

DRAFT BASIC ASSESSMENT REPORT APPENDICES: VOLUME NR. 1

DEVELOP AN AGRICULTURAL ESTATE ON REMAINDER PORTIONS 8, 13, 14 AND
20 OF MALELANE ESTATE 140 JU:
MALELANE, MPUMALANGA

PREPARED BY:



RHENGU ENVIRONMENTAL SERVICES

P O Box 1046
MALELANE
1320

Cell: 082 414 7088

Fax: 086 685 8003

E-mail: rhengu@mweb.co.za

PREPARED FOR:

BLUE GRASS TRADING 128 CC: MR. ANDRE DE ZWARDT
(APPLICANT REPRESENTATIVE)

FOR SUBMISSION TO:



DEPARTMENT OF AGRICULTURE, RURAL DEVELOPMENT, LAND AND
ENVIRONMENT AFFAIRS, MPUMALANGA PROVINCIAL GOVERNMENT

JULY 2021

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ORGANISATION	CONTACT	COPIES
DARDLEA	Ms. Robyn Luyt	1
IUCMA: Nelspruit	Mr. Thabo Rasiuba Mr. Sandile Dlamini Ms. Thandi Dzhangsi	1
SAHRA: Cape Town Office	Ms. Nokukhanya Khumalo	1
MTPA	Ms. Khumbelo Malele	1
DAFF	Mr. Zinzile Mtotywa	1
DAFF: LUSM	Mr. Frans Mashabela	1
DARDLA	Mr. Louw Bierman	1
SANPARKS: KNP	Dr. Marisa Coetzee	2
Nkomazi Municipality	Mr. Jan Mashele	1
Applicant	Mr. Andre De Zwardt (Applicant Representative)	2
Irrigation Boards: Malelane Office	Ms. Nancy O'Farrell	1
Rhengu Environmental Services	Mr. Ralf Kalwa	1
TOTAL COPIES		14

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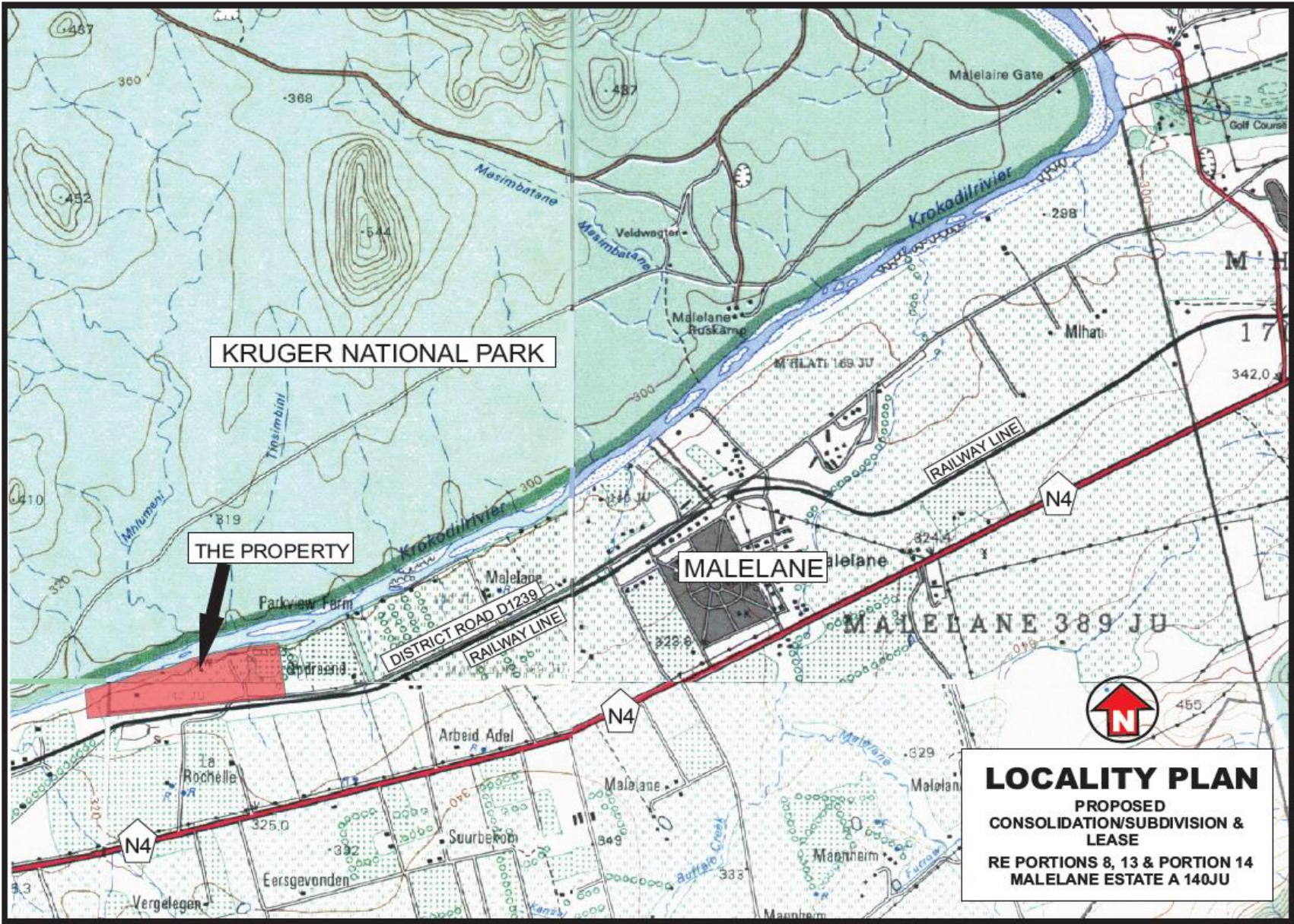
ABBREVIATIONS

ASAP	As Soon As Possible
Asl	Above sea level
CBA's	Critical Biodiversity Areas
cm	centimetre
DAFF	Department of Agriculture, Forestry and Fisheries
DARDLA	Department of Agriculture: Resource Management: Provincial
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
ESAs	Ecological Support Areas
ESKOM	Electricity Supply Commission
GPS	Geographical Positioning System
HIA	Heritage Impact Assessment
HIV	Human Immunodeficiency Virus
I&AP's	Interested and Affected Parties
IEM	Integrated Environmental Management
KMAE	Kruger Malelane Agri Estate
LFIS	Low Flow Irrigation System
m	metre
mm	millimetre
m/s	metre per second
NA	Not Applicable
NDA	National Department of Agriculture
NEMA	National Environmental Management Act
MTPA	Mpumalanga Tourism and Parks Agency
PDI	Previously Disadvantaged Individual

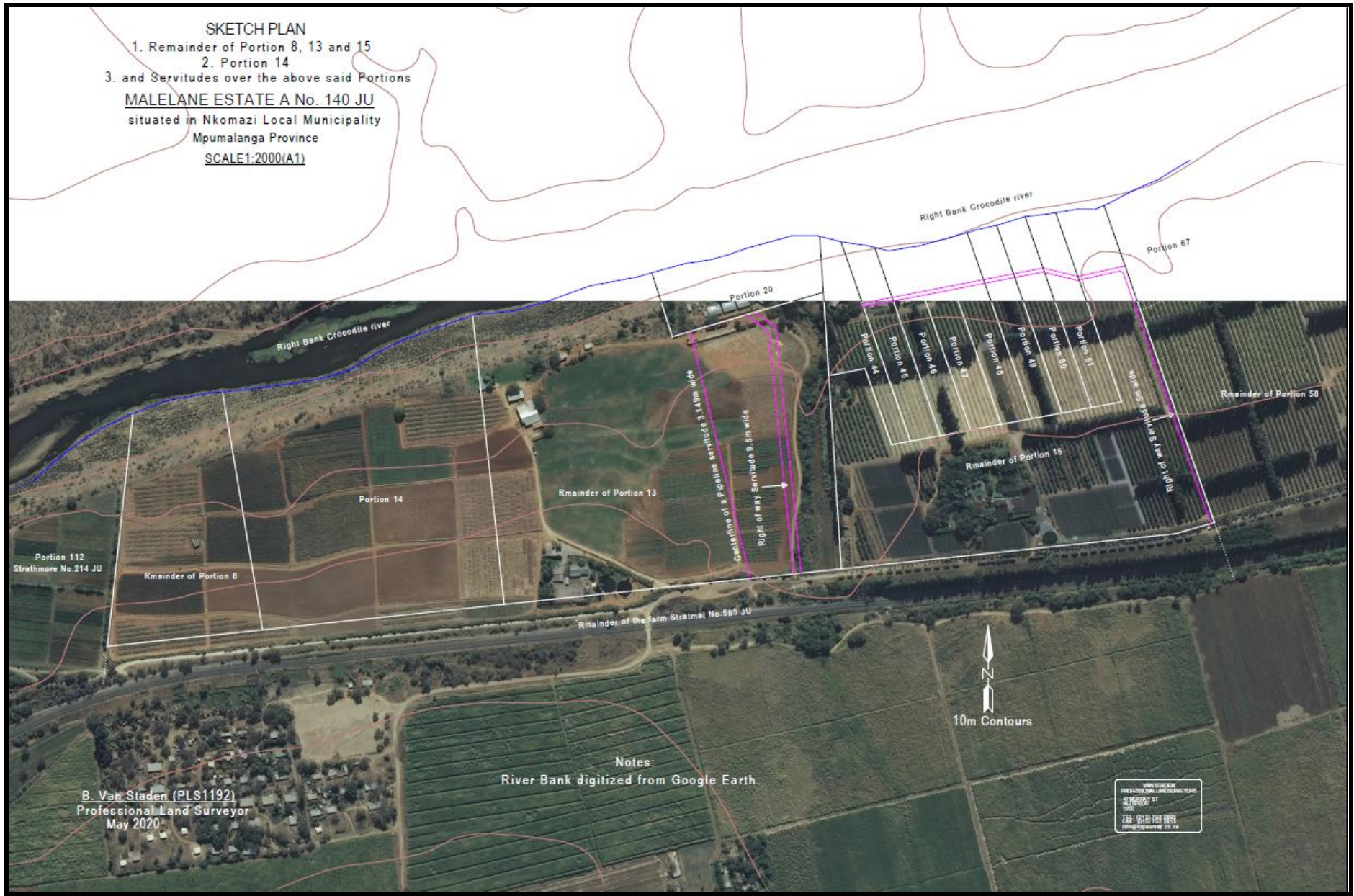
RES	Rhengu Environmental Services
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resources Agency
sqm	square metre

APPENDIX 1:
SITE MAPS
SITE PHOTOGRAPHS

LOCALITY AND TOPOGRAPHICAL MAP: MALELANE ESTATES 140 JU



GOOGLE PROJECT MAP: MALELANE ESTATES 140 JU

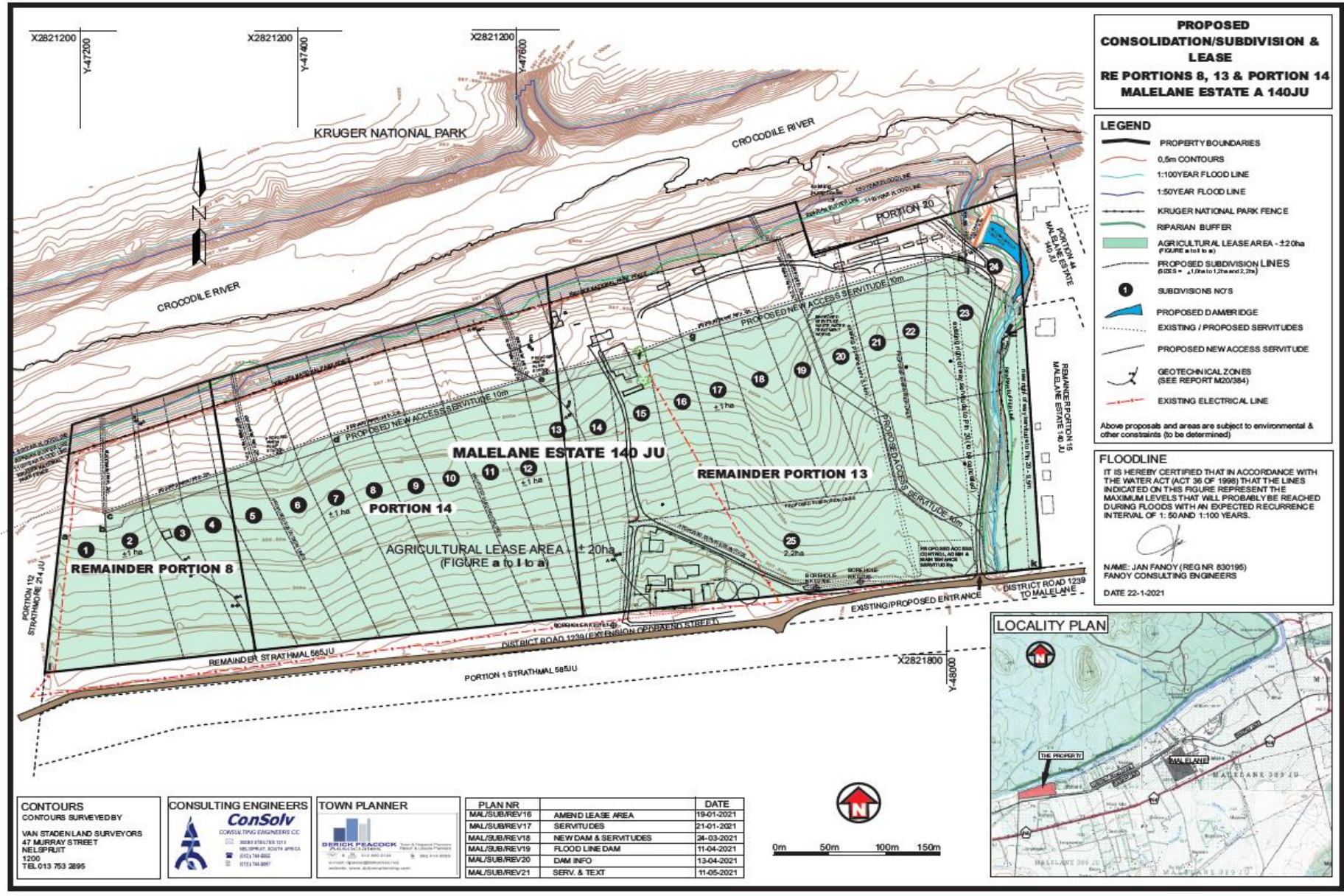


SURVEYOR MAP SHOWING THE OLD LANDS: MALELANE ESTATES 140 JU



BM1	-47848.895	2821742.874	309.727 Hole in Concrete
BM2	-48020.453	2821393.108	292.458 12mm Peg
BM3	-47972.817	2821745.423	308.753 Hole in Concrete

DETAILED LAYOUT MAP WITH ERVEN, FLOODLINES: MALELANE ESTATES 140 JU



CONTOURS
CONTOURS SURVEYED BY
VAN STADEN LAND SURVEYORS
47 MURRAY STREET
NELSPRUIT
1200
TEL 013 753 2895

CONSULTING ENGINEERS
Consolv
CONSULTING ENGINEERS CC
1011 STRATHMAL 585JU
MELBURY 3075 APRICA
013 341 880
013 341 887

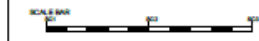
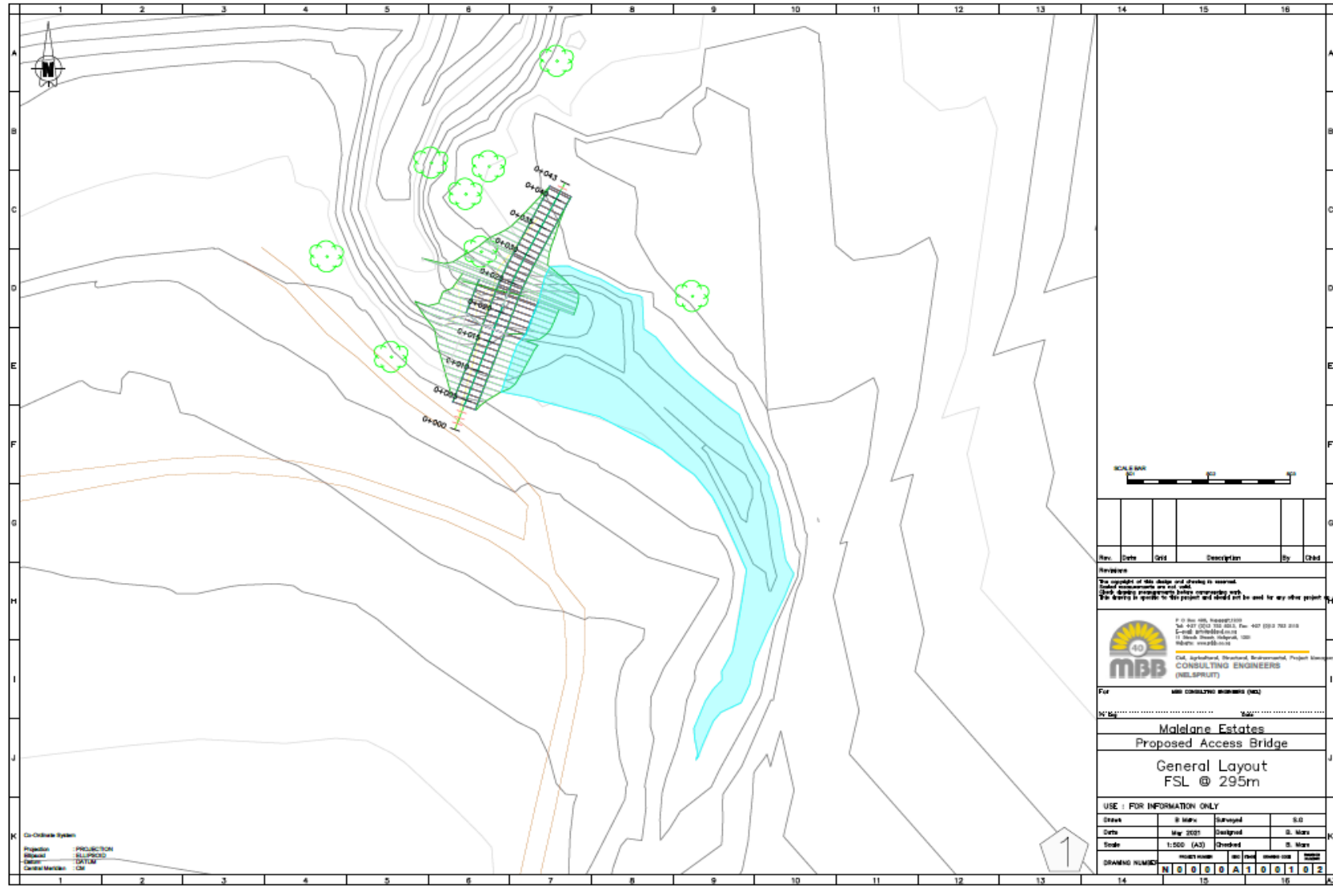
TOWN PLANNER
BRUNCK PRAGDOCK
Town & Regional Planners
1011 STRATHMAL 585JU
MELBURY 3075 APRICA
013 341 880
013 341 887

PLAN NR	AMEND LEASE AREA	DATE
MAL/SUB/REV16	AMEND LEASE AREA	19-01-2021
MAL/SUB/REV17	SERVITUDES	21-01-2021
MAL/SUB/REV18	NEW DAM & SERVITUDES	24-03-2021
MAL/SUB/REV19	FLOOD LINE DAM	11-04-2021
MAL/SUB/REV20	DAM INFO	13-04-2021
MAL/SUB/REV21	SERV. & TEXT	11-05-2021

EXISTING BRIDGE ACCESS LAYOUT MAP ON EASTERN DRAINAGE LINE:
MALELANE ESTATES 140 JU



ENGINEER DIAGRAM OF THE UPGRADING OF THE EXISTING BRIDGE: MALELANE ESTATES 140 JU



Rev.	Date	By	Description

MBB CONSULTING ENGINEERS (Pty) Ltd
 40
 CONSULTING ENGINEERS
 (Pty) Ltd

Malelane Estates
 Proposed Access Bridge
 General Layout
 FSL @ 295m

USE : FOR INFORMATION ONLY

Drawn	By	Checked	S.D.

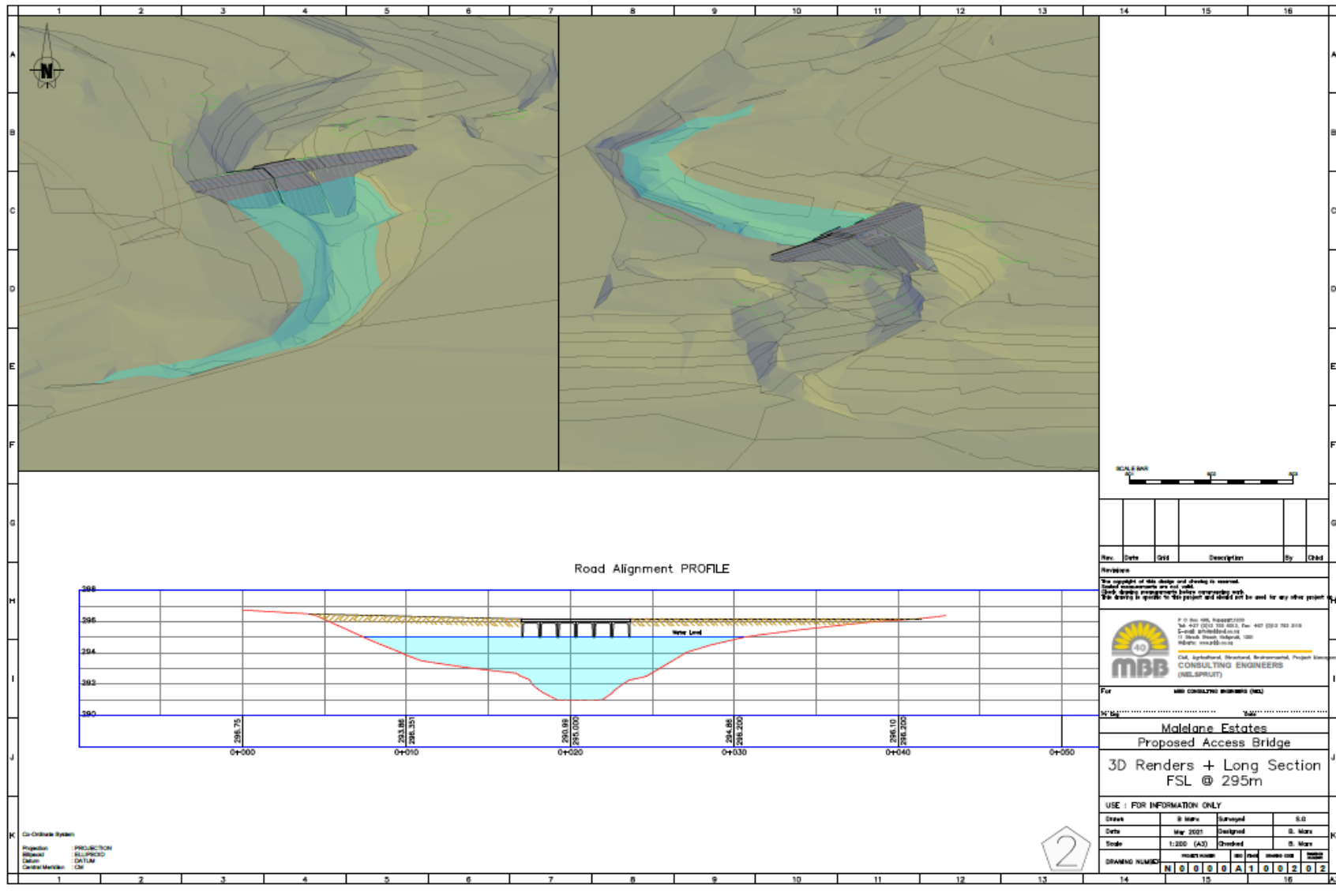
Date	Designed	S. Marks

Scale	Checked	S. Marks
1:500 (A3)		

DRAWING NUMBER: **N0000A100102**

Co-Ordinate System
 Projection: PROJECTION
 Datum: DATUM
 Center Meridian: CM

1



MUNICIPAL ZONATION PLAN FOR THE MALELANE AREA: MALELANE ESTATES 140 JU

PLANNING REGION - 1

NKOMAZI LAND USE SCHEME 2017

SHEET 1E



NOTES:
 1. The position of all roads (both national and provincial roads) as well as railway lines outside provincial boundaries are approximate and not final.
 2. Some settlement boundaries have been captured through a desktop exercise, are not calculated based and are therefore not necessarily accurate.

