.Tshivhandekano@lephalale.gov.za, K Mogohloana <Mogohloana@gmail.com>

Dear Sir/Madam,

This correspondence serves as a notification of the availability for comment of the Draft Basic Assessment Report (BAR) in terms of the Proposed Construction of a Dam for the Storage of Water - Joe Kloppers, Vaalwater Area, Lephalale Local Municipality, Limpopo Province. A copy of the Draft BAR was placed on the Dropbox platform on the internet for your convenience and can be viewed or downloaded from here. Please note that you will have to download the Dropbox programme from the internet to use this platform. It is free and easy to use. The Internet link to the Dropbox folder is as follows: https://www.dropbox.com/sh/ei72l2soxc8ty34/AABOIbU-bTD2HZAb9Viz10Oda?dl=0

The purpose of this notification is to provide you with the opportunity to study the report and to offer comments should you want to. The Environmental Assessment Practitioner (SPOOR) will respond to comments raised. Comments and responses to these comments will thereafter be documented in the Final BA Report, which will be submitted to the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) for review.

All comments on the Final BAR should be made to the EAP in writing on or before the **5th of February 2021**. We trust that the above is acceptable to you. We would welcome any further discussions regarding the matter.

Kind regards

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

c: +27 (0)83 280 5932 e: jcvr@spoorenvironmental.co.za
t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

Original Message

Message ID	<4024761d86f04ff0b48381c9b26f21f8@V13-09461MAI10.saps.gov.za>
Created at:	Tue, Jan 5, 2021 at 9:59 AM (Delivered after 10 seconds)
From:	"LIM:Vaalwater-Uniform" <lim.vaalwater.unif@saps.gov.za>
To:	"jcvr@spoorenvironmental.co.za" <jcvr@spoorenvironmental.co.za>
Subject:	Read: NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER - JOE KLOPPERS, VAALWATER, LEPHALALE LOCAL MUNICIPALITY - DRAFT BASIC ASSESSMENT REPORT AVAILABLE FOR COMMENT
SPF:	NEUTRAL with IP 196.35.198.32 Learn more

Download Original

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```
Delivered-To: jcvr@spoorenvironmental.co.za
Received: by 2002:adf:9dd0:0:0:0:0:0 with SMTP id
q16csp15848477wre;
        Mon, 4 Jan 2021 23:59:24 -0800 (PST)
X-Google-Smtp-Source:
ABdhPJxVYRwojXqlp8Z38zQjvsSs9N8MeG0+YsBdzak1JM+xCgJcuVCUImXVzXeZNS
yfsQnSEuNk
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        Mon, 04 Jan 2021 23:59:24 -0800 (PST)
ARC-Seal: i=1; a=rsa-sha256; t=1609833564; cv=none;
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LZ
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SHIPMENT TRACKER

Shipment Summary	
Shipment Number	PNA11725144626
Pickup Date	01/05/2021 4:49:00 PM
Shipper Reference	
Current Status	Delivered PJ MOHWASA(Notify me when the shipment is delivered)
Delivered On	1/7/2021 10:51:00 AM
Delivered To	PJ MOHWASA

For inquiries and amending delivery instructions about this shipment, click here to submit a customer care request or contact origin office at:+ 27 (12) 7420300 , destination office at: + 27 (11) 457 3000

Time values are local to the service area in which the shipment checkpoint is recorded.

Shipment History

Location	Date	Activity
Sandton, South Africa	1/7/2021 10:51:00 AM	Delivered
Pretoria, South Africa	1/5/2021 9:19:00 PM	Shipment Forwarded to Beyond/Remote Area Sorting Location
Pretoria, South Africa	1/5/2021 4:49:00 PM	Record created.

Shipper		Receiver	
Shipper Name:	PostNet - Glenfair	Delivered To:	PJ MOHWASA
Sent By:	JC VAN ROOYEN	Destination:	Lephalale,South Africa
Shipper Address:	Entrance 1 Glenfair Boulevard - Cnr Lynnwood & Daventry Rds	Pickup Date:	01/05/2021 4:49:00 PM

Shipment Details

STATE DEPARTMENTS

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER, VAALWATER AREA, LEPHALALE LOCAL MUNICIPALITY - JOE KLOPPERS - DRAFT BASIC ASSESSMENT REPORT AVAILABLE FOR COMMENT

JC van Rooyen <jcvr@spoorenvironmental.co.za> Tue, Jan 5, 2021 at 8:00 AM
To: Jackie Phosa <phosamj@gmail.com>, Love Hlekane <HlekaneL@dws.gov.za>, Ms Maphuti Ramalla <newsroom@dpw.gov.za>, PP Mokgadi <Malulekeev@ledet.gov.za>, Pulane Matswi <MatswiP@dws.gov.za>, Ms Maphuti Ramalla <maphuti.ramalla@drdlr.gov.za>

Dear Sir/Madam,

This correspondence serves as a notification of the availability for comment of the Draft Basic Assessment Report (BAR) in terms of the Proposed Construction of a Dam for the Storage of Water - Joe Kloppers, Vaalwater Area, Lephalale Local Municipality, Limpopo Province. A copy of the Draft BAR was placed on the Dropbox platform on the internet for your convenience and can be viewed or downloaded from here. Please note that you will have to download the Dropbox programme from the internet to use this platform. It is free and easy to use. The Internet link to the Dropbox folder is as follows: https://www.dropbox.com/sh/ei72l2soxc8ty34/AABOIbU-bTD2HZAb9Viz10Oda?dl=0

The purpose of this notification is to provide you with the opportunity to study the report and to offer comments should you want to. The Environmental Assessment Practitioner (SPOOR) will respond to comments raised. Comments and responses to these comments will thereafter be documented in the Final BA Report, which will be submitted to the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) for review.

All comments on the Final BAR should be made to the EAP in writing on or before the **5th of February 2021**. We trust that the above is acceptable to you. We would welcome any further discussions regarding the matter.

Kind regards

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

c: +27 (0)83 280 5932 e: jcvr@spoorenvironmental.co.za
t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

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SHIPMENT TRACKER

Shipment Summary	
Shipment Number	PNA11777437853
Pickup Date	01/05/2021 5:12:00 PM
Shipper Reference	
Current Status	Delivered Matome(Notify me when the shipment is delivered)
Delivered On	1/13/2021 1:45:00 PM
Delivered To	Matome

For inquiries and amending delivery instructions about this shipment, click here to submit a customer care request or contact origin office at:+ 27 (12) 7420300 , destination office at:

Time values are local to the service area in which the shipment checkpoint is recorded.

Shipment History

Location	Date	Activity
Sandton, South Africa	1/13/2021 1:45:00 PM	Delivered
Sandton, South Africa	1/13/2021 8:24:00 AM	Out for Delivery
Sandton, South Africa	1/13/2021 12:42:00 AM	Shipment Update
Polokwane, South Africa	1/12/2021 6:02:00 PM	Shipment Forwarded to Beyond/Remote Area Sorting Location
Pretoria, South Africa	1/5/2021 10:47:00 PM	Record Created
Pretoria, South Africa	1/5/2021 10:47:00 PM	Departed Operations facility – In Transit
Pretoria, South Africa	1/5/2021 5:13:00 PM	Record Created
Pretoria, South Africa	1/5/2021 5:13:00 PM	Data received.

Shipper Receiver

Shipper		Receiver	
Shipper Name:	PostNet - Glenfair	Delivered To:	Matome
Sent By:	JC VAN ROOYEN	Destination:	POLOKWANE ,South Africa
Shipper Address:	Entrance 1 Glenfair Boulevard - Cnr Lynnwood & Daventry Rds	Pickup Date:	01/05/2021 5:12:00 PM

Shipment Details			
Origin	South Africa/LYNNWOOD MANOR	Destination:	
Service:		Shipment Type:	ONP
Pieces:	1	Description:	CD -
Weight:	0.17 KG		

Shipment Attachments		
Type	Size	Date

HEAD OFFICE

CALL CENTRE: 0860 767 8638

ADDRESS
92 Augrabies Road
Waterfall Office Park
Bekker Road
Midrand
1685

SERVICE PROVIDERS

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER, VAALWATER AREA, LEPHALALE LOCAL MUNICIPALITY - JOE KLOPPERS - DRAFT BASIC ASSESSMENT REPORT AVAILABLE FOR COMMENT

JC van Rooyen <jcvr@spoorenvironmental.co.za> Tue, Jan 5, 2021 at 8:00 AM
To: marellem@eskom.co.za

Dear Sir/Madam,

This correspondence serves as a notification of the availability for comment of the Draft Basic Assessment Report (BAR) in terms of the Proposed Construction of a Dam for the Storage of Water - Joe Kloppers, Vaalwater Area, Lephalale Local Municipality, Limpopo Province. A copy of the Draft BAR was placed on the Dropbox platform on the internet for your convenience and can be viewed or downloaded from here. Please note that you will have to download the Dropbox programme from the internet to use this platform. It is free and easy to use. The Internet link to the Dropbox folder is as follows: https://www.dropbox.com/sh/ei72l2soxc8ty34/AABOIbU-bTD2HZAb9Viz10Oda?dl=0

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Kind regards

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

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t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

NGO'S, CBO'S, CONSERVANCIES, RESIDENT ASSOCIATIONS ETC.

Gmail JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER - JOE KLOPPERS - DRAFT BASIC ASSESSMENT REPORT AVAILABLE FOR COMMENT

JC van Rooyen <jcvr@spoorenvironmental.co.za> Tue, Jan 5, 2021 at 8:00 AM
To: info@welgevonden.org, Ben Mostert <benmostert@gmail.com>, Dr Rupert Baber <rupertbaber@yebo.co.za>, Francois van der Berg <mogbes@xsinet.co.za>, Ian van der Merwe <ianjvdm@gmail.com>

Dear Sir/Madam,

This correspondence serves as a notification of the availability for comment of the Draft Basic Assessment Report (BAR) in terms of the Proposed Construction of a Dam for the Storage of Water - Joe Kloppers, Vaalwater Area, Lephalale Local Municipality, Limpopo Province. A copy of the Draft BAR was placed on the Dropbox platform on the internet for your convenience and can be viewed or downloaded from here. Please note that you will have to download the Dropbox programme from the internet to use this platform. It is free and easy to use. The Internet link to the Dropbox folder is as follows: https://www.dropbox.com/sh/ei72l2soxc8ty34/AABOIbU-bTD2HZAb9Viz10Oda?dl=0

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Kind regards

spoor environmental services

JC van Rooyen (Director)
Pr LA Techno M.Sc (Env Soc) SACLAP

c: +27 (0)83 280 5932 e: jcvr@spoorenvironmental.co.za
t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 w: www.spoorenvironmental.co.za
a: Postnet Suite 448, Private Bag X025 Lynnwood Ridge, 0040, South Africa

Gmail

JC van Rooyen <jcvr@spoorenvironmental.co.za>

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PROCESS: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER - JOE KLOPPERS - DRAFT BASIC ASSESSMENT REPORT AVAILABLE FOR COMMENT

Mokolo WGV <mogbes@xsinet.co.za> Mon, Jan 11, 2021 at 9:18 AM
To: jcvr@spoorenvironmental.co.za

APPENDIX E_6

COMMENTS AND RESPONSES REPORT

COMMENTS AND RESPONSES REPORT: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER VAALWATER AREA LEPHALALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

SUBMITTED TO:

Limpopo Department of Economic Development, Environment & Tourism

20 Hans van Rensburg Street/
19 Biccard Street
Polokwane
Limpopo
0699

APPLICANT:

Joe Kloppers
PO Box 103
Vaalwater
0530

spoor environmental services

t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 e: info@spoorenvironmental.co.za

p: Postnet Suite 448, Private Bag X025, Lynnwood Ridge, 0040, Pretoria, South Africa

w: www.spoorenvironmental.co.za

February 2021

REPORT TITLE	:	Comments and Responses Report in terms of the Proposed Construction of a Dam for the Storage of Water, Vaalwater, Lephalale Local Municipality, Limpopo Province
CLIENT	:	Joe Kloppers
REPORT STATUS	:	Final
PLACE AND DATE	:	Pretoria, February 2021

APPLICANT

Applicant:	Mr Joe Kloppers
Contact Person:	Mr Joe Kloppers
Postal address:	PO Box 103 Vaalwater 0530

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Consultant:	SPOOR Environmental Services (PTY) Ltd.
Contact Person:	JC van Rooyen
Physical Address:	891 Jan Shoba Street, Brooklyn, Pretoria, 0181
Postal address:	Postnet Suite 448, Private Bag X025, Lynnwood Ridge, 0040
Telephone:	012 804 1181
Fax:	086 763 5635
Email:	jcvr@spoorenvironmental.co.za

DECLARATION OF INDEPENDENCE

I, JC van Rooyen as authorised representative of SPOOR Environmental Services (PTY) Ltd. hereby confirm my independence as an Environmental Assessment Practitioner and declare that neither I nor SPOOR Environmental Services (PTY) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which SPOOR Environmental Services (PTY) Ltd. was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Basic Assessment Application for the Proposed Construction of a Dam for the Storage of Water, Vaalwater Area, Lephalale Local Municipality.

Signed:… JC van Rooyen……. Date:…. ...2021-02-10……

DOCUMENT HISTORY

Report	Date	Version	Status
Comments and Responses Report in terms of the Proposed Construction of a Dam for the Storage of Water, Vaalwater, Lephalale Local Municipality, Limpopo Province	October 2020	1.0	Draft
Comments and Responses Report in terms of the Proposed Construction of a Dam for the Storage of Water, Vaalwater, Lephalale Local Municipality, Limpopo Province	October 2021	2.0	Final

DISTRIBUTION OF BASIC ASSESSMENT REPORT

Municipal, Provincial and State Departments	
Name	**Institution**
Mr E. V. Maluleke	Limpopo Department of Economic Development, Environment & Tourism: Sustainable Utilization of the Environment Branch
Mr D M Nethengwe	Department of Water and Sanitation: Limpopo WMA
Pulane Matswi	Department of Water and Sanitation: Limpopo WMA
Mr. T Tshivhandekano	Lephalale Local Municipality – Parks Department

TABLE OF CONTENTS

ABBREVIATIONS

AH	-	Agricultural Holding
BID	-	Background Information Document
CPF	-	Community Policing Forum
CLO	-	Community Liaison Officer
DEA	-	Department of Environmental Affairs
DEAT	-	Department of Environmental Affairs and Tourism
DWS	-	Department of Water and Sanitation
EAP	-	Environmental Assessment Practitioner
ECA	-	Environment Conservation Act
EMPr	-	Environmental Management Programme
IEM	-	Integrated Environmental Management
IDP	-	Integrated Development Plan
I&AP	-	Interested and Affected Parties
ISDF	-	Integrated Spatial Development Framework
LDEDET	-	Limpopo Department of Economic Development, Environment and Tourism
MAMSL	-	Metres Above Mean Sea Level
NEMA	-	National Environmental Management Act
NEMBA	-	National Environmental Management Biodiversity Act
NEMWA	-	National Environmental Management Waste Act
NFEPA	-	National Freshwater Ecosystems Priority Areas
NHRA	-	National Heritage Resources Act
OHS	-	Occupational Health and Safety
QDSG	-	Quarter Degree Square Grid
SABS	-	South African Bureau of Standards
SAHRA	-	South African Heritage Resources Agency
SDF	-	Spatial Development Framework
WUA	-	Water Users Association
WULA	-	Water Use Licence Application

1. INTRODUCTION

SPOOR Environmental Services (Pty) Ltd was appointed as the independent environmental assessment practitioner (EAP) to manage the Basic Assessment application in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The Application is for the proposed construction of a dam for the storage of water on Portion 2 of the Farm Doornspruit 215 KQ, Vaalwater Area, Lephalale Local Municipality, Limpopo Province.

This report provides a chronological account of the Public Participation Process conducted by the Environmental Assessment Practitioner (EAP) to date.

The process included:

- Creating initial awareness to the relevant Interested and Affected Parties (I&AP's) by distribution of Background Information Documents, putting up of site notices and placing an advertisement in a prescribed newspaper;
- Giving an opportunity to register as a stakeholder in the public participation process and make comments on and contributions;
- Responding to the comments received from the I&AP in the initial awareness process.

2. PUBLIC PARTICIPATION PROCESS (PPP)

The PPP forms a fundamental part of the Basic Assessment process. Its aim is to provide an opportunity for all interested and affected parties (I&APs) to obtain clear, accurate and comprehensive information about the proposed development and the anticipated environmental impacts thereof. In addition, the process provides I&APs with the opportunity to indicate their viewpoints, issues, and concerns regarding the proposal and/or alternatives. All inputs from the public and interested and/or affected groups are considered in the planning stages of the project. As a result, a clear recording of all issues raised, and comments made is maintained in the register of comments and responses. This register is updated as and when new comments and concerns are raised and considered.

The following phases allow I&APs to make comments during the BA process:

Phase 1: Initial Public Notification and Awareness;
Phase 2: Comment on the Draft BA Report;
Phase 3: Environmental Authorisation

The image below illustrates the PPP phases diagrammatically. At the time of submission of this report, Phase 2 of the PPP was completed. In Phase 2, comment was requested on the Draft BAR. These comments as well as the responses on these comments has been included in the Final BAR which will now be submitted to the LDEDET.

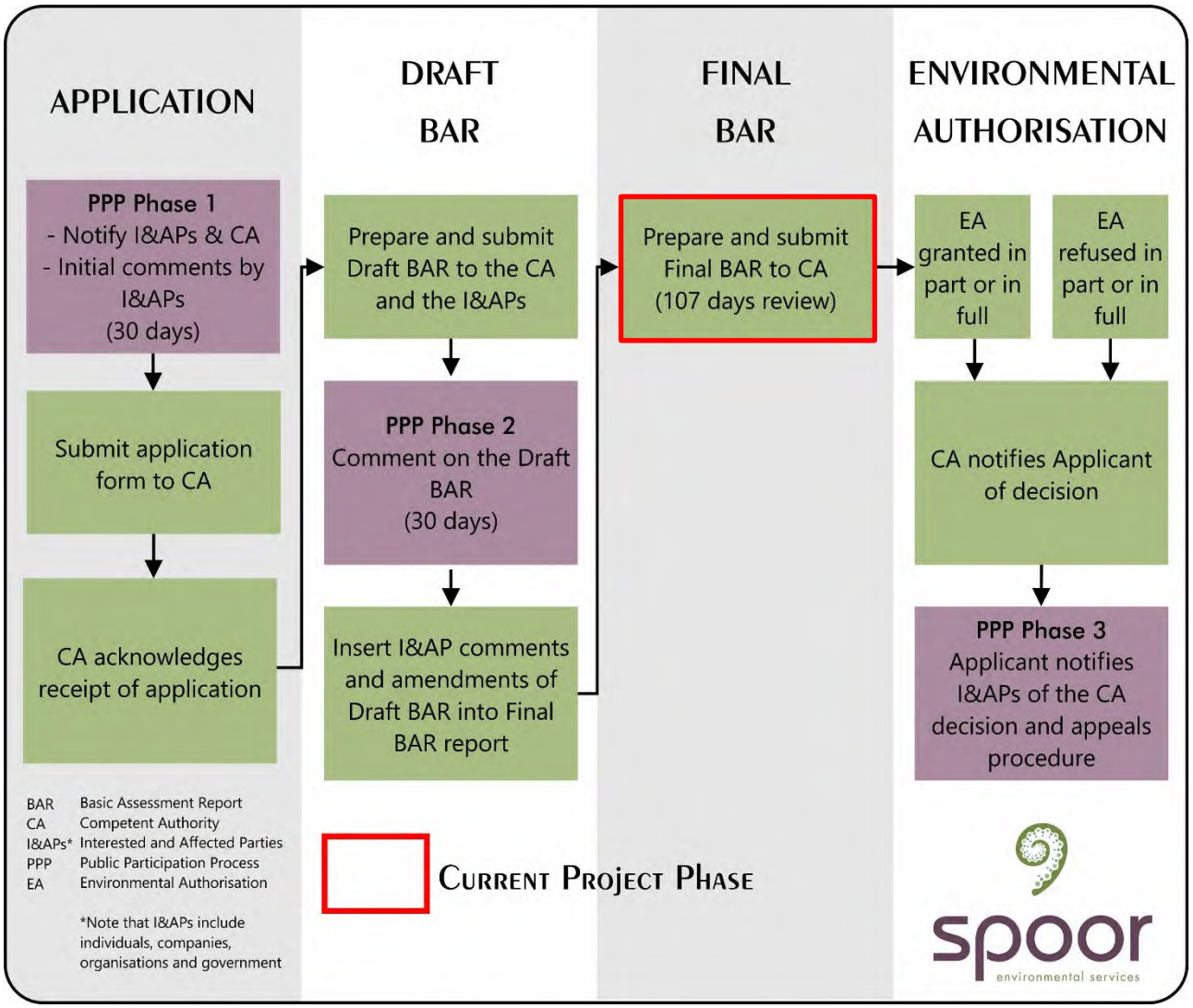

Figure 1: Public Participation Process

3. PUBLIC PARTICIPATION PROCESS PHASES

3.1. Phase 1: Initial Public Awareness

Initial awareness of the dam development was created via the distribution of the Background Information Documents, the placement of site notices on the property boundary and the placement of a newspaper advertisement in a locally distributed newspaper (Die Pos).

3.1.1. Background Information Document (BID)

A BID was drafted that informed potential I&APs of the following:

- The background of the project;
- Proposed development description;
- Project location;
- Listed Activities in terms of NWA (Act 36 of 1998)
- Explanation of what the WULA process entails;
- I&AP involvement in the process;
- Details of the Applicant;
- Contact details of the EAP;
- A locality map of the proposed development area; and
- A form for I&APs to register.