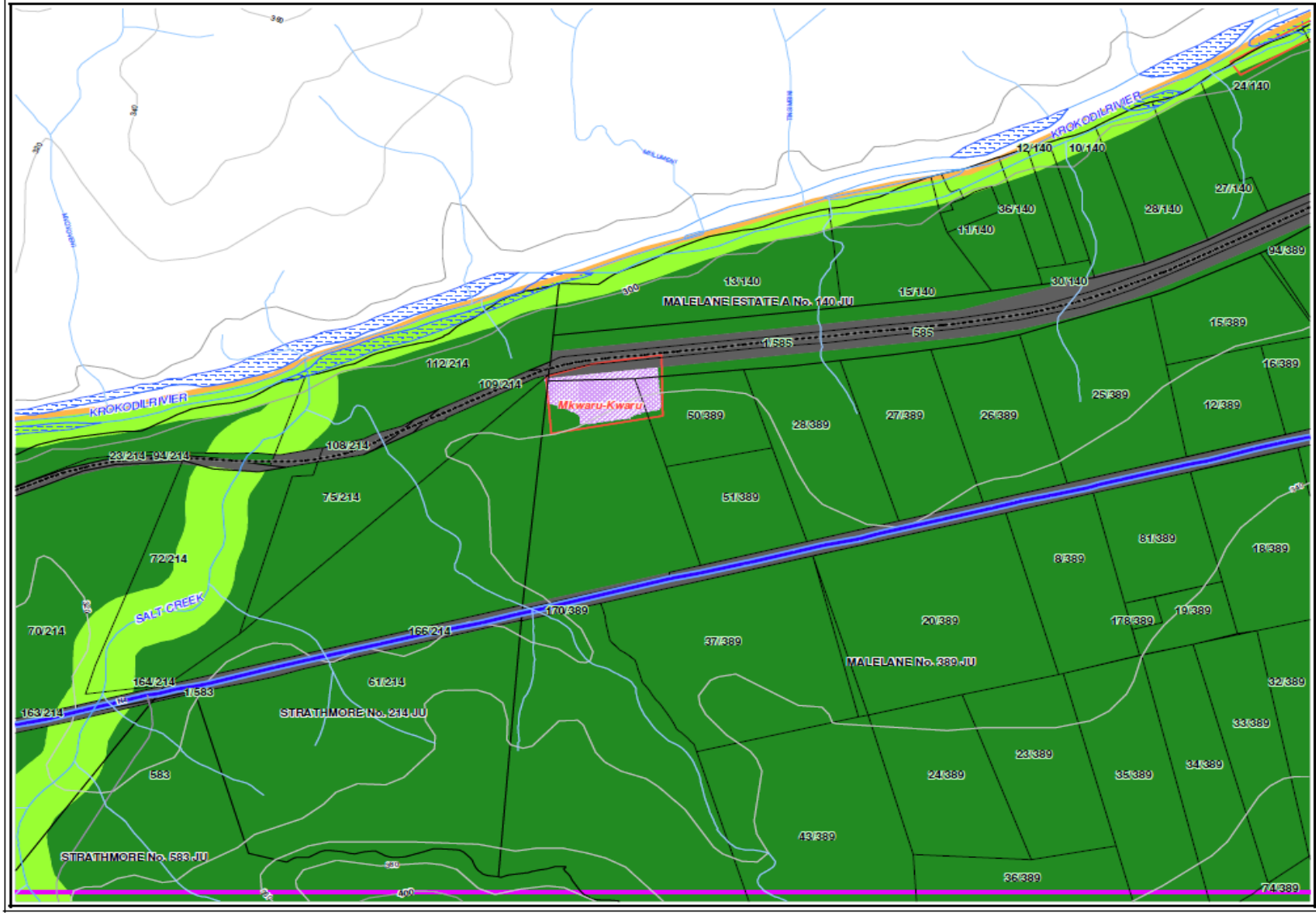
Legend

BOUNDARIES
 - 1:1000 Scale
 - 1:5000 Scale
 - Local Municipality
 - Province
 - National V-Shape
 - Water Features
 - Dam
 - River
 - Dam (Abandoned)

ROADS
 - National Road
 - Provincial Road
 - Local Road
 - Railway

WATER & WATERSHEDS
 - National Watershed
 - Provincial Watershed
 - Local Watershed

LAND USE
 - Agriculture
 - Residential (High Density - R20)
 - Residential (Medium Density - R30)
 - Residential (Low Density - R40)
 - Residential (Very Low Density - R50)
 - Commercial Area
 - Industrial Area
 - Recreation
 - Conservation
 - Conservation (Highly Sensitive)
 - Conservation (Medium Sensitive)
 - Conservation (Low Sensitive)
 - Conservation (Very Low Sensitive)
 - Conservation (Highly Sensitive - 2)
 - Conservation (Medium Sensitive - 2)
 - Conservation (Low Sensitive - 2)
 - Conservation (Very Low Sensitive - 2)
 - Wetland
 - Wetland (High Density)
 - Wetland (Medium Density)
 - Wetland (Low Density)



SCALE (A3) 1:12500

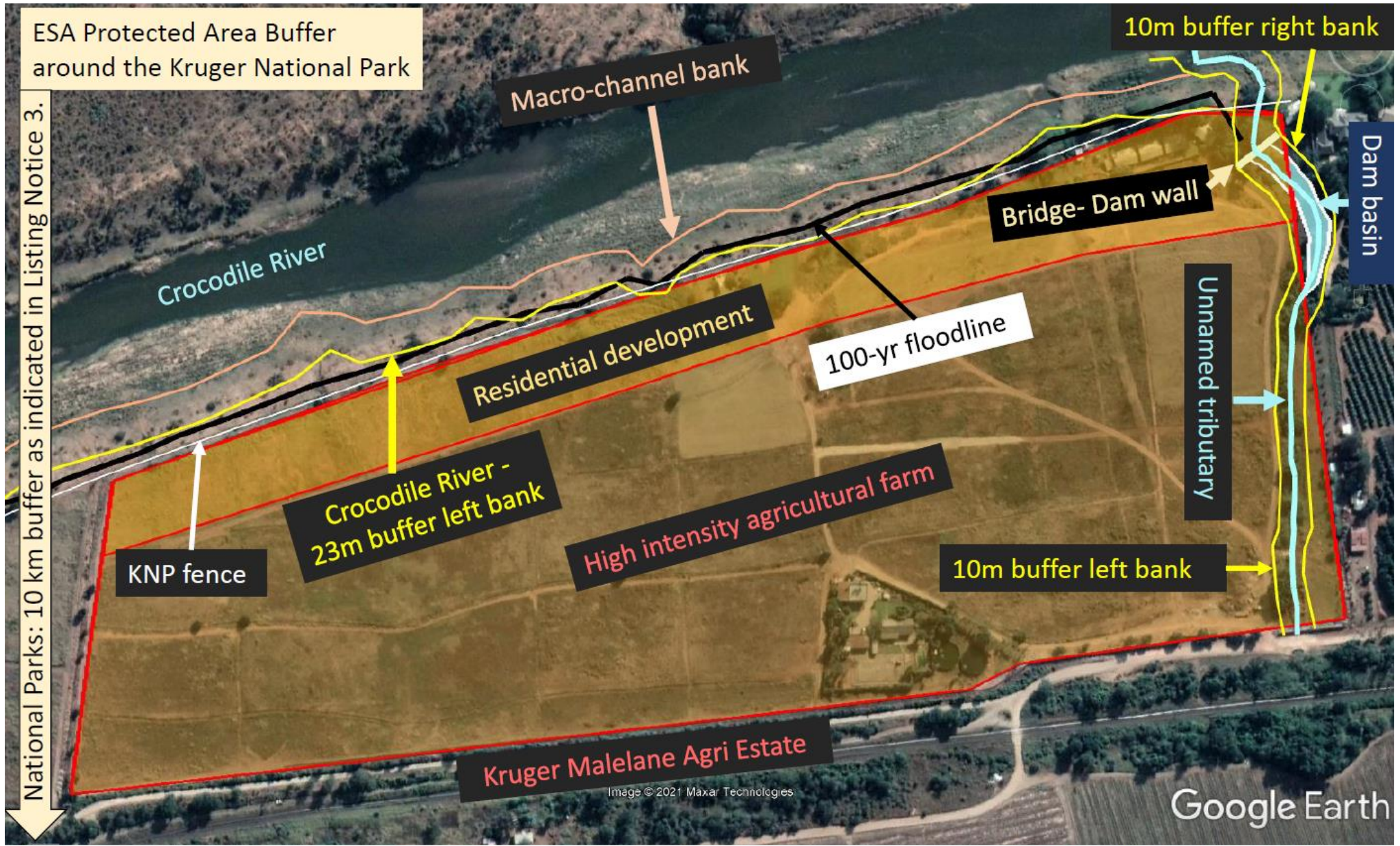
RECOMMENDED FOR APPROVAL

MUNICIPAL MANAGER

NKOMAZI 2017

APPROVED

FINAL DEVELOPMENT MAP WITH SENSITIVE AREAS: MALELANE ESTATES 140 JU



Kruger Malelane Agri Estate - unique lifestyle gated community inside a high intensity agricultural farm (28.4 ha) in the Greater Malelane Town Area, Mpumalanga Province.

High intensity agricultural farm – Agriculture lease area (20 ha); currently fallow lands; economical irrigation unit with 12.4 ha listed water.

Residential development - consist of 25 subdivisions; 8.4 ha.

KNP fence – Fence on southern boundary of the Kruger National Park.

100-yr flood line: 1:100 yr flood line of the Crocodile River.

Macro-channel bank: Used to establish the ecological buffer in the absence of a defined riparian zone.

Crocodile River - 23m buffer left bank: Riverine buffer.

Unnamed tributary - non-perennial drainage feature.

10m buffers on left and right bank of Unnamed tributary.

Bridge- Dam wall – Proposed dam small dam wall that will also serve as a river crossing; approximately 650m long.

Dam basin – of proposed dam.

Site Photographs: EIA: Malelane Estates 140 JU



Figure 1: Public Participation: Advertisement at the Project Site eastern entrance.

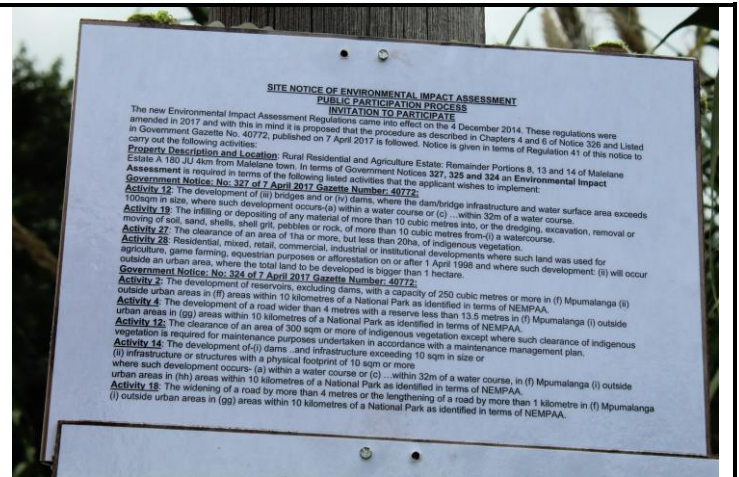


Figure 2: Public Participation: Close up of advertisement: Eastern Entrance.

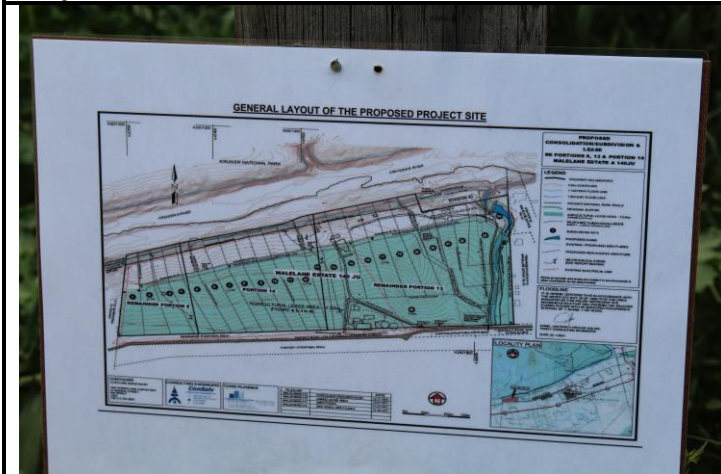


Figure 3: Public Participation: Public Participation: Close up of advertisement: Eastern Entrance.



Figure 4: Public Participation: Advertisement at western entrance to the Project Site.



Figure 5: Public Participation: Advertisement at western entrance to the Project Site along the Provincial Access Road.



Figure 6: Public Participation: Advertisement at western entrance to the Project Site. Close up view.

Site Photographs: EIA: Malelane Estates 140 JU



Figure 7: Public Participation: Advertisement at the SPAR Centre in Malelane Town.



Figure 8: Public Participation: Advertisement at the SPAR Centre in Malelane Town. Community Notice Board.



Figure 9: Public Participation: Advertisement at the SPAR Centre in Malelane Town. Community Notice Board.



Figure 10: Public Participation: Public meeting on site.



Figure 11: Public Participation: Public meeting on site.



Figure 12: Public Participation: Public meeting on site.

Site Photographs: EIA: Malelane Estates 140 JU



Figure 13: Provincial Access Road: Southern boundary of the project site.



Figure 14: Eastern Drainage Line on the Property: Polluted with litter, household waste and run-off waste.



Figure 15: Eastern Drainage Line on the Property: Polluted with litter, household waste and run-off waste.



Figure 16: Existing bridge crossing on the eastern drainage line.

APPENDIX 2:
PUBLIC PARTICIPATION PROCESS
ISSUES AND RESPONSES REPORT
INTERESTED AND AFFECTED PARTIES REGISTER
COPIES OF ADVERTISEMENTS, NEWSPAPER NOTICES AND MINUTES
COPIES OF E-MAIL CORRESPONDENCE
COPIES OF NOTIFICATIONS AND REPORT SUBMISSIONS

ISSUES AND RESPONSES REPORT:
DEVELOP AN AGRICULTURAL ESTATE ON REMAINDER PORTIONS 8, 13, 14 AND 20 OF MALELANE ESTATE 140 JU:
MALELANE, MPUMALANGA

<p style="text-align: center;"><u>Interested and Affected Party:</u></p> <p>Note: Questions/queries posed by all parties during meetings, discussions and informal conversations are listed below and included in the report.</p>	<p style="text-align: center;"><u>Response</u></p>
<p>1.JB: JB raised several concerns and issues pertaining to the supply of water and the registration process with the local municipality. In summary the following:</p> <ul style="list-style-type: none"> • <u>Water Resources:</u> The water resources for the property (boreholes etc.) are interconnected to underground aquifers and surrounding impacts such as run-off from neighbouring properties. • <u>Yield and Contamination:</u> The developers must take note of this and ensure that the proposed development has sufficient clean, potable water to fulfil its obligations. Primarily one would want to know what the yield of the boreholes would be, how will the aquifers be recharged and he also believes E. coli contamination in one of the boreholes requires attention. • <u>Hydrological Survey:</u> Essentially JB believes that a full hydrological assessment is required to ensure answers to the above and to define the water balance for the development. This approach will provide answers to ensure adequate capacity is available for the development in the long term. • <u>Registration Process:</u> JB mentioned that the developer must register as a Water Services Provider (as per the Water Services Act) with the local municipality and reach an agreement to provide water to the various users. JB is prepared to assist JE with this registration process. 	<p>1. RK: Hydrogeological Studies have been completed by specialists and these documents will be included in the Appendices section of the impact assessment reports.</p> <ul style="list-style-type: none"> • <u>Water Balance:</u> The Hydrogeological Study confirmed that the two boreholes combined can provide a sustainable yield of 222.77kl/day. The requirements of the 25 erven are in the region of 57.5kl/day. • <u>Agricultural Water:</u> The property is listed with the Inkomati Usuthu Water Management Agency (IUCMA) for 12.4ha that will together with the grey water from the sewer plant be used for irrigation. • A Water Treatment Plant (to ensure clean, uncontaminated water) will be located at the existing reservoirs to ensure water quality is maintained as per SABS and Department of Water and Sanitation (DWS) required standards. This facility will be registered during the water use licence application process. • <u>Registration Process:</u> JE and JB will combine their efforts to complete the registration process with the local municipality. • JE and JB have met with applicable stakeholders and initiated this process. • <u>Focus Group Meeting:</u> A focus group meeting was held with members of the Irrigation Board to address any outstanding issues pertaining to access control, maintenance of infrastructure and administrative issues (now and in the future).

<p>2. NF: Administration Process: NF raised a concern pertaining to the supply and management of water to each property in 50 years from now once the lease agreement lapses. The Irrigation Board is concerned that this would become a very onerous administrative challenge at the time.</p> <ul style="list-style-type: none"> • Logistical Arrangements: Currently the Irrigation Board manages a pump house and abstraction point near the Crocodile River on Portion 20. Other affected infra-structure includes pipelines, staff housing and canals. • It must be noted that all these aspects must be allowed to continue functioning unhindered as a supplier of irrigation water. • The staff of the board require 24-hour access to the various facilities under its jurisdiction. 	<p>2.RK: See comment above on Focus Group Meeting.</p> <ul style="list-style-type: none"> • RK also recommended that the developer and the Irrigation Board agree to- and compile an Operational- and Maintenance Management Plan to ensure an amicable relationship for all parties going forward. • Rights to Access etc.: Comment noted. The Irrigation Board and its staff members will be allowed to function as per normal working- and maintenance requirements.
<p>3.LH:</p> <ul style="list-style-type: none"> • Density of Dwellings per Stand: LH enquired how many dwellings would be allowed per stand/erf? • Change in Land Use in Future: What will happened to Portion 20 in future if the developer is not successful in obtaining the property during this current tender process? • Security: LH is pleased to see that this development will improve the general security of the area and the neighbouring properties. 	<p>3.RK:</p> <ul style="list-style-type: none"> • One dwelling per stand/erf. • If the developer is unsuccessful in obtaining Portion 20 then it will be business as usual as per the Irrigation Boards functioning, needs and requirements. • Should another party purchase Portion 20 then any change in land use etc. will have to undergo the authorisation and application processes as per legislative requirements.

List of Participants in Discussions and Queries listed above:

- | | |
|-----------------------------|---|
| • Ms Nancy O'Farrell (NF) | Irrigation Boards (Malelane and Crocodile). |
| • Mr. Johan Boshoff (JB) | Irrigation Boards (Malelane and Crocodile). |
| • Mr. Renald Radley (RR) | Malelane irrigation Board. |
| • Mr. Lex Hollmann (LH) | Lex Hollman Trust and Jakkalsbessie Homeowners. |
| • Mr. Andre de Zwardt (AdZ) | Applicant Representative |
| • Dr. Andrew Deacon (AD) | Biodiversity Specialist. |
| • Mr. Johan Enslin (JE) | IWULA Consultant. Project Team Member. |
| • Mr. Ralf Kalwa (RK) | Rhengu Environmental Services. |

PUBLIC PARTICIPATION AND ROLEPLAYERS REGISTER:
INTERESTED AND AFFECTED PARTIES: REMAINDER PORTIONS 8,13,14 AND 20 OF MALELANE ESTATE 140JU

Name; Company, Department	Postal Address	E Mail	Fax	Telephone or Cell Number
Deacon, Andrew Dr	House 4, Jakkalsbessie Farm, Opdraend Road, Malelane	andrewd@mpu.co.za	NA	082 325 5583
Enslin, Johan	Riverside Estate, Skeerpoort, 0232	iwulaspecialist@gmail.com	NA	072 332 2442
Hollmann, Lex: Chairman: Mtoma Home Owners Association and Lex Hollmann Trust	House 1, Jakkalsbessie Farm, Opdraend Road, Malelane	Lex@edlex.co.za	013 790 1658	083 254 0687
Marx, Barend	11 Streak Street, Nelspruit, P. O. Box 498, Nelspruit, 1200	barend@mbbnel.co.za	013 752 8213	083 354 5521 013 752 8213/6
Government or Official Departments/Business Interests	Postal Address	E Mail	Fax	Telephone or Cell Number
Boshoff, Johan: Malelane Irrigation Board	P. O. Box 16092 Nelspruit, 1200	<u>0829575915@vodamail.co.za</u> johanboshoff@gmail.com	086 515 7645	082 789 1422
Coetzee, Marisa Dr.: Kruger National Park.	Private Bag X 402, Skukuza, 1350	Marisa.Coetzee@sanparks.org	NA	082 739 3650
Du Plessis, Ben Dr.: Department of Veterinary Services: DALA: Mpumalanga Provincial Government.	Private Bag X 11309, Nelspruit, 1200	bjadp@vodamail.co.za	NA	082 575 1601
Khumalo, Nokukhanya: SAHRA.	P. O. Box 4637, Cape Town, 8001	nkhumalo@sahra.org.za	021 462 4509	021 462 4502
Malele, Khumbelo: MTPA	Private Bag X 11338, Nelspruit, 1200.	khumbelomalele@gmail.com	NA	013 235 2395 Ext. 222
Mashabela, Frans: DAFF: LUSM.	P. O. Box 8806, Nelspruit, 1200.	FransMas@nda.agric.za	013 754 0735	013 754 0730 072 130 1204

Mashele, Jan: Nkomazi Municipality.	Private Bag X 101, Malelane, 1320	Jan.Mashele@nkomazi.gov.za	013 790 0886	013 790 1303 082 265 0528
O'Farrell, Nancy: Irrigation Boards and Water Management.	P. O. Box 382, Malelane, 1320	nancy@rmputter.co.za	NA	063 734 5226
Radley, Renald: Malelane Irrigation Board.	P. O. Box 35, Malelane, 1320	renald@radleylg.co.za	NA	082 388 3643
Rasiuba, Thabo: IUCMA	13 Streak Street MAXMA Building, Nelspruit, 1200	rasiubat@iucma.co.za	013 753 2786	013 753 9030
Smith. Albert: Section Ranger: Malelane: Kruger National Park.	Private Bag X 402, Skukuza, 1350	Albert.smith@sanparks.org	NA	084 700 1489
Shabangu, Sampie: IUCMA.	13 Streak Street MAXMA Building, Nelspruit, 1200	shabangus@iucma.co.za	NA	013 753 9000 062 907 9061
Mtotywa, Zinzile: DAFF.	Private Bag X 11243, Nelspruit, 1200.	ZinzileM@nda.agric.za	086 628 7137	013 754 0761 071 883 2768
Van der Merwe, Wehncke: Kruger Bufferzone Coordinator	NA	wehncke@kruger2canyons.org	NA	084 796 0834

**MINUTES OF THE MEETING/DISCUSSIONS
HELD WITH INTERESTED AND AFFECTED PARTIES (I&AP's):
DEVELOP AN AGRICULTURAL ESTATE ON REMAINDER PORTIONS 8, 13, 14 AND 20 OF
MALELANE ESTATE 140 JU:
MALELANE, MPUMALANGA
24 MAY 2021
10H00**

1. Participants:

- Ms Nancy O'Farrell (NF) Irrigation Boards (Malelane and Crocodile).
- Mr. Johan Boshoff (JB) Irrigation Boards (Malelane and Crocodile).
- Mr. Renald Radley (RR) Malelane irrigation Board.
- Mr. Lex Hollmann (LH) Lex Hollman Trust and Jakkalsbessie Homeowners.
- Mr. Andre de Zwardt (AdZ) Applicant Representative
- Dr. Andrew Deacon (AD) Biodiversity Specialist.
- Mr. Johan Enslin (JE) IWULA Consultant. Project Team Member.
- Mr. Ralf Kalwa (RK) Rhengu Environmental Services.

2. Apologies:

None.

3. Welcome and Background:

RK thanked the participants for the opportunity to meet. RK introduced the various members of the meeting to each other. RK briefly explained the role of Interested and Affected Parties in an Environmental Impact Assessment (EIA) Process and encouraged everyone to participate in an open and transparent manner. Participants should feel free to voice their comments and provide input at any stage of the process. RK also gave an overview of the EIA process and the procedure of collecting information, the opportunity for I&APs to comment and the procedure for submitting the reports.

This meeting is but one of a set of meetings which will be held during the Public Participation Phase. Comments and concerns raised today will be included in the participation process and by attending this meeting the participants have registered their interest in the project. These minutes will be included in the Environmental Assessment documentation.