The BID was initially distributed to the relevant identified I&APs during September 2020. BIDs were also forwarded to other I&APs at the time of receiving additional requests for information from parties that came across the notices in the press and the on-site advertisements. The BID was distributed to the following stakeholders:

Immediate Neighbours and Adjacent Landowners
Adjacent landowners and property owners received the BID notices via registered letters, email notifications and telephonic discussions.

Directly Affected Properties
Property Owners of properties affected by the dam project were notified via, email, site visits and telephone discussions and informed about the dam project.

Ward Councillors
Cllr K Mogohloana (Ward 5) was contacted via email and telephone provided with the project BID.

Local Authorities
The BID was forwarded to the relevant Departments of the Lephalale Municipality as well as to the Waterberg District Municipality and the Vaalwater SAPS.

Government Departments
The Department of Water and Sanitation, the Limpopo Province Department of Economic Development,

Environment and Tourism, the Limpopo Department of Agriculture and Rural Development, the Limpopo Department of Rural Development and Traditional Affairs, the South African Heritage Resources Agency (SAHRA), the and the Limpopo Department of Public Works, Roads and Infrastructure were notified.

Other I&AP's, NGOs, CBOs, Conservancies, Resident Associations & Service Providers
The BID notices were distributed to the relevant service providers and other I&AP's including Eskom and Eskom Vaalwater Branch, the Mokolo and Vaalwater Water Users Associations, Local Farmer's Association, The Waterberg Biosphere Reserve, and the Welgevonden Nature Reserve.

3.1.2. Site Notices

Detailed site notices in accordance with the requirements of the NEMA regulations were placed at a strategic and visible place on the boundary fence of the entrance to the farm on the 22nd of September 2020.

3.1.3. Newspaper Advertisements

A newspaper advertisement including all relevant information and a description of WULA process was placed in *Die Pos* paper of the 18th of September 2020.

3.2. I&AP Registration and Initial Comments

I&APs were registered on an I&AP database in line with their responses to the BID, the press advertisements and site notices. Concerns, requests, and suggestions from I&APs were listed in the Comments and Responses register. The EAP communicated relevant information to all registered I&AP throughout the BA process to date, for them to respond and comment on the proposal.

3.3. Summary of Comments Received During Phase 1

Immediate Neighbours, Adjacent Landowners and Landowners
In short, the following aspects were noted by the adjacent landowners:

- Mr Radie van Wyk of the Farm Elserafie 214 KQ replied on the BID and noted that he supported the development.

Ward Councillors

- No comments were received to date.

Government Departments

- No comments were received from any State Department.

Local Authorities

- No comments were received from any Municipal Department.

NGOs, CBOs, Conservancies, Residential Associations, Service Providers

- Mr Andre Burger of the Welgevonden Game Reserve registered as and I&AP on the project and noted that they have no concerns at the moment. They requested to be kept abreast of further developments on the project.

The EAP responded to each of the aspects raised above and the responses are summarised in the paragraph below.

3.4. Summary of Responses During Phase 1

The summary below provides an overview of the responses made by the EAP on the principle comments raised by the stakeholders. Feedback in this section represents that included up to the submission of the WULA Report.

Immediate Neighbours, Adjacent Landowners and Landowners
The EAP thanked Mr van Wyk for his participation.

Other NGOs, CBOs, Conservancies, Residential Associations, Service Providers
The EAP registered the Welgevonden Game Reserve and notified Mr Burger that they would be kept abreast of further developments in the BA process.

3.5. Summary of Responses During Phase 2

The summary below provides an overview of the responses made by the EAP on the principle comments raised by the stakeholders in terms of the Draft BA report. Feedback in this section represents that included up to the submission of the Final BA Report.

Ward Councillors

- No comments were received to date.

Government Departments

- A Digital and a hard copy (In CD Format) of the Draft BA was submitted to the DWS in Polokwane. No comments were received from the DWS or any State Department.

Local Authorities

- A Digital and a hard copy (In CD Format) of the Draft BA was submitted to the office of the acting Municipal Manager and the Head of the Parks and Infrastructure sections. The Draft report was also submitted to the Waterberg District Municipality. No comments were received from any Municipal Department to date.

Immediate Neighbours, Adjacent Landowners and Landowners
No further comment was received from adjacent landowners.

Other NGOs, CBOs, Conservancies, Residential Associations, Service Providers
The Draft BA Report was submitted to the Welgevonden Nature Reserve as well as the Mokolo and the Vaalwater Sub Water Users Associations. Read receipts were received from the Water Users Associations, but no further comment or feedback were received by the EAP.

4. CONCLUSION

The overarching aim of the PPP is not only to adhere to the required legislation, but also to give as many stakeholders as possible an opportunity to be actively involved in this process. SPOOR Environmental Services (Pty) Ltd. identified and contacted the relevant I&APs as far as possible to inform them of the proposed dam

development and relevant procedures as well as to provide opportunity to raise issues and concerns about the dam development.

SPOOR believes that I&APs were given sufficient opportunity to participate in the environmental process to date. I&APs that registered because of the advertisements and subsequent notices were logged and provided with additional information where this was requested. The Draft BA report were made available in hard copy and digital formats. All of these responses (to and from the EAP) were included in the assessment to guide the studies to reach the most productive solutions for the dam project.

APPENDIX E_7

I&AP DATABASE

INTERESTED AND AFFECTED PARTIES DATABASE

PROJECT NAME	**Joe Kloppers Dam 7 Basic Assessment Application, Vaalwater, Lephalale Local Municipality, Limpopo Province**
Name & Surname	**Organisation**
CLIENT	
Mr Joe Kloppers	Joe Kloppers Boerdery
PROJECT TEAM	
Mr. J.C. van Rooyen	SPOOR Environmental Services - EAP
IMMEDIATE NEIGBOURS AND ADJACENT LANDOWNERS	
T Maritz	REM, 1 & 2 GROENDRAAI 213 KQ THINUS MARITZ BOERDERY (PTY) LTD.
R VAN WYK	ELSERAFIE 214 KQ Radie van Wyk
R & S VENEMA	PTN 5,7,9 STERKSTROOM 250 KQ VENEMA BROERS CC
J H JONES	PTN 2 STERKSTROOM 250 KQ HENJON STERKSTROOM BOERDERY CC
BD MOSTERT	PTN 1 STERKSTROOM 250 KQ

M GUERINI	PTN 0 & 4 DOORNSPRUIT 249 KQ
ANDRIES KRUGER	PTN 1 DOORNSPRUIT 215 KQ ANDRIES KRUGER TRUST
WARD COUNCILLORS	
Cllr K Mogohloana	Lephalale Local Municipality Councillor Ward 5
LOCAL GOVERNMENT	
Ms. Edith Tukakgomo	Lephalale Local Municipality - MM
	Lephalale Local Municipality
Me Maria Cocquyt	Lephalale Local Municipality - MM (Acting)
Me Riekie Coetzee	MM Secretary
Mr. Thomas Tshivhandekano	Lephalale LM - Parks
	Lephalale LM - Infrastructure
Nozi Molteno	Waterberg District Municipality
Station Manager	Vaalwater Police Department
STATE DEPARTMENTS	
Pulane Matswi Love Hlekane	Limpopo Department of Water and Sanitation

PP Mokgadi For attention Mr Maluleke EV	Limpopo Department of Economic Development, Environment and Tourism
Mr Jackie Phosa	Limpopo Department of Agriculture and Rural Development
Ms. Nokukhangya Khumalo	South African Heritage Resources Agency
Ms Maphuti Ramalla	Limpopo Department of Rural Development and Land Reform Deputy Direcctor: Capricorn & Waterberg District (REID)
	Limpopo Department of Public Works, Roads and Infrastructure
OTHER NGOs, CBOs, CONSERVANCIES, RESIDENTS ASSOCIATIONS, ETC.	
Francois van der Berg	Mokolo Water User Association
Marietjie Marx	Water Irrigation Association
Ben Mostert	Local Farmers Association
Dr Rupert Baber	Chair: Waterberg Biosphere Reserve
	Welgevonden Nature Reserve
Ian van der Merwe	Vaalwater Water Users Association
SERVICE PROVIDERS	
Mr Christo Louw Mr Vuyo Nyamane	Eskom Wayleaves
Emile Marell	Eskom Vaalwater

APPENDIX F

ENVIRONMENTAL MANAGEMENT PROGRAMME

ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER VAALWATER AREA LEPHALALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

SUBMITTED TO:

Limpopo Department
of Economic Development,
Environment & Tourism

20 Hans van Rensburg Street
/19 Biccard Street
Polokwane
Limpopo
0699

APPLICANT:

Joe Kloppers
PO Box 103
Vaalwater
0530

spoor
environmental services

SPOOR Environmental Services (PTY) Ltd.

t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 e: info@spoorenvironmental.co.za

p: Postnet Suite 448, Private Bag X025, Lynnwood Ridge, 0040, Pretoria,

South Africa

February 2021

REPORT TITLE:	EMPr in terms of the Proposed Construction of a Dam for the Storage of Water, Vaalwater, Lephalale Local Municipality, Limpopo Province
APPLICANT:	Joe Kloppers
SPOOR PROJECT REFERENCE:	09/09_j kloppers dam 7_ba

DOCUMENT HISTORY

REPORT	DATE	VERSION	STATUS
Joe Kloppers Storage Dam 7 EMPr	November 2020	1.0	Draft
Joe Kloppers Storage Dam 7 EMPr	February 2021	2.0	Draft

APPLICANT

APPLICANT:	Mr. Joe Kloppers
CONTACT PERSON:	Mr. J Kloppers
POSTAL ADDRESS:	PO Box 103 Vaalwater 0530

ENVIRONMENTAL ASSESSMENT PRACTITIONER

CONSULTANT:	SPOOR Environmental Services (Pty) Ltd
CONTACT PERSON:	Mr. JC van Rooyen
POSTAL ADDRESS:	Postnet Suite 448, Private Bag X025, Lynnwood Ridge, 0040
TELEPHONE:	012 804 1181
FAX:	086 763 5635
EMAIL:	jcvr@spoorenvironmental.co.za

DECLARATION OF INDEPENDENCE

I, JC van Rooyen as authorised representative of SPOOR Environmental Services (PTY) Ltd. hereby confirm my independence as an Environmental Assessment Practitioner and declare that neither I nor SPOOR Environmental Services (PTY) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which SPOOR Environmental Services (PTY) Ltd. was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with Basic Assessment Application for the Proposed Construction of a Dam for the Storage of Water, Vaalwater Area, Lephalale Local Municipality.

Signed: JC van Rooyen Date: 2021-02-10

Disclaimers

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EXECUTIVE SUMMARY

Introduction

SPOOR Environmental Services (Pty) Ltd was appointed as the independent environmental assessment practitioner (EAP) to manage the Basic Assessment application in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The Application is for the proposed construction of a dam for the storage of water on Portion 2 of the Farm Doornspruit 215 KQ, Vaalwater Area, Lephalale Local Municipality, Limpopo Province.

Locality

The subject property is located approximately 20km northwest of the town Vaalwater, Limpopo Province, South Africa and falls under the jurisdiction of the Lephalale Local Municipality as well as the Waterberg District Municipality. The proposed dam extends over portion 2 of the Farm Doornspruit 215 KQ, which falls within the Vaalwater area and the Lephalale Local Municipality. The project furthermore falls in the A42E quaternary drainage region (QDR) of the Limpopo Water Management Area (WMA). Access to the property are gained via the R517 which runs on the southern border of the application area.

Discussion

South Africa is situated in a semi-arid region and as such, is classified as a water-scarce country. Due to the high variability in river water storage needs to be implemented in order to assure the water availability for crop irrigation during dry-spells. In addition, the Limpopo Employment, Growth and Development Plan (LEGDP), which culminates from the revision of the Provincial Growth and Development Strategy (PGDS), includes the policy framework that contains the strategic vision of the province with the aim of growing the economy and enhancing sustained economic growth and job creation.

The Joe Kloppers farming operations is one of a number of other irrigation farms along the Sterkstroom River where pivot irrigation is used for crop farming. In terms of the ecological impacts, the specialist Ecologist reported that the irrigation dams are not situated in sensitive watercourses and also on previously disturbed areas.

Environmental Impacts Identified

Anticipated impacts have been identified and described because of the abovementioned processes and the pertinent impacts are summarized in the table below.

Impact Summary

Potential Impacts	Impact Significance with Mitigation
Geology and Soils:	
❖ Possible scouring and erosion ❖ Possible loss of topsoils ❖ Contaminations	Low Low Low
Hydrology:	
❖ ELU ❖ Surface water contaminations ❖ Sedimentation and siltation ❖ River contaminations	Medium Low Low Low

Potential Impacts	Impact Significance with Mitigation
Stormwater Management:	
❖ Erosion and siltation	Low
Fauna and Flora	
❖ EWR ❖ Riverine habitat deterioration and loss ❖ Proliferation of alien vegetation	Medium Low Medium
Operational Maintenance	
❖ Damage to river areas as a result of lacking operational maintenance	Low
Local Employment:	
❖ Additional local job opportunities	High (positive)

The Applicant will carry the responsibility of duty of care towards the site and this Environmental Management Programme has therefore identified associated mitigation measures to assist the Applicant and the rest of the Stakeholders with the management of this responsibility. It is believed that the identified impacts can be significantly minimised provided that the mitigation and rehabilitation measures included in section 7 of this EMPr are strictly adhered to.

Environmental Management Programme

The aim of this Environmental Management Programme is to ensure that the planning, assessment, and construction phases of the dam development comply with the relevant environmental management procedures. The Environmental Management Programme furthermore aims to organise and coordinate the proposed environmental management and mitigation measures and to describe these measures to prevent, reduce or otherwise manage the potential negative social and environmental impacts associated with the development and to add to the favourable impacts of the project.

DETAILS AND EXPERTISE OF SPOOR ENVIRONMENTAL SERVICES

Name: JC van Rooyen
Company: SPOOR Environmental Services (Pty) Ltd
Qualifications: Pr LA Techno B.L. M.Sc. (Env Soc)
Professional Registration: SACLAP (20187)

In accordance with Appendix 4 (1) (a) (ii) of Government Notice No. R. 982 of December 2014, this section provides an overview of SPOOR Environmental Service's experience with EMPr's. SPOOR Environmental Services (Pty) Ltd. has been in operation since 2011. The Director, Mr. JC van Rooyen, has been involved in an array of environmental consultation and planning projects in various spheres of the landscape design, development and environmental management disciplines over the past 20 years. SPOOR Environmental Service's approach towards projects is to strive for sustainable environments that not only reflect artistic and aesthetic quality but also hold diverse ecological and cultural value. The Company can conduct environmental applications and landscape development planning and design for various projects including:

- Scoping & Environmental Impact Assessment Reports,
- Visual Impact Assessments,
- Environmental Management Systems/ Plans,
- Environmental Management Programmes (EMPr),
- Environmental Audits & Monitoring,
- Waste Management Licence Applications,
- Air Emission Licences (AEL's),
- Water Use Licence Applications (WULA),
- Integrated Environmental Management (IEM),
- Tree Removal Permits,
- Environmental Rehabilitation,
- Conservation Planning / Eco-tourism Developments,
- Landscape Design and Development, and
- Landscape/ Environmental Project Management.

PROJECT TEAM

The environmental assessment practitioner working on the project will be:

- **Mr. J.C. Van Rooyen** *(BL., M.Sc. (Env. Soc) (SACLAP) (Principle EAP)*
  Landscape Technologist and Environmental Assessment Practitioner

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ABBREVIATIONS

CBA	-	Critical Biodiversity Area
CLO	-	Community Liaison Officer
COIDA	-	Compensation for Occupational Injuries and Diseases Act (No 130 of 1993)
DWS	-	Department of Water and Sanitation
EAP	-	Environmental Assessment Practitioner
ECA	-	Environment Conservation Act
ECO	-	Independent Environmental Control Officer acting on behalf of the Client
EIA	-	Environmental Impact Assessment
ELU	-	Existing Lawful Use
EMPr	-	Environmental Management Programme
ESA	-	Ecological Support Area
EWR	-	Ecological Water Requirement
H&S Rep	-	Health and Safety Representative
IEM	-	Integrated Environmental Management
IDP	-	Integrated Development Plan
I&AP	-	Interested and Affected Parties
LLM	-	Lephalale Local Municipality
MAMSL	-	Metres Above Mean Sea Level
NEMA	-	National Environmental Management Act
NEMBA	-	National Environmental Management Biodiversity Act
NEMWA	-	National Environmental Management Waste Act
NFEPA	-	National Freshwater Ecosystems Priority Areas
NHRA	-	National Heritage Resources Act (Act 25 of 1999)
NWA	-	National Water Act (Act 36 of 1998)
OHS	-	Occupational Health and Safety
OHS Act	-	Occupational Health and Safety Act (No 85 of 1993)
PC	-	Principal Contractor
PHRA	-	Provincial Heritage Resources Authority
PM	-	Project Manager
PPE	-	Personal Protective Equipment
QDR	-	Quaternary Drainage Region
QDSG	-	Quarter Degree Square Grid
SABS	-	South African Bureau of Standards
SAHRA -	-	South African Heritage Resources Agency
SANS	-	South African National Standards
SDF	-	Spatial Development Framework
SHE	-	Safety, Health and Environment
SME	-	Small and Medium Enterprise
SSC	-	Species of Special Concern
TDS	-	Total Dissolved Solids
WDM	-	Waterberg District Municipality
WMA	-	Water Management Area
WUA	-	Water Users Association
WULA	-	Water Use Licence Application

1. INTRODUCTION

SPOOR Environmental Services (Pty) Ltd. *(hereafter referred to as SPOOR)* was appointed by Mr. Joe Kloppers, to manage the Basic Assessment application in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The Application is for the proposed construction of a dam for the storage of water on Portion 2 of the Farm Doornspruit 215 KQ, Vaalwater Area, Lephalale Local Municipality, Limpopo Province.

2. EMPR OBJECTIVES

The aim of the EMPr is to ensure that the design, planning, construction, and operational phases of the development comply with the relevant environmental legislation, regulations, and guidelines. The EMPr furthermore aims to organise and coordinate the proposed environmental management and mitigation measures and to describe these measures to prevent, reduce or otherwise manage the potential negative social and environmental impacts associated with the dam development and to add to the favourable impacts of the project. In brief, the EMPr therefore aims to ensure that:

- activities arising as a consequence of the design, planning and construction on the site of the developments are managed in a way that reduces or avoids negative social and environmental impacts and to enhance its positive effects;
- impacted environments are restored per the recommendations of the EMPr;
- ensuring that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts;
- efficient information sharing is maintained, and a clear understanding exists of all the responsibilities of all the relevant stakeholders;
- the necessary precautions are taken against damages and claims that occur because of the implementation of the development in a timeous fashion;
- accurate records are kept of the progress of the development during its various stages as well as of the ongoing monitoring of all its associated social and environmental impacts;
- stakeholders respond to unforeseen events;
- feedback is provided for continual improvement in environmental performance; and
- timeous completion occurs of all the implementation activities on account of generally sound management.

3. PROJECT DESCRIPTION

3.1 Project Overview

Mr Joe Kloppers is applying for environmental authorization as required for the storing of water in a dam. The said farm portion is owned and farmed by Mr Joe Klopper- the Applicant. The application constitute the storing of the existing lawful water allocation in a dam on the said farm portion for the purposes of agricultural irrigation. The proposed infrastructure includes;

- Dam with a capacity of 52 000m³;
- Dam area of 1, 725 hectares;
- Maximum dam wall height of 4,73m;
- Service spillway on the dam crest and associated outlet infrastructure.

Table 1: Storage Dam Detail

Vaalwater Dams - Joe Kloppers						
No.	**Dam ID**	**Farm name**	**Volume**	**Size**	**Status**	**Coordinate**
1	Dam 7	Doornspruit 215 KQ Ptn 2	52 000m³	1, 725 ha	New	24° 11' 53.40" S 27° 57' 31.81" E

3.2 Locality

The subject property is located approximately 20km northwest of the town Vaalwater, Limpopo Province, South Africa and falls under the jurisdiction of the Lephalale Local Municipality as well as the Waterberg District Municipality . See Figure 1 & Figure 2.