- To comply with **Environmental Legislation** an **Application** will be submitted to the Department of Rural Development, Land and Environmental Affairs (DARDLEA) in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment (EIA) Regulations of 2014.
- Several activities which require approval by DARDLEA are listed in these regulations.
- The purpose of this assessment process is to investigate the impact of implementing such activities (i.e., developing an agricultural estate with 25 erven) on the farm.
- Erf Nr. 25 is represented by the existing farmhouse and will serve the purposes of accommodating the farm manager.
- The zonation of the property will not be amended and the existing land use/agricultural activity will remain in place, i.e., production of agricultural crops i.e., macadamia orchards.
- **Two land use alternatives** are thus proposed, i.e., residential on the sections overlooking the Kruger National Park and an agricultural activity towards the southern section of the property. One dwelling will be allowed per erf property. Erf sizes vary between 1ha and 2ha each.

Having said this, Rhengu Environmental Services (RES) were appointed to undertake the assessment process. As part of this assessment process a **Public Participation Process (PPP)** must be initiated to involve all potential interested and affected parties.

Several Specialist Studies have been commissioned to investigate and evaluate various aspects pertaining to the project site: Biodiversity Study (Aquatic and Terrestrial); Geotechnical and Hydrological Studies; Heritage Study; View Shed Analysis; Flood line delineation; Buffer Zone delineation; Services Reports and a Traffic Impact Study. Together with the Engineering Reports, these studies will allow the Project Team an opportunity to take an informed decision on the various impacts associated with the proposed development.

Finally, RK reiterated that in parallel to the EIA process the applicant must submit a Water Use Licence Application (WULA) to the Department of Water and Sanitation (IUCMA, i.e., Catchment Management Agency). This process will be managed by Johan Enslin. JE informed the meeting as follows:

- The WULA process will run concurrently with the EIA process. IUCMA have been on site and JE will continue liaising with the department during the WULA process. This Public Participation Process (PPP) will support the WULA process.
- JE recognises the need to register as a Water Services Provider and or to obtain a Letter of Consent from the local municipality.
- The following issues were raised by participants during the meeting:

Issue	Response
<p>1.JB: JB raised several concerns and issues pertaining to the supply of water and the registration process with the local municipality. In summary the following:</p> <ul style="list-style-type: none"> • Water Resources: The water resources for the property (boreholes etc.) are interconnected to underground aquifers and surrounding impacts such as run-off from neighbouring properties. • Yield and Contamination: The developers must take note of this and ensure that the proposed development has sufficient clean, potable water to fulfil its obligations. Primarily one would want to know what the yield of the boreholes would be, how will the aquifers be recharged and he also believes E. coli contamination in one of the boreholes requires attention. • Hydrological Survey: Essentially JB believes that a full hydrological assessment is required to ensure answers to the above and to define the water balance for the development. This approach will provide answers to ensure adequate capacity is available for the development in the long term. • Registration Process: JB mentioned that the developer must register as a Water Services Provider (as per the Water Services Act) with the local municipality and reach an agreement to provide water to the various users. JB is prepared to assist JE with this registration process. 	<p>1. RK: Hydrogeological Studies have been completed by specialists and these documents will be included in the Appendices section of the impact assessment reports.</p> <ul style="list-style-type: none"> • Water Balance: The Hydrogeological Study confirmed that the two boreholes combined can provide a sustainable yield of 222.77kl/day. The requirements of the 25 erven are in the region of 57.5kl/day. • Agricultural Water: The property is listed with the Inkomati Usuthu Water Management Agency (IUCMA) for 12.4ha that will together with the grey water from the sewer plant be used for irrigation. • A Water Treatment Plant (to ensure clean, uncontaminated water) will be located at the existing reservoirs to ensure water quality is maintained as per SABS and Department of Water and Sanitation (DWS) required standards. • Registration Process: JE and JB will combine their efforts to complete the registration process with the local municipality. • Focus Group Meeting: A focus group meeting will be held with members of the Irrigation Board to address any outstanding issues pertaining to access control, maintenance of infrastructure and administrative issues (now and in the future). Agenda items can be sent to Derick Peacock at dpasso@telkomsa.net.
<p>2. NF:</p> <ul style="list-style-type: none"> • Administration Process: NF raised a concern pertaining to the supply and management of water to each property in 50 years from now once the lease agreement lapses. The Irrigation Board is concerned that this would become a very onerous administrative challenge at the time. • Logistical Arrangements: Currently the Irrigation Board manages a pump house and abstraction point near the Crocodile River on Portion 20. Other affected infra-structure includes pipelines, staff housing and canals. • It must be noted that all these aspects must be allowed to continue functioning unhindered as a supplier of irrigation water. • The staff of the board require 24-hour access to the various facilities under its jurisdiction. 	<p>2.RK: See comment above on Focus Group Meeting.</p> <ul style="list-style-type: none"> • RK also recommended that the developer and the Irrigation Board agree to- and compile an Operational- and Maintenance Management Plan to ensure an amicable relationship for all parties going forward. • Rights to Access etc.: Comment noted. The Irrigation Board and its staff members will be allowed to function as per normal working- and maintenance requirements.

3.LH:

- **Density of Dwellings per Stand:** LH enquired how many dwellings would be allowed per stand/erf?
- **Change in Land Use in Future:** What will happen to Portion 20 in future if the developer is not successful in obtaining the property during this current tender process?
- **Security:** LH is pleased to see that this development will improve the general security of the area and the neighbouring properties.

3.RK:

- One dwelling per stand/erf.
- If the developer is unsuccessful in obtaining Portion 20 then it will be business as usual as per the Irrigation Boards functioning, needs and requirements.
- Should another party purchase Portion 20 then any change in land use etc. will have to undergo the authorisation and application processes as per legislative requirements.

General Comments:

The meeting and site visit adjourned at 11h20.

**MINUTES OF THE VIRTUAL FOCUS GROUP MEETING/DISCUSSIONS
HELD WITH SANPARKS: MR. WEHNCKE VAN DER MERWE:
DEVELOP AN AGRICULTURAL ESTATE ON REMAINDER PORTIONS 8, 13, 14 AND 20 OF
MALELANE ESTATE 140 JU:
MALELANE, MPUMALANGA
25 MAY 2021
16H15**

1.Participants:

- Mr. Wehncke van der Merwe (WvdM) SANParks (KNP) Bufferzone Coordinator.
- Mr. Andre de Zwardt (AdZ) Applicant Representative.
- Mr. Derick Peacock (DP) Town Planner.
- Dr. Andrew Deacon (AD) Biodiversity Specialist.
- Mr. Ralf Kalwa (RK) Rhengu Environmental Services.

2.Apologies:

Dr. Marisa Coetzee (KNP).

3.Welcome and Background:

- **Background Information:** DP welcomed all to this meeting and provided a brief background to the proposed development as follows:
- The proposed development is inside the Urban Edge of Malelane and the development team (DT) is following the SPLUMA Process.
- The DT has learnt from existing examples along the Crocodile River (Jakkalsbessie and Mjejane) and will follow similar mitigation measures to ensure that the proposed development fits in with surrounding land uses.
- The property will be managed for agriculture (zonation will not change) with 24 residential stands facing the Kruger National Park. Stand 25 is the existing farmhouse and will be occupied by the Farm Manager.
- Each stand/erf will be between 1ha-2ha in size with a development footprint of approximately 3000sqm.
- Each stand will accommodate one dwelling.
- The design, shape and look of the buildings will be earthy in nature and colour and located amongst many trees and rehabilitated vegetation (more than 300 indigenous trees commensurate with the surrounding Malelane Mountain Bushveld have been planted to date).
- Architectural guidelines will channel all design options to fit in with the above and a height restriction of 7m will be regarded as a maximum for the development.
- **Historical Background:** RK provided some historical- and *status quo* information as follows:
- The Farm was owned by the Goeveia Family for more than 50 years and was used a vegetable farm.
- Once the family passed on the 4 children did not want to pursue the farming enterprise and the farm was rented out to the Snyman Family in Malelane. The property was used to produce lawns for commercial purposes and served as a distribution node for agricultural fertilizers.
- The removal of lawns from the farm has denuded the property of valuable topsoil over the past 10 years. Erosion and run-off damage into the Crocodile River has compounded the environmental impacts on the property.
- For all essential purposes no natural vegetation is found on the farm and the land has been transformed in all its facets.
- Several **Specialist Studies** have been completed to date as follows:
- Geohydrology; Biodiversity; Flood lines; Buffer areas; Fishway; Heritage; Services (stormwater plan); Visual Impact (7m height restriction); Earthy colours (architectural guidelines); Engineering Reports and Traffic Impact.

- **SANParks:** WvdM was pleased to see that several concerns had been addressed to date and added that he would submit a list of conditions which SANParks would like to see included in the assessment process.
- **RK:** Requested that the document be submitted ASAP so that it could receive the required attention and **where applicable** the conditions will be included in the Environmental Management Programme of the EIA.

General Comments:

The meeting adjourned at 17h20.

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 0515 Flats / Units
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 0524 Holiday Accommodation
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0535 OFFICES / SHOPS / BUSINESS PREMISES

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SUBMITTED
 Comments should be made in writing and be addressed to the municipality concerned and a copy to the applicant, to reach the said addresses within thirty (30) days of this publication.
 Municipality Name where comments must be submitted: MBOMBELA LOCAL MUNICIPALITY
 District: EHLANZENI
 Municipality's address: CIVIC CENTRE, 1 NEL STREET, NELSPRUIT, 1201
 Applicant's address: STAND 018197, MISOGWABA
 Advertiser Name: CHRISTINA THOLAKELE MADONSOLA
 Her postal address: STAND 018197, MISOGWABA
 Advertiser Email: bawinlamd32@gmail.com
 TA010372

NOTICE
MPUMALANGA LIQUOR LICENCING ACT (ACT NO. 5 OF 2006)
INVITATION FOR PUBLIC COMMENTS IN RESPECT OF THE TRANSFER OF A LIQUOR LICENCE IN TERMS OF SECTION 43 OF THE MPUMALANGA LIQUOR LICENCING ACT, 2006
A. PERSONAL DETAILS
 I, JASULANI WILLIAM MAMBEA with ID No. 60020 5607 084, a male, hereby invite written public comments concerning my application to the Mpumalanga Liquor Authority for the transfer of liquor licence number: MPU-022983 trading under the name of EMASOFENI TARVEN, I make this application on behalf of myself.
B. LICENCE TYPE
 (a) the retail sale of liquor for consumption on the premises where the liquor is sold;
C. BUSINESS PREMISES
 Comments should be made in writing and be addressed to the municipality concerned and a copy to the applicant, to reach the said address within thirty (30) days of this publication.
D. ADDRESSES TO WHICH COMMENTS MUST BE SUBMITTED
 Applicant's address: STAND NO. 5332, PHOLA TRUST, situated within the Mombela Local Municipality, being an address within the Republic of South Africa and within the boundaries of the Mpumalanga Province.
 Postal address: STAND NO. 5332, PHOLA TRUST, 1200
D. ADDRESSES TO WHICH COMMENTS MUST BE SUBMITTED
 Applicant's address: STAND NO. 28, ALEXANDRIA TRUST
 TA010281

NOTICE OF A WATER USE LICENCE APPLICATION IN TERMS OF SECTION 40 OF THE NATIONAL WATER ACT (ACT 36 OF 1998) (NWA) FOR THE STORMING OF WATER ON REMAINING EXTENT OF THE FARM KLIPKRAAL 170 JT
 Notice is hereby given that York Trens (Pty) Ltd is applying for a Water Use Licence Applications (WULA) in terms of Section 40 of the NWA (Act 36 of 1998) for the storming of water in an off-channel storage dam on Remaining Extent of the Farm Klipkraal 170 JT. All interested and Affected Parties (I&APs) are invited to register and submit their comments to the contact address below within 30 days of the release of this notice. Additional information can be obtained upon request via the same address.
 Contact: Insole Environmental Consulting.
 E-Mail: insole@insoleconsult.co.za, Tel: 082-338-1382 / 074- 103-3306. TA010356

0910 PUBLIC / LEGAL NOTICES

NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT PUBLIC PARTICIPATION PROCESS INVITATION TO PARTICIPATE
 The new Environmental Impact Assessment Regulations came into effect on the 4 December 2014. These regulations were amended in 2017 and with this in mind it is proposed that the process as described in Chapters 4 and 6 of Notice 326 and Listed in Government Gazette No. 40772, published on 7 April 2017 is followed. Notice is given in terms of Regulation 16(1) to invite interested parties to participate in the following activities:
Property Description and Location: Rural Residential and Agriculture Estate: Remainder Portions 8, 13 and 14 of Malilane Estate A 180 JU 4km from Malilane town. In terms of Government Notices 327, 325 and 324 an Environmental Impact Assessment is required in terms of the following listed activities that the applicant wishes to implement.
Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772.
Activity 12: The development of (ii) bridges and or (iv) dams, where the dam/bridge infrastructure and water surface area exceeds 100cqm in size,

where such development occurs-
 (a) within a water course or (c) within 32m of a water course
Activity 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shales, shell grit, pebbles or rock, of more than 10 cubic metres from(i) a watercourse.
Activity 27: The clearance of an area of the or more, but less than 20ha, of indigenous vegetation.
Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.
 Government Notice: No: 324 of 7 April 2017 Gazette Number: 40772.
Activity 2: The development of reservoirs, excluding dams, with a capacity of 250 cubic metres or more in (f) Mpumalanga (i) outside urban areas in (f) areas within 10 kilometres of a National Park as identified in terms of NEMPPA.
Activity 4: The development of a road wider than 4 metres with a reserve less than 13.5 metres in (f) Mpumalanga (i) outside urban areas in (gg) areas within 10 kilometres of a National Park as identified in terms of NEMPPA.
Activity 12: The clearance of an area of 300 sqm or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.
Activity 14: The development of (i) dams - and infrastructure exceeding 10 sqm in size or (ii) infrastructure or structures with a physical footprint of 10 sqm or more where such development occurs- (a) within a water course or (c) within 32m of a water course, in (f) Mpumalanga (i) outside urban areas in (hh) areas within 10 kilometres of a National Park as identified in terms of NEMPPA.
Activity 18: The widening of a road by more than 4 metres or the lengthening of a road by more than 1 kilometre in (f) Mpumalanga (i) outside urban areas in (gg) areas within 10 kilometres of a National Park as identified in terms of NEMPPA.
Project Specifics include:
 + Establishment 25 sub-divisions (the 2.2ha each).
 Create a lease over the southern sections of each sub-division that will continue to be used for agriculture.
 The northern section of each sub-division will accommodate one private residence overlooking the Crocodile River.
 + The development of services infrastructure (electricity, potable water and sewers) to each sub-division.
 The purpose of this assessment process is to investigate the impact of implementing such activities at Remainder Portions 8, 13 and 14 of Malilane Estate A 180 JU 4km from Malilane town. In terms of Government Notice: No. 2393/05
 In the matter between: **NONYANA FW** Plaintiff and **MOJAPELLO & CO INC** Defendant
KINDLY TAKE NOTICE THAT in terms of judgment granted on the 24th of January 2017 in the High Court of South Africa, Gauteng Division, Pretoria.
 Case No. 2393/05
 In the matter between: **NONYANA FW** Plaintiff and **MOJAPELLO & CO INC** Defendant
KINDLY TAKE NOTICE THAT in terms of judgment granted on the 24th of January 2017 in the High Court of South Africa, Gauteng Division, Pretoria, a sale in execution of the under mentioned goods will be held on **FRIDAY, 7 MAY 2021 at 09h00 at THE SHERIFF'S OFFICES, 99 JACARANDA STREET, WEST ACRES, MBOMBELA** to the highest bidder:
 1 x Reception desk
 1 x Nashua Coping machine
 1 x Computer
 1 x Chair
 1 x Hisense Bar fridge

0916 TITLE DEEDS

NOTICE
LOST OR DESTROYED DEED FORM JJJ
 Notice is hereby given that under the provisions of regulation 68 of the Deeds Regulations Act, 1937, of the intention to apply for the issue of a certified copy of NOTARIAL DEED OF CESSION OF RIGHT TO EXCLUSIVE USE AREA SK5068/07 (TWELVE) square metres being BOUGAINVILLE PLACE in respect of the land and building or buildings situated at ERF 434 SONHEUWEL TOWNSHIP City of Mbombela as shown and more fully described on Sectional Plan Number SS1147/07 which has been lost or destroyed.
 All interested persons having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds, Mpumalanga at Nelspruit within two weeks from the date of the publication of this notice.
 Dated at NELSPRUIT on 17 MARCH 2021.
APPLICANT
KRUGER AND PARTNERS INC
NELSPRUIT
 Itsele@kmprop.co.za
 013-745-5300 TA010357

0915 SALES IN EXECUTION

NOTICE
LOST OR DESTROYED DEED FORM JJJ
 Notice is hereby given that under the provisions of regulation 68 of the Deeds Regulations Act, 1937, of the intention to apply for the issue of a certified copy of NOTARIAL DEED OF CESSION OF RIGHT TO EXCLUSIVE USE AREA SK5068/07 (TWELVE) square metres being BOUGAINVILLE PLACE in respect of the land and building or buildings situated at ERF 434 SONHEUWEL TOWNSHIP City of Mbombela as shown and more fully described on Sectional Plan Number SS1147/07 which has been lost or destroyed.
 All interested persons having objection to the issue of such copy are hereby required to lodge the same in writing with the Registrar of Deeds, Mpumalanga at Nelspruit within two weeks from the date of the publication of this notice.
 Dated at NELSPRUIT on 17 MARCH 2021.
APPLICANT
KRUGER AND PARTNERS INC
5 VAN RENSBURG STREET, NELSPRUIT
 Itsele@kmprop.co.za
 013-745-5300 TA010358

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COPY OF SITE NOTICE:
SITE NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT
PUBLIC PARTICIPATION PROCESS
INVITATION TO PARTICIPATE

The new Environmental Impact Assessment Regulations came into effect on the 4 December 2014. These regulations were amended in 2017 and with this in mind it is proposed that the procedure as described in Chapters 4 and 6 of Notice 326 and Listed in Government Gazette No. 40772, published on 7 April 2017 is followed. Notice is given in terms of Regulation 41 of this notice to carry out the following activities:

Property Description and Location: Rural Residential and Agriculture Estate: Remainder Portions 8, 13, 14 and 20 of Malelane Estate 140 JU 4km from Malelane town. In terms of Government Notices 327, 325 and 324 an **Environmental Impact Assessment** is required in terms of the following listed activities that the applicant wishes to implement:

Government Notice: No: 327 of 7 April 2017 Gazette Number: 40772:

Activity 12: The development of (iii) bridges and or (iv) dams, where the dam/bridge infrastructure and water surface area exceeds 100sqm in size, where such development occurs-(a) within a water course or (c) ...within 32m of a water course.

Activity 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock, of more than 10 cubic metres from-(i) a watercourse.

Activity 27: The clearance of an area of 1ha or more, but less than 20ha, of indigenous vegetation.

Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.

Government Notice: No: 324 of 7 April 2017 Gazette Number: 40772:

Activity 2: The development of reservoirs, excluding dams, with a capacity of 250 cubic metres or more in (f) Mpumalanga (ii) outside urban areas in (ff) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

Activity 4: The development of a road wider than 4 metres with a reserve less than 13.5 metres in (f) Mpumalanga (i) outside urban areas in (gg) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

Activity 12: The clearance of an area of 300 sqm or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.

Activity 14: The development of-(i) dams ..and infrastructure exceeding 10 sqm in size or

(ii) infrastructure or structures with a physical footprint of 10 sqm or more

where such development occurs- (a) within a water course or (c) ...within 32m of a water course, in (f) Mpumalanga (i) outside urban areas in (hh) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

Activity 18: The widening of a road by more than 4 metres or the lengthening of a road by more than 1 kilometre in (f) Mpumalanga (i) outside urban areas in (gg) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

Project Specifics include:

- Establish 25 subdivisions (1ha-2.2ha each). Create a lease over the southern sections of each sub-division that will continue to be used for agriculture.
- The northern section of each sub-division will accommodate one private residence overlooking the Crocodile River.
- The development of services infrastructure (electricity, potable water and sewerage) to each sub-division.

The purpose of this assessment process is to investigate the impact of implementing such activities at Remainder Portions 8, 13 and 14 of Malelane Estate A 180 JU.

Applicant Representative: **Consultant and Contact Person:**

Mr. Andre de Zwardt
Cell: 082 820 4228

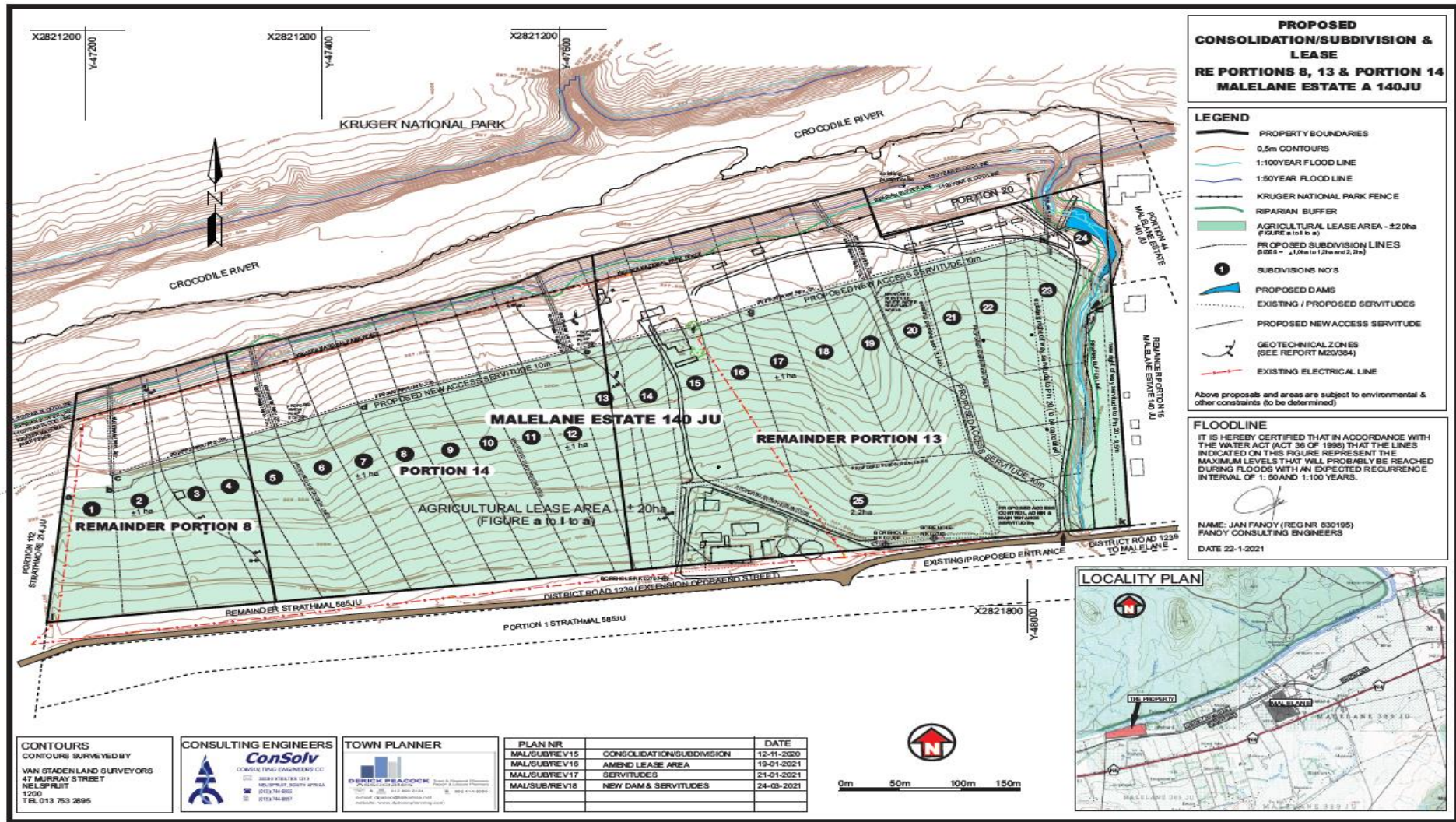
Rhengu Environmental Services

Contact Person: Ralf Kalwa
P. O. Box 1046
Malelane, 1320
Cell: 082414 7088
E Mail: rhengu@mweb.co.za

In order to ensure that you are identified/registered as an interested and/or affected party please submit your name, contact information (e-mail; telephone; fax number) and interest in the matter in writing to the contact person on or before **3 May 2021**.

Date of Notice: 8 April 2021.