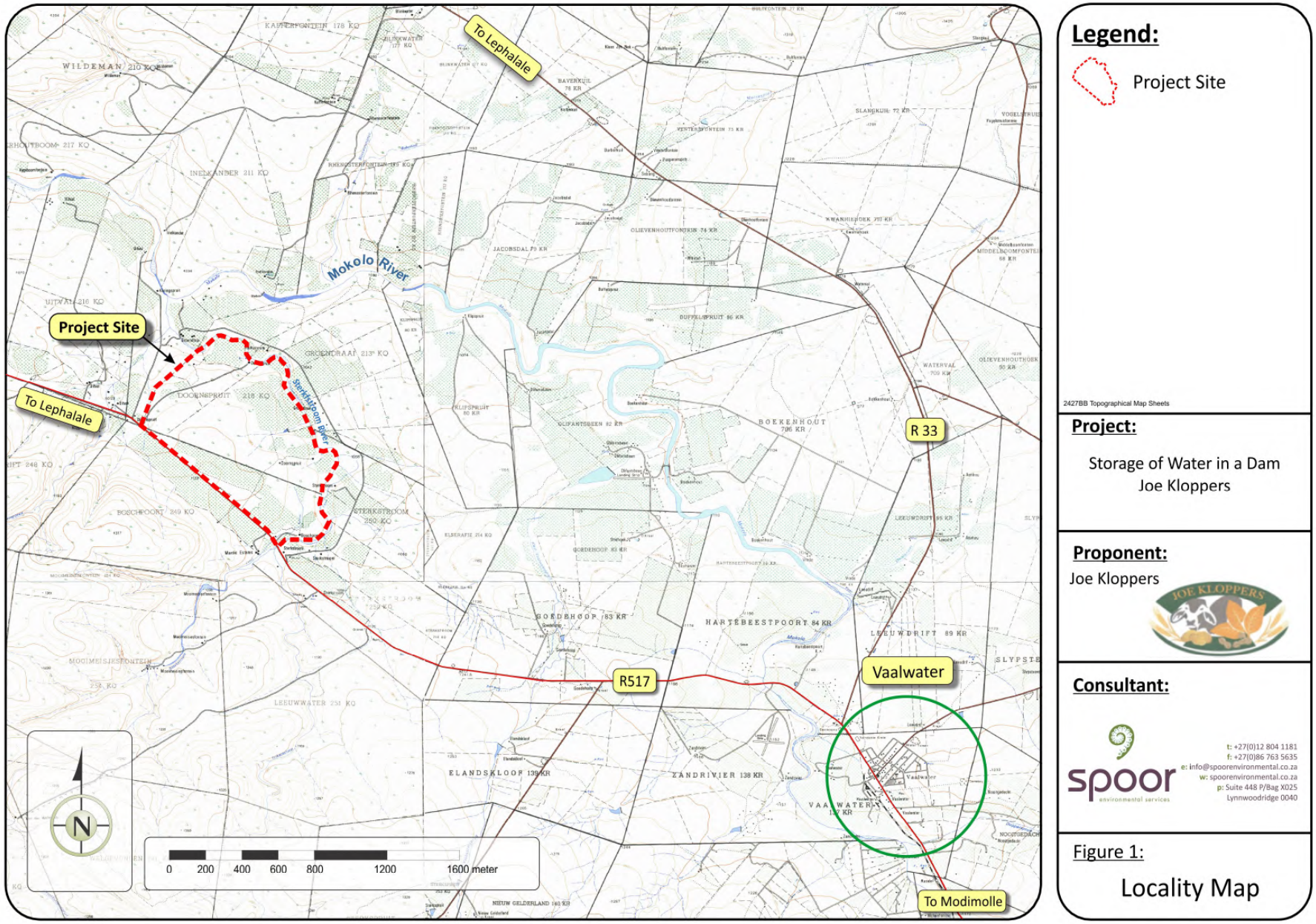

Figure 1: Locality

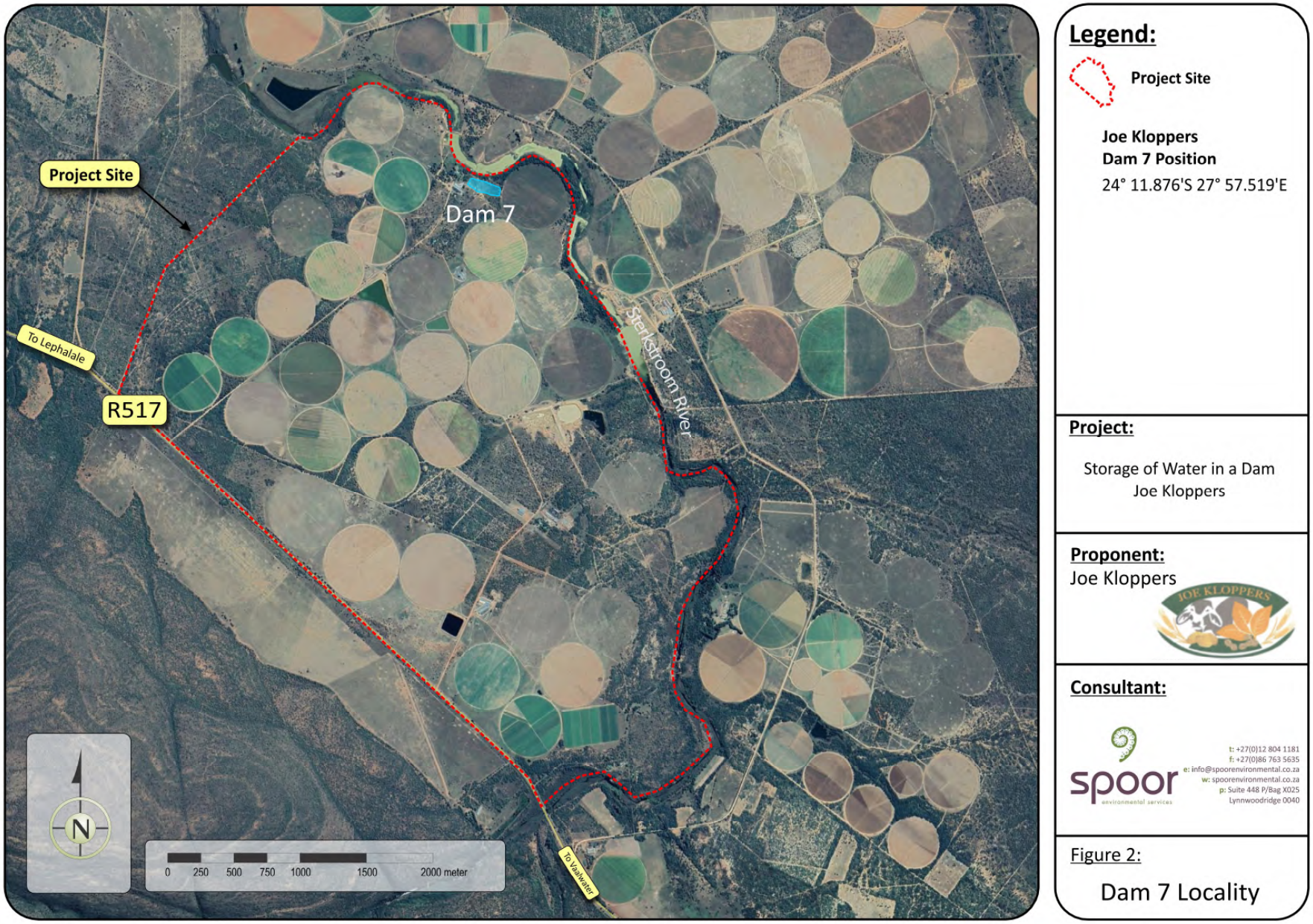

Figure 2: Dam Locality

4. RECEIVING ENVIRONMENT

4.1 Bio-Physical Environment

The applicable farm portions falls within a summer rainfall region, with precipitation on average falling between 500-700 mm annually where the highest rainfall occurs during the December and January months. Winters, in contrast are found to be extremely cold and very dry- during which fairly infrequent frost incidences may occur (approximately 4 days p.a.). The mean monthly maximum and minimum temperatures for the area are 35.3°C (indicative of a warm temperate climatic regime) and 0.9°C for November and June, respectively (Mucina & Rutherford, 2006).

In terms of the local geology, the farm portions are located on the Bb, Fa, Ba, Bd and Ac land types. Primarily underlying this site is the Lebowa Granite Suite (to the south). As in the name, this formation can be characterized by granite, along with subvolcanic granophyre of the Rashoop Granophyre Suite of the Bushveld Complex, Vaalian Era. To the north of the site, the sedimentary rocks such as sandstone, conglomerate and siltstone of the Waterberg Group (Mokolian Erathem); and sandstone and shale of the Vaalwater Formation, are more significant. Well-drained, deep Hutton or Clovelly soils are located at the higher elevations onsite, where a catenary sequence of Hutton-series to a Clovelly-series, persist on the lower areas. (Mucina & Rutherford, 2006).

The study area consists of a low undulating area, with no prominent topographic features located within its extent. A sequence of hills is, however, present on the more northern edge of the site- whose characteristics are further emphasized by small non-perennial streams flowing between them in wet-, summer (seasonal) months. Elevation (MAMSL) is found to be higher in the southern side (approximately, 1119 MAMSL) of the site area, when compared to the southern side (approximately 1071mamsl) (see Figure 6). The highest on-site topographical elevation point was recorded at 1131 mamsl and the lowest point at 1014mamsl, with an elevation loss off 117 m over 2.8 km.

With regard to hydrological features the application area is located in the A42E quaternary drainage region (QDR). The relevant watercourses and spatial framework falls within the Sterkstroom River (A42D-346). The A42E QDR are located in the Limpopo Water Management Area (WMA). Regionally, the area exhibits a weak branched drainage pattern that can be contributed to its gently sloping topography.

The storage dam site is situated within the Mixed Bushveld and Sourish Mixed Bushveld veld type, as described by Acocks (1988) as well as by Low & Rebelo (1996). In the new vegetation map of South Africa, the area falls within the Central Sandy Bushveld vegetation type (SVcb 12, Mucina & Rutherford 2006). This vegetation unit is vulnerable with less than 3% statutorily conserved (Doorndraai Dam and Skuinsdraai Nature Reserves) and with about 24% transformed mainly by cultivation (19 %) and (4 %) urban and built-up areas (Mucina & Rutherford 2006).

Almost all the natural vegetation was replaced by crop farming activities such as mixed crop and cattle farming activities. The following crops are planted on a rotational basis, viz. Peanuts; Tobacco; Potatoes; Flowering bulbs (Amaryllis); Corn; Watermelon and grazing for the owner's cattle. In terms of the site specific area, Dam 7, are situated in a CBA2 listed area in the terms of the Limpopo Conservation Plan V2. reported that the irrigation dam are not situated in an on-stream position of a sensitive watercourse. The riverine area has been identified and the proposed dam has been moved outside of this area with a buffer of 15m.

With regards to mammal biodiversity, the Specialist reported that no Red Data or sensitive species are deemed present on the site since the site falls outside of their distributional ranges or does not offer suitable habitat(s). In terms of sensitive bird species, no species of international and/or national conservation concern (Red Data species, IUCN/Birdlife International 2011, Barnes 2000), ranging from Near Threatened to Vulnerable, were considered as possible to occur on site..

In terms of reptilian biota one red data specie are listed to habituate the area. The African Rock Phyton (*Phython natalensis*). None was identified on site although habitat exists for them. Proper environmental awareness training should be done for all staff on the farms to enlighten then to the possible occurrence and how to act when these species are encountered.

4.2 Socio Economic Environment

4.2.1 Lephalale Local Municipality

The Lephalale Municipality is located in the north western part of the Waterberg District of Limpopo and is the biggest municipality in the province- covering 14 000km². Lephalale Local Municipality is rich in natural resources that give it a competitive advantage in Mining, Energy, Tourism and Agriculture (Lephalale Municipality, 2018). Agriculture as a sector, presents one of the greatest opportunities to significantly grow the South-African economy and create jobs. According to the IDP, agriculture is the sector that employs the largest part (38.85%) of the workforce within the municipality and is followed directly by community service (15.71%). The agricultural sector is therefore essential for food security and employment contribution within the municipality. This is vital as the unemployment in the area is a staggering 22% of the population. Further demographics state that the Lephalale Municipality has a population of 140 240 people (Statistics South Africa, 2016).

The youth represent 40.7% of the population. Approximately 43 002 households live within the municipality, with an average household size of 3.2 people. Given the size and the population, the population density within the area is calculated as 8 people per square kilometres. The community survey of 2016 projected a 21.8% in the male population compared to the 13.5% of the female population with an overall increase of 18% in 2016 against the 35.8% of 2011. This increase can be attributed to the skills development- and job opportunities within the municipality as a result of the Waterberg coalfield. The survey also suggested a population increase that is found to be higher than the provincial growth rate of 0.84% p.a. for the past five years. Almost 58.4% of the population is economically active in terms of age.

Lephalale offers a variety of scenic contrasts which includes mountain ranges, clear streams and rolling hills. Archeologically, the municipality is rich in geological sites encompassed by rock art- attributing to the tourist attractiveness of the area. Tourism in the area is also increased by the hunting and ecotourism industries. Industrial operations as well as related business tourism also contribute economically to the municipality. Agriculture, especially red meat is one the potential economic activity which is likely to grow in the municipal area. Both social infrastructure and economic infrastructure indicators show that much must still be done to improve the quality of life of the people of Lephalale (Lephalale Municipality, 2018).

5. LEGISLATIVE FRAMEWORK

The following section includes the primary list of legislation which is deemed relevant to the proposed development on all levels of government, including the constitutional, national, provincial, and local level. Although the aim was to be as comprehensive as possible the list does not represent a complete legal compliance review and the responsibility remains with the Proponent to ensure compliance with the required legislation.

5.1 The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)

The Constitution of the Republic of South Africa is the principal legal source of the Republics' legislative framework, including its environmental law. The Bill of Rights is fundamental to the Constitution of South Africa. Section 24 of the Act states that:

Everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that (i) prevent pollution and Ecological degradation; (ii) promote conservation; and (iii) secure Ecologically sustainable development and use of natural resources while promoting justifiable Economic and social development. (Government Gazette, 1996).

The Constitutional environmental right not only afforded every person with the entitlement to enjoy a right to an environment which is not harmful to their health and well-being, but also placed a constitutional mandate on government to protect the environment through reasonable legislative and other measures. (PULP, 2010)

5.2 Environment Conservation Act, 1989 (ECA) (Act 73 of 1989)

The primary objective of the ECA is to provide for the effective protection and controlled utilization of the environment. This Act has been largely repealed by NEMA, but certain provisions remain, in particular provisions relating to environmental impact assessments (EIA). Section 2 of the act contains the policy framework of the to achieve the above. It states that:

> *2(1) Subject to the provisions of subsection (2) the Minister may by notice in the gazette determine the general policy to be applied with a view to –*
> *(a) the protection of ecological processes, natural systems, and the natural beauty, as well as the preservation of biotic biodiversity in the natural environment;*
> *(b) the promotion of sustained utilization of species and ecosystems and the effective application and re-use of natural resources;*
> *(c) the protection of the environment against disturbance, deterioration, defacement, poisoning, or destruction as a result of man-made structures, installations, processes, products, or human activities; and*
> *(d) the establishment, maintenance and improvement of environments which contribute to a generally acceptable quality of life for the inhabitants of the Republic of South Africa.* (ECA) (Act 73 of 1989).

5.3 National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)

The NEMA Act provides the primary enabling vehicle Section 24 of the Constitution of the Republic of South Africa (Act 108 of 1996). The core environmental principle is the promotion of ecologically sustainable development. This Act introduces cooperative governance of environmental matters by establishing the

necessary governmental institutions that will ensure proper implementation of environmental protection. NEMA also makes provision for fair environmental decision-making and for conciliation and arbitration of conflicts. As part of the process of integrated environmental governance, NEMA introduces a new framework for environmental impact assessments. Finally, based on the doctrine of strict liability, NEMA also introduces a far-reaching general duty of care to prevent, control and rehabilitate the effect of significant pollution and environmental degradation, including historic pollution and environmental degradation. (PULP, 2010)

5.4 National Environmental Management: Biodiversity Act, 2004 (NEM:BA) (Act 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. It provides for the protection of species and ecosystems in need of protection, sustainable use of indigenous biological resources, equity in bio-prospecting, and the establishment of a regulatory body on biodiversity –South African Biodiversity Institute. (PULP, 2010) In terms of the Biodiversity Act, Proponents have the responsibility for:

- The conservation of endangered Ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations),
- Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with Ecological sustainable development and protection of biodiversity,
- Limit further loss of biodiversity and conserve endangered Ecosystems.

5.5 National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)

In regulating air quality in South Africa, the NEM:AQA was introduced to protect the environment by introducing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development whilst promoting justifiable economic and social development. In addition, the act aims to provide national norms and standards for regulating air quality monitoring as well as air quality management and control. The list of activities included in General Notice 248 must be considered for any activities that produces emissions. The following passages of the act bare relevance;

Section 22: No person may without a provisional atmospheric emissions licence conduct an activity;
(a) listed on the national list anywhere in the Republic; or
(b) listed on the list applicable in a province anywhere in the province.

5.6 National Environmental Management: Waste Act, 2008 (Act 59 of 2008)

Act no 59 of 2008 provides for the control of waste management activities which have or is likely to have a detrimental effect on the environment. The act aims to;

- Reform the law regulating waste management in order to protect health and the environment by providing reasonable measures to prevent pollution and Ecological degradation and for securing Ecologically sustainable development,
- To provide for institutional arrangements and planning matters,
- To provide for national norms and standards for regulating the management of waste by all spheres of government,
- To provide for specific waste management measures,
- To provide for the licensing and control of waste management activities,

- To provide for the remediation of contaminated land,
- To provide for a national waste information system,
- To provide for compliance and enforcement, and
- To provide for all matters related to the above aspect.

Importantly the act furthermore includes requirements that stipulate that no person may commence, undertake, or conduct a waste management activity listed in the act unless a licence is issued in respect of that activity.

5.7 National Water Act, 1998 (NWA) (Act 36 of 1998)

The National Water Act (NWA) identifies 11 consumptive and non-consumptive water uses in terms of section 21 of the act which must be authorized. The authorization system includes scheduled uses, general authorizations, and licences. It allows for the reserve of the specific water resource to be determined and also includes a public involvement process in the establishment of strategies and decision-making and guarantees the right to appeal against such decisions. The reserve is defined by the quality and quantity of the water resource in order to meet basic human needs as well the Ecological requirements.

Section 27 of the NWA specifies that the following factors regarding water use authorization be taken in consideration:

- The efficient and beneficial use of water in the public interest;
- the socio-Economic impact of the decision on whether or not water use is authorized;
- alignment with the catchment management strategy;
- the impact of the water use and possible resource directed measures;
- investments made by the Proponent in relation with the water resource in question.

5.8 National Heritage Resources Act, 1999 (NHRA) (Act 25 of 1999)

Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study be undertaken for:

(a) construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;

(b) construction of a bridge or similar structure exceeding 50 m in length; and

(c) any development, or other activity which will change the character of an area of land, or water –

(1) exceeding 10 000 m^2 in extent;

(2) involving three or more existing erven or subdivisions thereof; or

(3) involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or

(d) the costs of which will exceed a sum set in terms of regulations; or

(e) any other category of development provided for in regulations.

5.9 Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)

The main aim of this act is to provide a legal vehicle for the protection of productive agricultural resources. The act provides for the control and protection of wetlands, soil conservation matters, control and prevention of veld fires, control of weeds and invader plants, and the control of pollution via agricultural practices. The act therefore focusses on fighting of soil erosion, the protection of water resources, and combatting the

degradation of indigenous vegetation conducive to agricultural practices through the control of invasive alien vegetation.

5.10 Municipal Systems Act, 2000 (Act 32 of 2000)

The Municipal Systems Act form part of a string of other legislation which aims at empowering local government to fulfil its constitutional obligations. As part of this objective the SA government published the Local Government White Paper in 1998, which outline the policy framework for local government structures. In addition, government furthermore published the Municipal Demarcation Act, 1998 (Act 27 of 1998) which allowed for the demarcation of new municipal boundaries, the Municipal Structures Act, 2000 (Act 33 of 2000) which outlines the required structures of a local authority and the Municipal Financial Management Act, 2003 (Act 56 of 2003) which must secure sound and sustainable management of the fiscal and financial affairs of municipalities and municipal entities by establishing norms and standards and other requirements for the lawful financial management of these entities.

The Municipal Systems Act work in unison with these sets of legislation by regulating key municipal organizational, planning, participatory and service delivery systems. In combination, these sets of legislation provide a framework for the democratic, accountable, and developmental local government system as envisaged by the Constitution.

5.11 National Development Plan

The National Development Plan aims to eliminate poverty and reduce inequality by 2030. South Africa can realise these goals by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society. It is a plan for South Africa, and it provides a broad strategic framework to guide key choices and actions. Given the complexity of national development, the plan sets out six interlinked priorities:

- Uniting all South Africans around a common programme to achieve prosperity and equity.
- Promoting active citizenry to strengthen development, democracy, and accountability.
- Bringing about faster economic growth,
- Higher investment and greater labour absorption. Focusing on key capabilities of people and the state.
- Building a capable and developmental state.
- Encouraging strong leadership throughout society to work together to solve

5.12 Integrated Environmental Management

The term Integrated Environmental Management (IEM) has been used in South Africa since the 1980's. Documentation on how IEM would assist the EIA process was originally produced in 1992 by the then National Environmental Management Competent Authority. The need has since arisen for more comprehensive inputs in the EIA process and this paved the way for the development of the Integrated Environmental Management Series in 2002 which consisted of a set of booklets providing more detailed insights in the approach and methodologies associated with EIA. In brief, the IEM seeks to achieve the following;

> *"Integration of environmental considerations across the full lifecycle of the activity: for example, for a project this implies consideration of environmental issues through pre-feasibility, feasibility, planning and design, construction, operation and decommissioning" (DEAT 2002).*

5.13 Occupational Health and Safety Act, 1993 (Act 85 of 1993)

The Occupational Health and Safety Act, 1993 (Act 85 of 1993) provides for the health and safety of persons at work as well as for the health and safety of persons working near or with plant and machinery. The Act also protects persons, other than persons at work, against hazards to health and safety due to the activities of persons at work.

5.14 Sustainable Project

The principle of Sustainable Project has been established in the Constitution of the Republic of South Africa (108 of 1996) and given effect by NEMA and the ECA. Section 1(29) of NEMA states that sustainable project means the integration of social, economic, and environmental factors into the planning, implementation, and decision-making process so as to ensure that project serves present and future generations. Thus, Sustainable Project requires that:

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

5.15 The Waterberg Bioregional Plan

Bioregional plans are one of a range of tools provided for in the National Environmental Management: Biodiversity Act (No. 10 of 2004) (hereafter referred at as the Biodiversity Act) that can be used to facilitate the management and conservation of biodiversity priority areas outside the protected area network. The purpose of a bioregional plan is to inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity. This is done by providing a map of biodiversity priority areas, referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), with accompanying land-use planning and decision-making guidelines. (WDBP, 2016)

In terms of this plan the site area has been identified as a CBA2 and ESA1 site. In terms of the bioregional plan this translates into areas that have been selected as the best option for meeting biodiversity targets based on complementarity, efficiency and/or avoidance of conflict with other land uses. In terms of the ESA1 category the site is described as containing remaining areas of Waterberg escarpment, hills and ridges, which is identified as sensitive habitats in the Environmental Management Framework and other ecological support features such as climate change adaptation and Important Bird Areas (IBA's)

6. ROLES AND RESPONSIBILITIES

In order to ensure that the prescribed mitigation, rehabilitation and monitoring measures are effectively and efficiently implemented in all the relevant stages of the proposed development, it is important to assign certain responsibilities to the specific managers thereof. The success of the implementation of the aims of this EMPr will not only depend on whether appropriate mitigation and rehabilitation measures have been adequately identified, but also on the level of commitment of all the responsible individuals to implement the recommendations which are proposed in this document.

6.1 Government Departments

As the responsibility for the protection of our natural heritage lies with the relevant Government Departments, they have the power to conduct site inspections to ensure that the development complies with all legislation, regulations and standards. They may enforce penalties where non-compliance occurs.

6.2 Applicant

The party or agent who is the contractual owner of the project during the construction and operational phases and who will be responsible for the long-term maintenance of the proposed infrastructure is the Applicant. In the case of the Storage Dam Development, the Applicant is;

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The Applicant is responsible for:

- the implementation of the EMPr (from the initiation of the project up to and during the operational phase) and all the prescribed rehabilitation,
- the relevant environmental management measures (i.e. constant monitoring and maintenance in line with the conditions of environmental authorizations and licenses) in terms of the operational phase and associated infrastructure,
- appointing a project manager/s (PM) that will represent the Applicant and who will liaise competently will all the Services agencies, contractors, the local community and the other entities involved.

6.3 Principal Construction Contractor or Principal Contractor (PC)

The Principle Contractor will be responsible for the implementation of this document during the construction phase of the project. With relevance to the EMPr the PC is responsible for:

- appointing a construction manager to act as representative for the PC and their staff,
- responding timeously to any complaints and commands issued by the Environmental Control Officer (ECO) or,
- recording any paper trails from the developer/implementing agent, ECO, Community and the PM,
- rehabilitating the site to conditions acceptable to the directives of the EMPr and the reasonable approval of the ECO,
- compliance to any applicable laws and acts specifically those relevant to the project

- ❖ conducting site inspections along with the ECO.

PLEASE NOTE: It is imperative that the EMPr must be included in the principle construction contract documents and the PC must also include the items of the EMPr to be priced in the bill of quantities, in order for the required provisions to be made towards responsible environmental management.

6.4 Environmental Control Officer (ECO)

The Applicant is responsible for employing an Environmental Control Officer (ECO) at the start of the construction phase.

The ECO, on behalf of the implementing agent will be responsible for:

- ❖ liaising with the PC to ensure that the environmental management procedures of the EMPr are implemented and are effective,
- ❖ ensuring that the Contractors/Sub-contractors and Employees are aware of their environmental impact,
- ❖ conducting monthly compliance audits and developing detailed reports with concerns identified and proposed risk mitigation for the PC to consider and attend to,
- ❖ liaising between the developer/implementing agent and the PC (and the relevant appointed sub-contractors) with regard to all environmental concerns, and
- ❖ the ECO in association with the relevant parties will also be responsible for assisting in the resolution of conflicts arising due to the proposed infrastructure development.

6.5 The Local Community

It is important to involve the local communities where this is relevant in terms of impacts that the development may have on their activities or facilities. If possible, a local community member or group should be identified to which pertinent information can be communicated. These parties will also have an open channel through the ECO to communicate any issues to the Applicant.

6.6 In General

All of the abovementioned parties are responsible for appointing representatives that are suitably qualified to perform the necessary tasks appointed to them. These representatives must also be able to interact within a professional team in order to facilitate all the relevant activities needed for the successful implementation of the EMPr and the completion of the proposed Dam Infrastructure development.

6.7 Monitoring

Monitoring forms an integral part of the success of an EMPr and must take place on a continual basis. This will ensure that the EMPr is implemented appropriately. Monitoring will also assist in establishing the appropriateness of the mitigating measures and in identifying any other aspects that might need to be included in the EMPr. Where non-compliance did occur, monitoring will assist in determining the effectiveness of the remediation measures implemented and it will assist in identifying any other measures that might be needed. The monitoring programme will be addressed in Chapter 8.

7. BIOPHYSICAL, SOCIO-ECONOMIC AND CULTURAL IMPACTS AND THE ASSOCIATED MITIGATION AND REHABILITATION MEASURES

Table 2: Mitigation & Rehabilitation Measures

BIOPHYSICAL ENVIRONMENT			
ASPECT & RELATED ENVIRONMENTAL RISKS	**RISK CATEGORY (With Mitigation)** **LOW** **MEDIUM** **HIGH**	**PROJECT PHASE** **RESPONSIBLE PARTY** **PERFORMANCE INDICATOR**	**MITIGATION AND REHABILITATION MEASURES**
Aspect: **Environmental Awareness** **Impacts:** ❖ Fires. ❖ Sensitive habitat. ❖ Sensitive species. (See Vegetation and Animal Life) ❖ Proper personal conduct. ❖ Community safety. ❖ Spread of HIV Aids. ❖ Pollution. ❖ EMPr.	 ❖ Low ❖ Medium ❖ Low ❖ Low ❖ Medium ❖ Low ❖ Low ❖ Low	**Project Phase:** ❖ Construction & Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Environmentally sensitive and responsible conduct. ❖ Community safety.	❖ If any, cooking in the construction camps must be performed by electrical or gas stoves in well ventilated areas which are declared safe for this purpose. Designated fireplaces must be provided for, in the construction camps in safe areas away from flammable materials. No fires may be built outside these areas. ❖ Sufficient temporary ablution facilities (1 for every 15 people) in the form of chemical toilets must be provided for all employees during the construction phase of the development. These ablution facilities must be serviced on a regular basis as per the contractor's schedule that provides them. ❖ Conduct Environmental Awareness talks to sensitize any and all visitors and employees on the site to the relevant site-specific sensitivities. ❖ AIDS awareness talks must be also form part of the Environmental Awareness Talks. ❖ This EMPr must be made available to all employees, construction employees, visitors and maintenance personnel on the site to ensure that they are informed of the appropriate environmentally responsible conduct. A copy must therefore be held at the site offices at all times. ❖ All employees, construction employees, maintenance personnel and the PM must be made aware of the location of the EMPr document (at the site and farm office) and of their responsibility to adhere to the content thereof.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			This action can be performed at an Environmental Awareness talks at the first appropriate time when the bulk of the contractors and sub-contractors have been appointed. ❖ Activities such as littering, informal settlement, loud music and other ill-mannered behaviour will be regarded as unacceptable and it will be the responsibility of the various contractors and other employers to ensure that employees under their supervision conduct themselves appropriately. These actions must be reported to the ECO who will see to the issuing of the relevant fines. See APPENDIX 1. ❖ No damage and/or removal of indigenous plant or animal material for cooking or other purposes will be allowed. See APPENDIX 1.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
Aspect: **Start of Construction & Related Activities** **Impacts:** ❖ Site clearance for dam ❖ Compaction of resident soils by construction vehicles. ❖ Possible contamination by fuels and other construction materials. ❖ Security. ❖ Traffic. ❖ Access. ❖ Informal traders. ❖ Occupational Health and Safety. *See Appendix 2_Typical Composition of Construction Camp*	❖ Low ❖ Low ❖ Medium ❖ Low ❖ Medium ❖ Low ❖ Low ❖ Medium	**Project Phase:** ❖ Pre-construction & Construction **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Public awareness of start of construction on site. ❖ Safety around the construction site. ❖ Design and construction of the construction camps. ❖ Responsible environmental management in and around construction camps. ❖ Concurrent management of Occupational Health and Safety aspects.	❖ The PC must, at a relevant staff meeting communicate the dangers of the construction site and stress that the site is specifically out of bounds for staff and farm children. ❖ Special arrangements must be made for traffic management specifically during the construction phase and the of the Applicant and the PC must ensure that the relevant warnings are communicated to the surrounding landowners before the commencement of major construction. ❖ A complaints register must be maintained on site. (See APPENDIX 5) ❖ The whole of the construction site should preferably be fenced off during construction. The PC must in addition provide suitably visible signage (visible for farm staff) informing people that the site is under construction and that no access is allowed for any unauthorised persons. No casual access may be allowed here. ❖ Full documentation (ID, contact details and of next of kin) of all construction personnel must be kept on file at the site office and no unauthorized persons may be allowed on site. ❖ The construction phase must be managed by strict management guidelines (EMPr as well as the internal guidelines of the individual contractors) and it will be the responsibility of the relevant contractors to ensure that they themselves and their employees conduct themselves according to the management guidelines laid down. ❖ Vegetation clearance for the erection of construction camps must be avoided and the existing farm facilities must be used. ❖ The main site office must be situated at or near the closes farm store area. Temporary water and fuel tanks must also be contained in the camp as well as a workshop area. ❖ Adequate water, sanitation and solid waste disposal services must be provided or arranged for prior to human habitation on the site. Solid waste should be sorted into categories and those not suited to be dumped in an appropriate

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			waste skip at the temporary facility (E.g. cement and chemicals) must be dumped at a licenced waste disposal facility designed for this purpose. A suitable site must be selected for the waste skip site and this site should only contain materials that do not pose any risk in terms of surface or sub surface environmental contamination (e.g. building rubble). This site must also be suitably rehabilitated after completion of the construction activities. ❖ Any batching plants must be positioned away from any drainage feature (i.e. Further than 100m away, horizontally from any drainage feature). All runoff from batching areas must be strictly controlled. ❖ Cement contaminated water must be collected, stored and disposed of at a site approved by the ECO. Appropriate measures for overflow from batching plants, e.g. during heavy rains, must be put in place. The batching plant shall be bunded with earth berms, sandbags or straw bales to prevent runoff escaping from the site. ❖ Waste concrete and cement sludge must be scraped off the site of the batching plant daily and removed to an approved landfill site. Concrete shall not be mixed directly on the ground. Plastic liners or mixing trays are to be used. ❖ Special attention must be given to any temporary fuel tank and its surrounding area. This area should be appropriately designed, in a watertight bunker which is able to hold 110% of the volume of the tank itself. The area should be monitored on a weekly basis to ensure that no fuel is leaking into the local environment. ❖ The drainage valve of the bunded area may not be allowed to drain into the surrounding environment but must be pumped or emptied into containers to be removed by an oil recycling company or other suitable hazardous waste Contractor. ❖ Should an accidental puncture of a fuel tank occur and the bunded area be breached, an appropriate Spills Specialist should be contacted immediately for clean-up operations. The topsoils and sub soils of the site of the spillage must be completely removed and be disposed of at a fittingly licensed facility by the Specialist. The excavation must be filled up to the top with healthy topsoils. This must be performed directly after a spillage and not only at the final

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			rehabilitation of the construction camp to ensure no leaching of oils and fuels into the sub soils. See APPENDIX 3 for options. ❖ Containment bunkers must be kept empty at all times to be prepared for any emergency spills. ❖ All construction materials must be stored in designated areas that are suitable for the containment of that specific material. (Cement, paints, acidic cleaning agents and bitumen, must be stored in watertight containers within the construction camp). In the event of a spillage the appropriate environmental Spills Specialist must be contacted. The contaminated soils must be removed to a depth at which no sign of the contaminant is visible and replaced with healthy topsoils. See APPENDIX 3 for options. ❖ Construction vehicles and equipment must be monitored and maintained on a regular basis (weekly) to ensure that no environmental contamination is brought about by oil, fuel or hydraulic fluid leakages. ❖ All fuel and lubricant oriented areas (for storage and waste) at the construction camp (e.g. diesel tanks, workshop shed, and compressor shed) must be constructed with impervious concrete floors and oil and fuel resistant walls, with watertight sumps at the end of the catchment drains of these areas. Sumps must be pumped into suitable containers and removed by an appropriate Specialist, to a suitably licensed waste disposal facility. ❖ On completion of construction the total extent of the construction camp must be dismantled, and full rehabilitation of the site be done. ❖ Compacted soils must be loosened to a depth of 300mm and reseeded with seed of locally occurring indigenous grass species. This must occur in all the areas not to be taken up by buildings or paved infrastructure. All soils in areas contaminated with cement dust, small oil and fuel leakages and other contaminants must be removed to an appropriate depth as per the specific contaminant as prescribed by the ECO. These soils must be replaced with suitably healthy soils (able of harbouring plant and animal life) and be stabilized by contouring the soils according to the local site contours, be reseeded or re planted with soil stabilising grass species.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			❖ Drivers of construction vehicles must be informed to make use of accepted access roads only and not enter into any sensitive areas. (E.g. 32m buffer areas of rivers) ❖ A suitably qualified and duly registered Occupational Health and Safety Officer must be appointed to manage the relevant health and safety aspects during the proposed Infrastructure development. ❖ Construction employees and staff must be supplied with sufficient protective clothing and other gear (e.g. ear plugs) and must furthermore be trained how to use this gear properly by the Occupational Health and Safety Officer. ❖ Also see Recommendations under Geology and Soils.
Aspect: **Cutting and Filling** **Impacts:** ❖ Stability of specific cut and fill sites. ❖ Public Safety. ❖ Occupational Health and Safety. ❖ Rubble removal. ❖ Waste Soils. ❖ Blasting	❖ Low ❖ Low ❖ Low ❖ Low ❖ Low ❖ Low	**Project Phase:** ❖ Pre-construction ❖ Construction **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Environmentally responsible conduct during cutting and/or blasting operations. ❖ Occupational health and safety.	❖ Specific sites where cut and fill activities are needed must be inspected by qualified engineers and signed off as stable and safe before construction activities can commence here. ❖ Topsoil (top 300mm layer minimum) must be removed, prior to any earthmoving activities and stockpiled separately from subsoil material. ❖ Where these procedures are used during the construction process, rubble associated with the cut operations (natural and not building rubble) must be used during rehabilitation in the fill areas where no structural stability is needed. E.g. in front of the structures. Rubble may not be left anywhere on the construction site or be pushed down valleys or drainage ways. Materials and rubble left over must otherwise be reshaped and re-vegetated to resemble the surrounding landscape. ❖ Material (only natural) from cutting should be used for the shaping of earth berms or for rehabilitation. ❖ Near vertical slopes (1:1 or 1:2) where erosion control measures (e.g. gabions) are not to be placed must be stabilized using hard structures following specifications, preferably with a natural look and facilities for plants to grow in.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			- Areas with a 1:3 – 1:6 slopes must be logged or covered with a biodegradable membrane material (e.g. Kaytech Soil Saver). - Secured logs must be placed in continuous lines following the contours and spaced appropriately depending on the steepness (aspect) of the slope. - These slopes must be seeded with an indigenous grass mix to reduce soil erosion. - A maintenance programme must be developed to ensure sufficient coverage of the grassed areas and to detect and rehabilitate eroded areas timeously. ❖ Where the excavation work involves the use of explosives, a method statement must be developed in accordance with the applicable explosives legislation, The Explosives Act 2003 (Act 15 of 2003) by an appointed person who is competent in the use of explosives for excavation work and the contractor shall ensure that the procedures therein are followed. ❖ Where there is a reasonable possibility of damage to power and telephone lines or any other property, the contractor shall suitably adapt his method of blasting and the size of charges and shall use adequate protective measures, such as cover blasting, to limit the risk of damage as far as possible. Specific requirements relating to certain services may be included in the Project Specifications. ❖ Vibrations caused by blasting operations must be recorded by one or more blasting seismographs of a type as approved by the Engineer and in positions as described by the specialist blasting Consultant. ❖ A photographic record shall be kept by the blasting Consultant of all properties that may be affected by the blasting operations. ❖ The Engineer shall be given 24 hours' notice by the Contractor before each blasting operation is carried out.
Aspect:		**Project Phase:**	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
Climate **<u>Impacts:</u>** ❖ High rainfall in 24 hours could cause potential storm water related impacts e.g. scouring and erosion. ❖ Potential water saturated soil conditions. ❖ Flooding. ❖ Electrical storms. ❖ Veld fires. ❖ Precautionary measures.	❖ Low ❖ Low ❖ Low ❖ Low ❖ Low ❖ Low	❖ Pre-construction ❖ Construction ❖ Operation **<u>Responsible Parties:</u>** Applicant, PC, PM, & ECO **<u>Performance Indicators:</u>** ❖ Storm water management. ❖ Responsible personal conduct of construction staff. ❖ Responsible environmental management practice. ❖ Personal safety	❖ Implement a construction/management plan to specify the most appropriate time (preferably May – early September) for any construction activities to commence and to phase the construction phase so as to clear only those areas influenced by the next phase of construction. ❖ Special attention must be given to the overall storm water design so as to increase the volume of local storm water absorption, thereby decreasing the volumes and velocities of storm water at the discharge ends of the storm water system. ❖ Construction and occupational phase storm water management must ensure community safety. Concentrated discharge must be avoided as far as possible and discharged safely. ❖ Special attention must also be given to the design of the stormwater structures at the discharge ends of the overflow system so as not to cause erosion damage here. ❖ Employees and staff must be educated on the incidence of lightning and how to work safely under these conditions. This aspect must furthermore be overseen by the site health and safety representative. ❖ Ensure that the founding structures of all the dam wall structures and infrastructure are constructed during a time of stable sub soil conditions and as per engineer's detail. ❖ Special attention must be given to the recommendations of the dam safety reports. It is further recommended that the applicant compile a list of emergency contacts (SAPS, Vaalwater and Lephalale EMS Services) Downstream neighbours) who must be contacted during the event of a dam failure. ❖ Strict safety management rules must accompany the manifest of the Infrastructure development in terms of fire safety. No fires may be allowed outside of designated fireplaces and braai areas. All activities and facilities which has fire related activities must be provided with the appropriate fire distinguishing equipment which must be monitored and serviced by a qualified service operator on a regular basis, according to NHBRC specification.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			❖ Heavy downpours can create flash floods and the site area is specifically prone to these incidences during the summer months. The PC during construction and the Farm management during the operational phase must create clearly visible on-site awareness to the risk of flash flooding.
Aspect: **Geology and Soils** **Impacts:** ❖ Loss of topsoil – (essential vegetative substrate). ❖ Scouring and erosion ❖ Compressibility and collapse potential of transported and residual soils between founding depth and bedrock. ❖ Site drainage – to reduce risk of subsurface material saturation and consequent differential movement.	❖ Low ❖ Low ❖ Low ❖ Low	**Project Phase:** ❖ Pre-construction ❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Topsoil conservation. ❖ Storm water management. ❖ Management of accidental contamination and spills. ❖ Responsible environmental management practice.	❖ Topsoil (top 300mm layer minimum) must be removed prior to any earthmoving activities and stockpiled separately from subsoil material and only at the sites of the construction camps and the footprints of the specific structures to be built. The stockpiled topsoil mounds should not exceed 1,5m in height. ❖ Topsoil stripping should occur in a phased manner and only where construction will follow rapidly to avoid long periods of exposure and only during periods of low precipitation to avoid erosion and subsequent siltation of nearby water bodies. ❖ Areas where construction must take place must be clearly demarcated to ensure that only these areas are stripped. ❖ Stockpiled topsoil must not be compacted by any vehicle and should be protected against erosion. (E.g. construct a bunded area of sand around the topsoil stockpiles to ensure the containment of the topsoil). ❖ Stockpiled topsoil must not be contaminated with oil, diesel, petrol, construction material or rubble or any other foreign matter, which may inhibit its potential to harbour faunal and floral communities after rehabilitation. ❖ Stockpiled topsoil must not be used as fill material and should be replaced wherever rehabilitation is needed, after construction. ❖ Compressibility and collapse potential of the soils and subsurface material of areas where the infrastructure is to be constructed should be investigated by a qualified engineer and construction should then commence according to the engineering Specialist's recommendations) ❖ It is recommended that an engineering geologist or geotechnical engineer inspect all foundation areas and trenches prior to construction in order to

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
❖ Perched water conditions on shallow soils. ❖ Pipe leakage during construction and especially the operational phases. ❖ Contaminations	❖ Low ❖ Medium ❖ Medium		identify and evaluate any surface or subsurface geological characteristics in variance with that found during the original geotechnical investigations. Any trench or cutting must also be declared safe to work in by the relevant Engineer and OHS Officer. ❖ Special attention should be given to site drainage details. Qualified engineers should inspect the overflow areas and adequate drainage structures should be designed and constructed to avoid subsurface water saturation and possible structural failure. ❖ Erosion control measures should be implemented to prevent siltation and loss of existing and remaining topsoil on site. ❖ In the event of spills from vehicles, the area should be cleaned immediately using a bioremediation product, such as Petro-Clean TM or similar. The absorbent and soil must be placed in a bin and removed from the site by a certified company and disposed of as a hazardous waste at a licensed commercial facility. No Hydrocarbons may escape into the environment. A spill recovery kit must be on site, along with trained personnel. See APPENDIX 3. ❖ Vehicle tanks must not be over-filled. Overfill protection devices and shear-off valves must be installed in fuel dispensers and fuel dispensing hoses to prevent fuel spillages in the event of a drive-away during refuelling operations. ❖ Staff must be trained to fill vehicles without spilling fuel. ❖ A sufficient no. of Spill Kits must supply by a suitably accredited Supplier for the construction phase. ❖ Any spill should be cleaned up immediately. Surface contaminations as a result of spillages outside of the dispensing apron area should also be cleared up immediately. Contaminated topsoils and surface water should be disposed of at designated hazardous waste handling facility or be managed by an appropriately qualified Contractor.
Aspect: **Hydrology**		**Project Phase:** ❖ Pre-construction	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
Impacts: ❖ Lawful water use volumes. ❖ EWR ❖ Unstable soil conditions as a result of water saturation. ❖ Site drainage ❖ Scouring and erosion ❖ Siltation of downstream water bodies ❖ Surface water pollution as a result of spillages ❖ Possible groundwater pollution. ❖ Spillages that may occur during refuelling. ❖ Ponding	❖ Low ❖ Medium ❖ Low ❖ Low ❖ Low ❖ Low ❖ Medium ❖ Medium ❖ Low ❖ Low	❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Storm water management. ❖ Management of accidental contamination and spills. ❖ Responsible environmental management practice.	❖ Water use volumes must stay within the existing lawful water use volumes allocated to the Joe Kloppers farming operations. Reporting on the water use volumes must be conducted in terms of the DWS guidelines on a monthly basis. ❖ The DWS must conduct the relevant ecological water reserve assessments for the Sterkstroom river to determine the correct EWR values for the local reach of the river. ❖ No long-term vegetation clearing of may occur. A construction management plan should be implemented to specify appropriate time for the bulk of the construction activities to commence (preferably May to early September). ❖ The whole of the construction site may also not be cleared of vegetation at once. Site clearance may only proceed for the next phase of construction as per the construction management plan. ❖ Construction work must be performed between the months of April/May to September/October as far as this is reasonably possible. Where this is not possible the PC must prepare a report stating the reasons and additional measures that will be taken to curb storm water related impacts as well as the degradation of water quality. ❖ The PC and the Applicant must create awareness of the dangers of the rivers and the dam infrastructure and especially during periods of high precipitation. ❖ All such materials, fuels and chemicals must be stored in a specific and secured area to prevent pollution from spillages and leakages. Sufficient bunding of fuel storage tanks and chemical storage areas must be provided. ❖ Construction vehicles and machines must be maintained properly to ensure that oil spillages are kept at a minimum. ❖ Spill trays must be provided if refuelling of construction vehicles is done on site. See APPENDIX 3. ❖ On site waste disposal and pit latrines must strictly be prohibited during the construction phase and disposal must be carried out with standard sealed chemical toilets and waste disposal containers. The Principle Contractor must make arrangements with the Vaalwater Municipality's waste section for proper disposal at licenced waste disposal sites of all construction waste.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			❖ No uncontrolled discharges may be permitted from the construction camp. ❖ All spillages from any potential contaminants such as lubricants and hydro-carbon based fuels must be safely and immediately removed and disposed of at an appropriate site. ❖ Surface water draining of contaminated areas containing oil and petrol should be channelled towards a sump which will separate these chemicals and oils. ❖ Storm water shall not be allowed to flow through the batching area. Cement sediment shall be removed from time to time and disposed of in a manner as instructed by the RE. ❖ Spoil sites may not be used for the disposal of hazardous or toxic waste. ❖ Special attention must be given to site drainage details and adequate drainage structures must be designed and constructed to avoid subsurface water saturation and possible structural failure of infrastructure. ❖ The use of all materials, fuels and chemicals which could potentially leach into underground water must be controlled and managed according to the relevant legislation. ❖ Storm water drainage structures must be designed by qualified engineers and in a way, that disposes of the site storm water in a safe matter, which is not harmful to the surrounding environment in any way. ❖ Sufficient numbers of temporary chemical toilets (1 per 15 people) must be installed by the PC for the time of the construction activity. ❖ Storm water runoff must be channelled from open areas with retention structures around the construction areas. This must be done without compromising the conditions of the sub soil stability. Storm water outlets discharging stormwater from the surrounding areas during construction must contain energy dissipating structures that will curb erosion at specific dams into the stormwater canal as well as the at the Mokolo and Sterkstroom rivers. ❖ Straw bales should be placed and adequately secured on all downhill locations where erosion may occur to prevent washouts and to retain siltation and topsoil from the site. A supply of straw bales must be kept on site for this purpose.