GENERAL LAYOUT OF THE PROPOSED PROJECT SITE



COPIES OF E MAILS, NOTIFICATIONS AND RECEIPT OF DOCUMENTS

From: rhengu@mweb.co.za rhengu@mweb.co.za

Sent: Thursday, 01 April 2021 07:56

To: 'EdLiz Harris' <lizedharris@gmail.com>; 'Andre De Zwart' <andre@ingweconstruction.co.za>; 'Wendy Thornley' <wendy@thornleysav.co.za>; rhengu@mweb.co.za

Cc: 'Bob Thornley' <bob@thornleysav.co.za>; 'Dave Carr' <carrdave@mweb.co.za>; 'Jackey Deacon' <dot@mpu.co.za>; 'Francois Esselen' <fesselen@lantic.net>; 'Sue de Zwart' <sue@talkingturf.co.za>; 'willem joubert' <willemj@me.com>; 'Alicia Bennewith' <bennewitha@icloud.com>; 'Anne Hollmann' <Ginalex@edlex.co.za>; andrew@mpu.co.za; 'Kierryn Harris' <kierrynharris@gmail.com>; 'Ansel Harris' <anselkierryn@gmail.com>; 'Francois Mete' <fmete@wanadoo.fr>; 'Lex Hollmann' <Lex@edlex.co.za>; 'Andrew' <andrew@nethog.co.za>

Subject: EIA MALELANE ESTATES

Dear Interested and Affected Party and Government Official

1. Please find attached a notification for the Environmental Impact Assessment on the Farms: Remainder Portions 8,13 and 14 of Malelane Estate A180JU in your area. This notification will be advertised in the Lowvelder newspaper on **8 April 2021.**
2. Please take note that the date for the Public Meeting on-site will be announced once the registration period (after 3 May 2021) has lapsed.
3. Feel free to contact me to discuss any issues of concern and or to verify any information.

Kind regards,
Ralf Kalwa
Rhengu Environmental Services
Cell: 082 414 7088

From: rhengu@mweb.co.za <rhengu@mweb.co.za>

Sent: Friday, 02 April 2021 08:00

To: iwulaspecialist@gmail.com; 'Barend Marx' <barend@mbbnel.co.za>; 'Frans Krige' <franskrige@telkomsa.net>; 'Frans Krige' <Frans.Krige@mtpa.co.za>; FransMas@nda.agric.za; jan.mashele@nkomazi.gov.za; 'Sampie Shabangu' <shabangus@iucma.co.za>; 'ZinzileM' <ZinzileM@daff.gov.za>; 'Marisa Coetzee' <Marisa.Coetzee@sanparks.org>; 'Tracy Petersen' <tracy.petersen@sanparks.org>; 'Albert Smith' <albert.smith@sanparks.org>; 'Darryl Pepworth' <pepworth@mweb.co.za>; 'Nancy' <nancy@rmputter.co.za>; Nancy.putter@lantic.net

Cc: rhengu@mweb.co.za

Subject: EIA MALELANE ESTATES

Dear Interested and Affected Party and Government Official

1. Please find attached a notification for the Environmental Impact Assessment on the Farms: Remainder Portions 8,13 and 14 of Malelane Estate A180JU in your area. This notification will be advertised in the Lowvelder newspaper on **8 April 2021.**
2. Please take note that the date for the Public Meeting on-site will be announced once the registration period (after 3 May 2021) has lapsed.
3. Feel free to contact me to discuss any issues of concern and or to verify any information.

Kind regards,
 Ralf Kalwa
 Rhengu Environmental Services
 Cell: 082 414 7088

From: rhengu@mweb.co.za <rhengu@mweb.co.za>
Sent: Monday, 12 April 2021 12:47
To: 'Lex Hollmann' <Lex@edlex.co.za>
Cc: lizedharris@gmail.com; 'Anne Hollmann' <Ginalex@edlex.co.za>;
 rhengu@mweb.co.za
Subject: RE: EIA MALELANE ESTATES

Thanks Lex.
 As the Chairman of the HOA I will register you for both entities (Trust and HOA).
 I will also keep sending notifications to all neighbours.
 Regards.

Ralf
 RES

From: Lex Hollmann <Lex@edlex.co.za>
Sent: Monday, 12 April 2021 12:28
To: rhengu@mweb.co.za
Cc: lizedharris@gmail.com; Anne Hollmann <Ginalex@edlex.co.za>
Subject: RE: EIA MALELANE ESTATES

Hi Ralf
 Do I need to do anything else to register as an interested party?
 I would represent the "Lex Hollmann Trust" which is the owner of JB1, JB2 and JB12.
 Should we be registering as a Home-Owners association as well for Jakkalsbessie?

Lex Hollmann
 +27(83)254-0687 - Mobile
 +27(13)790-0235 - Office
 +27(13)790-1658 – FAX

From: rhengu@mweb.co.za <rhengu@mweb.co.za>
Sent: Wednesday, 12 May 2021 07:49
To: 'EdLiz Harris' <lizedharris@gmail.com>; 'Andre De Zwart' <andre@ingweconstruction.co.za>; 'Wendy Thornley' <wendy@thornleysav.co.za>; 'Derick Peacock' <derick@dptownplanning.com>; iwulaspecialist@gmail.com; 'Lex Hollmann' <Lex@edlex.co.za>; 'Barend Marx' <barend@mbbnel.co.za>; 'Darryl Pepworth' <pepworth@mweb.co.za>; 'Marisa Coetzee' <Marisa.Coetzee@sanparks.org>; bjadp@vodamail.co.za; 'Navashni Govender' <navashni.govender@sanparks.org>; nkhumalo@sahra.org.za; 'Khumbelo Malele' <khumbelomalele@gmail.com>; 'Khumbelo Malele' <Khumbelo.Malele@mtpa.co.za>; FransMas@nda.agric.za; jan.mashele@nkomazi.gov.za; 'Nancy' <nancy@rmputter.co.za>; 'Thabo Rasiuba' <rasiubat@iucma.co.za>; 'Albert Smith' <albert.smith@sanparks.org>; 'Sampie Shabangu' <shabangus@iucma.co.za>; 'ZinzileM' <ZinzileM@daff.gov.za>; rhengu@mweb.co.za
Cc: 'Bob Thornley' <bob@thornleysav.co.za>; 'Dave Carr' <carrdave@mweb.co.za>; 'Jackey Deacon' <dot@mpu.co.za>; 'Francois Esselen' <fesselen@lantic.net>; 'Sue de Zwart' <sue@talkingturf.co.za>; 'willem joubert' <willemj@me.com>; 'Alicia Bennewith' <bennewitha@icloud.com>; 'Anne Hollmann' <Ginalex@edlex.co.za>; andrew@mpu.co.za; 'Kierryn Harris' <kierrynharris@gmail.com>; 'Ansel Harris'

<anselkierryn@gmail.com>; 'Francois Mete' <fmete@wanadoo.fr>; 'Lex Hollmann' <Lex@edlex.co.za>; 'Andrew' <andrew@nethog.co.za>

Subject: EIA MALELANE ESTATES

Dear Interested and Affected Party and Government Official

1. Please find attached a notification for the Environmental Impact Assessment on the Farms: Remainder Portions 8,13, 14 and 20 of Malelane Estate A180JU in your area.
2. Please take note that the Public Meeting will be held on site on **24 May 2021 at 10h00**. Please RSVP on the **attached comment/registration form** to me by close of business on **21 May 2021** to confirm your attendance.
3. As per Covid 19 regulations and restrictions participants must register to ensure we maintain numbers within the framework of legislation.
4. Feel free to contact me to discuss any issues of concern and or to verify any information.

Kind regards,

Ralf Kalwa
Rhengu Environmental Services
Cell: 082 414 7088

From: Nancy <nancy@rmputter.co.za>
Sent: Wednesday, 12 May 2021 09:59
To: rhengu@mweb.co.za
Subject: RE: EIA MALELANE ESTATES

Ralf

See attached registration form for both Malelane and Crocodile River irrigation board.
Regards

Nancy O'Farrell
Irrigation Boards & Water Management
Tel : 013 79 00 591
Tel : +27 63 734 5226
28 Air Street, Malelane, 1320
P O Box 382 Malelane, 1320

APPENDIX 3:
DOCUMENTATION WITH DARDLEA

None at this stage of the process

APPENDIX 4:
SUPPORTIVE DOCUMENTATION

4.1. TITLE DEEDS

4.2. LAND CLAIM DOCUMENT

4.3. WATER RIGHTS

4.4. SPECIALIST STUDIES:

4.4.1. AGRICULTURAL POTENTIAL OF THE PROJECT SITE

**4.4.2. TERRESTRIAL ECOLOGY, BIODIVERSITY AND RIPARIAN
ECOLOGY**

4.4.3. FISHWAY/LADDER STUDY

4.4.4. HERITAGE SPECIALIST REPORT

4.4.5. VIEW SHED ANALYSIS

4.1. TITLE DEED



DEED OF TRANSFER

in favour of

BLUEGRASS TRADING 1028 CC


over

REMAINING EXTENT OF PORTION 8 OF THE FARM MALELANE ESTATE A 140
and REMAINING EXTENT OF PORTION 13 (A PORTION OF PORTION 8) OF THE
FARM MALELANE ESTATE A 140 and PORTION 14 (A PORTION OF PORTION 8)
OF THE FARM MALELANE ESTATE A 140



DEEDS
STAMP DUTY R
FOOT
FEES R 3397-00

Prepared by me


 CONVEYANCER
 CHRISTIAAN JOHANNES
 ENGELBRECHT
 LPCM10070

T 000010198 / 2020


DEED OF TRANSFER

BE IT HEREBY MADE KNOWN THAT

HORACE WILLIAM DONCASTER (39187) P

appeared before me, the Registrar of Deeds Mpumalanga at Nelspruit, the said appearer, being duly authorised thereto by a power of attorney granted to her by

The Trustees in the Estate of the late MARIA DE GOUVEIA TRUST
Registration Number MC16854/2010

signed at Pretoria on 28 February 2020 

SA

And the appearer declared that:

Whereas the Transferor had truly and legally sold the undermentioned properties on 5 December 2019 by Private Treaty

Now therefore the Appearer on behalf of the Transferor, did by these presents, cede and transfer to and on behalf of

BLUEGRASS TRADING 1028 CC
Registration Number 2007/014308/23

its successors in title or assigns, in full and free property

1. **REMAINING EXTENT OF PORTION 8 OF THE FARM MALELANE ESTATE A 140, REGISTRATION DIVISION J.U., PROVINCE OF MPUMALANGA**

MEASURING 6,6983 (SIX COMMA SIX NINE EIGHT THREE) HECTARES

FIRST REGISTERED BY CERTIFICATE OF REGISTERED TITLE T5948/1946 WITH DIAGRAM ANNEXED THERETO AND HELD BY DEED OF TRANSFER T

for the sum of R4 000 000,00 (Four Million Rand) and that Transfer Duty was paid on the amount of R4 230 000,00 (Four Million Two Hundred and Thirty Thousand Rand) consisting of the purchase price and commission in the amount of R230 000,00 (Two Hundred and Thirty Thousand Rand)

SUBJECT to the following conditions:

CERTAIN Remaining Extent of the aforesaid farm, measuring 177 morgen 527 square roods (of which a portion is hereby transferred) is subject to the following conditions:-

- (a) That the Republic shall at all times have the right in such manner and under such conditions as it may think fit, to construct and form dams and reservoirs upon the land, and to erect make and construct telegraph and telephone lines, roads railways, water-furrows, pipelines, canals and drains, upon and conduct the same through and over the land in the interest of the public or of the owner lessee or occupier of or holder of a Mining Title, or any land adjoining or in the neighbourhood of the land hereby transferred, and to take materials therefrom for the foregoing purposes on payment (save as may otherwise provided by law) to the owner such sums of money as compensation for damage or damages actually sustained as may be mutually agreed to between the Republic and the owner, or failing such agreement as may be determined by Arbitration Ordinance 1904 (Transvaal) provided that the Arbitrators may set off against the loss or damage caused to the owner, the benefit, instant or prospective, which he shall or may derive in consequence of the construction of any of the said works.

SO

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- (b) That the owner shall be entitled to take from any public stream on the land such water as he may reasonably require for domestic purposes, and for watering his own stock running on the land, but he shall not be entitled to take for any other purposes than those aforementioned any water in such stream without permission of the Minister of Mines or his authorised representative being first had obtained. The Republic hereby specially reserves the right and power in addition to those already reserved herein (under clause a) to enter upon the land at any time, and to authorise other to do so, for the purpose of making use of the water of the land by building of reservoirs, dams intakes, outlets, flumes and the like, or by pumping or otherwise removing the same from the said land subject to compensation as set forth in clause (a) hereof.
- (c) The said property is further subject and entitled to an Order of the Water Court with regard to the division of the water out of Malelane Creek, as will appear from the said Order, a Grosse whereof is annexed to the aforesaid Crown Grant No. 78/1920.

AND FURTHER SUBJECT to all such conditions as are mentioned or referred to in the aforesaid deed/s.

2. REMAINING EXTENT OF PORTION 13 (A PORTION OF PORTION 8) OF THE FARM MALELANE ESTATE A 140 REGISTRATION DIVISION J.U., PROVINCE OF MPUMALANGA

MEASURING 13,6164 (THIRTEEN COMMA SIX ONE SIX FOUR) HECTARES

FIRST TRANSFERRED BY DEED OF TRANSFER T5951/1946 WITH DIAGRAM ANNEXED THERETO AND HELD BY DEED OF TRANSFER T 10198/2020

for the sum of R6 100 000,00 (Six Million One Hundred Thousand Rand) and that Transfer Duty was paid on the amount of R6 450 750,00 (Six Million Four Hundred and Fifty Thousand Seven Hundred and Fifty Thousand Rand) consisting of the purchase price and commission in the amount of R350 750 000,00 (Three Hundred and Fifty Thousand Seven Hundred and Fifty Thousand Rand)

SUBJECT to the following conditions:

- A. CERTAIN Remaining Extent of the aforesaid farm, measuring 177 morgen 527 square rods (of which a portion is hereby transferred) is subject to the following conditions:-
- (a) That the Republic shall at all times have the right in such manner and under such conditions as it may think fit, to construct and form dams and reservoirs upon the land, and to erect make and construct telegraph and telephone lines, roads railways, water-furrows, pipelines, canals and drains, upon and conduct the same

Ja

 Page 3 of 6

through and over the land in the interest of the public or of the owner lessee or occupier of or holder of a Mining Title, or any land adjoining or in the neighbourhood of the land hereby transferred, and to take materials therefrom for the foregoing purposes on payment (save as may otherwise provided by law) to the owner such sums of money as compensation for damage or damages actually sustained as may be mutually agreed to between the Republic and the owner, or failing such agreement as may be determined by Arbitration Ordinance 1904 (Transvaal) provided that the Arbitrators may set off against the loss or damage caused to the owner, the benefit, instant or prospective, which he shall or may derive in consequence of the construction of any of the said works.

- (b) That the owner shall be entitled to take from any public stream on the land such water as he may reasonably require for domestic purposes, and for watering his own stock running on the land, but he shall not be entitled to take for any other purposes than those aforementioned any water in such stream without permission of the Minister of Mines or his authorised representative being first had obtained. The Republic hereby specially reserves the right and power in addition to those already reserved herein (under clause a) to enter upon the land at any time, and to authorise other to do so, for the purpose of making use of the water of the land by building of reservoirs, dams intakes, outlets, flumes and the like, or by pumping or otherwise removing the same from the said land subject to compensation as set forth in clause (a) hereof.
- (c) The said property is further subject and entitled to an Order of the Water Court with regard to the division of the water out of Malelane Creek, as will appear from the said Order, a Grosse whereof is annexed to the aforesaid Crown Grant No. 78/1920.

B. The following conditions imposed and enforceable by ALLEN FRANCIS DOWDLE shall be registered against the aforesaid property:-

- (a) Allen Francis Dowdle reserves the right to place telegraph poles, wires and cabled for transmission of electric current for power, lighting and other purposes across the property sold and to be entitled to free access thereon for purposes of repair and renewal.
- (b) The said Allen Francis Dowdle reserves the right to cut and make canals for water transmissions, and to lay pipes and conduits for the same purpose across the property sold, and to enter on the property for purposes of repair and renewal thereof, and to make dams on the property sold for water distribution purposes.

JA

 Page 4 of 6

- (c) The said Allen Francis Dowdle reserves the right to make roads giving rights of way over the property sold for purposes of public convenience.
 - (d) That all cowbryes, pigsties or any structure or kraals shall only be constructed on the property sold in such a position as shall not affect the health and comfort of adjoining farm owner or owners.
- C. ALL rights to trade over the property hereby transferred are reserved to ALLEN FRANCIS DOWDLE or his successors in title or Assigns.

AND FURTHER SUBJECT to all such conditions as are mentioned or referred to in the aforesaid deed/s.

**3. PORTION 14 (A PORTION OF PORTION 8) OF THE FARM MALELANE ESTATE A 140
REGISTRATION DIVISION J.U.
PROVINCE OF MPUMALANGA**

MEASURING 8,1163 (EIGHT COMMA ONE ONE SIX THREE) HECTARES

FIRST TRANSFERRED BY DEED OF TRANSFER T5953/1946 WITH DIAGRAM ANNEXED THERETO AND HELD BY DEED OF TRANSFER T

for the sum of R5 000 000,00 (Five Million Rand) and that Transfer Duty was paid on the amount of R5 287 500,00 (Five Million Two Hundred and Eighty Seven Thousand Five Hundred Rand) consisting of the purchase price and commission in the amount of R287 500,00 (Two Hundred and Eighty Seven Thousand Five Hundred Rand)

SUBJECT to the following conditions:

- A. CERTAIN Remaining Extent of the aforesaid farm, measuring 177 morgen 527 square roods (of which a portion is hereby transferred) is subject to the conditions lettered A(a) to (c) more fully set out under paragraph 2 hereof, and to the conditions lettered B(a) and (d) and C more fully set out under paragraph two hereof.

AND FURTHER SUBJECT to all such conditions as are mentioned or referred to in the aforesaid deed/s.

WHEREFORE the appearer, renouncing all the right and title the said

The Trustees in the Estate of the Late MARIA DE GOUVEIA TRUST

heretofore had to the premises, did, in consequence also acknowledge them to be entirely dispossessed of, and disentitled to, the same; and that, by virtue of these presents, the said

BLUEGRASS TRADING 1028 CC

 Page 5 of 6

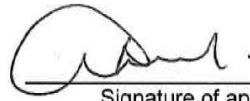
S

its successors in title or assigns, now is and henceforth shall be entitled thereto, conformably to local customs; the State, however, reserving its rights, and finally acknowledging that the purchase price is the amount of R15 000 000,00 (Fifteen Million Rand).


IN WITNESS WHEREOF I, the said Registrar, together with the appearer, have subscribed to these presents, and have caused the seal of office to be affixed thereto.

THUS DONE AND EXECUTED at the Office of the Registrar of Deeds Mpumalanga at Nelspruit on

18 NOV 2020


Signature of appearer *q.q.*

In my presence


Registrar of Deeds Mpumalanga

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CONVEYANCER'S CERTIFICATE

I, the undersigned,

CHRISTIAAN JOHANNES ENGELBRECHT

Conveyancer and Notary, practicing as such in NELSPRUIT, Province of MPUMLALANGA,
under the name and style of Esselens Engelbrechts Inc,

Hereby certify that

1. I have inspected the Deed of Transfer **T10190/2020**.
2. According to the information before me, the said deed is registered in favour of:

BLUEGRASS TRADING 1028 CC

Registration number 2007/014308/23

And held the following properties:

A. Remaining Extent of Portion 8 of the farm MALELANE ESTATE A. No 140

Registration Division J.U., (formerly NO 276) Province Mpumalanga

In extent 6,6983 (Six Comma Six Nine Eight Three) Hectares

B. Remaining Extent of Portion 13 (a Portion of portion 8)

of the farm MALELANE ESTATE A no 140

Registration Division J.U (formerly No 276), Province Mpumalanga,

In extent as such 13,6164 (Thirteen Comma Six One Six Four) Hectares

C. Portion 14 (a portion of portion 8)

of the farm MALELANE ESTATE A no 140

Registration Division J.U (formerly No 276) Province Mpumalanga,

In extent 8,1163 (Eight Comma One One Six Three) Hectares.



3. The said deed is made subject to the following conditions:

**A. Remaining Extent of Portion 8 of the farm
MALELANE ESTATE A. No 140**

CERTAIN Remaining Extent of the aforesaid farm, measuring 177 morgen 527 square roods (of which a portion is hereby transferred) is subject to the following conditions:-

(a) *That the Republic shall at all times have the right in such manner and under such conditions as it may think fit, to construct and form dams and reservoirs upon the land, and to erect make and construct telegraph and telephone lines, roads railways, water-furrows, pipelines, canals and drains, upon and conduct the same through and over the land in the interest of the public or of the owner lessee or occupier of or holder of a Mining Title, or any land adjoining or in the neighbourhood of the land hereby transferred, and to take materials therefrom for the foregoing purposes on payment (save as may otherwise provided by law) to the owner such sums of money as compensation for damage or damages actually sustained as may be mutually agreed to between the Republic and the owner, or failing such agreement as may be determined by Arbitration Ordinance 1904 (Transvaal) provided that the Arbitrators may set off against the loss or damage caused to the owner, the benefit, instant or prospective, which he shall or may derive in consequence of the construction of any of the said works.*

(b) *That the owner shall be entitled to take from any public stream on the land such water as he may reasonably require for domestic purposes, and for watering his own stock running on the land, but he shall not be entitled to take for any other purposes than those aforementioned any water in such stream without permission of the Minister of Mines or his authorised representative being first had obtained. The Republic hereby specially reserves the right and power in addition to those already reserved herein (under clause a) to enter upon the land at any time, and to authorise other to do so, for the purpose of making use of the water of the land by building of reservoirs, dams intakes, outlets, flumes and the like, or by pumping or otherwise removing the same from the said land subject to compensation as set forth in clause (a) hereof.*

(c) The said property is further subject and entitled to an Order of the Water Court with regard to the division of the water out of Malelane Creek, as will appear from the said Order, a Grosse whereof is annexed to the aforesaid Crown Grant No. 78/1920.

**B. Remaining Extent of Portion 13 (a Portion of portion 8) of the farm
MALELANE ESTATE**

A. CERTAIN Remaining Extent of the aforesaid farm, measuring 177 morgen 527 square roods (of which a portion is hereby transferred) is subject to the following conditions:-

(a) That the Republic shall at all times have the right in such manner and under such conditions as it may think fit, to construct and form dams and reservoirs upon the land, and to erect make and construct telegraph and telephone lines, roads railways, water-furrows, pipelines, canals and drains, upon and conduct the same through and over the land in the interest of the public or of the owner lessee or occupier of or holder of a Mining Title, or any land adjoining or in the neighbourhood of the land hereby transferred, and to take materials therefrom for the foregoing purposes on payment (save as may otherwise provided by law) to the owner such sums of money as compensation for damage or damages actually sustained as may be mutually agreed to between the Republic and the owner, or failing such agreement as may be determined by Arbitration Ordinance 1904 (Transvaal) provided that the Arbitrators may set off against the loss or damage caused to the owner, the benefit, instant or prospective, which he shall or may derive in consequence of the construction of any of the said works.

(b) That the owner shall be entitled to take from any public stream on the land such water as he may reasonably require for domestic purposes, and for watering his own stock running on the land, but he shall not be entitled to take for any other purposes than those aforementioned any water in such stream without permission of the Minister of Mines or his authorised representative being first had obtained. The Republic hereby specially reserves the right and power in addition to those already reserved herein (under clause a) to enter upon the land at any time, and to authorise other to do so, for the purpose of making use of the water of the land by building of reservoirs, dams intakes, outlets, flumes and the like, or by pumping or otherwise removing the same from the said land subject to compensation as set forth in clause (a) hereof.



(c) *The said property is further subject and entitled to an Order of the Water Court with regard to the division of the water out of Malelane Creek, as will appear from the said Order, a Grosse whereof is annexed to the aforesaid Crown Grant No. 78/1920.*

B. *The following conditions imposed and enforceable by ALLEN FRANCIS DOWDLE shall be registered against the aforesaid property:-*

- a. *Allen Francis Dowdle reserves the right to place telegraph poles, wires and cabled for transmission of electric current for power, lighting and other purposes across the property sold and to be entitled to free access thereon for purposes of repair and renewal.*
- b. *The said Allen Francis Dowdle reserves the right to cut and make canals for water transmissions, and to lay pipes and conduits for the same purpose across the property sold, and to enter on the property for purposes of repair and renewal thereof, and to make dams on the property sold for water distribution purposes.*
- c. *The said Allen Francis Dowdle reserves the right to make roads giving rights of way over the property sold for purposes of public convenience.*
- d. *That all cowbryes, pigsties or any structure or kraals shall only be constructed on the property sold in such a position as shall not affect the health and comfort of adjoining farm owner or owners.*

C. *ALL rights to trade over the property hereby transferred are reserved to ALLEN FRANCIS DOWDLE or his successors in title or Assigns.*

C. Portion 14 of the farm MALELANE ESTATE A. No 140

A. *CERTAIN Remaining Extent of the aforesaid farm, measuring 177 morgen 527 square roods (of which a portion is hereby transferred) is subject to the following conditions: -*

- a) *That all rights to minerals, mineral products, mineral oils, metal and precious stones on or under land are reserved to the State.*
- b) *That the Republic shall at all times have the right of resuming the whole or any portion of the land if required for public or mining purposes, on payment to the owner of such sums of money as compensation as may be mutually agreed upon*

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by the Republic and the owner, or failing such agreement, as may be determined by arbitration in manner provided by the Arbitration Ordinance, 1904 (Transvaal).

B. The following conditions imposed and enforceable by ALLEN FRANCIS DOWDLE shall be registered against the aforesaid property:-

a) Allen Francis Dowdle reserves the right to place telegraph poles, wires and cables for transmission of electric current for power, lighting and other purposes across the property sold and to be entitled to free access thereon for purposes of repair and renewal.

d) That all cowbryes, pigstics or any structure or kraals shall only be constructed on the property sold in such a position as shall not effect the health and comfort of adjoining farm owner or owners

C. ALL rights to trade over the property hereby transferred are reserved to ALLEN FRANCIS DOWDLE or his successors in title or assigns:

4. ENDORSEMENTS

There are no endorsement(s) for noting against the said deed.

5. NOT IN TITLE DEED

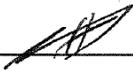
Portion 20 of the Farm Malelane Estate 140A JU Registration Division JU; Province Mpumalanga In extent 1.0100 hectares, and held by Deed Of Transfer T22664/1985 is entitled to

- a right of way servitude, as depicted on surveyor diagram S.G. A 2147/1953, and marked a b c d e f mainly over Portion 14 of the farm Malelane Estate 140A, (previously remainder of portion 15), Registration Division JU, Province Mpumalanga.
- A pipeline servitude depicted on surveyor diagram S.G. A 2147/1953 and marked EF mainly over Portion 14 of the farm Malelane Estate 140A (previously remainder of portion 15), Registration Division JU, Province Mpumalanga.

6. COMMENTS

In the light of the above information, I hereby certify that there are no restrictive conditions of title to be complied or dealt with before the proposed subdivision can be commenced with.

SIGNED at MALELANE on 09 December 2020



CHRISTIAAN JOHANNES ENGELBRECHT

Esселens Engelbrechts Ing/Inc

Web: www.mindmatters.co.za

chris@mindmatters.co.za

4.2. LAND CLAIM DOCUMENTS



OFFICE OF THE REGIONAL LAND CLAIMS COMMISSION: MPUMALANGA PROVINCE
30 SAMORA MACHELL DRIVE, RESTITUTION HOUSE, NELSPRUIT
PRIVATE BAG X 11330 NELSPRUIT, 1200
TEL : 013 756 6000 FAX : 013 752 3859

ENQUIRY: Dudu Makhubela
CONTACT: 013 752 4054
YOUR REF:

MALELANE ESTATE 140 JU-SEYMORE DU TOIT -SMUTS AND PARTNERS
E-mail: mvdwesthuizen@dtsmp.co.za
ATT: Mari van der Westhuizen

RE: YOUR ENQUIRY: LAND RESTITUTION CLAIMS AGAINST THE FOLLOWING PROPERTY IN
TERMS OF THE RESTITUTION OF LAND RIGHTS ACT NO.22 OF 1994

DETAILS OF PROPERTY DESCRIPTION


Property Description	Comments
Province of Mpumalanga Magisterial District: Nkomazi <ul style="list-style-type: none"> • Property: Portion 8,13,& 14 of the farm Malelane Estates 140 JU 	According to our Database, there is currently no registered Land Claim which was lodged against the mentioned property.

1. We refer to your letter received on the 01/09/2017 regarding an enquiry to a Restitution claim against the above property.
2. We advise that there is no claim lodged against the property.
3. **TAKE NOTICE that** land claims are lodged with the office of the Commission in accordance with the historical and or present property descriptions of the dispossessed properties and therefore may not match the current property description as described in your correspondence in respect of the above-mentioned properties.

However, if the historical description of any of the above property has changed since 1913, or you are aware of any other local or official name by which it was then described or currently known, kindly supply us with such information to enable us to search further.

4. **TAKE NOTICE FURTHER THAT** while the Regional Land Claims Commission: Mpumalanga has taken reasonable care to ensure the accuracy of the above-mentioned information, the Commission cannot be held accountable if, through the process of further on- going investigation, additional information may be found that contradicts paragraph 2 above.

Yours Faithfully

PP 
.....

MR. E.S. NKOSI
CHIEF DIRECTOR
OFFICE OF REGIONAL LAND CLAIMS COMMISSION
DATE: 01/09/2017.

4.3. WATER RIGHTS

12.2 WATER RIGHTS



INKOMATI-USUTHU

WATER MANAGEMENT BOARD

Suite 301, 8th Floor
 The Inkosi Building
 23 Street Street
 Mbombela

Private Bag X32218
 Mbombela
 5300

Tel 013 753 5000
 Fax 013 753 2786

Equities Verification Office
 Reference: 140712-8
 E-mail: verification@ncma.co.za

Agronet CC

FORMER INKOMATI WATER MANAGEMENT AREA, WITHIN THE INKOMATI-USUTHU WATER MANAGEMENT AREA

CROCODILE RIVER MAJOR IRRIGATION BOARD - ONDER

MALELANE ESTATE A 140, JU, PORTION 8, SIZE 0,0000 ha: DECLARATION OF WATER USE AS AN EXISTING LAWFUL WATER USE IN TERMS OF SECTION 33(2) OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Under Section 33(2) of the National Water Act, 1998 (Act 36 of 1998) [“the Act”], the following volume(s) are declared as existing lawful water use(s) on the above mentioned property:


Type of water use	Volume (m ³ /annum)
Taking of water for irrigation purposes	76,700,0000
Taking of water for non-irrigation purposes	
Storing of water	

This use may be continued with under Section 34(1) subject to any existing conditions or obligations attached to the use until a licence replaces it.


In terms of Section 148(1)(e) of the Act you may appeal against this declaration to the Water Tribunal within 30 (thirty) days from the date of this letter. The Water Tribunal can be contacted as follows:

The Registrar of the Water Tribunal, Mr Robert Mabe
 Water Tribunal
 Private Bag X316
 Pretoria
 01
 Tel: 012 336 7034
 Email: maber@dws.gov.za

Nyakane-Maluka (Chairperson) | Mr MS Mthembu (Deputy Chairperson) | Dr JB Motlantwa | Dr PE Motokwane | Ms SD Wiggins
 Mr PA Shabangu | Mr FJ Venter | Mr JM Mathebula | Dr TK Gyedu-Ababio [Ex-Officio]



Suite 801, 8 th Floor The MAXSA Building 11 Streak Street Mbombela	Private Bag X11214 Mbombela 1200	Tel 013 753 9000 Fax 013 753 2786
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INKOMATI-USUTHU
KROONBURG WATER MANAGEMENT AREA
 Enquiries: Verification Office
 Reference: 140JU/14
 E-mail: verification@ucma.co.za

Agronet CC

FORMER INKOMATI WATER MANAGEMENT AREA, WITHIN THE INKOMATI-USUTHU WATER MANAGEMENT AREA

CROCODILE RIVER MAJOR IRRIGATION BOARD - ORDER

MALELANE ESTATE A 140, JU, PORTION 14, SIZE 0.0000 ha: DECLARATION OF WATER USE AS AN EXISTING LAWFUL WATER USE IN TERMS OF SECTION 33(2) OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Under Section 33(2) of the National Water Act, 1998 (Act 36 of 1998) [“the Act”], the following volume(s) are declared as existing lawful water use(s) on the above mentioned property:

Type of water use	Volume (m ³ /annum)
Taking of water for irrigation purposes	70 ha 91,000.0000
Taking of water for non-irrigation purposes	
Storing of water	

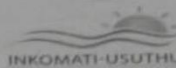
This use may be continued with under Section 34(1) subject to any existing conditions obligations attached to the use until a licence replaces it.

In terms of Section 148(1)(e) of the Act you may appeal against this declaration to the Water Tribunal within 30 (thirty) days from the date of this letter. The Water Tribunal can be contacted as follows:

The Registrar of the Water Tribunal, Mr Robert Mabe
 Water Tribunal
 Private Bag X316
 Pretoria
 001

Phone: 012 336 7034
 Mail: maber@dws.gov.za

Mr P Nyakane-Maluka (Chairperson) | Mr MS Mthembu (Deputy Chairperson) | Dr JB Mchwantwa | Dr PE Molokwane | Ms SD Wiggins
 Mr PA Shabangu | Mr PJ Venter | Mr JM Mathabula | Dr TK Gyedu-Ababio (Ex-Officio)



INKOMATI-USUTHU

WATER MANAGEMENT AREA

Suite 801, 8th Floor | Private Bag X11214 | Tel 013 752 9000
 The MAKSA Building | Mbombela | Fax 013 752 2786
 13 Struik Street | 1300

Empowerment Verification Office
 Reference: 14011-13
 E-mail: empowerment@dws.gov.za

Agronet CC

FORMER INKOMATI WATER MANAGEMENT AREA, WITHIN THE INKOMATI-USUTHU WATER MANAGEMENT AREA

CROCODILE RIVER MAJOR IRRIGATION BOARD - ONDER

MALELANE ESTATE A 140, JU, PORTION 13, SIZE 0.0000 ha: DECLARATION OF WATER USE AS AN EXISTING LAWFUL WATER USE IN TERMS OF SECTION 33(2) OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Under Section 33(2) of the National Water Act, 1998 (Act 36 of 1998) [‘the Act’], the following volume(s) are declared as existing lawful water use(s) on the above mentioned property:

Type of water use	Volume (m ³ /annum)
Taking of water for irrigation purposes	123.500.0000
Taking of water for non-irrigation purposes	
Storing of water	

This use may be continued with under Section 34(1) subject to any existing conditions or obligations attached to the use until a licence replaces it.

In terms of Section 148(1)(e) of the Act you may appeal against this declaration to the Water Tribunal within 30 (thirty) days from the date of this letter. The Water Tribunal can be contacted as follows:

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 Mr PA Shabangu | Mr PJ Venter | Mr JM Mathibane | Dr TK Gyedu-Abalo (Ex-Officio)

12.3 POLICY CONSIDERATIONS

Although not yet enacted, the objectives of the *Preservation and Development of Agricultural Land Framework Bill, 2016* are to –

1. Regulate the subdivision, rezoning and protection of agricultural land;
 - preserve and develop agricultural land by –
 - Encouraging farming on agricultural land in collaboration with other role players; and provincial and local government to enable and promote the use of agricultural land for farming purposes and compatible uses in their policies, legislation, Integrated Development Plans, Spatial Development Frameworks and other relevant administrative frameworks and procedures;
 - discouraging or prohibiting – land uses unrelated to agriculture from taking place on agricultural land, including urban and other non-agricultural developments that are

APPENDIX 4.4
SPECIALIST STUDIES

APPENDIX 4.4.1.
AGRICULTURAL POTENTIAL OF THE PROJECT SITE

Agricultural potential study of Ptn 13 of
Malelane 140JU and part of Farm 585

DRAFT 1

INDEX (Pty) LTD
Compiled by Dr A Gouws

TEL (012) 346 5307, FAX: (012) 460 4045, INDEX@IAFRICA.COM

November 9, 2017

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AGRICULTURAL STUDY

DECLARATION

The observations, conclusions and recommendations made in this report are based on the best available data and on best scientific and professional knowledge of the directors of INDEX (Pty) Ltd. The report is based on GIS programming and utilises satellite tracking to map survey points. Survey points are normally accurate to within 2 to 5 metres; which must be considered in the use of the information.

The directors of INDEX (Pty) Ltd exercises due care and diligence in rendering services and preparing documents. However, the company accepts no liability, and the client, by receiving this document, indemnifies INDEX (Pty) Ltd and its directors and employees, by the use of the information contained in this document, against any action, claim, demand, loss, liability, cost, damage and expense arising from or in connection with services rendered.

The property and copyright of this report shall remain vested in INDEX (Pty) Ltd. The client that commissioned the report may use the information as it may think fit; but only for the land for which it was commissioned.

General declaration:

- INDEX acted as the independent specialist in this application;
- 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;
- There were no circumstances that may compromise INDEX's objectivity in performing such work;
- INDEX have expertise in conducting the specialist report relevant to this application and its regulations and any guidelines that have relevance to the proposed activity;
- Have no, and will not engage in conflicting interests in the undertaking of the activity.

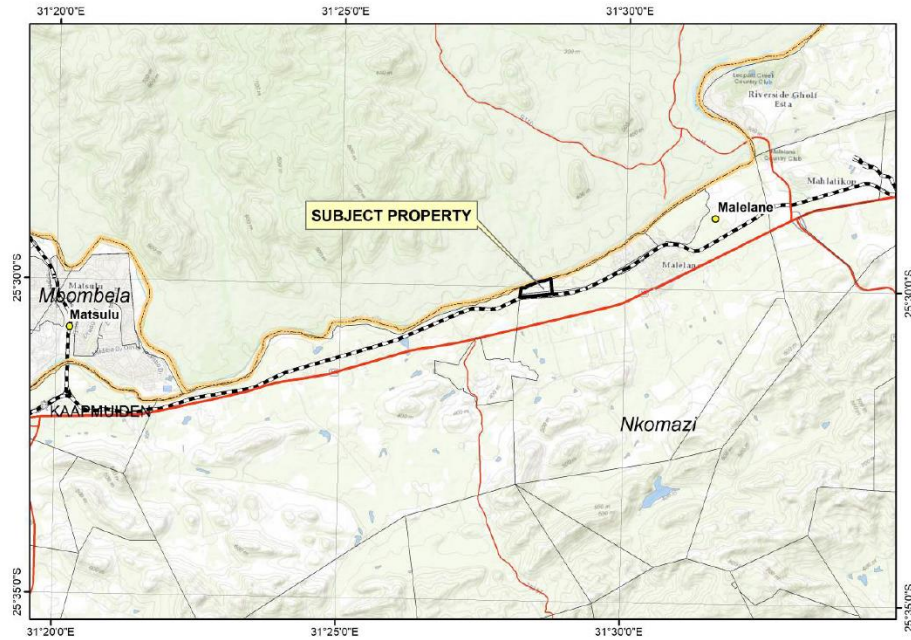


S. Spawt list
for INDEX(PTY) LTD
November 2017

1 BACKGROUND

Index was appointed by Deric Peacock Associates, Town and Regional Planners to do an agricultural potential study for Portion 13 of Malelane 140JU and part of Farm 585. The properties are located west of Malelane town and on the banks of the Crocodile River in Mpumalanga. North of the property is the Kruger National Park. Refer to the figure below:

Figure 1. Locality map



2 THE PROPERTIES

The properties that is the subject of this report is 33 hectares in size and comprise the following:

- 1) Portion 13 of Farm Malelane 140;
- 2) A part of Farm 585.

Figure 2. Subdivisions of the subject properties



3 PROPOSED DEVELOPMENT

The concept development plan for the property is a lifestyle village comprising of housing units and a medical services for the occupiers.



4 PRESENT LAND USE

The properties is used for seed production of crops and for instant lawn.

Figure 3. Present land use



Table 1. Land uses on the property

LAND USE	AREA (ha)
Cultivated	18.5
Housing	2.2
Industry (Packing shed)	0.3
Instant Lawn	5.9
Vacant	6.2
Total	33.1



Photo 1. Aerial view of the western section



Photo 2. Aerial view of the eastern section

5 NATURAL RESOURCES

5.1 CLIMATE

5.1.1 Rainfall

The average annual rainfall is 624mm to 716mm, depending on the source of information.

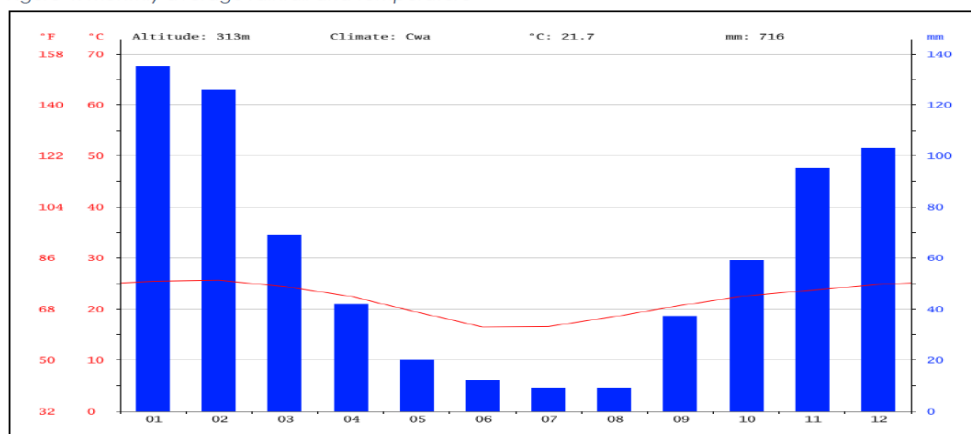
Table 2. Rainfall for rainfall stations in the region

Station Name	Station name	Distance from site (km)	Mean annual rainfall (mm/y)	Altitude (m)
Malelane	0556898_W	2.5	645	323
Malelane	0557029_W	4	671	320
Mhlati	0557058_S	8	592	309
Kaalrug	0520037_S	14.5	881	366
Riverside	0557115_W	15.5	573	289

The rainfall is in a typical summer rainfall pattern that commences in October/November and lasts till end March. Though the monthly average is fairly high in spring and autumn, these are also the periods of exceptionally high variation in quantity and intensity.

Hail is rare and normally occurs in spring and summer.

Figure 4. Monthly average rainfall and temperature



5.1.2 Temperature

The area is free of frost.

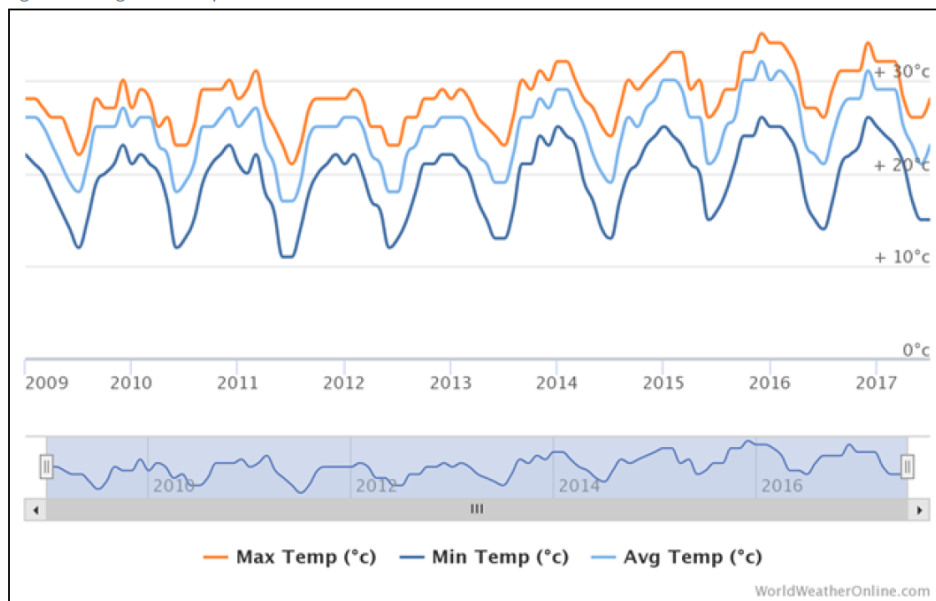
- Average temp
 - The monthly maximum temperature reaches a peak of 33°C in January and then steadily falls to 12,°C in July.
 - The summers are hot and maximum temperatures above 35°C are common.
- Minimum temperature
 - The average monthly minimum temperature is 8°C in June and July, while the absolute minimum can reach 2°C.

- The area is frost free.

Table 3. Average monthly temperatures

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	25.4	25.6	24.4	22.5	19.4	16.5	16.6	18.5	20.7	22.6	23.7	24.8
Min. Temperature (°C)	20	20.2	18.8	16.3	11.9	8.4	8.3	10.5	13.8	16.4	18	19.3
Max. Temperature (°C)	30.8	31	30.1	28.8	27	24.6	25	26.5	27.7	28.8	29.5	30.3
Avg. Temperature (°F)	77.7	78.1	75.9	72.5	66.9	61.7	61.9	65.3	69.3	72.7	74.7	76.6
Min. Temperature (°F)	68.0	68.4	65.8	61.3	53.4	47.1	46.9	50.9	56.8	61.5	64.4	66.7
Max. Temperature (°F)	87.4	87.8	86.2	83.8	80.6	78.3	77.0	79.7	81.9	83.8	85.1	86.5
Precipitation / Rainfall (mm)	135	128	69	42	20	12	9	9	37	59	95	103

Figure 5. Long term temperature statistics



5.1.3 Wind

- Wind with moderately high speeds occurs from late winter to early summer.
- The main wind direction is south and south-south-east

Figure 6. Average wind statistics for Malelane

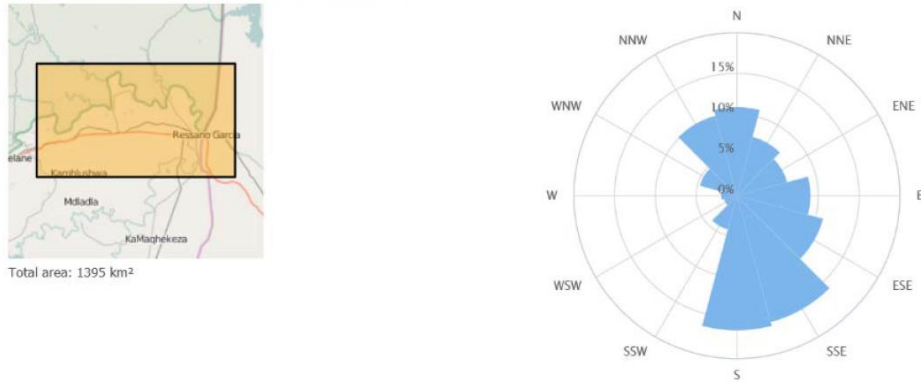
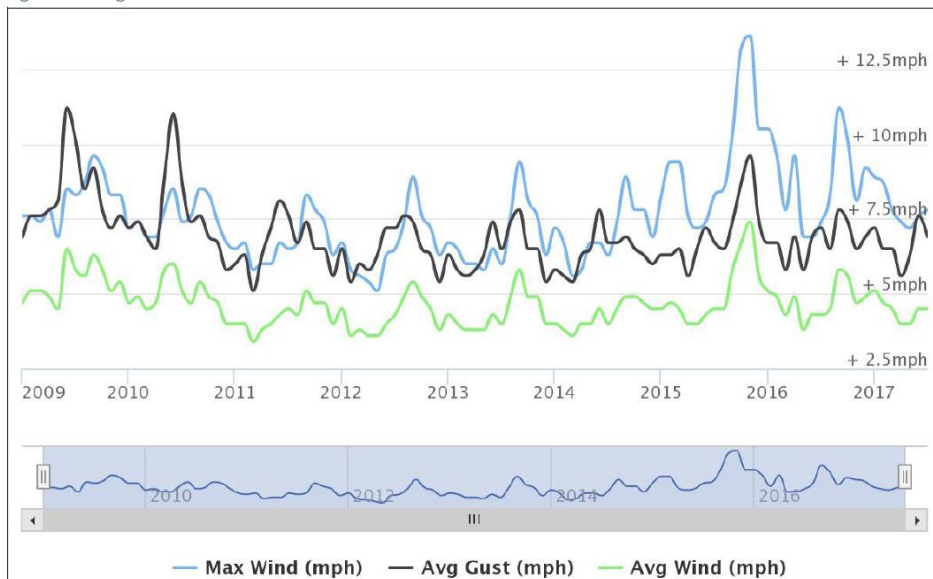


Figure 7. Long term wind statistics

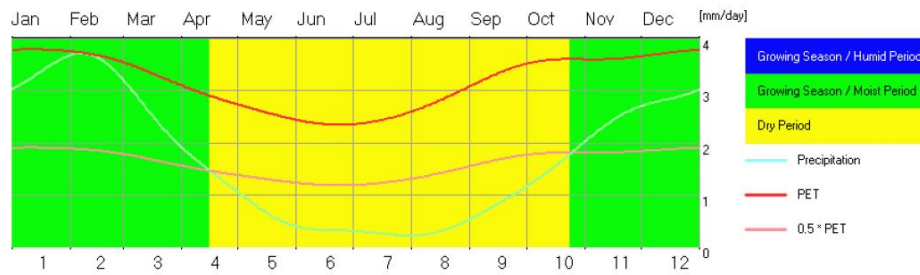


5.1.4 Growing season

When the rainfall is plotted against the temperature at a ratio of 1:2 the resulting graph indicates the growing season. See the climatogram below.