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			❖ Vehicle tanks must not be over-filled. Overfill protection devices and shear-off valves must be installed in fuel dispensers and fuel dispensing hoses to prevent product free flow or fuel spillages in the event of a drive-away during refuelling operations. ❖ Any spill should be cleaned up immediately. Surface contaminations as a result of spillages should be cleared up immediately. ❖ The Applicant must develop a routine maintenance and rehabilitation for the Dam infrastructure. The plan must include routine inspections at all of the dam sites itself as well as along the entire length of the associated infrastructure according to the industry standard in order to detect any damage or erosion that might occur. Any damage or erosion damage must be reported and repaired immediately.
Aspect: **Vegetation and Animal Life** **Impacts:** ❖ Removal of vegetation and habitat as a result of construction activity. ❖ Alien invasive plant species management.	❖ Low ❖ Low	**Project Phase:** ❖ Pre-construction ❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicator:** ❖ Protection of indigenous vegetation.	❖ All of the significant indigenous trees and other indigenous vegetation which fall within the areas to be developed if any must be retained or transplanted under the supervision of a specialist. Special attention must be given to ensure that the vegetation in these areas are not disturbed for any purposes i.e. firewood. ❖ Any significant indigenous plant specimens (e.g. trees of 1,5m high with a trunk thicker than 150mm and vegetation clusters) that will come into harm's way must be transplanted, (if feasible from a transplantable point of view and to a similar suitable natural area of the site or in a temporary nursery (this can happen at a safe site near the construction camp) and be replanted in the natural areas of the site or be used in the rehabilitation or landscaping of the site during the post construction period. ❖ Only indigenous vegetation must be planted during the operational phase to increase the biodiversity of the site and effort should be given to retain the natural character of the site as far as possible. ❖ Any small game or other bird, reptile or amphibian specie that becomes trapped in the trenches or in any construction related activity may not be harmed and

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
		❖ Relocation of sensitive species on site. ❖ Management of alien invasive species. ❖ Environmental Awareness Training.	must be placed in a suitable container. The relevant LDEDET or closest SPCA must then be contacted to come and remove the animal. This Conservation Department or SPCA will then bear the responsibility to relocate the specie to a suitable habitat. ❖ Proliferation of alien and invasive species is expected within disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the proposed Infrastructure project. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled. ❖ Removal of the alien and weed species encountered on site must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). ❖ Removal of species should take place throughout the construction and rehabilitation/ maintenance phases. ❖ Removal of alien vegetation within the riverine areas must be undertaken manually, to prevent further disturbances to the soils which may exacerbate the problem. ❖ Removal of alien vegetation within the riparian zone must preferably be undertaken manually. ❖ Avoid the use of herbicides as far as possible. Should herbicides be deemed necessary, only herbicides approved by the Department of Water and Sanitation (DWS) may be used and care should be taken with the choice of herbicide to ensure no additional impacts on the riverine areas or indigenous floral species occur due to the herbicide used. ❖ All removed plant material must be covered with a sail, that is tied down during transportation by road to prevent any blow-off from the vehicle. ❖ Alien vegetation must be disposed of at a designated waste disposal site.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			❖ Alien invasive species management over the longer term must include the following measures: - Liaison with surrounding stakeholders by the relevant department of the Vaalwater, to control upstream and surrounding nodes of seed production; - Identify priority species to control in consultation with relevant stakeholders; - Develop protocols for the removal of all alien species that show recruitment; - Rehabilitate disturbed areas to pre-disturbance conditions, invasive grass species must not be utilised during rehabilitation activities; - Keep grass height (of indigenous grass species) as tall as possible as this enables it to effectively out-compete weeds and tolerate greater disease/ pest pressure so reducing the number of herbicides needed. Taller grass also uses water more efficiently than shorter grass and protects the soil from moisture loss and erosion (USEPA. 2006); - Re-assessment and monitoring of the area to determine success of the action and any follow-up measures required; and - Alien vegetation needs to be cleared on an ongoing basis along the length of both freshwater systems (where the Municipality has jurisdiction) in order to ensure these species do not outcompete re-established indigenous vegetation.
Aspect **Site Sensitivities: Sterkstroom River** **Impacts:**		**Project Phase:** ❖ Pre-Construction ❖ Construction ❖ Operation **Responsible Parties:**	❖ Any construction or rehabilitation must preferably be undertaken in the dry seasons between April/May to September/October. ❖ Rehabilitation of any areas cleared for any farming activity must be performed as soon as possible and as the construction process proceeds. ❖ Rehabilitation in areas other than that mentioned in the first bullet of this section should include the following:

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
❖ Infrastructure repair. ❖ Construction activities. ❖ Maintenance operations. ❖ Watercourse rehabilitation	❖ Low ❖ Low ❖ Low ❖ Low	Applicant, PC, PM, & ECO **<u>Performance Indicators:</u>** ❖ Site sensitive design ❖ Sensitive construction procedures ❖ Watercourse specific construction method statements ❖ Environmentally sensitive maintenance operations	- Construction within the 32m buffer area of the Sterkstroom River must be conducted according to watercourse specific method statements. - Where feasible, the bank of the watercourse where construction will occur should be sloped no steeper than 1:4 gradient to ensure stability and prevent further erosion. - When excavating for the repairs, care must be taken to store excavated soils as close as possible to the excavation itself but outside of any area susceptible to scouring and erosion. - It is of CRITICAL importance that excavated soils must be replaced in the same order than in which it was excavated. For this reason, soils must be stored in a manner that will allow for this. - Excavated soils must be protected against contaminations, rain downpours and associated stormwater impacts. - When construction has been completed, excavated soils in the 32m buffer areas of the riverine areas must be replaced in the same sequence as was excavated to ensure speedy restoration of these areas. - Where required, erosion berms should be designed below un-surfaced access roads (maintenance), to prevent siltation and erosion of the freshwater resources. The following points should serve to guide the placement of erosion berms: • Where the track has slope of less than 2%, berms every 50m should be installed; • Where the track slopes between 2% and 10%, berms every 25m should be installed; • Where the track slopes between 10%-15%, berms every 20m should be installed; and • Where the track has slope greater than 15%, berms every 10m should be installed.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
Aspect **Waste Management** **Impacts:** ❖ Waste Management Plan ❖ Recycling ❖ Storage ❖ Cleaning ❖ Disposal ❖ Waste Removal ❖ Record Keeping	❖ Low ❖ Low ❖ Low ❖ Low ❖ Low ❖ Low ❖ Low	**Project Phase:** ❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Construction Waste Management Plan. ❖ Closure and Rehabilitation of construction site and construction site camps on completion of construction phase. ❖ Waste re-use, recycling and disposal record keeping. ❖ Hazardous waste	❖ All construction related areas and roads should be cleared of any construction waste and should be swept clean as to avoid the waste from entering the storm water systems. ❖ All solid waste must be removed and transported to an approved registered landfill site on a weekly basis. ❖ On completion of works, the contractor shall clear away and remove from the site all construction paint, surplus material, foundations, plumbing and other fixtures of every kind. Areas thus cleared shall be graded and scarified to restore the ground as near as possible to its original profile. ❖ Keep monthly records of waste reuse, recycling and disposal for future reference. Provide information to ECO. ❖ Waste must be sorted into the various categories (glass, paper, metals and plastics) and the relevant local recycling contractors should be contacted to remove this waste on a weekly basis. ❖ The contractors must supply the principle construction Contractor with a monthly report indicating the types and volumes of waste removed from site. ❖ All hazardous waste including used oils and fuels and wash water containing hydrocarbons must be managed in accordance with its hazardous substance category. Hazardous wastes must be taken away to the nearest hazardous waste handling facility on managed by an appropriate hazardous wastes Contractor.
Aspect **Fuel Management** **Impacts:**		**Project Phase:** ❖ Construction ❖ Operation	❖ Re-fuelling must take place in the designated area with sufficient surface sealing such as a concrete liner to prevent spillage and soil contamination. See APPENDIX 1 &APPENDIX 3.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
❖ Storage ❖ Re-Fuelling ❖ Drip trays and Spill Kits ❖ Notification ❖ Rehabilitation	❖ Medium ❖ Medium ❖ Low ❖ Medium ❖ Low	**Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Management of fuel related areas. ❖ Spill management.	❖ Drip trays (min 100mm deep) must be placed under all vehicles awaiting maintenance, suspected of having a mechanical problem that can lead to a significant leakage, that is decommissioned and awaiting removal or that will remain or the parking area for more than one week. ❖ Spill kits must be available in all vehicles that transport hydrocarbons for dispensing to other vehicles on the site. The dispensing devices (pump heads) must be compatible with the vehicles to which they are dispensing. In addition, the dispensing devices must be fitted with the necessary valves/ apparatus that will ensure that the nozzles do not drip fuel after pumping has stopped. See APPENDIX 3. ❖ The whole of the site where vehicles are operated must undergo routine weekly inspections for any spillages, and these areas must be rehabilitated accordingly. ❖ Applicable provincial and local government departments, local municipalities and adjacent landowners must be notified within 24 hours of a spillage or leak. ❖ In the event of spills from vehicles, the area should be cleaned immediately using a bioremediation product, such as Petro-Clean TM The absorbent and soil must be placed in a bin and removed from the site by a certified company and disposed of as a hazardous waste at a licensed commercial facility. No Hydrocarbons may escape into the environment. A spill recovery kit must be on site, along with trained personnel. See APPENDIX 3.
Aspect: **Vehicle Maintenance** **Impacts:** ❖ Design ❖ Maintenance area ❖ Equipment ❖ Machinery	❖ Medium ❖ Low ❖ Low ❖ Low	**Project Phase:** ❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:**	❖ Vehicle maintenance may only be performed if in a sealed off area with an oil impenetrable floor. In the case that the PC cannot supply such a facility on site, all vehicles and machinery must be services and maintained off site. Vehicle maintenance yards and secured storage areas will be established as far as is practicable, further than 100m horizontally from and water course and buffer areas as determined by the storm water management plan. The maintenance yard should be indicated on the layout plan of the site. ❖ The maintenance of vehicles and equipment used for any purpose during any phase must take place only in the maintenance yard.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
		❖ Sustainable vehicle management for optimal use.	❖ Any breakdown other than that in the maintenance area of the site requires the presence of a spill treatment team and equipment. This team must prevent and mitigate any spills that occur in this situation. ❖ Equipment used in the construction phase must be adequately maintained in order not to spill oil, diesel, fuel, or hydraulic fluid during operations. ❖ Machinery or equipment used on the site must not constitute a pollution hazard in respect of the above substances. The main contractor, site manager or ECO shall order such equipment to be repaired or withdrawn from use if he or she considers the equipment or machinery to be polluting and irreparable.
Aspect: **General Rehabilitation Measures** **Impacts:** ❖ Relevant phases of the activity ❖ Contamination ❖ Rehabilitation measures	❖ Low ❖ Medium ❖ Low	**Project Phase:** ❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Removal and rehabilitation of construction camps. ❖ Rehabilitation of contaminated areas. ❖ Establishment of sufficient vegetation	❖ Rehabilitation should be implemented immediately after construction activities and should aim to prevent erosion and aid the return of natural, endemic and indigenous vegetation cover. ❖ After any construction activities are complete, the services camp must be taken down and full rehabilitation of the temporary construction site be done. Compacted soils must be loosened to a depth of 300mm re-compacted lightly (via turf roller) and reseeded with seed of locally occurring indigenous ground covering species. ❖ All soils contaminated with cement dust, small oil and fuel leakages and other contaminants must be removed to an appropriate depth as per the specific contaminant and as prescribed by the EO and be taken to an approved landfill site. These soils must be replaced with healthy soils (able of harbouring plant and animal life) and be stabilized by contouring the soils according to the local site landform. ❖ Site roads used during construction must also be reshaped according to the prevailing landform, scarified, fertilized and re-seeded and re-vegetated with indigenous grasses and vegetation. ❖ After construction, the PC/PM must ensure that the site is clean, and void of any soils, construction rubble or any other construction related materials.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
		layer on all barren soil areas.	❖ All barren sections of the finished construction area around the development must be wetted and stabilized to form a good medium for planting. These areas must then be reseeded with indigenous species. ❖ Construction areas must be cleared of any loose laying mounds of soil or other construction materials and litter. The ECO and the PC/PM must organize a final site inspection to see if this measure is in place before the site is signed off as finished. ❖ Cognisance must be taken of all of the mitigation and rehabilitation measures in the site specific EMPr and must be read in conjunction with this rehabilitation plan.
Aspect: **Visual Environment** **Impacts:** ❖ Construction related activities. ❖ Final visual outlook of the development. ❖ Environmental lighting.	❖ Low ❖ Low ❖ Low	**Project Phase:** ❖ Pre-construction ❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Maintenance of construction camps and site during construction phase. ❖ Screening of negative visual aspects of the proposed Infrastructure	❖ Negative impacts related to the construction phase of the development will only last for the duration of the construction phase of the development and will thus not be permanent. The PC and subcontractors must see to the overall tidiness of the construction area and that construction vehicles, materials and personnel stay within the construction camps after hours, over weekends and on public holidays. For the relevant proposed fines see APPENDIX 1. ❖ Indigenous vegetation must be used to screen negative visual aspects of structures. Screening must however not be obtrusive to the natural character of the site. ❖ Screening vegetation and landscaping must be planted to ensure that it is applied in a way that compliments the vegetation of the region. ❖ Existing vegetation should be retained as far as possible at the construction site and the temporary construction camp structures to act as visual screens/absorbers and dust collectors.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
		Development with vegetation. ❖ Downlighting.	❖ Construction camp to be positioned so as to reduce its visual intrusion. The construction camp and laydown areas must furthermore be screened with netting to reduce its visual impact during the construction phase ❖ No painting or marking of natural features shall be allowed. Marking for surveying and other purposes shall only be with pegs and beacons. ❖ Additional locally indigenous landscaping should also be implemented in key areas to screen negative visual aspects. ❖ Topographic shaping should be implemented - final profile of rehabilitated areas is formed to emulate natural contours of the area. Cuttings and fill areas to be rehabilitated to emulate occurrence of natural rocky outcrops in the area both in colour and shape. ❖ Rehabilitate/restore exposed areas as soon as possible after construction activities are complete. ❖ Dust suppression techniques should be in place at all times during the construction phase. ❖ No construction rubble, construction material, refuse, litter or any other material not found naturally in the surroundings should be allowed at any time to be lying around on the construction site. ❖ Lighting of the proposed development must be in keeping with the relevant municipal bylaws. No unnecessary lighting may be applied, and lighting must in general point downwards in all instances.
Aspect: **Noise:**		**Project Phase:** ❖ Construction ❖ Operation	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
Impacts: ❖ Possible noise pollution occurring as a result of construction and operation activities. ❖ Occupational Health and Safety	❖ Low ❖ Low	**Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Notification of surrounding landowner's pre-construction commencement. ❖ Maintenance of construction and maintenance equipment. ❖ Proper personal conduct by all construction staff. ❖ Compliance with occupational health and safety regulations.	❖ The surrounding landowners must be notified of the commencement of construction activities well in advance of the actual start of the activities (At least 6 weeks). ❖ Structures containing activities that may contribute to undesirable noise levels in the area must be placed and orientated to face away from areas sensitive to noise pollution as far as possible. ❖ Noisy activities related to the construction phase of the development (e.g. vehicles, compressors, employees) must be kept to the necessary minimum. Construction activities must also be restricted to between 08:00 in the mornings and 05:30 in the evening and not on any weekend or public holidays. This must be monitored by the ECO and fines must be levied for non-compliance. (See APPENDIX 1). ❖ All employees, construction employees and maintenance personnel must be instructed to be sensitive towards the surrounding landowners. This action can be performed via an Environmental Awareness Workshop at the first appropriate time when the bulk of the contractors and sub-contractors have been appointed. (See APPENDIX 1) ❖ Activities such as loud music and other ill-mannered behaviour must not be allowed. This behaviour will be regarded as unacceptable and it will be the responsibility of the various contractors and other employers to ensure that employees under their supervision conduct themselves appropriately. These actions must be reported to the ECO who will see to the issuing of the relevant fines. (See APPENDIX 1). ❖ Construction vehicles and equipment must be regularly serviced to avoid the noise that these machines may make if in disrepair. ❖ Construction employees and staff must be supplied with sufficient protective clothing and other gear (e.g. ear plugs) and must furthermore be trained how to use this gear properly by the Occupational Health and Safety Officer. ❖ The contractor shall give the Engineer 24 hours' notice before any blasting operation is carried out.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			❖ The Applicant via the contractor must inform surrounding landowners, the local community and any other registered I&AP at least 24 hours prior to blasting operations in order for them to make the necessary arrangement.
Aspect: **Air Quality:** **Impacts:** ❖ Increased dust pollution could occur during construction activities. ❖ Generation of dust on site dirt roads. ❖ Occupational Health and Safety ❖ Fuel related vapours and fuelling odour.	❖ Low ❖ Low ❖ Low ❖ Low	**Project Phase:** ❖ Pre-construction; ❖ Construction and ❖ Operation **Responsible Parties:** PC, PM, & ECO **Performance Indicators:** ❖ Sufficient dust suppression regimes during construction and operation. ❖ Speed control on gravel roads during construction and operation. ❖ Operational phase air quality.	❖ Dust suppression must be performed according to the seasonal changes and according to the prevailing site-specific circumstances via a dust suppression truck on the site roads, other construction areas and the parking areas. ❖ Vegetation and landscaping of the larger development environment will help improve air quality over the long term and must therefore be planted wherever disturbed as far as possible. ❖ Site roads and parking areas must furthermore be maintained to remain in a good condition (e.g. roads must be kept from widening so as to keep the exposed area (area influenced by winds) as small as possible. ❖ Construction vehicles must maintain low speeds on all site roads (10 – 30 km\h) to reduce dust dispersal during construction. ❖ The health and safety manager must ensure that employees are supplied with the correct safety wear and equipment (e.g. dust masks) and that they are informed as to their appropriate use.
Aspect: **Archaeological Findings:**		**Project Phase:** ❖ Pre-construction	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
Impacts: ❖ Possible archaeological findings.	❖ Low ❖ Low	❖ Construction ❖ Operation **Responsible Parties:** Applicant, PC, PM, & ECO **Performance Indicators:** ❖ Environmental Awareness	❖ Employees, contractors and construction employees should be informed to report any unusual finds during the construction phase, to the ECO in order to implement the correct procedures according to the South African Heritage Resources Act to conserve these finds appropriately. ❖ This impact must be brought forward during the environmental awareness workshops.

8. MONITORING & AUDITING

8.1 Purpose

The key to the successful implementation of the EMPr is appropriate monitoring and review to ensure effective functioning of the EMPr and to identify and implement corrective measures in a timely manner. In the event where discrepancies are identified, the problem must be investigated and attended to. All the results obtained during environmental monitoring must be documented for audit purposes.

An audit of the environmental monitoring and management actions undertaken is essential to ensure that it is effective in operation, is meeting specified goals, and performs in accordance with relevant regulations and standards. Audits should be conducted during the construction phase of the facility to ensure compliance with the management measures contained in the EMPr. The construction and operational phase audit schedule is as follows:

- Monthly external audits by the ECO during construction;
- One post-construction audit by an independent external auditor;
- External audits by an independent auditor pertaining to compliance with the water use licence conditions;
- Annual audits for the first five years of the operational phase.

The audits will incorporate the monthly reports submitted by the ECO. The frequency of the operational phase audits may be increased should the findings of the audits find that the conditions of the EMPr and EA are not being complied with.

Table 3: Fulfilment of the EMPr Mitigation & Rehabilitation Measures

Fulfilment of EMPr Mitigation and Rehabilitation Measures			
ASPECT	**DESCRIPTION**	**SCORE**	**NOTES / ACTION**
	TOTAL SCORE		
	AS AVERAGE		
	AS PERCENTAGE		

9. CONCLUSION

South Africa is situated in a semi-arid region and as such, is classified as a water-scarce country. Due to the high variability in river water storage needs to be implemented in order to assure the water availability for crop irrigation during dry-spells. In addition, the Limpopo Employment, Growth and Development Plan (LEGDP), which culminates from the revision of the Provincial Growth and Development Strategy (PGDS), includes the policy framework that contains the strategic vision of the province with the aim of growing the economy and enhancing sustained economic growth and job creation.

The Joe Kloppers farming operations is one of a number of other irrigation farms in the area where pivot irrigation is used for crop farming. In terms of the ecological impacts, the specialist Ecologist reported that the irrigation dam are not situated in an on-stream position of a sensitive watercourse. The riverine area has been identified and the proposed dam has been moved outside of this area with a buffer of 15m.

To ensure that water use stays within the ecological water requirement and existing lawful use volume limits on a farm by farm basis is critical. Firstly, for the purposes of safeguarding the required water volumes in the Sterkstroom, to allow this river system to function on optimal ecological levels, and secondly to permit water users to use their lawful use volumes. Should there not be enough water to allow for the EWR requirements in the Sterkstroom river, it will have almost immediate negative implications. These include socio ecological impacts such as reduced water availability and reduced water quality.

The reverse of the above scenario is a situation where all the stakeholders, from the Farmer to the WUA to the local and district Municipalities, the provincial Authorities and the DWS WMA Managers, perform their duties responsibly to ensure sustainable water availability for the river system itself and all the lawful water users, in the long term.

It is believed that the identified impacts can be effectively minimised provided that the mitigation and rehabilitation measures included in section 7 of this EMPr are strictly adhered to. It is therefore very important that the relevant Managers (the Applicant, LDEDET, the project Engineers and construction phase & operational phase Managers) of each development stage of this development take cognisance thereof and implement it accordingly.

10. EMPR UPDATES

The EMPr will be updated as new aspects are identified and mitigating measures for these aspects are proposed.

Table 4: EMPr Updates

ASPECT / IMPACT	MITIGATING MEASURES	DATE	RESPONSIBLE PERSON

After an update, the site and project team are to be updated to ensure continual implementation of the EMPr occurs. Low risk updates can be conducted as part of ongoing environmental awareness on the site. High risk updates are to be communicated as soon as possible.

11. REFERENCES

11.1 Published Sources

- Acocks, J. P. H., 1975. Veld Types of South Africa. Memoirs of the Botanical Survey of South Africa, No 40. Pretoria: Botanical Research Institute.
- DEAT. 2004. Environmental Management Plans, Integrated Environmental Management, Information Series 12. Pretoria: Department of Environmental Affairs and Tourism (DEAT).
- ENPAT, 1998. Van Riet, Claasen, van Rensburg, Du Plessis, Environmental Potential Atlas of South Africa.
- Kruger, A. C., 2002. Climate of South Africa: Surface Winds (WS43), Pretoria: South African Weather Service.
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- Mucina, L. & Rutherford, M. C. (eds.) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. Pretoria: South African National Biodiversity Institute.
- Shultze, R. E., 1997. South African Atlas of AgroHydrology and Climatology, Pietermaritzburg: Department of Agricultural Engineering, University of Natal.

11.2 Unpublished Resources

- Pirie, A., 2019. Quantification of the Irrigation Water Requirements and Assessment of the Ecological Water Requirements for the Joe Kloppers Farming, Limpopo Province Hydrospatial.
- Joubert, F., 2019. Safety Assessment and As-Built Reports Dams 1 – 6 Joe Koppers Boerdery. Johannesburg: PG Consulting Engineers.
- Tate R., & Fry C., 2019. Riverine Ecological Assessment for the Existing and Proposed Water Storage Facilities in the Mokolo River Catchment. The Biodiversity Company.
- van Staden, P.,J., 2019. An Ecological Assessment Survey for Existing Retention Dams on Portion 3 of Boschpoort 249 KQ and the Remainder of Doornspruit 215 KQ near Vaalwater, Limpopo Province. PVS Environmental Services

APPENDIX 1

Proposed Penalties and Fines Associated with Various Acts of Non-compliance and Miss-Conduct

PROPOSED PENALTIES AND FINES FOR NON-COMPLIANCE OR MISCONDUCT

This EMPr forms part of the contract agreement between the Client and the PC and the Construction Manager. As such, non-compliance with conditions of the EMPr will amount to a breach of contract. Penalties will be issued directly to the PC/Construction Manager by the EO in the event of non-compliance to the EMPr specifications. The issuing of a penalty will be preceded by a verbal warning by the EO, as well as strict instruction in at least one monthly EO report to rectify the situation. The EO and PC/Construction Manager will communicate with regards to realistic time-frames for possible rectification of the contravention, and possible consequences of continued non-compliance to the EMPr.

Penalties incurred do not preclude prosecution under any other law. Cost of rehabilitation and/or repair of environmental resources that were harmed by the actions of the PC/ Construction Manager if such actions were in contravention of the specifications of the EMPr will be borne by the PC/ Construction Manager himself. Penalties may be issued over and above such costs. The repair or rehabilitation of any environmental damage caused by non-compliance with the EMPr cannot be claimed in the Contract Bill, nor can any extension of time be claimed for such works. Penalty amounts shall be deducted from Certificate payments made to the Contractor.

The following categories of non-compliance are an indication of the severity of the contravention, and the fine or penalty amounts listed in table 1 may be adjusted depending on the seriousness of the infringement.

Category One: Acts of non-compliance that are unsightly, a nuisance or disruptive to adjacent landowners, existing communities or persons passing through the area.

Category Two: Acts of non-compliance that cause minor environmental impact or localised disturbance.

Category Three: Acts of non-compliance that affect significant environmental impact extending beyond point source.

Category Four: Acts of non-compliance that result in major environmental impact affecting large areas, site character, protected species or conservation areas.

All of the contraventions mentioned in table 1 as well as any other contravention to the EMPr specifications should be measured in terms of one of these 4 categories of non-compliance and penalties or fines should be adjusted accordingly.

TABLE 1: List of Proposed Fines and Penalties as Applicable to Various Acts of Non-Compliance or Misconduct

DESCRIPTION OF NON-COMPLIANCE TO EMPr SPECIFICATION	*SPOT FINES AND PENALTIES THAT COULD BE INCURRED*
Any person, vehicle, plant or other activity related to the contractor's operations that spill over into a "no-go" or sensitive area	R 4 000
Any vehicle driving in excess of specified speed limits	R 1 000
Vehicles being driven, plant or construction materials being stored outside of demarcated areas within the construction site. Unauthorised persons on site.	R 2 000
Persistent, un-repaired oil/fuel leaks from machinery/vehicles. Spillages of oil/fuel at the re-fuelling site. Spillage of hazardous (e.g. Cement, Asphalt, Chemicals) materials on site. Burying of soils containing these spillages.	R 5 000
Litter on site or dumping/ burying of rubble or waste outside designated location/s. Inadequate provision of waste disposal facilities on site	R 2 000
Illegal Fires on site	R 5 000
Eating / cooking food outside of designated areas. Inadequate site ablution facilities or failure to make use of the site ablution facilities.	R 1 000
Excessive noise and / or dust as a result of site activities	R 2 000
Contractor's operations causing a public nuisance as a result of contravention of EMPr specifications.	R 2 000
Activities in contravention of EMPr that cause water waste or pollution	R 5 000
Poaching/ setting of snares or traps.	R 5 000
Damage to cultural Sites	Up to R 100 000
Erosion as a result of non-compliance – penalty shall be equivalent to the cost of rehabilitation plus 20%	

DESCRIPTION OF NON-COMPLIANCE TO EMPr SPECIFICATION	***SPOT FINES AND PENALTIES THAT COULD BE INCURRED***
Severe oil spills - penalty shall be equivalent to the cost of clean-up operations plus 20%	
Damage to indigenous vegetation or sensitive environments - penalty shall be equivalent to the cost of rehabilitation plus 20% Penalties for removing or damaging trees that are to be retained	
Girth of Trunk am above ground level	Replacement value per tree
0 – 15 mm	R 100
16 – 30 mm	R 200
31 – 50 mm	R 500
51 – 75 mm	R 1 000
76 – 100 mm	R 2 500
101 – 150 mm	R 5 000
151 – 300 mm	R 10 000
Larger than 300 mm	R 15 000 – R 100 000

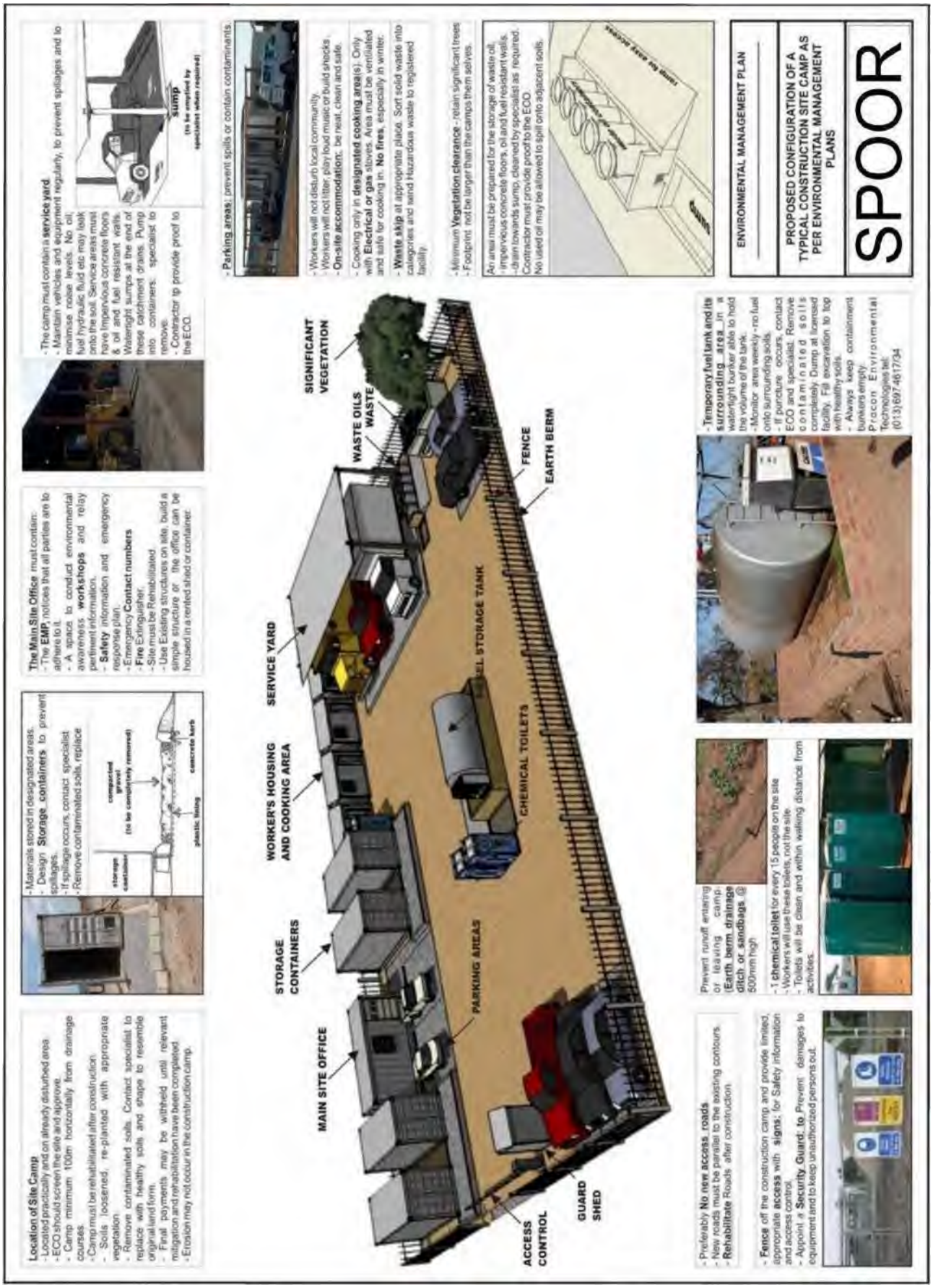
PLEASE NOTE: **For any repeat offenders the fine will be DOUBLED, and a third offence could result in permanent suspension.**

The following acts and legislation, amongst others, apply and will be enforced and monitored by the ECO;

- Environmental Conservation Act, (Act 73 of 1989)
- National Environmental Management Act, (Act 107 of 1998)
- National Environmental Management: Biodiversity Act, (Act 10 of 2004)
- Water Act, 1998, (Act 36 of 1998)
- National Parks Act, (Act 57 of 1976)
- Lake Areas Development Act, (Act 139 of 1975)
- Mountain Catchment Areas Act, (Act 63 of 1970)
- Forest Act, (Act 122 of 1984)
- Conservation of Agricultural Resources Act, (Act 43 of 1983)
- All Provincial ordinances and regulations as applicable

APPENDIX 2

Typical Composition of a Construction Camp


SPOOR
ENVIRONMENTAL MANAGEMENT PLAN
PROPOSED CONFIGURATION OF A TYPICAL CONSTRUCTION SITE CAMP AS PER ENVIRONMENTAL MANAGEMENT PLANS
MAIN SITE OFFICE
STORAGE CONTAINERS
WORKER'S HOUSING AND COOKING AREA
SERVICE YARD
SIGNIFICANT VEGETATION
WASTE OILS
WASTE
FENCE
EARTH BERM
PARKING AREAS
FUEL STORAGE TANK
CHEMICAL TOILETS
ACCESS CONTROL
GUARD SHED
Location of Site Camp
- Located practically and on already disturbed area.
- ECO should screen the site and approve.
- Camp minimum 100m horizontally from drainage courses.
- Camp must be rehabilitated after construction.
- Soils loosened, re-planted with appropriate vegetation.
- Remove contaminated soils. Contact specialist to replace with healthy soils and shape to resemble original land form.
- Final payments may be withheld until relevant mitigation and rehabilitation have been completed.
- Erosion may not occur in the construction camp.
- Materials stored in designated areas.
- Design Storage containers to prevent spillages.
- If spillage occurs, contact specialist
- Remove contaminated soils, replace
storage container
compacted gravel (to be completely removed)
plastic lining
concrete kerb
The Main Site Office must contain:
- The EMP, notices that all parties are to adhere to it.
- A space to conduct environmental awareness workshops and relay pertinent information.
- Safety information and emergency response plan.
- Emergency Contact numbers
- Fire Extinguisher.
- Site must be Rehabilitated.
- Use Existing structures on site, build a simple structure or the office can be housed in a rented shed or container.
- The camp must contain a service yard.
- Maintain vehicles and equipment regularly, to prevent spillages and to minimise noise levels. No oil, fuel hydraulic fluid etc may leak onto the soil. Service areas must have impervious concrete floors & oil and fuel resistant walls. Watertight sumps at the end of these catchment drains. Pump into containers: specialist to remove.
- Contractor to provide proof to the ECO.
sump (to be emptied by specialist when required)
- Parking areas: prevent spills or contain contaminants.
- Workers will not disturb local community.
- Workers will not litter, play loud music or build shacks.
- On-site accommodation: be neat, clean and safe.
- Cooking only in designated cooking area(s). Only with Electrical or gas stoves. Area must be ventilated and safe for cooking in. No fires, especially in winter.
- Waste skip at appropriate place. Sort solid waste into categories and send Hazardous waste to registered facility
- Minimum Vegetation clearance - retain significant trees
- Footprint not be larger than the camps themselves.
An area must be prepared for the storage of waste oil, impervious concrete floors, oil and fuel resistant walls, drain towards sump, cleaned by specialist as required. Contractor must provide proof to the ECO. No used oil may be allowed to spill onto adjacent soils.
- Temporary fuel tank and its surrounding area. In a watertight bunker able to hold the volume of the tank.
- Monitor area weekly - no fuel onto surrounding soils.
- If puncture occurs, contact ECO and specialist. Remove contaminated soils completely. Dump at licensed facility. Fill excavation to top with healthy soils.
- Always keep containment bunkers empty
Pracon Environmental Technologies tel: (013) 697 4617/34
Prevent runoff entering or leaving camp. (Earth berm, drainage ditch or sandbags @ 500mm high
- 1 chemical toilet for every 15 people on the site
- Workers will use these toilets, not the sile
- Toilets will be clean and within walking distance from activities.
- Preferably No new access roads
- New roads must be parallel to the existing contours.
- Rehabilitate Roads after construction.
- Fence off the construction camp and provide limited, appropriate access with signs: for Safety information and access control.
- Appoint a Security Guard: to Prevent damages to equipment and to keep unauthorized persons out.

APPENDIX 3

Spill Management Contractors List

	SPILL AND POLLUTION RESPONSE COMPANIES					
	Company	**Product Description**	**Operating District**	**Website**	**Email address**	**Contact details**
Services Providers	24 Hour Spill Response Association	Oil and hazardous materials spills, Truck roll-overs/transfers, derailments, acid spills, biohazard containment and cleanup, ship leaks, fuel spills, industrial plant emergencies, air quality monitoring, clean up and remediation including facility and equipment decontamination, soil excavation and disposal, sludge processing, cleaning services, waste management ensuring safe disposal and safe disposal certificates, contingency planning, asbestos removal, offshore vessel services and support, pollution control, maintenance and service, consumable sales	National	www.24hourspillresponse.co.za www.facebook.com/pages/24-Hour-Spill-Response/203191236393968	info@24hourspillresponse.co.za	t: 0800 00 5817
	Oil Spill Control	Range of absorbent materials for oil and other hydrocarbon based products, chemicals and other liquids, spill kits, oily water separators, oil skimmers, pumps, oil containment booms, training service, spill response service, site inspection service, providing guidance on safety, environment and ISO regulations	Western Cape	http://oilspillcontrol.co.za/		t (sales): 021 531 5335 t: 082 774 8964 t: 082 455 7832
	Oil-Gone Agency cc Enretech	Bioremediation, spill clean-ups, spill kits, environmental remediation technology	Eastern Cape	http://www.oilgone.co.za/ http://www.enretech.co.za		t: 084 580 0327
	Procon Environmental Technologies	Environmental Products and Technologies, specializing in systems that minimize the impact of contamination on the environment and surrounding areas, prevention and treatment of oil pollution in soil and water	Centurion Witbank	http://www.pro-enviro.co.za/	procon@pro-enviro.co.za	t: 013 697 4617/4634 f: 013 697 4618 t: 012 667 5389 f: 012 667 5389
	ROSE Foundation (Recycling Oil Saves the Environment)	None-profit organisation - collect used oil	Burgersfort, Cape Town, Durban, Johannesburg, Middelburg, Nelspruit, Pietermaritzburg, Port Elizabeth, Pretoria, Richards Bay, Rustenberg, Weenen	http://www.rosefoundation.org.za/	usedoil@iafrica.com	t: 021 448 7492 c: 082 378 8556 f: 086 652 7384
	Spill Tech	Spill response 24/7, absorbent products, spill kits, asbestos disposal service, hazmat, high pressure cleaning, waste management, marine response, bioremediation, clean up after fires and floods.	National	http://www.spilltech.co.za/	info@spilltech.co.za	t: 0861 000 366
	HazClean	24h spillage response, skill kits, equipment, absorbent products	National	http://www.hazclean.co.za/	ian@hazclean.co.za	t: 0080 00 5817
	IFRT Spill Response	24h spillage response, industrial cleaning, skill kits, equipment, absorbent products, training	Vereeniging	http://www.ifrt.co.za/		t: 016 428 2207 t: 083 284 1879 t: 083 284 1880
Products	Absorbetech Environmental (former name SupaZorb Sales)	Absorbetech, a hydrocarbon absorbent, which is used to clean up spillages in factories, on water and capped or uncapped outdoor surfaces. The main benefit of using this product however, is the bio-remedial capacity it possesses. This means, the cleaning of such spillages utilizing a natural process through which a blend of bacteria and fungi break down, or degrade, a wide variety of hydrocarbons. In addition we offer a number of related products.	Durban Cape Town Johannesburg	http://absorbetech.yellowpages.co.za/	info@absorbetech.com	t: 031 914 3939 t: 031 700 8617 t: 021 531 9999 t: 011 708 1494
	Bio-systems SA	Products for the bioremediation of oil-contaminated soils, the bioaugmentation of urban, agricultural and rural effluent streams and the re-use of grey water.		www.biosystemssa.co.za	info@biosystemssa.co.za	t: 021 786 2972 f: 086 726 5445
	Earthwize Environmental SA (PTY) Ltd.	Oil and chemical absorbent products	National	http://www.spillsorb.co.za/	gus@enviroshore.co.za	t: 012 568 1043

APPENDIX 4

Environmental Incident Register Template

Environmental Incident Register Template

Environmental Incident Register						
Environmental Incident			**Mitigation Measures**		**Incident Closure**	
Date and Time	**Reported by**	**Description of Incident**	**Description of Mitigation Action**	**Responsible Person**	**Date**	**Responsible Person**

APPENDIX 5

Environmental Complaints Register Template

Environmental Complaints Register Template

Nature of Complaint	Date and Time	Contact Details	Response and Investigation Undertaken	Actions Taken (and by whom)	Formal Response Date

APPENDIX G

OTHER INFORMATION

LIST OF STATE DEPARTMENTS ADMINISTERING A LAW RELATING TO A MATTER LIKELY TO BE AFFECTED BECAUSE OF THIS ACTIVITY

LIST OF STATE DEPARTMENTS ADMINISTERING A LAW RELATING TO A MATTER LIKELY TO BE AFFECTED AS A RESULT OF THIS ACTIVITY

Authority	**Lephalale Local Municipality** **Department of Environmental Management**		
Contact person:	Mr. T Tshivhandekano		
Postal address:	Private Bag X136, Lephalale		
Postal code:	0555	**Cell:**	
Telephone:	014 762 1640	**Fax:**	
E-mail:	Thomas.Tshivhandekano@lephalale.gov.za		

Authority	**Department of Water Affairs** **Limpopo Water Management Area**		
Contact person:	Pulane Matswi Love Hlekane		
Postal address:	49 Azmo Place, Joubert Street, Polokwane		
Postal code:	0700	**Cell:**	
Telephone:	(015) 290 1210	**Fax:**	
E-mail:	MatswiP@dws.gov.za HlekaneL@dws.gov.za		

Authority	**South African Heritage Resources Agency**		
Contact person:	Ms N Khumalo		
Postal address:	111 Harrington Street, CAPE TOWN		
Postal code:	8001	**Cell:**	
Telephone:	021 462 4502	**Fax:**	
E-mail:	NKhumalo@sahra.org.za		

PROPERTY DESCRIPTIONS

Proposed Dam 7 List of Affected Properties

Property	Owner	SG Codes
Properties and Owners from South to North		
Portion 2 of the Farm Doornspruit 215 KQ	Interfocus Investments SA (PTY) Ltd. Mr Joe Kloppers - Director	T0IR03160000238100000

COR21.1

Date: 15/10/2013

Our Reference 110707881
Box: **156135**
Sequence: **49**

SHELF COMPANY WAREHOUSE (LIMPOPO) GOUWS
Basket: CGSWPO

RE: Amendment to Company Information
Company Number: 2013/017750/07
Company Name: INTERFOCUS SA INVESTMENTS 58 (PTY) LTD

We have received a COR21.1 (Address Change) from you dated 09/09/2013.