The growing season commences in late October when precipitation exceeds 50% of transpiration. This lasts until the middle of April. The dry season with a rain deficit lasts for almost 7 months of the year. The winter period is dry with little or no vegetative growth. This confirms that, for animal grazing on the property, it will be necessary to produce feed for the winter months.

Figure 8. Climatogram



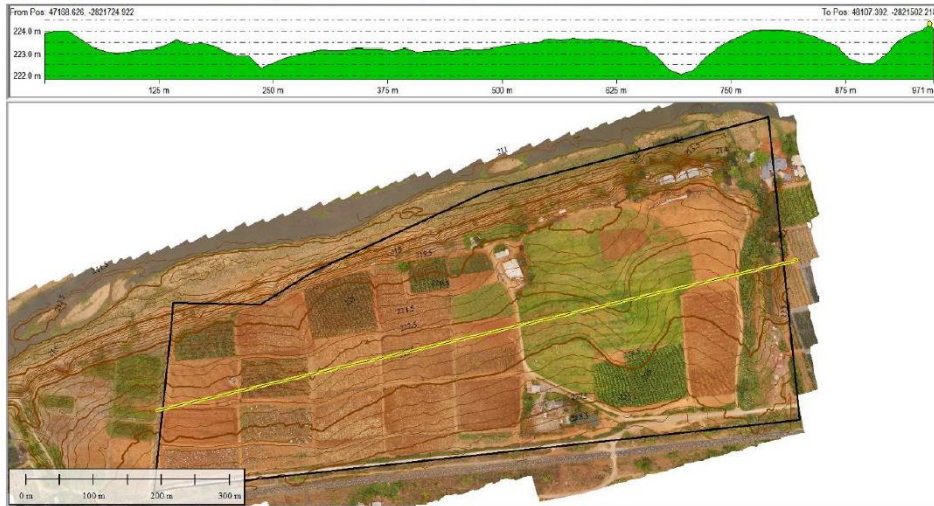
5.2 TOPOGRAPHY AND GEOMORPHOLOGY

The property is characterised by even sloped convex ridges and concave valleys that slopes in a northerly direction towards the Crocodile River.

Figure 9. Profile of the landscape from South west to north east on Farm 1337



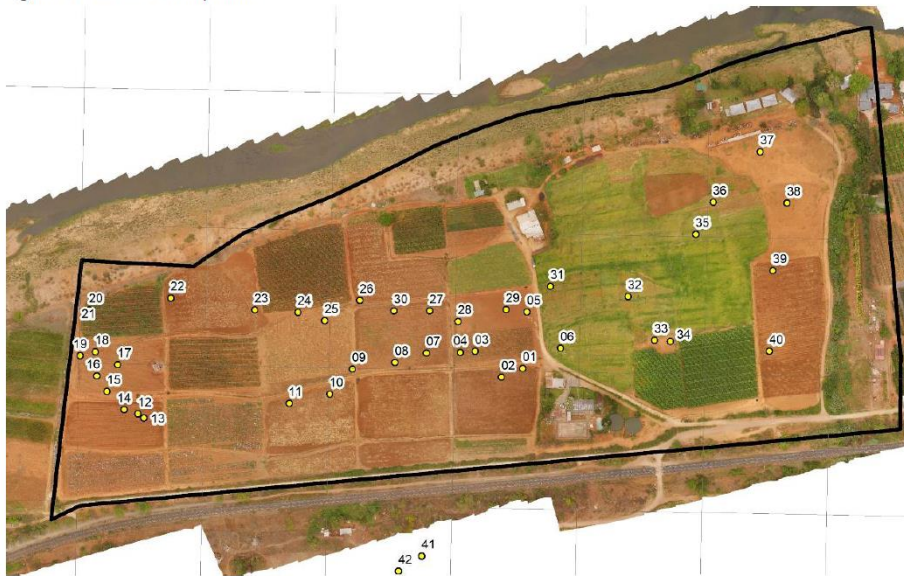
Figure 10. Profile of the landscape from the Vineyard to the south eastern border



5.3 OBSERVATION POINTS

Forty two observations were made and photographed. The figure below indicates the positions.

Figure 11. Observation points



5.4 SOIL

The property is located on alluvium close to the river and residual towards the south. The topography consists of mid-slopes that slopes towards the north. The higher lying morphological units consist of red well-drained Hutton soils with loose stone in places. Forty survey points were investigated by soil augur or probe or by visual inspections.

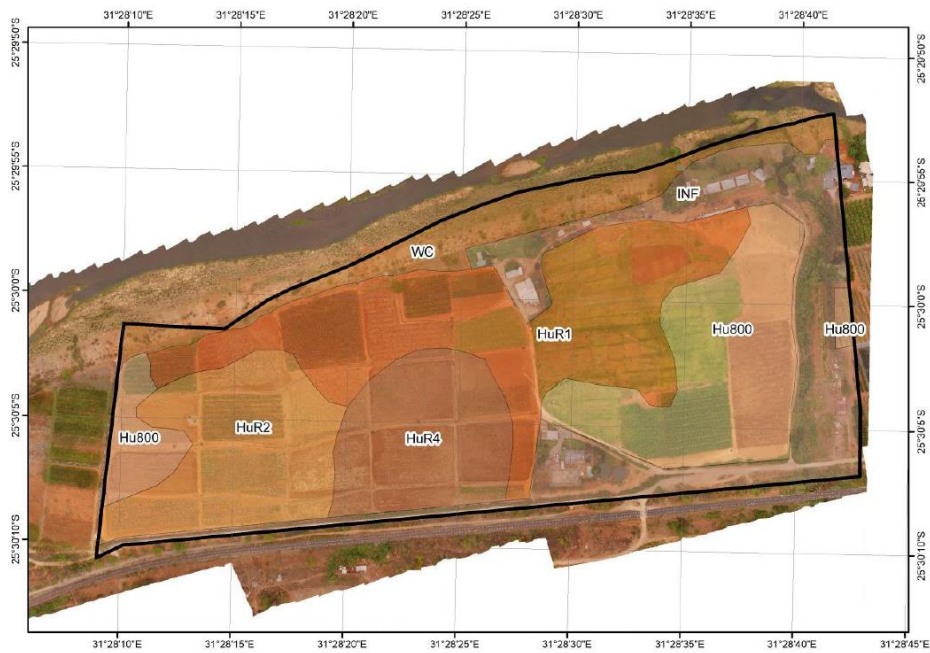
The notations on the soil map indicates the amount of rock in the profile; R0 is free of rock while more than 70% of the matrix is rock in the case of R4. Refer to the description of the map units later in the report.

The observation points indicating the amount of stones in the profile, are as follows:

Figure 12. Soil observations








Figure 13. Soil map



The main soil types are as follows:

Table 4. Soil description

Map unit	Description	Photo	Area (ha)
Hu800	The unit consists of reddish brown topsoil that overlies red apedal subsoil. The soil is between 800 to 1000 mm deep with a coarse-grained sandy clay loam texture (18 - 30% clay). It soil is free of mottles with few stones. Dominant soil families: Hutton and Shortlands.		6.47
R1	The unit consists of reddish brown topsoil that overlies red apedal subsoil. The soil is between 800 to 1000 mm deep with coarse-grained sandy clay loam texture (18 - 30% clay). It soil is free of mottles. Approximately 10-20% of the matrix consists of loose stones and rock. Dominant soil families: Hutton and Shortlands.		8.40

Map unit	Description	Photo	Area (ha)
R2	The unit consists of reddish brown topsoil that overlies red apedal subsoil. The soil is between 800 to 1000 mm deep with coarse-grained sandy clay loam texture (18 - 30% clay). It soil is free of mottles. Approximately 20 - 40% of the matrix consists of loose stones and rock. Dominant soil families: Hutton and Shortlands.		4.52
R4	The unit consists of reddish brown topsoil that overlies red apedal subsoil. The soil is 800 to 1000 mm deep with coarse-grained sandy clay loam texture (18 - 30% clay). It soil is free of mottles. More than 50% of the matrix consists of loose stones and rock. Dominant soil families: Hutton and Shortlands		3.76
WC	Watercourse		2.91
Inf	Buildings, sheds, gardens, etc.		7.10
TOTAL			33.16

5.5 WATER

Groundwater

- There is a borehole on the property that supplies domestic and irrigation water.

Surface water

- Total river frontage to the Crocodile River is 812 metres and is an additional source of the irrigation water.

Irrigation rights

- Water rights available 295 500m³/annum (see addenda for details).

5.6 VEGETATION

There is no natural vegetation or grazing on the property.

6 FARMING POTENTIAL

6.1 LAND USE CAPABILITY

There are various legislation that applies in determining farming potential, notably Act 43 of 1983 and the recent Draft Framework Bill of 2016. According to these, the following are highlighted:

Directorate Land use and Soil Management

Criteria for high potential agricultural land in South Africa was compiled by the ARC in August 2005 for the Directorate Land Use and Soil Management.

Agricultural land is considered as high potential if it can be cultivated in terms of Part 1 of the regulations of Conservation of Agricultural Resources Act 43 of 1983; if it meets the following criteria:

- If it is under permanent irrigation, or
- can be classified into one of the soil forms listed below, and
- the effective soil depth is equal to or greater than the minimum as stated below, and
- the average topsoil clay content falls within the limits as stated below.

Table 5. Soil classification of high potential agricultural land

Qualifying soil forms	Minimum effective soil depth	Topsoil clay content
Avalon, Clovelly, Griffin, Hutton, Inanda, Magwa, Oakleaf, Pinedene, Shortlands and Tukulu	600mm	All

Although large portions of land has an abundance of stones throughout the profile, it is under irrigation, and therefore, would qualify as high potential land.

Land use capability (Land Framework Bill)

Guidelines from the *Preservation and Development of Agricultural Land Framework Bill, 2016* is used in this study to determine the capability of soils and, hence, their agricultural potential.

1. Among a host of other objectives, the Bill aims at preserving high potential land and provide guidelines regarding and use and subdivision of agricultural land.
2. The classic eight-class land capability system was adopted to determine the agricultural potential or capability of land (Klingebiel & Montgomery, 1961). Land capability classes are interpretive groupings of land units with similar potential and continuing limitations or hazards. Land capability is a more general term than land suitability and more conservation oriented. It involves consideration of (i) the risks of land damage from erosion and other causes and (ii) the difficulties in land use owing to physical land characteristics, including climate.

Capability classification classes are determined by the following guidelines:

- land capability Class i land means land –
 - (a) that has a very high potential for intensive crop production;
 - (b) with few permanent limitations that restrict its use;
 - (c) which may be used safely and profitably for cultivated crops;
 - (d) of which the soils –
 - i. are nearly level and deep;

- ii. hold water well;
 - iii. are generally well drained;
 - iv. are easily worked;
 - v. are fairly well supplied with plant nutrients or are highly responsive to inputs of fertilizer; and
 - vi. when used for crop production, needs ordinary management practices to maintain productivity;
- (e) and which has a local climate favourable for growing many of the common field crops;
- land capability Class ii land means land –
 - a) with some permanent limitations that reduce the degree or intensity of crop production but is nevertheless of high potential;
 - b) which requires moderate conservation practices;
 - c) which may be used for cultivated crops, but with less latitude in the choice of crops or management practices than land capability class ii and;
 - d) with few limitations; and
 - e) the production and conservation practices that are easy to apply;
 - land capability Class iii land means land –
 - a) with severe permanent limitations that restricts the choice of alternative uses and the intensity of crop production;
 - b) which is of moderate potential;
 - c) which requires special conservation practices;
 - d) which may be used for cultivated crops, but has more restrictions than land capability class II land;
 - e) when used for cultivated crops, the conservation practices of which are usually more difficult to apply and to maintain; and
 - f) of which the number of practical alternatives for average farmers is less than that for soils in land capability class iii;
 - land capability Class iv land means land –
 - a) with very severe permanent limitations that restrict the choice of alternative uses and the potential for crop production;
 - b) which requires very careful management;
 - c) which may be used for cultivated crops, but more careful management is required than for land capability class III land and conservation practices are more difficult to apply and maintain;
 - d) with restrictions to land use which are greater than those in land capability class iii land; and
 - e) on which the choice of plants is more limited;
 - land capability Class v land means land –
 - a) that is unsuitable for the cultivation of annual crops;
 - b) with a slight erosion hazard under natural veld, established pastures, forestry or special crops that provides adequate cover;
 - c) which may be tilled for the establishment of pastures, forestry and special crops; and
 - d) which has one or more of the following limitations which are impractical to remove:
 - i. wetness or frequently flooded;
 - ii. stoniness or rockiness; or
 - iii. climatic limitations;
 - land capability Class vi land means land – which has
 - (a) permanent limitations that make it generally unsuited to cultivation and limit its use largely to natural grazing, browsing, afforestation or game farming; and
 - (b) which has continuing limitations that cannot be corrected, including –
 - i. steep slope;

- ii. severe erosion hazard;
 - iii. effects of past erosion;
 - iv. stoniness;
 - v. shallow rooting zone;
 - vi. excessive wetness or flooding;
 - vii. low water-holding capacity;
 - viii. salinity;
 - ix. sodicity; or
 - x. unfavourable climate;
- land capability Class vii land means land with –
 - (a) very severe permanent limitations that make it unsuited to cultivation and that restrict its use largely to natural grazing, browsing, afforestation or game farming; and
 - (b) restrictions that are more severe than those for land capability class vii and because of one or more continuing limitations that cannot be corrected, such as –
 - i. very steep slopes;
 - ii. erosion;
 - iii. shallow soil;
 - iv. stones;
 - v. wet soil;
 - vi. salinity;
 - vii. sodicity; or
 - viii. unfavourable climate.
 - land capability Class viii land means land with limitations that
 - a) preclude its use for commercial agricultural production;
 - b) restrict its use to recreation, wildlife, extensive game farming, water supply or aesthetic purposes; and
 - c) cannot be corrected as a result of, amongst others, the effects of one or more of the following:
 - i. erosion or erosion hazard;
 - ii. severe climate;
 - iii. wet soil;
 - iv. stones;
 - i. low water-holding capacity.

ASSESSMENT OF THE SITE

There is an abundance of rock on the surface and throughout the profile. Hutton and Shortlands soils were identified. Generally, the soil is deeper than 700mm.

In our opinion the arable portion on the subject property falls in LAND CAPABILITY CLASSES i to v.

Table 6. General potential classification according to Agricultural Land Framework Bill

Soil unit	Frame Bill class	Description	Area (ha)
Hu800	Class i	Soil that is free of any impediment for cultivation. It is considered as high potential arable land	6.47
HuR1	Class ii	Soil that has moderate amounts of rock and stone, which would require some management input for optimal production. It will also restrict the choice of alternative uses and the intensity of crop production. It is considered as high potential arable land.	8.4

Soil unit	Frame Bill class	Description	Area (ha)
HuR2	Class iv	Soil with moderate to large amounts of rock and stones that limits it's use. It will require some management input for optimal production. It is considered as medium potential arable land.	4.52
HuR4	Class v	Soil that large amounts of rock and stones that limits it's arable use. It will require much management input for optimal production. It is considered as low potential arable land.	3.76
INF	Class viii	Infrastructure and roads that is not suitable for cultivation.	7.1
WC	Class viii	River	2.91
TOTAL			33.16

Figure 14. Land capacity - Agricultural land Framework Bill



Within each capability class are agricultural activities that the land is suitable for. For example, available water for irrigation would create farming opportunities on Land Capability classes iv and poorer, while Class i capability is only suitable for grazing if the climate is not favourable.

In the case of the subject properties 14,9 ha is high potential land. The balance is either too rocky or under infrastructure and falls into Class iv and poorer. Availability of irrigation water could change the agricultural potential from poor to high.

6.2 ANALYSIS OF LAND FOR DIFFERENT LAND USES

Land use patterns more often than not, follow the situation experienced on the farm rather than land use potential. Shallow and moderate potential land that are not economically viable for cash crop production are sometimes cultivated and planted to maize or other crops because

of the contribution it can make in the total fodder flow where cattle and crop production takes place in a mixed farming unit. In addition, where irrigation water is available, it changes marginal land to high potential. This also the case on the subject farm where the abundance of stone and rock is not considered as high potential land but can be gainfully uses in horticulture.

The potential of a specific crop can also change with market price fluctuations. With the present free market pricing for agricultural produce, enterprise choice has become even more difficult (and risky) for the farmer. Furthermore, the financial ability of the farmer changes over time and even seasonally; influencing the land use as normal land uses may be altered or seasonally abandoned until financial conditions changes or return to normal.

This report, will therefore assume some recommendations that will form the basis for further analysis.

The following analysis is done for various enterprises from a natural resource perspective, in other words, purely based the climate, soil properties and water availability, and will apply to the portions that are already under cultivation.

Table 7. Enterprise evaluation

Enterprise	Discussion
Crops/horticulture	Although the soil is rocky and most only medium potential land, it is suitable for orchards. It is now under seed production of maize and sunflowers, with the balance under instant lawn, for which it is suited. However, due to the stony areas, it will require special management.
Beef Cattle	The land is too small for livestock

7 FARMING INFRASTRUCTURE

7.1 ON-FARM

- Fencing

The total farm is fenced.

- Water supply

There are sufficient water rights registered to irrigate the entire property.

- Farm buildings

There is a homestead on the southern part of the site and a packing shed on the central northern portion.

- Electricity

Is available.

7.2 REGIONAL

- Input supply

Farm inputs are provided from Malalane. The closest retail market is in Nelspruit, although there are numerous informal markets close by.

- Communication and electricity

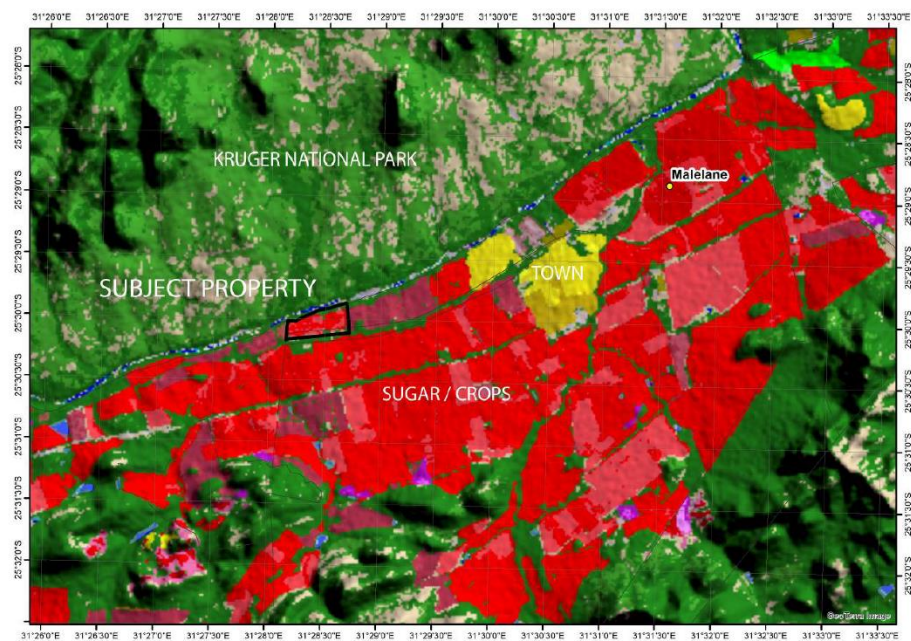
The area is supplied with cellular as well as land line communication. Eskom provides electricity. The capacity seems sufficient for the present activities.

8 SURROUNDING LAND USES

Main land uses within a 10km radius of the property are as follows:

- Sugar cane is the dominant crop;
- Orchards are found along the river;
- Nurseries directly adjacent;
- Field crops;
- Malelane is about 4km east and a small township directly south;
- The Kruger National Park is directly north of the site.

Figure 15. Surrounding land uses other than veld grazing and informal cropping (red indicates irrigated lands)



Impact of development on adjoining farming activities

- The estate will provide housing. It has nurseries directly west and a small settlement directly south of the western part of the development.
- It is our opinion that the development will not negatively influence farming activities of the adjoining properties.

9 IMPACT ASSESSMENT

9.1 IMPACT ON AGRICULTURAL PRODUCTION

The property will be removed from agriculture. Approximately 14.9 hectares of high potential farming land will be lost to agriculture.

9.2 IMPACT ON AGRICULTURAL RESOURCE UTILISATION

The property will be removed from agriculture. Approximately 14.9 hectares of high potential farming land will be lost to agriculture. The irrigation rights will be reemployed elsewhere, with no loss to agriculture.

9.3 AGRO-ECOSYSTEM IMPACT OF THE PROPOSED CHANGE IN LAND USE

Goods and services are the benefits arising from the ecological functions of ecosystems. Such benefits accrue to all living organisms, including animals and plants, rather than to humans alone.

- Production services

The land is now used for seed production and for instant lawn. The development will result in the loss of 14.9 hectares of high potential land. This will have a medium impact on local level but very little impact on regional level.

- Ecological services

The development will have no impact on the ecology. Instant lawn is produced on most of the high potential land. It's production has little beneficial impact on the environment.

- Socio-cultural services

The development will create more job opportunities that is available under farming.

10 CONCLUSION

The area in general has a tourism focus because of its proximity to the Kruger National Park. The effect is that land here will always be sought after for tourism and housing development.

The properties consists of 27 hectares that is used for seed production of crops and for instant lawn.

The soil along the river is alluvial and residual further away. Most of the soils have abundance of stones and is the main impediment to land use capability; more than half of the site was found to have more than 40% stone in the soil matrix, but certain portion contains more than 70%.

About 14,9 hectare is high potential land. The balance is either too rocky or under infrastructure and falls into Class iv and poorer. Availability of irrigation allowed for moderate potential land to become productive.

The development will result in the loss of 14,9 hectares of high potential land. This will have a medium impact on local level but very little impact on regional level.

It is further found that the development will have a little impact on the ecology. Instant lawn is produced on most the high potential land. It's production has little beneficial impact on the environment.

Further, the development will create more job opportunities that is available under farming.

11 SOURCES OF INFORMATION

- Criteria for high potential agricultural land in South Africa, Department of Agriculture, Directorate Land Use and Soil Management, 2002.
- Soil Management, Agricultural Research Council, 2005.
- GIS Layers, Environmental Potential Atlas, Department of Environment Affairs, 2002.
- Bing Satellite Imagery, 2017.
- Drone images, Index, 2017

12 ADDENDA

12.1 PHOTOGRAPHS



07.JPG



08.JPG



09.JPG



10.JPG



11.JPG



12.JPG



13.JPG



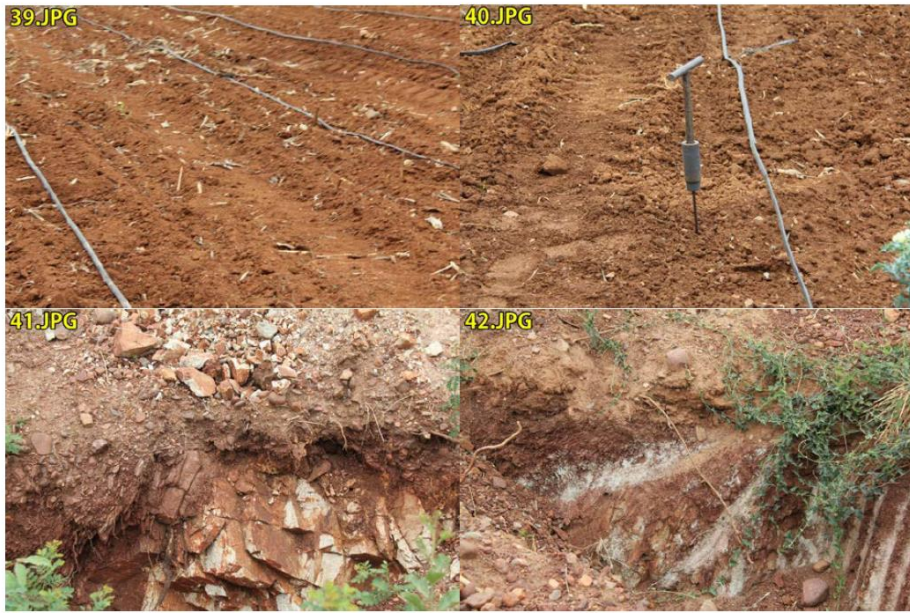
14.JPG












12.2 WATER RIGHTS

Suite 801, 8th Floor
The MAJOK Building
13 Street Street
Mbombela

Private Bag 531238
Mbombela
0300

Tel 013 753 5000
Fax 013 753 2786



INKOMATI-USUTHU
WATER MANAGEMENT BOARD

Enquiries/ Verification Office
Reference: 140JL/18
E-mail: verification@incmwb.co.za

Agronet CC

FORMER INKOMATI WATER MANAGEMENT AREA, WITHIN THE INKOMATI-USUTHU WATER MANAGEMENT AREA

CROCODILE RIVER MAJOK IRRIGATION BOARD - ORDER

MALELANE ESTATE A 140, JU, PORTION 8, SIZE 0.0000 ha: DECLARATION OF WATER USE AS AN EXISTING LAWFUL WATER USE IN TERMS OF SECTION 33(2) OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Under Section 33(2) of the National Water Act, 1998 (Act 36 of 1998) [“the Act”], the following volume(s) are declared as existing lawful water use(s) on the above mentioned property.