The COR21.1 was accepted and placed on file

With effect from 16/09/2013, the postal address was changed to:
POSEUS 454
MODIMOLLE
0510

With effect from 16/09/2013, the registered address was changed to:
FARM DOORNSPRUIT, PORTION 2
VAALWATER
VAALWATER
LIMPOPO PROVINSIE
0530

GESERTIFISEER AS 'N WARE AFSKRIF VAN OORSPRONKLIKE
CERTIFIED AS A TRUE COPY OF THE ORIGINAL

PIETER SNYMAN
KOMMISSARIS VAN EDE
COMMISSIONER OF OATHS
PRAKTISERENDE PROFESSIONELE REKENMEESTER (S.A.)
PRACTISING PROFESSIONAL ACCOUNTANT (S.A.)
LID NR 2818 MEMBERSHIP NO 2818
THABO MBEKI WEG 93 THABO MBEKI AVENUE
MODIMOLLE, 0510

26/07/2017

Yours truly

Commissioner: CIPC
SMP SMP

Please Note:

The attached certificate can be validated on the CIPC web site at www.cipc.co.za.
The contents of the attached certificate was electronically transmitted to the South African Revenue Services.

Certificate issued by the Companies and Intellectual Property Commission on Tuesday, October 15, 2013 03:04
Certificate of Confirmation

Registration number	2013 / 017750 / 07
Enterprise Name	INTERFOCUS SA INVESTMENTS 58 (PTY) LTD
Enterprise Shortened Name	None provided.
Enterprise Translated Name	None provided.
Registration Date	05/02/2013
Business Start Date	05/02/2013
Enterprise Type	Private Company
Enterprise Status	In Business
Financial year end	February
Main Business/Main Object	NO RESTRICTIONS ON BUSINESS ACTIVITIES
Postal address	POSBUS 494 MODIMOLLE 0510
Address of registered office	FARM DOORNSPRUIT, PORTION 2 VAALWATER VAALWATER LIMPOPO PROVINSIE 0530

GESERTIFISEER AS 'N WARE AFSKRIF VAN OORSPRONKLIKE
CERTIFIED AS A TRUE COPY OF THE ORIGINAL

PIETER SNYMAN
KOMMISSARIS VAN EDE
COMMISSIONER OF OATHS
PRAKTISERENDE PROFESSIONELE REKENMEESTER (S.A.)
PRACTISING PROFESSIONAL ACCOUNTANT (S.A.)
LID NR 2816 MEMBERSHIP NO 2816
THABO MBEKI WEG 93 THABO MBEKI AVENUE
MODIMOLLE, 0510

25/07/2014

COR21.1

Certificate issued by the Companies and Intellectual Property Commission on Tuesday, October 15, 2013 03:04
Certificate of Confirmation

Registration number: 2013/017750/07

Enterprise Name: INTERFOCUS SA INVESTMENTS 58 (PTY) LTD

Auditors

Name

Postal Address

Active Directors / Officers

Surname and first names	ID number or date of birth	Director type	Appointment date	Addresses
KLOPPERS, JOSEPH	6909175146089	Director	16/09/2013	Postal: P O BOX 103, VAALWATER, VAALWATER, 0530 Residential: FARM DOORNSPRUIT PORTION 2, VAALWATER, 0530

GESERTIFISEER AS 'N WARE AFSKRIF VAN OORSPRONKLIKE
CERTIFIED AS A TRUE COPY OF THE ORIGINAL

PIETER SNYMAN
KOMMISSARIS VAN EDE
COMMISSIONER OF OATHS
PRAKTISERENDE PROFESSIONELE REKENMEESTER (S.A.)
PRACTISING PROFESSIONAL ACCOUNTANT (S.A.)
LID NR 2815 MEMBERSHIP NO 2815
THABO MBEKI WEG 93 / THABO MBEKI AVENUE
MOOIMOLEE, 2610

WATER USE LICENSE(S) AUTHORISATION, ETC.

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria, 0001, Sedibeng Building, 185 Francis Baard Street, Pretoria,
Tel: (012) 336 7500 Fax (012) 323-4472 / (012) 326 - 2715

LICENCE IN TERMS OF CHAPTER 4 OF THE NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998) (THE ACT)

I, ***Trevor Balzer,*** in my capacity as Acting Director-General in the Department of Water and Sanitation and acting under authority of the powers delegated to me by the Minister of Human Settlements, Water and Sanitation, hereby authorises the following water uses in respect of this licence.

SIGNED: .....

DATE: 4/12/2020

LICENCE NO: 07/A42E/BCIBCI/10043
FILE NO: 27/2/1/A542/1/1

1. **Licensee:** **Mr Joseph Kloppers**

   Postal Address: PO Box 103
   Vaalwater
   0530

2. **Water Uses**

2.1 Section 21(b) of the Act: Storing water from a water resource, subject to the conditions set out in Appendices II and II.

3. **Properties is respect of which this licence is issued**

3.1 Boschpoort 249 KQ Ptn 3 and Doornspruit 215 KQ Ptn's 0 and 2

4. **Registered owners of the Properties**

Mr Joseph Kloppers

5. **Licence and Review Period**

This licence is valid for a period of twenty (20) years from the date of issuance and it may be reviewed at intervals of not more than five (5) years.

B 12272

6. Definitions

Any terms, words and expressions as defined in the National Water Act, 1998 (Act 36 of 1998) shall bear the same meaning when used in this licence.

"The Provincial Head" means the Head of Provincial Operations: LPNW - Polokwane.

"Extent of the watercourse" means the outer edge of the 1:100 year floodline or the delineated riparian habitat, whichever is the greatest.

"Regulated area of a wetland" is the use of water for section 21 c and i water uses within 500m radius from the boundary of any wetland.

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

The characteristics of a watercourse/s mean the flow regime, water quality, habitat (including the physical structure of the watercourse/s and associated vegetation) and biota found within the extent of the watercourse/s. The Resource Quality characteristics as defined in the National Water Act, 1998 (Act 36 of 1998).

7. Description of activity

This licence authorises Mr Joseph Kloppers for the water use in terms of section for Section 21 (b), of the National Water Act, 1998 (Act 36 of 1998), for storing water in for storage of water into five (5) off-channel dams for the purpose of irrigation. The water use extends over portions of three farms, the farm portions consist of Boschpoort 249 KQ Ptn 3 and Doornspruit 215 KQ Ptn's 0 and 2, which falls within the A42E quaternary drainage regions of the Limpopo Water Management Area (WMA).

APPENDIX I

General Conditions for the Licence

1. This licence is subject to all applicable provisions of the National Water Act, 1998 (Act 36 of 1998).

2. The responsibility for complying with the provisions of the licence is vested in the Licensee and not any other person or body.

3. The Licensee must immediately inform the Provincial Head of any change of name, address, premises and/or legal status.

4. If the property in respect of which this licence is issued is subdivided or consolidated, the Licensee must provide full details of all changes in respect of the properties to the Provincial Head within 60 days of the said change taking place.

5. If a Water User Association is established in the area to manage the resource, membership of the Licensee to the Association is compulsory. Rules, regulations and water management stipulation of such association must be adhered to.

6. The Licensee shall be responsible for any water use charges and/or levies imposed by a Responsible Authority.

7. While effect must be given to the Reserve as determined in terms of the Act, where a lower confidence determination of the Reserve has been used in issuance of this licence, the licence conditions may be amended should a higher confidence reserve be conducted.

8. The licence shall not be construed as exempting the Licensee from compliance with the provisions of any other applicable Act, Ordinance, Regulation or By-law.

9. The licence and amendment of this licence are also subject to all the applicable procedural requirements and other provisions of the Act, as amended from time to time.

10. The Licensee shall conduct an annual internal audit on compliance with the conditions of this licence. A report on the audit shall be submitted to the Provincial Head within one month of the finalization of the audit.

11. The Licensee shall appoint an independent external auditor to conduct an annual audit on compliance with the conditions of this licence. Both these audits may be subjected to external audit.

12. Any incident that causes or may cause water pollution must be reported to the Provincial Head or a designated representative within 24 hours.

13. The Department accepts no liability for any damage, loss or inconvenience, of whatever nature, suffered as a result of / amongst other things.

    13.1 Shortage of water;
    13.2 Inundation of flood;
    13.3 Any *force majeur* event;
    13.4 Siltation of the river or dam basin; and
    13.5 Required Reserve releases.

APPENDIX II

Section 21 (b) of the Act: Storing of water

1. Storing of water

1.1 This water use licence authorises the storage of water in the off-channel dams as indicated in Table 2:

Table 2: Water use activities

Water Use(s)	Purpose	Capacity (m^3)	Property Description	Co-ordinates
Section 21(b)				
Dam 1 Boschpoort	Irrigation	75 000m^3	Boschpoort 249 KQ Ptn 3	S 24°13'45.04" E 27°57'23.39"
Dam 2 Doornspruit	Irrigation	45 000m^3	Doornspruit 215 KQ Remainder (Ptn 0)	S 24°12'28.77" E 27°57'18.80"
Dam 3 Interfokus	Irrigation	110 000^3	Doornspruit 215 KQ Remainder (Ptn 0)	S 24°12'20.91" E 27°57'01.40"
Dam 6 Doornspruit C	Irrigation	50 000 m^3 to be increased to (120 000m^3)	Doornspruit 215 KQ Remainder (Ptn 0)	S 24°12'52.53" E 27°58'03.77"
Dam 7	Irrigation	100 000m^3	Doornspruit 215 KQ Ptn 2	S 24°11'53.58" E 27°57'31.20"

1.2 The Licensee is not exempted from compliance with any applicable Dam Safety Regulations.

2. Monitoring Requirements

2.1 To compile a water balance to manage the use of water optimally the Licensee shall monitor the quantity of water transferred into and from each of the dams set out in Condition 1.1 of Appendix III on a daily basis and submit this to the Provincial Head bi-annually.

2.2 The Licensee shall provide information on the method on the flow measurement within one year from the date of issuance the licence

2.3 All flow gauging devices shall be maintained in a sound state of repair.

2.4 All flow gauging devices shall be calibrated by a competent person, at intervals not exceeding one year.

2.5 The installation of flow meters shall comply with the specifications of the manufacturer with regard to distance from obstructions in the pipeline upstream and downstream of the meter to ensure accurate measurements.

2.6 Records confirming proof of the calibration must be kept and made available to the Provincial Head upon request.

3. Dam Safety Requirements:

3.1 The existing fresh water dam with a capacity of 50 000 m^3 and a wall height of 5 m has a dam with a safety risk, shall be carried out under supervision of a Professional Civil Engineer, registered and authorised by the dam Safety Office of the Department under the Engineering Profession of South Africa Act, 1990 (Act 114 of 1990). Any repair work on this dam must be done in consultation with dam safety office.

3.2 The Operating Manual of the dam facilities shall include a water management plan that describes capacity and operating methods for the components of the water management system such as the minimum freeboard.

3.3 The Licensee shall manage and operate the facility in accordance with the design plans and specifications. Not with standing these specifications, the operator of the facility should advise the professional person on any circumstances or aspect of the facility that, according to his operating experience, might either endanger the integrity of the dam facility or present a risk to the public or the environment.

3.4 Increased runoff due to vegetation clearance and/or soil compaction must be managed, and steps must be taken to ensure that stormwater does not lead to bank instability and excessive levels of silt entering the watercourse.

3.5 Soils that have become compacted through the activities during the raising of the dam wall must be loosened to an appropriate depth to allow seed germination.

3.6 All dam facilities shall be audited as per condition 10 and 11 of Appendix I of this licence.

3.7 For future upgrade the manure stockpiles, manure dams and oxidation ponds must be sufficiently lined must be approved by Civil Engineering.

4. Site specific conditions

4.1 Proposed off channel dam must be constructed outside of 1:100 year flood line or delineated riparian habitat whichever is the greatest;

4.2 Final master layout plan consist of a relationship between proposed off channel dam and 1:100 year flood line and delineated riparian habitat whichever is the greatest must be submitted to Department before commencement of proposed activity (dam 7).

END OF LICENCE

Mr Joseph Kloppers

Acting Director General

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

Private Bag X313, Pretoria, 0001 Sedibeng Building, 185 Francis Baard Street Pretoria,
Tel: (012) 336-7500, Fax: (012) 323-4472, www.dwa.gov.za

Mr Ndubane N
(012) 336 8851
27/2/1/A542/1/1

Mr. Joseph Kloppers
PO Box 103
Vaalwater
0530

Dear Sir

APPLICATION FOR WATER USE LICENCE IN TERMS OF SECTION 40 OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998) FOR SECTION 21 (B), (C) AND (I) WATER USE FOR STORING WATER IN THE INSTREAM DAMS AND THEIR ASSOCIATED INFRASTURES FOR THE PURPOSE OF AGRICULTURAL IRRIGATION ON THE FARM DOORNSPRUIT 215 KQ REMAINDER PORTION 0 WITHIN WATERBERG DISTRICT MUNICIPALITY IN LIMPOPO PROVINCE.

The Department has received and processed your application and the application was forwarded to me for consideration.

Kindly be informed that your application is unsuccessful for In-stream storage dams with respect to Section 21 (b), (c) and (i) water uses as the surface water resource is stressed such that no additional allocation and impounding structures can be allowed. You are therefore advised to continue with the confirmed Existing Lawful Water Uses in terms of S35(4) of NWA.

However, in terms of section 148 (1) (f) of the National Water Act, 1998 (Act No. 36 of 1998) an appeal against the above decision can be lodged with the Water Tribunal within Thirty (30) days.

The Water Tribunal can be reached at:

The Registrar
Water Tribunal
Private Bag X316
PRETORIA
0001

Physical Address:
Room 344
Waterbron Building
191 Schoeman Street
PRETORIA
0002

Telephone (012) 336-8297
Fax (012) 336-8666

Please note that any use of water without authorization is illegal as it is in contravention of the National Water Act, 1998 (Act No. 36 of 1998) and is punishable by law

ACTING DIRECTOR-GENERAL

DATE:

DEPARTMENT OF ENVIRONMENTAL AFFAIRS

SITE SENSITIVITY SCREENING REPORT

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION OR FOR A PART TWO AMENDMENT OF AN ENVIRONMENTAL AUTHORISATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number:

Project name: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER

Project title: DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER VAALWATER AREA LEPHALALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

Date screening report generated: 27/01/2021 15:51:52

Applicant: Joe Kloppers

Compiler: JC van Rooyen - SPOOR Environmental Services (PTY) Ltd.

Compiler signature:

.....

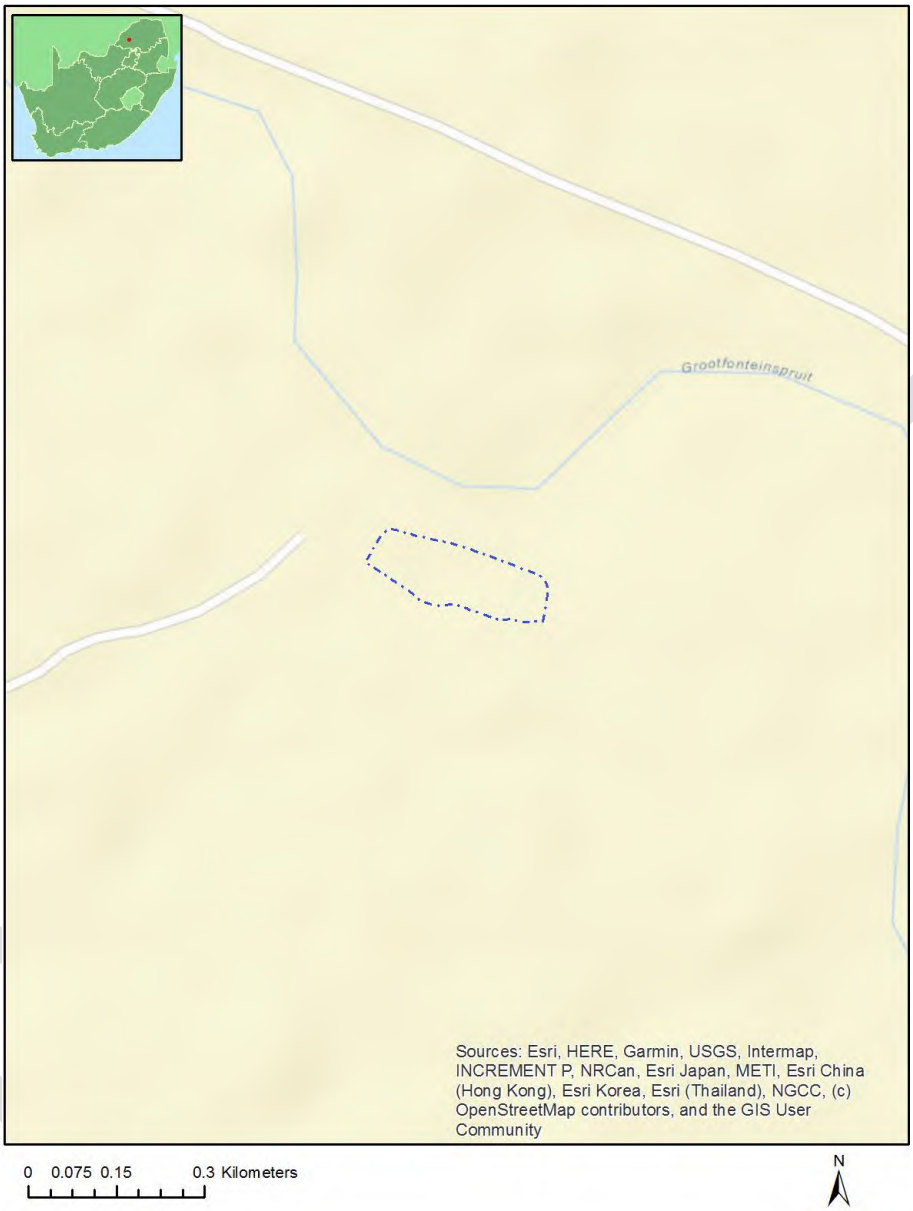
Application Category: Agriculture_Forestry_Fisheries|Crop Production

Table of Contents

Proposed Project Location

Orientation map 1: General location

General Orientation: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER



Map of proposed site and relevant area(s)

Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	DOORNSPRUIT	215	0	24°12'22.57S	27°57'0.95E	Farm
2	DOORNSPRUIT	215	2	24°12'9.16S	27°56'42.25E	Farm Portion
3	DOORNSPRUIT	215	0	24°12'49.82S	27°57'37.77E	Farm Portion

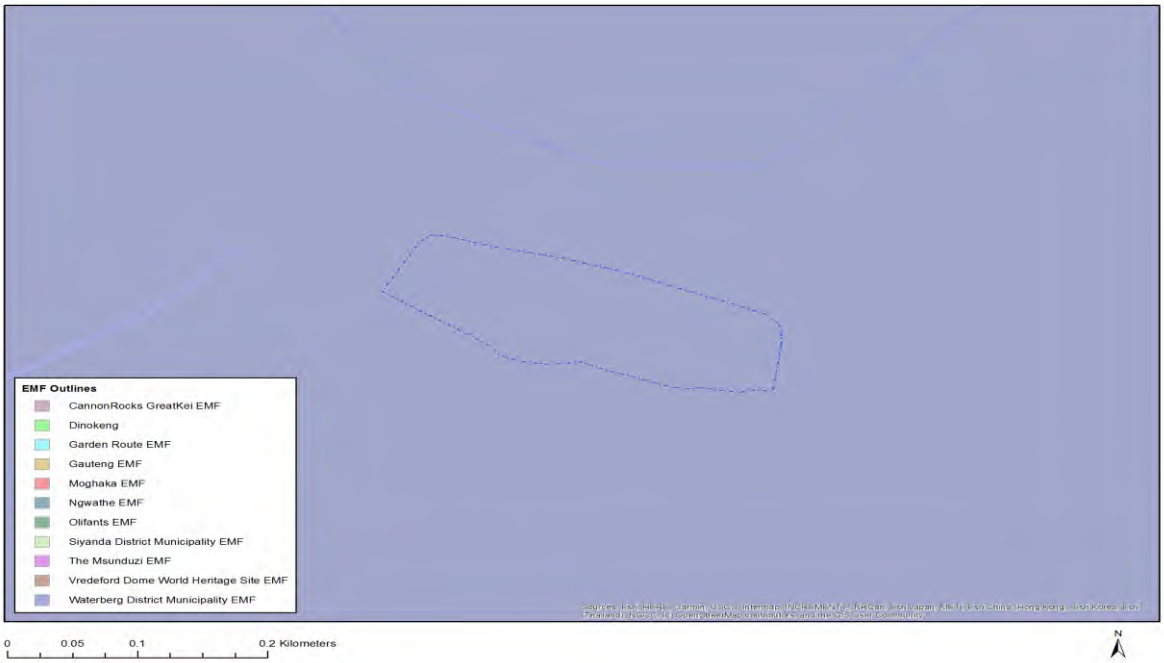
Development footprint[1] vertices:
No development footprint(s) specified.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	12/12/20/2298	Solar PV	Approved	26.6

[1] "development footprint", means the area within the site on which the development will take place and incudes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Environmental Management Frameworks relevant to the application



Environmental Management Framework	LINK
Waterberg District Municipality EMF	https://screening.environment.gov.za/ScreeningDownloads/EMF/WDEMF_Final_EMF_Report.pdf

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is: **Agriculture_Forestry_Fisheries|Crop Production**.

Relevant development incentives, restrictions, exclusions or prohibitions

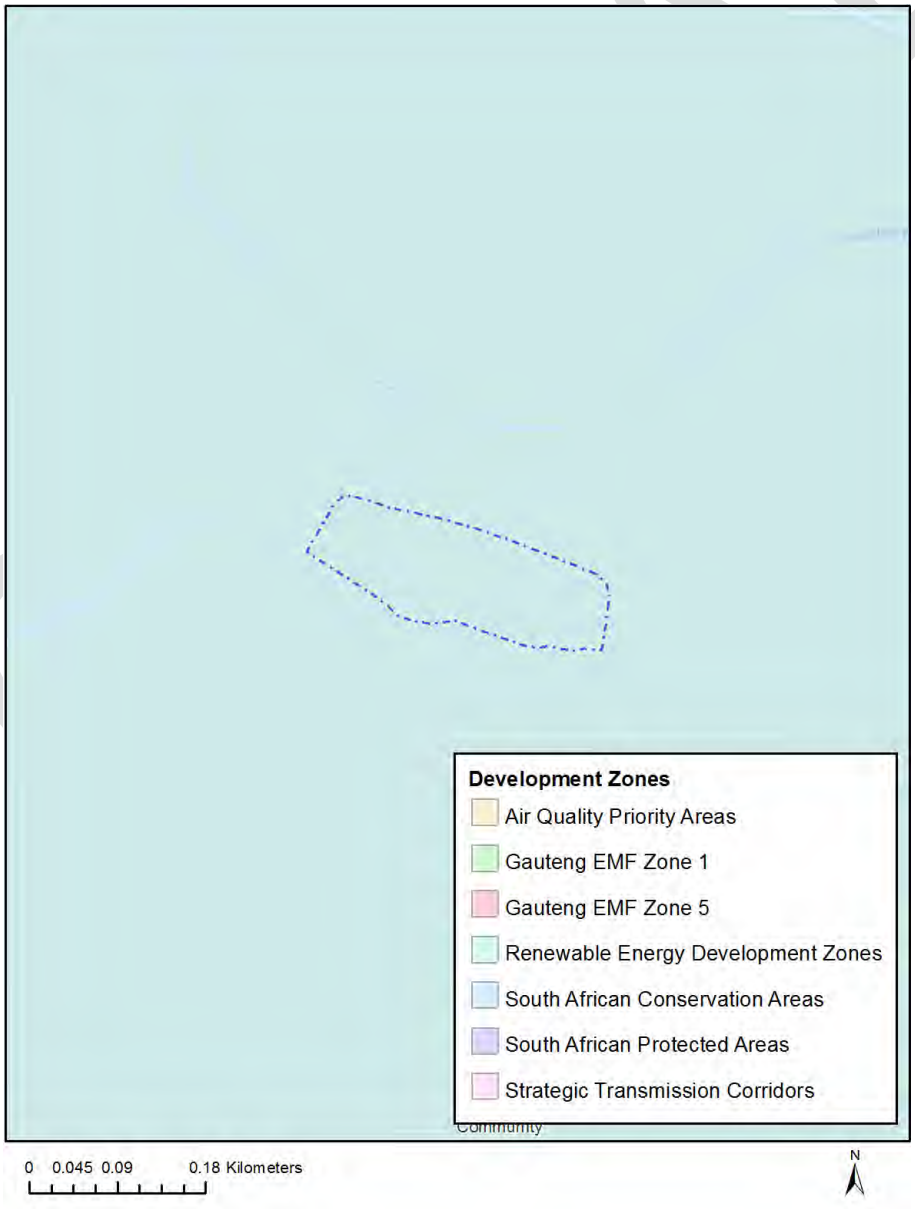
The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

Incentive, restriction or prohibition	Implication

Air Quality-Waterberg-Bojanala Priority Area	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/gg39489_nn1207a.pdf
South African Conservation Areas	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/SACAD_OR_2020_Q3_Metadata.pdf

Map indicating proposed development footprint within applicable development incentive, restriction, exclusion or prohibition zones

Project Location: PROPOSED CONSTRUCTION OF A DAM FOR THE STORAGE OF WATER



Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme			X	
Animal Species Theme			X	
Aquatic Biodiversity Theme				X
Archaeological and Cultural Heritage Theme		X		
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme			X	
Plant Species Theme				X
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report. It is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the site situation.

No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
2	Landscape/Visual Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
3	Archaeological and Cultural Heritage Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
4	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf

5	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
6	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
7	Hydrology Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
8	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
9	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
10	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY

Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Medium	Sensitive species 7

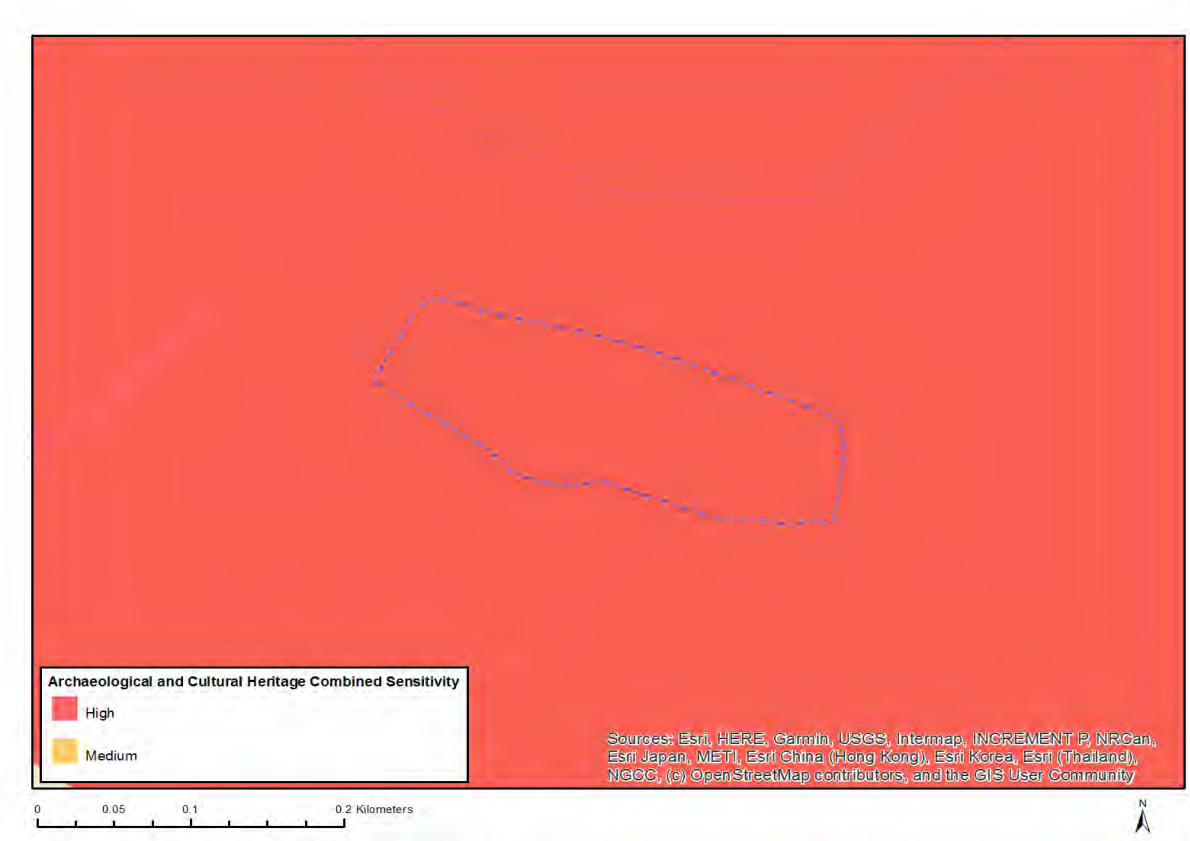
MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 500 m of an important river

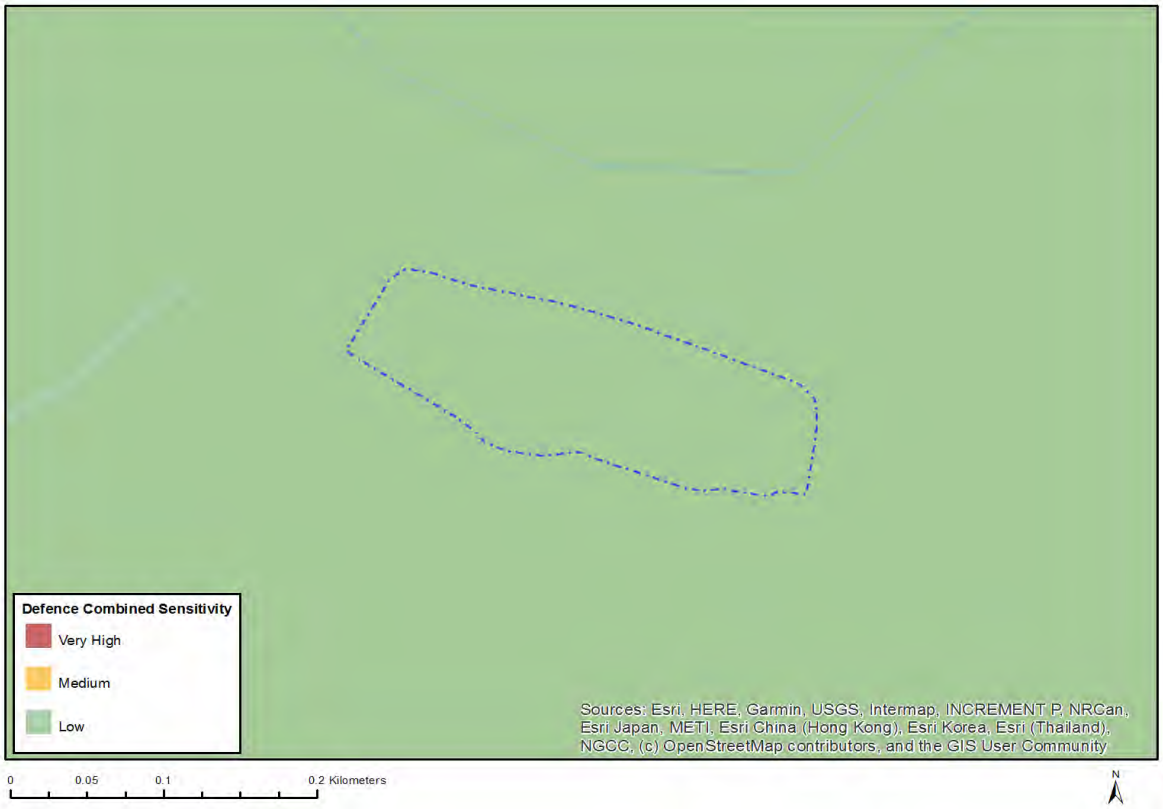
MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 8 km of other civil aviation aerodrome

MAP OF RELATIVE DEFENCE THEME SENSITIVITY

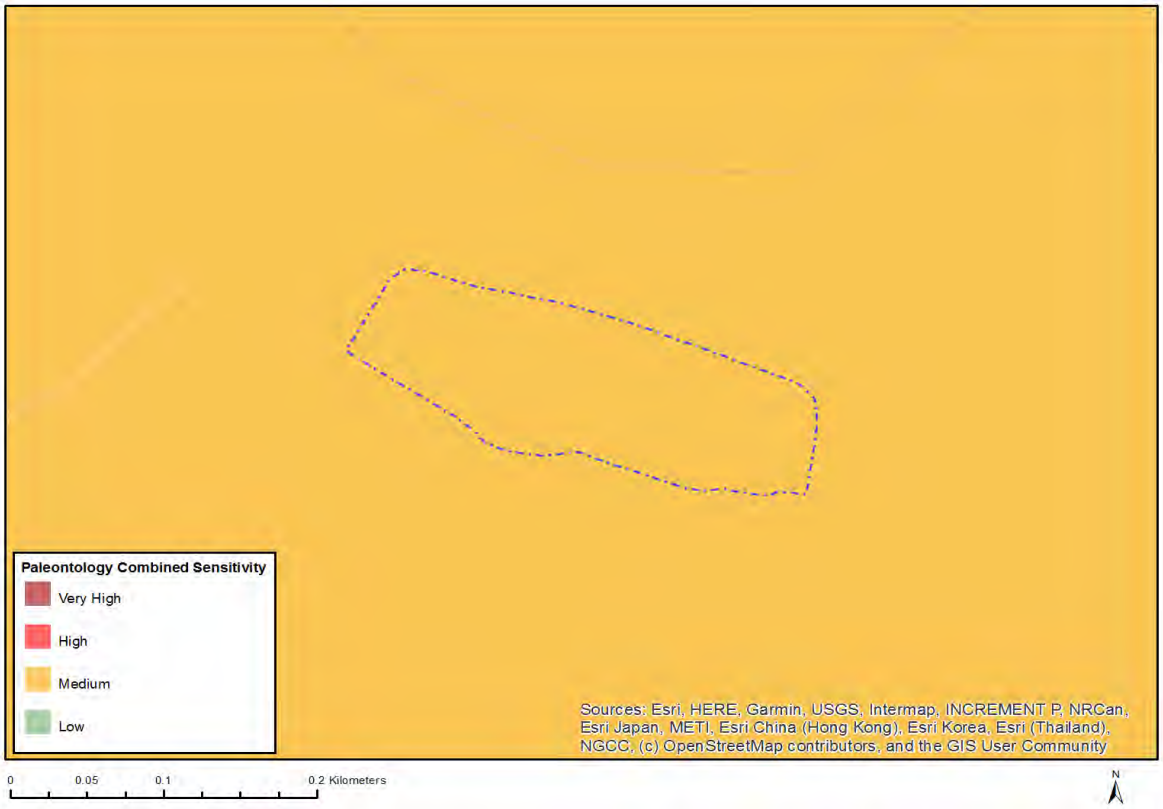


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

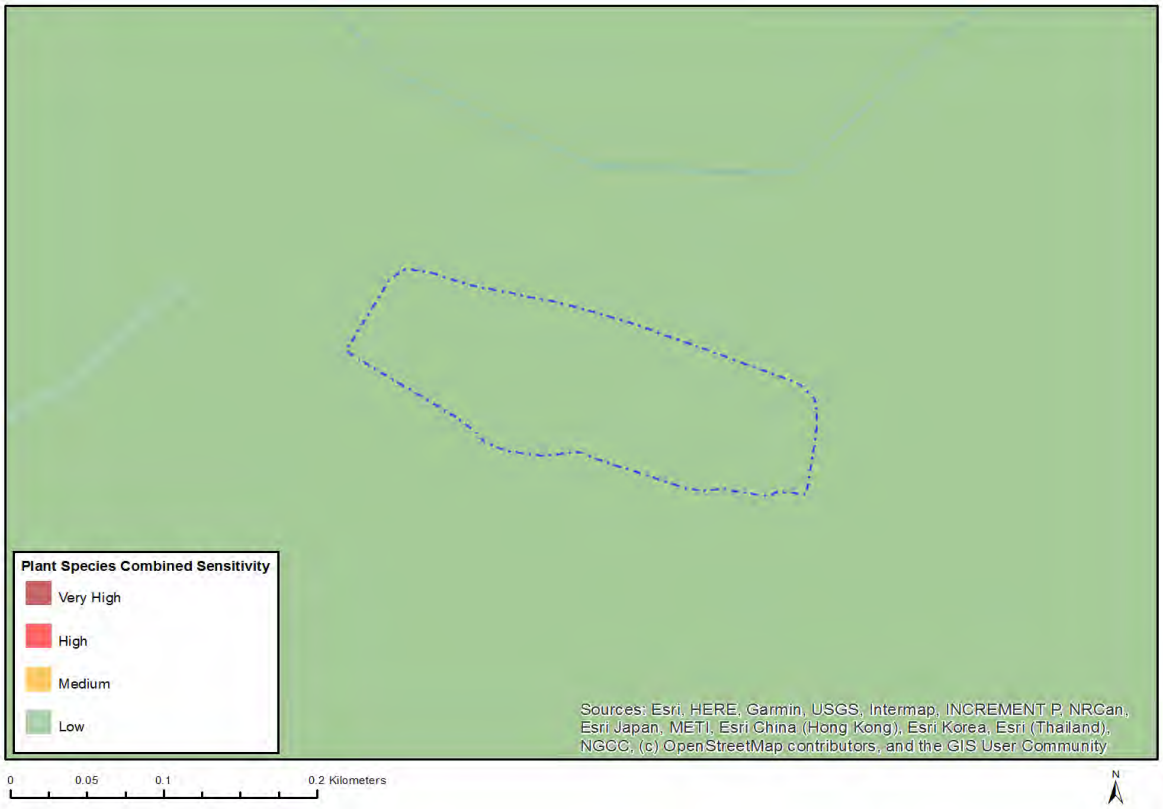


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Features with a Medium paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



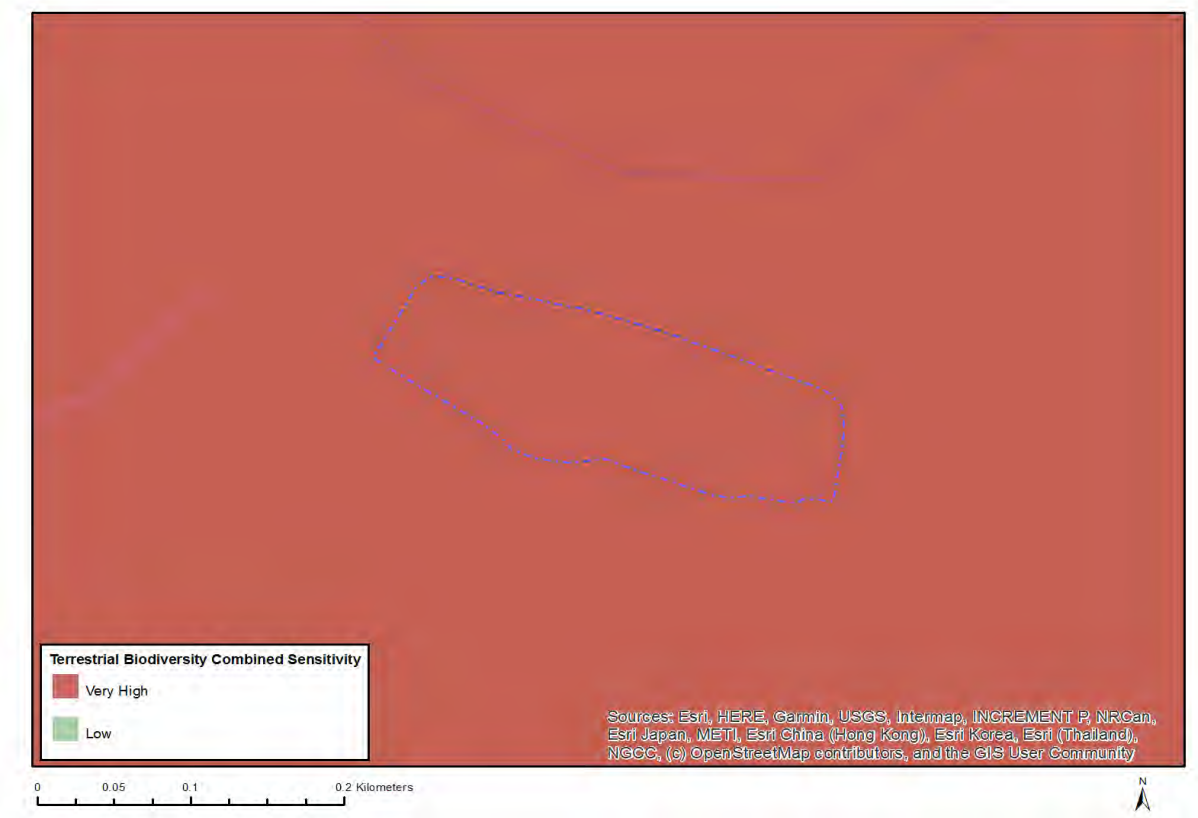
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical Biodiversity Area 2