Type of water use	Volume (m ³ /annum)
Taking of water for irrigation purposes	76,700.0000
Taking of water for non-irrigation purposes	
Storing of water	

This use may be continued with under Section 34(1) subject to any existing conditions or obligations attached to the use until a licence replaces it.

In terms of Section 148(1)(e) of the Act you may appeal against this declaration to the Water Tribunal within 30 (thirty) days from the date of this letter. The Water Tribunal can be contacted as follows:

The Registrar of the Water Tribunal, Mr Robert Mabe
Water Tribunal
Private Bag X316
Mbombela
0300
Tel: 012 336 7034
Email: maber@dws.gov.za

Nyikene-Maluka (Chairperson) | Mr MS Mthembu (Deputy Chairperson) | Dr JB Motswane | Dr PE Motswane | Ms SD Wiggins
Mr PA Mshangu | Mr PJ Venter | Mr JM Mathabulu | Dr TK Gyedu-Ababio (Ex-Officio)



Suite 801, 8 th Floor The MAXSA Building 11 Streak Street Mbombela	Private Bag X11214 Mbombela 1200	Tel 013 753 9000 Fax 013 753 2786
--	--	--------------------------------------


INKOMATI-USUTHU
WATER MANAGEMENT BOARD
 Enquiries: Verification Office
 Reference: 140JU/14
 E-mail: verification@ucema.co.za

Agronet CC

FORMER INKOMATI WATER MANAGEMENT AREA, WITHIN THE INKOMATI-USUTHU WATER MANAGEMENT AREA

CROCODILE RIVER MAJOR IRRIGATION BOARD - ORDER

MALELANE ESTATE A 140, JU, PORTION 14, SIZE 0.0000 ha: DECLARATION OF WATER USE AS AN EXISTING LAWFUL WATER USE IN TERMS OF SECTION 33(2) OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Under Section 33(2) of the National Water Act, 1998 (Act 36 of 1998) [“the Act”], the following volume(s) are declared as existing lawful water use(s) on the above mentioned property:

Type of water use	Volume (m ³ /annum)
Taking of water for irrigation purposes	7034 91,000.0000
Taking of water for non-irrigation purposes	
Storing of water	

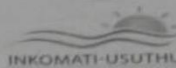
This use may be continued with under Section 34(1) subject to any existing conditions obligations attached to the use until a licence replaces it.

In terms of Section 148(1)(e) of the Act you may appeal against this declaration to the Water Tribunal within 30 (thirty) days from the date of this letter. The Water Tribunal can be contacted as follows:

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 Water Tribunal
 Private Bag X316
 Pretoria
 001

Phone: 012 336 7034
 Mail: maber@dws.gov.za

P Nyakane-Maluka (Chairperson) | Mr MS Mthembu (Deputy Chairperson) | Dr JB Mchwantwa | Dr PE Molokwane | Ms SD Wiggins
 Mr PA Shabangu | Mr PJ Venter | Mr JM Mathabula | Dr TE Gyedu-Ababio (Ex-Officio)



INKOMATI-USUTHU

WATER MANAGEMENT AUTHORITY

Suite 801, 8th Floor | Private Bag X11214 | Tel 012 752 9000
 The MAKSA Building | Mbombela | Fax 012 752 2786
 13 Struik Street | 1300

Empowerment Verification Office
 Reference: 14011-13
 E-mail: empowerment@dws.gov.za

Agronet CC

FORMER INKOMATI WATER MANAGEMENT AREA, WITHIN THE INKOMATI-USUTHU WATER MANAGEMENT AREA

CROCODILE RIVER MAJOR IRRIGATION BOARD - ONDER

MALELANE ESTATE A 140, JU, PORTION 13, SIZE 0.0000 ha: DECLARATION OF WATER USE AS AN EXISTING LAWFUL WATER USE IN TERMS OF SECTION 33(2) OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Under Section 33(2) of the National Water Act, 1998 (Act 36 of 1998) [‘the Act’], the following volume(s) are declared as existing lawful water use(s) on the above mentioned property:

Type of water use	Volume (m ³ /annum)
Taking of water for irrigation purposes	123.500.0000
Taking of water for non-irrigation purposes	
Storing of water	

This use may be continued with under Section 34(1) subject to any existing conditions or obligations attached to the use until a licence replaces it.

In terms of Section 148(1)(e) of the Act you may appeal against this declaration to the Water Tribunal within 30 (thirty) days from the date of this letter. The Water Tribunal can be contacted as follows:

The Registrar of the Water Tribunal, Mr Robert Mabe
 Water Tribunal
 Private Bag X316
 Pretoria
 0001

Tel: 012 336 7034
 E-Mail: maber@dws.gov.za

Dr TP Nyekezo-Maluku (Chairperson) | Mr MS Mthembu (Deputy Chairperson) | Dr JB Molekwa | Dr PE Molekwa | Mr SD Wiggins
 Mr PA Shabangu | Mr PJ Venter | Mr JM Mathibane | Dr TK Gyedu-Abalo (Ex-Officio)

12.3 POLICY CONSIDERATIONS

Although not yet enacted, the objectives of the *Preservation and Development of Agricultural Land Framework Bill, 2016* are to –

1. Regulate the subdivision, rezoning and protection of agricultural land;
 - preserve and develop agricultural land by –
 - Encouraging farming on agricultural land in collaboration with other role players; and provincial and local government to enable and promote the use of agricultural land for farming purposes and compatible uses in their policies, legislation, Integrated Development Plans, Spatial Development Frameworks and other relevant administrative frameworks and procedures;
 - discouraging or prohibiting – land uses unrelated to agriculture from taking place on agricultural land, including urban and other non-agricultural developments that are

likely to create conflict with established or proposed Protected Agricultural Areas; and subdivision and rezoning of agricultural land that results in fragmentation of farming systems, reduced agricultural productivity and land degradation;

- encouraging the mitigation of lost productive capacity of agricultural land if permanent impacts cannot be avoided and arise from development; and
 - promoting and encouraging long-term, viable farming units from an economic, environmental and social perspective;
2. implement a uniform, coordinated, cross-cutting national framework, including national norms and standards for the submission, consideration and approval or rejection of applications for the subdivision or rezoning of agricultural land to ensure coordinated, intergovernmental relations;
 3. build capacity in all three levels of government with regard to the consideration and execution of rezoning applications;
 4. ensure the sustainable use of the natural agricultural resources and maintain the agricultural landscape through the prohibition or discouragement of land use changes from agriculture to other forms of development;
 5. establish a framework that, in appropriate cases, facilitates concurrent land uses on agricultural land, such as renewable energy projects, without jeopardising long-term food security and natural resource integrity;
 6. protect the right to farm and to strengthen the rights of farmers to protect and manage agricultural land;
 7. establish formal structures at local, provincial and national levels to provide a basis for participation and to ensure transparency in, and accountability for, land use decisions that affect the availability and sustainable use of agricultural land;
 8. ensure that a minimum threshold of high potential cropping land available for agricultural production purposes is determined by the Department so as to maintain and increase food production and the potential productivity of the land concerned;
 9. demarcate Protected Agricultural Areas to ensure that high potential and best available agricultural land are protected against non-agricultural land uses in order to promote long-term agricultural production;
 10. encourage well-functioning intergovernmental relations and establish intergovernmental dispute resolution mechanisms; and
 11. establish an incentive-based regulatory regime that is linked to enforcement to actively promote the preservation and optimal agricultural use of agricultural land for agricultural production.

Inputs by municipality relating to high potential cropping land:

1. The provincial Department to which an application was submitted as contemplated in section 7, must send a copy of such application and all supporting documentation to the – (a) local municipality and district municipality; or (b) metropolitan municipality, concerned, as the case may be, within a period of 5 days after receipt of the complete application from the applicant.
2. The municipalities contemplated in subsection (1) must – (a) consider the application and supporting documents, taking into account the following: (i) the Integrated Development Plan; (ii) the Spatial Development Framework; (iii) the Local Economic Development plan; (iv) the Land Use Management Scheme; and (v) any other planning frameworks applicable to the area concerned; and (b) consult with traditional governance structures in the event that the application involves land occupied by a traditional community as contemplated in section 11.
3. The municipalities contemplated in subsection (1) must – (a) make a written recommendation in respect of the application; and (b) submit the recommendation contemplated in paragraph (a), together with any other written inputs, to the provincial Department concerned.

4. The recommendation by the municipalities contemplated in subsection (3) is not required in the event that the Intergovernmental Committee approves the application as contemplated in section 13. (a) In the event that the municipality concerned lacks sufficient capacity to fulfil its functions as contemplated in this Act, the provincial Department concerned, in consultation with the municipal manager, must execute such functions: Provided that the municipality concerned must comply with the provisions of subsection (3). (b) In the event that no recommendation is forthcoming from the municipality concerned after intervention by the provincial Department, the provincial Department must keep a record thereof and proceed with the application.
5. In the event that the municipality concerned does not submit its inputs to the provincial Department within a period of twenty days after receipt of the documents contemplated in subsection (1), the provincial Department is not obliged to consider its inputs.

ⁱ The Bill is still in process, but nevertheless, indicate the present thinking if the Department of Agriculture.

APPENDIX 4.4.2.
TERRESTRIAL ECOLOGY, BIODIVERSITY AND RIPARIAN ECOLOGY
REPORT

KRUGER MALELANE AGRI ESTATE: THE DEVELOPMENT OF A LIFESTYLE GATED COMMUNITY ON A CROP FARM

A specialist ecological study for an Environmental Impact Assessment on the Kruger Malelane Agri Estate, Greater Malelane Town Area (Mpumalanga)



SPECIALIST STUDY: ECOLOGICAL ASSESSMENT.

**DR ANDREW DEACON
April 2021**



A LIFESTYLE GATED COMMUNITY ON A CROP FARM

A specialist ecological study for an Environmental Impact Assessment on the Kruger Malelane Agri Estate, Greater Malelane Town Area (Mpumalanga)

April 2021

Dr Andrew Deacon (PhD Zoology)

Registered with the South African Council for Natural Scientific Professions
(Registration number: 116951)

Executive Summary

Rhengu Environmental Services were appointed to undertake an Environmental Impact Assessment (EIA) for the Kruger Malelane Agri Estate Development (Mpumalanga). This specialist ecological study forms part of the EIA process for the proposed project.

The Kruger Malelane Agri Estate (KMAE) development is planned as a unique lifestyle gated community on a crop farm in the Greater Malelane Town Area, Mpumalanga Province. The \pm 28.4 ha study area consists of a portion of Portions 8, 13 & 14 of the Farm Malelane Estate 140- JU. The area is located outside the 1:100 flood line of the Crocodile River and the river forms the southern boundary of the Kruger National Park.

This specialist report is based on the EIA guidelines provided in the Mpumalanga Biodiversity Sector Plan (MBSP). The Mpumalanga Tourism and Parks Agency (MTPA), as custodian of the environment in Mpumalanga, is the primary implementing agent of the MBSP for the province.

During the study, a total of three vegetation units were identified. These units consist of two subsections of untransformed riverine habitats and two units of transformed habitat types. These vegetation units and land cover type units are listed below:

Untransformed vegetation/habitat

1. Untransformed Riverine – Riparian and aquatic
 - 1a. Adjacent Crocodile River
 - 1b. Small stream on the eastern boundary

Transformed vegetation/habitat

2. Agriculture – Fallow lands
3. Infrastructure – housing

The fieldwork component of this study was conducted during the period November 2020 to April 2021. During the vegetation surveys, a total of 39 indigenous plant species were recorded during fieldwork as well as 11 exotic species, some declared alien invaders.

Aquatic macro-invertebrates were sampled in the unnamed drainage line according to the SASS5 method. The habitat scores at the sites are moderate and is thus categorized as “Fair”. On the other hand, the SASS scores represent a “Good” integrity and relative high number of families, which can be attributed to shallow, well aerated riffles, as well as some overhanging vegetation.

Six fish species were sampled in the unnamed drainage line and evaluated according to the FRAI method. The relative integrity score of 52% at this reach in the KMAE was placed within the limits of an ecological state category Class D (40 to 59%), which means this reach is “Largely modified”.

During surveys for frog species (November 2020 to April 2021), two of the 29 expected species were encountered in the KMAE project area. Using distribution maps and habitat quality, no endemic or threatened frog species are expected to occur in the project area. According to the distribution of reptiles in South Africa, 61 species have distribution ranges extending into the region. During the surveys of reptile species 3 of the 61 were encountered in the KMAE project area. Two threatened reptile species are expected for the surrounding area.

A total of 332 bird species were observed in this region during the Bird Atlas project. During the surveys of bird species, only 49 of the 332 species were encountered in the KMAE project area. Nineteen threatened bird species were recorded locally, many of these birds were observed in the adjacent KNP environment.

According to the distribution of mammals in South Africa, 100 species have distribution ranges extending into the region. During the surveys for mammal species only 3 of the 100 were encountered in the KMAE project area. A total of 35 observed mammal species were

listed for a property 160 metres downstream of the KMAE project area, which include 11 threatened species (most of these mammals were observed in the adjacent KNP environment).

Overlaying the BGIS Critical Biodiversity Areas map onto the project area, we found the KMAE is situated in the following sensitive areas:

- Terrestrial:
 - Ecological Support Area: Protected area buffer
 - Vulnerable Ecosystem Status: Granite Lowveld – Vulnerable
- Aquatic:
 - NFEPA River: Crocodile River

Apart from a drainage line which is classified as an Other Natural Area, most of the project area has been totally transformed by agriculture (“Heavily Modified”). On the other hand, the entire farm is situated in an ESA: Protected Area Buffer (Kruger National Park). According to the desired management objectives for an ESA: Protected Area Buffers, these buffers are areas around protected areas where changes in land-use may affect the ecological functioning or tourism potential of the adjacent protected area. The purpose of buffer zones is to reduce the impacts of undesirable land-uses on the environment and to provide opportunities for tourism/recreation.

The potential impacts of the project on the biodiversity of the study area are assessed under the following broad categories, namely:

Activity 1. Construction of the lifestyle units.

1.1 Storm water and erosion/siltation

1.2 Pollution

1.2.1 Sewerage

1.2.2 Hazardous substances associated with construction activities

1.2.3 Solid waste

Activity 2. Construction of a dam in an unnamed drainage line.

2.1 Inundation of the stream

2.2 Migration barrier

Activity 3. Establishment of the orchards

3.1 Storm water and erosion/siltation

Activity 4. Human wildlife conflict – fences, elephants and orchards; scavenging; lighting, etc.

Activity 5. Alien invasive vegetation.

Reasoned opinion

It is evident that a central concern regarding the development on the KMAE property is the deterioration of the ground cover on the farm and the resultant erosion and siltation of the receiving environment. Most of the problem can be attributed to the neglected stormwater management of the farm in the recent years. With the current planned development, there are two sources of potential erosion:

- a) the residential areas with housing units, roads, and other forms of impervious surfaces;
- b) and the current fallow land to be developed into macadamia orchards.

To prevent the continuation of donga formation and sediment deposition on the receiving Kruger Park landscape, a number of stormwater decelerating schemes are available to the engineers when developing the stormwater drainage system. A number of these schemes are discussed in the ConSolv Engineering Service Report (2020) and a combination of these methods can be implemented in both the residential and agricultural areas.

In the residential areas, soakaways could be used to lessen the impact of runoff from impervious surfaces, rainwater harvesting can receive some of the water and swales along all the access roads, can all serve as primary local control systems. All channelled water should be slowed down before it reaches the KNP fence/boundary with decelerating systems, such as infiltration trenches and vegetated swales. The planting of lush Lowveld

gardens, which will establish rapidly in the rich soils and controlled watering systems, will also be an effective control addition to slow down stormwater.

Different controls could be incorporated in the orchards, beginning from the southern boundary, all the way to the storm water channelling system along the main road. The stormwater decelerating methods could include filter strips, swales, infiltration trenches and retention areas (see ConSolv Engineering Service Report, 2020). These systems will be able to slow down stormwater before it reaches the storm water channelling system which will intercept the surface flows before it reaches the residential areas.

However, it is important to firstly divert most of the initial flows towards the natural drainage line to the east of the property, thereafter the increased flow will then overflow into the secondary storm water channels. More important now is to slow down the water towards the point of release in order to prevent concentrated flows discharged into the receiving environment. In order for that to happen, it is suggested that the stormwater channels release the water into a system of drains and rock-filled sumps to slow down the flows and dissipate the released water over a wider surface area to prevent further erosion and siltation on the KNP side of the fence.

Pollution of the drainage systems (including the channelled stormwater) on the farm and the adjacent Crocodile River, is another concern in developing the estate. If there is a pollution risk, it will persist into the operational phase. There are three aspects of concern relating to potential pollution, namely the sewerage system, solid waste and hazardous substances associated with construction and afterwards stemming from household tasks.

The wastewater treatment addressing the sewerage effluent will be a waterborne sewerage system. The system will be installed with a Maskam Fusion WWTW which will ensure that the outflow from the system will conform to general standards required by the department of Water and Sanitation (DWS) and be used for irrigation of the macadamia orchards.

In order to protect the riverine area from potential sources of pollution, the following mitigation measures are proposed:

- Implementation and maintenance of the aquatic buffer zones around the local waterways,
- and adhering to Best Practice Guidelines and Specifications relating to all construction activities (camps, storage, dumping, ablution, servicing, cement mixing and stockpiling).

Solid waste will initially be managed effectively by the construction teams and during the operational phase the management of the estate development will fulfil this function. Refuse removal will be a daily door-door service by KMAE Management, and the refuse temporarily stored at a holding facility. The stored waste will be collected weekly by the Nkomazi Municipality.

Repairing and improving the dam/bridge structure over the small stream has a two fold function: i) damming water in the stream will create a small dam which will act as a water feature for the development; ii) the structure will also continue to serve as an access route to allow vehicles to cross the stream. The construction of an in-stream dam will have the following impact on the system:

- the completed dam wall will interfere with the flow in the river;
- the wall will act as a migration barrier for aquatic animals;
- when the dam basin fills with water, the water will inundate a relatively large area of natural riverine habitat and terrestrial landscape.

In order to address the migration barrier issue, a fishway (fish ladder) was proposed for the dam overflow, which will allow migrating fish swimming up the drainage line, to negotiate over the dam wall during their migration and disperse further upstream into the catchment.

However, based on the results of an assessment with regards to the necessity for providing a fishway at the said barrier (Kotze, 2021), it was concluded that a fishway will add little, if

any ecological benefit at the proposed dam site. Due to this assessment, it was decided that no fishway is required for installation at the proposed dam. This recommendation is based on ecological considerations.

As indicated in the section with reference to "Assessment of Impacts", most of the impacts can be mitigated to a certain degree. However, filling the dam and inundating the riparian vegetation are impacts that cannot be mitigated fully as a relatively large surface area is inundated and eliminated from the ecosystem footprint, therefore the significance of this action is still listed in a "Medium" category.

To protect the remaining riparian zone of the stream, a 10m buffer around the riparian zone has been established using the DWS Buffer Tool. In order to re-establish the link between the riparian corridors upstream and downstream of the dam basin, a 10m riparian buffer should also be established along the new marginal zone around the dam.

It is thus anticipated that, in order to mitigate for the impacts of the proposed dam on the environment, the listed adverse influences should be managed to such a degree that the overall ecology in the project area will still be functional.

It is expected that aspects such as "Human Wildlife Conflict" and "Alien Plant Control" can be managed without difficulty through protocols implemented by the KMAE Management and if maintained it should successfully mitigate these potential impacts.

By implementing all the mitigation measures and managing the system as prescribed on an ongoing basis, all the impacts will be addressed to a satisfactory level. Therefore, it is proposed that the construction and operation of the project should be authorised with the provision that the mitigation measures prescribed in this document are included in the EMPr.

General Requirements for EAPs and Specialists including Content of Specialist Reports in terms of Appendix 6 of the EIA Regulations, 2014

	Specialist reports and reports on specialist processes Checklist	STATUS
	Requirements for Specialist Reports Appendix 6 of Amendments to the environmental impact assessment regulations, 2014 (Government Notice No 326, 7th April 2017), promulgated in terms of National Environmental Management Act, 1998 (Act No. 107 of 1998).	Reference to section of specialist report or justification for not meeting requirement
1	A specialist report prepared in terms of these Regulations must contain—	
(a) i	The specialist who prepared the report; and	The title page of this report.
(a) ii	The expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.6 Details of the Author; Appendix 2 of this report.
(b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 1 of this report: Details of specialist and the declaration of interest following this section.
(c)	An indication of the scope of, and the purpose for which, the report was prepared;	1.3 Terms of Reference.
(cA)	An indication of the quality and age of base data used for the specialist report;	1.4 Database Review
(cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	5.4 Assessment of impacts 5.3.6 Land-use guidelines 5.3.7 Desired management Objective
(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	2. Methodology - Baseline Data
(e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	2. Methodology
(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;	5.2 Sensitivity mapping. 5.5 Conditions for inclusion in the environmental authorisation
(g)	An identification of any areas to be avoided, including buffers;	5.3.7 Desired management Objective
(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;	5.3 Land-use planning and Decision-making: 5.3.5 Buffer zones
(i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	1.5 Assumptions, Limitations and Knowledge gaps

	Specialist reports and reports on specialist processes Checklist	STATUS
(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;	5.4 Assessment of impacts
(k)	Any mitigation measures for inclusion in the EMPr	5.4. Impact Assessment
(l)	Any conditions for inclusion in the environmental authorisation	5.5 Conditions for inclusion in the environmental authorisation.
(m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	5.6 Monitoring requirements
(n)	A reasoned opinion -	
.i	As to whether the proposed activity, activities or portions thereof should be authorised;	5.7.2 Reasoned opinion
(iA)	Regarding the acceptability of the proposed activity or activities; and	5.7.2 Reasoned opinion
.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;	5.7.1 Summary of mitigation measures
(o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	5.7.3 Consultation process
(p)	A summary and copies if any comments that were received during any consultation process, and where applicable all responses thereto; and	n/a
(q)	Any other information requested by the competent authority.	n/a

DECLARATION

I, Andrew Richard Deacon, declare that I –

- act as an independent specialist consultant in the field of ecological science;
- 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, 2006;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report;
- and will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

ANDREW RICHARD DEACON

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References

Appendices

Abbreviations

ADU	Animal Demographic Unit
AQV	Aquatic vegetation
ASPT	Average Score per Taxon
BA	Basic Assessment
BGIS	Biodiversity Geographic Information System
BODATSA	Botanical Database of Southern Africa
°C	Degrees Celsius
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Areas
cm	Centimetre
DALRRD	Department of Agriculture, Land Reform and Rural Development
Dr	Doctor
DWA	Department of Water Affairs (post-2010)
DWAF	Department of Water Affairs and Forestry (pre-2010)
DWS	Department of Water and Sanitation (since May 2014)
E	East
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
e.g.	For example
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMF	Environmental Management Frameworks
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Areas
FRAI	Fish Response Assessment Index
FROC	Frequency of Occurrence
GGP	Gross Geographic Product
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
HCR	Habitat Cover Ratings
HQI	Habitat Quality Index
IHAS	Integrated Habitat Assessment System
IHI	Index of Habitat Integrity
IUCN	International Union for Conservation of Nature
kl/day	Kilolitre per day
km	Kilometre
km ²	Kilometre square
KMAE	Kruger Malelane Agri Estate
KNP	Kruger National Park
LUDS	Land-Use Decision Support Tool
m	Metre
m ²	Square metre
m ³	Cubic metre
m ³ s	Cubic metre per second
mamsl	Metres above mean sea level
MAP	Mean annual precipitation
max	Maximum
MBCP	Mpumalanga Biodiversity Conservation Plan

MBSP	Mpumalanga Biodiversity Sector Plan
min	Minimum
min	Minutes
mm	Millimetre
MNCA	Mpumalanga Nature Conservation Act
mS/m	milliSiemens per metre
MTPA	Mpumalanga Tourism and Parks Agency
MV	Marginal Vegetation
NEMA 1998)	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management & Biodiversity Act
NEMPAA	National Environmental Management: Protected Areas Act
NFEPA	National Freshwater Ecosystem Priority Areas
NP	National Park
NSBA	National Spatial Biodiversity Assessment
NT	Near-threatened
NWA	National Water Act
ONA	Other Natural Areas
PAR	Register of Protected Areas
PCB	Polychlorinated biphenyl
PES	Present Ecological State
PESEIS	Present Ecological State, Ecological Importance and Ecological Sensitivity
PhD	Doctor of Philosophy
POSA	Plants of Southern Africa
Pr. Sci. Nat	Natural Scientific Professionals
Reg. no.	Registration number
RHP	River Health Programme
S	South
SA	South Africa
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SARCA	South African Reptile Conservation Assessment
SASS5	South African Scoring System version 5
SCC	Species of Conservation Concern
SHI	Site Fish Habitat Integrity Index
SIC	Stones in Current
SOOC	Stones Out Of Current
SQ	Sub-quadernary
Sqm	Square metre
SSC	Species of Special Concern
SuDS	Sustainable Drainage Systems.
TOPS	Threatened or Protected Species
VEGRAI	Riparian Vegetation Response Assessment Index
WMA	Water Management Area
WSUD	Water Sensitive Urban Design
WWTW	Waste Water Treatment Works

1. Introduction

Rhengu Environmental Services were appointed to undertake an Environmental Impact Assessment for the Kruger Malelane Agri Estate Development (Mpumalanga). This specialist ecological study forms part of the EIA process for the proposed project (Figure 2).

This project and the report below, are based on the EIA guidelines provided in the Mpumalanga Biodiversity Sector Plan (MBSP, 2014). The Mpumalanga Tourism and Parks Agency (MTPA), as custodian of the environment in Mpumalanga, is the primary implementing agent of the MBSP for the province.

This report addresses the findings of the field surveys as well as a desktop review of the potentially occurring threatened flora and fauna in the proposed development footprint.

1.1 Project Description

Proposed Residential Township: Portions 8, 13 and 14 Malelane Estate 140 JU, Mpumalanga Province.

The Kruger Malelane Agri Estate (KMAE) development is planned as a unique lifestyle gated community on a crop farm in the Greater Malelane Town Area, Mpumalanga Province. The ± 28.4 ha study area consists of a portion of Portions 8, 13 & 14 of the Farm Malelane Estate 140- JU. The area is located outside the 1:100 flood line of the Crocodile River and the river forms the southern boundary of the Kruger National Park (Figure 1).

The area is located between contours 290m and 311m above mean sea level and the average annual rainfall is 460mm. The terrain is undulating with relative flat gradients including a natural waterway along the eastern boundary. The ground surface drains via sheet-wash and the aforementioned drainage feature drains towards the north in the direction of the Crocodile River at an average gradient ranging of some 5%.

The registered owner of the property proposes to establish a residential development on the property. The aim of the development is to create a desirable landscape consisting of a mix of agriculture and lifestyle living facing the Kruger National Park. The development will consist of 25 subdivisions which will each have a demarcated area along the Crocodile River front or the stream to the east for the purpose of building a residence and the remainder of the property will be used for farming.

The development will be provided with internal services which will consist of a metered water connection for each building, a waterborne sewerage connection and access to a road network.

Access to the development will be from an existing road D1239, which is an extension of Opdraend Street in Malelane. Access to the development will be from road D1239 located along the southern boundary of the development area.

Water for the project will be provided from three sources. Firstly, the property has 13Ha of water rights on the Malelane Irrigation Board water canal which will be used for the farming operation. In addition to this, there are 3 boreholes on the property. Two of the boreholes will be utilised for domestic water supply to the residential properties and the other as supplementary water for the farm. Finally, water will be recovered from the sewerage treatment plant and this will be used to supplement the irrigation water on the farm.

A sewerage treatment plant will be constructed at a suitable position within the development area and all the sewerage from the reticulated sites within the development will be treated at this treatment plant. A Waste Water Treatment Plant will be constructed next to the water treatment plant and the treated water will be used for irrigation. The treated effluent will comply with the general standards required by the department of Water and Sanitation (DWS) and will be of such quality that the treated water can be used for irrigation purposes.

The area drains towards the north-east, and the lowest point is next to the Crocodile River. It is proposed that the sewer lines be placed outside the riparian buffer. No reticulation lines will be constructed within the 1:100-year flood line and one sewer pump station will be required to pump sewer to the proposed sewer treatment plant. The total Annual Average Dry Weather Sewerage Flow is estimated at 21.66 kl/day.

Refuse removal will be undertaken by KMAE Management. Waste will be collected weekly by the Nkomazi Municipality. It is proposed that solid waste be taken daily in municipal refuse bags to a holding facility at the entrance gate to the development. The holding facility must be properly walled in with a concrete floor, including water supply for washing of the area. The Nkomazi Municipality will collect the waste on a weekly basis.

Eskom is the supply authority for electricity in the area.

Proper storm water management is essential to ensure protection of life and property from flood hazards and that the natural environment is protected.

The objectives of storm water management can be summarised as follows:

- to provide a storm water drainage system for the protection of the property from damage by runoff from frequent storms;
- to prevent loss of life and reduce damage of the property from severe storms;
- to prevent land and watercourse erosion;
- to protect water resources from pollution;
- to preserve natural watercourses and their eco-systems;
- to achieve the foregoing objectives at optimal total cost.

The storm water channels and structures will be designed for a 1:2-year storm recurrence, except at the piped crossings where a 1:5 year storm recurrence is catered for. The infrastructure will be located within the road servitudes.



Figure 1: The KMAE project area location in the surrounding environment

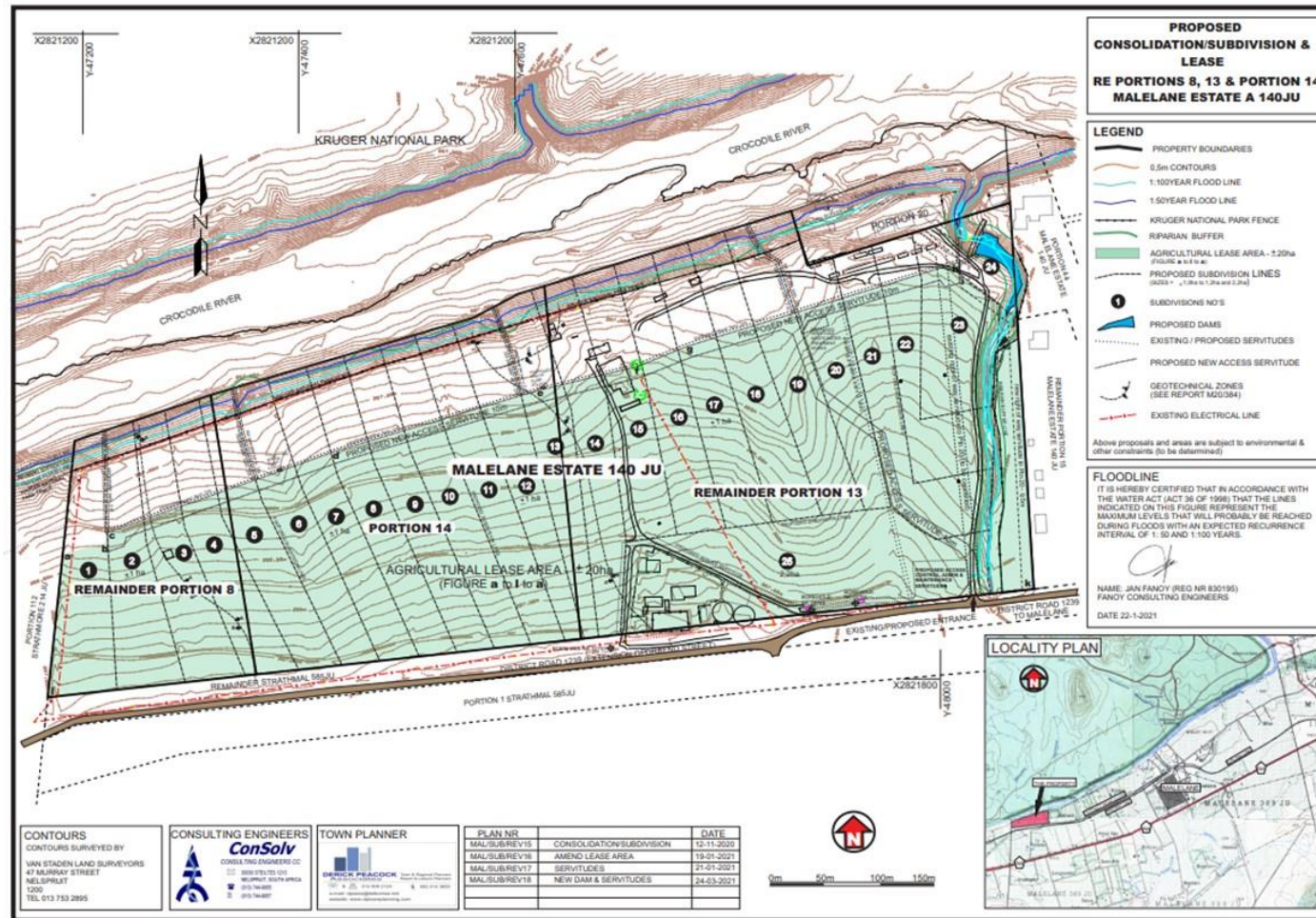


Figure 2: The proposed Kruger Malelane Agri Estate Development is planned as a unique lifestyle gated community on a crop farm in the Greater Malelane Town Area.



Figure 3: A map of the current farming operation and present ecological state of the Malelane Estates (Gouws, 2017).

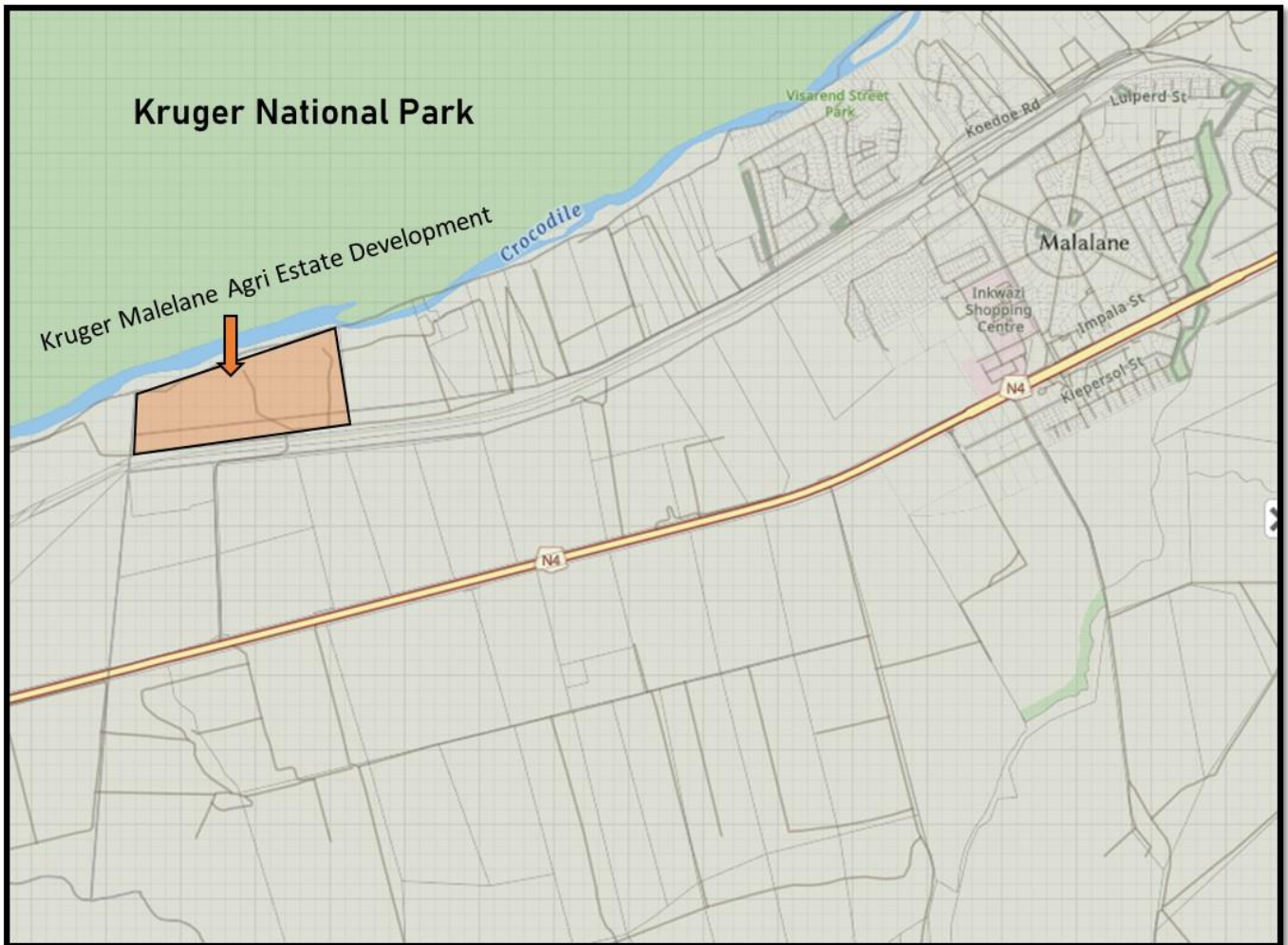


Figure 4: The proposed Kruger Malelane Agri Estate Development site (orange rectangle), illustrating the surrounding areas of importance.

An agricultural area over the aforementioned 25 subdivisions will be subject to an agricultural lease. The project will thus have both a “residential” as well as an agricultural component.

The property has in the past been used for agricultural purposes (Figure 3) and it was therefore decided to retain 20ha for agriculture, which will be an economical irrigation unit in terms of the standards of Department of Agriculture, Land Reform and Rural Development (DALRRD).

The project proposal is that 20 ha (with 12.4 ha listed water) still functions as agricultural via a long-term lease. Agriculture can thus be “classified as the dominant use as more than 71% of the property will still be utilised for agriculture. Planting of Macadamia orchards will improve and ensure the sustainable continued use of the property for agriculture (Gouws, 2017).

Proposed access bridge

The study area is bordered by a non-perennial drainage feature to the east, by a railway line to the south, by a wholesale nursery to the west and by the Crocodile River to the north. The ground surface drains via sheetwash and the drainage feature drains towards the north in the direction of the Crocodile River at an average gradient ranging of some 5%.

As part of the proposed development a small dam wall (that will also serve as a river crossing) at **an existing low water bridge** is considered.

In order to access the property in the NE boundary of the project area, the existing crossing needs to be raised to a level that aligns with the proposed new roadway which will service the riverfront stands. The most cost-effective way to achieve this, is by backfilling the affected area. This will result in the damming of the area to the south of the stream crossing. It is important that every measure be taken to ensure that the impact of this crossing is minimised.

The inclusion of the dam into the project will have many additional benefits over and above the necessity to provide access to the property in the NE corner of the property. The dam created by the access wall will enhance the overall experience of a lifestyle estate. It is an intention to create walks and picnic areas around the dam so that the property owners will be able to enjoy the birds, riverine environment and water features that this type of environment will encourage. The dam will also add an aesthetic charm to the property.

On the other hand, this proposed dam wall may create a migration barrier to fish and a study was initiated to assess the potential migratory impact of this proposed dam and determine the necessity and priority of implementing a fishway at the proposed structure (Kotze, 2021).

This stream may have been a seasonal drainage line under natural conditions and has been altered (made perennial) by irrigation return flows (sugar cane). An existing low-water bridge located on the property and in close proximity to the inflow of the Crocodile River (approximately 100m) already creates a migration barrier (due to drop/height during low flows and high velocity through pipes during high flows) (Figure 5a).

The stream, upstream of the current and hence proposed dam that can be used by aquatic biota, is only approximately 650m long. Upstream of the train bridge the catchment has been radically transformed by sugarcane (Figure 5c and d). Irrigation return flows are transported in a canal along the railway line that flows into the stream at the railway bridge. The canal is of no habitat value to fish and another migration barrier to movement (due to continuous high velocity over long distance) (Figure 5b).

The stream in its current state is highly transformed from its natural state, and it is estimated that the return flows have created a perennial stream that was once only a seasonal/ephemeral drainage line.

The habitat available within the approximately 650m of river is also in a poor state due to sedimentation and alien vegetation encroachment in the riparian zone and is generally of limited value to aquatic fauna.

Although this stream provides some refugia for fish (utilised by opportunistic biota because of the artificial habitat created by the return flows), it is thought to be of very limited ecological value (due to the short reach and relative low diversity) (Kotze, 2021).



Figure 5 (Kotze, 2021):

a: Existing bridge (barrier)

b and c: Canal / irrigation return flows (upstream of railway bridge).

d: Radically transformed upstream catchment (upstream of railway bridge).

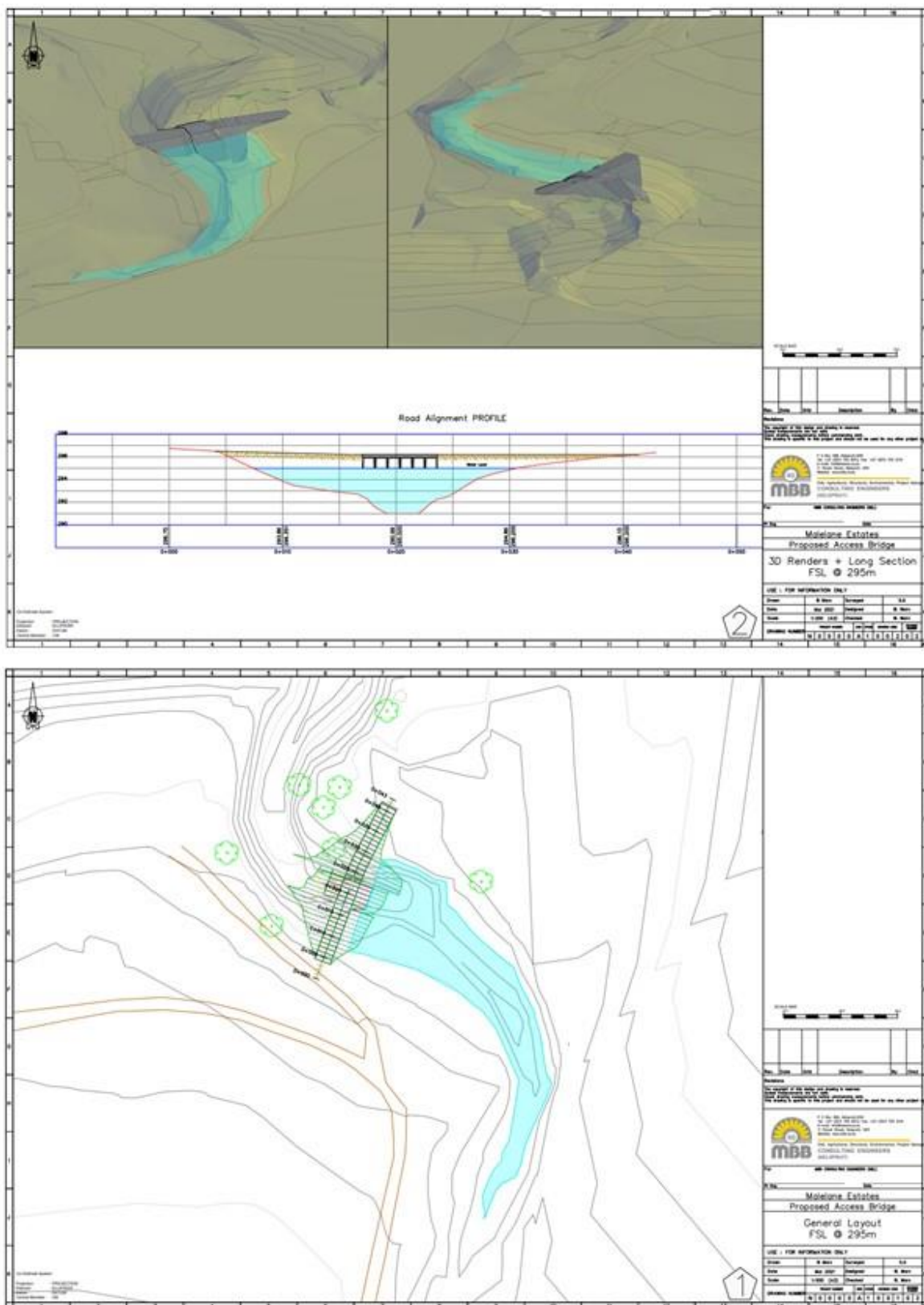


Figure 6: The general layout of the proposed access bridge in the Kruger Malelane Agri Estate Development unnamed drainage line.

1.2 Legislative requirements

The new Environmental Impact Assessment Regulations came into effect on the 4 December 2014. These regulations were amended in 2017 and with this in mind it is proposed that the procedure as described in Chapters 4 and 6 of Notice 326 and Listed in Government Gazette No. 40772, published on 7 April 2017 is followed. Notice is given in terms of Regulation 41 of this notice to carry out the following activities:

Property Description and Location:

Rural Residential and Agriculture Estate: Remainder Portions 8, 13 and 14 of Malelane Estate A 180 JU 4km from Malelane town. In terms of Government Notices 327, 325 and 324 an Environmental Impact Assessment is required in terms of the following listed activities that the applicant wishes to implement:

Government Notice: 327 of 7 April 2017 Gazette Number: 40227:

Activity 12: The development of-

(iii) bridges and or

(iv) dams, where the dam infrastructure and water surface area exceed 100sqm in size, where such development occurs - (a) within a water course or (c)within 32m of a water course.

Activity 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock, of more than 10 cubic metres from-(i) a watercourse.

Activity 27: The clearance of an area of 1 hectare or more, but less than 20ha, of indigenous vegetation.

Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.

Government Notice: 324 of 7 April 2017 Gazette Number: 40227:

Activity 2: The development of reservoirs, excluding dams, with a capacity of 250 cubic metres or more in (f) Mpumalanga (ii) outside urban areas in (ff) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

Activity 4: The development of a road wider than 4 metres with a reserve less than 13.5 metres in (f) Mpumalanga (i) outside urban areas in (gg) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

Activity 12: The clearance of an area of 300 sqm or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.

Activity 14: The development of-(i) dams ..and infrastructure exceeding 10 sqm in size or (ii) infrastructure or structures with a physical footprint of 10 sqm or more where such development occurs- (a) within a water course or (c) ...within 32m of a water course, in (f) Mpumalanga (i) outside urban areas in (hh) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

Activity 18: The widening of a road by more than 4 metres or the lengthening of a road by more than 1 kilometre in (f) Mpumalanga (i) outside urban areas in (gg) areas within 10 kilometres of a National Park as identified in terms of NEMPAA.

1.3 Terms of Reference

Project Proposal: A development on the property Malelane Estates 140JU. This project is prepared for a Specialist Study for an EIA: An assessment of the local Ecology (fauna and flora) and an Environmental Evaluation of the 30-ha project area. The following services/specialist components will be addressed:

1: Specialist Studies for the EIA.

Specialist reports and reports on specialist processes as per EIA Regulations will be addressed and the following specialist reports will be completed for the EIA report:

1a: Vegetation studies (according to the MTPA Minimum Requirements). Establish historic location of original riparian vegetation. A Wetland Delineation report for the riparian corridor of the Crocodile River and other wetlands (according to methodology prescribed by DWS), with their scientific determined buffers in place. All these features need GPS boundaries, so that they could be overlain on a plan.

1b: Faunal studies (according to the MTPA Minimum Requirements), including herpetofauna, avifauna and mammals. Establish sensitivity of the landscape and determine potential habitats for local fauna.

2. General Reporting

- **Master Layout Plan:** Planned infrastructure will be included (supplied by the developers), and flood lines will be supplied (requested from the Engineer). All these features need GPS boundaries, so that they could be overlain on a plan.
- Discuss existing land and water use impacts (and threats) on the characteristics of the area.
- List and map sensitive environments in proximity of the project locality-sensitive environments.
- Suggest and discuss mitigation measures relating to the proposed project.

1.4 Database Review - an indication of the quality and age of base data used for the specialist report;

The following sources of information provided important information for the area as a whole.

Biota:

- Conservation-important biota listed for the quarter-degree grid 2531CB in the Mpumalanga Tourism & Parks Agency's (MTPA) (2021).
- Mpumalanga Species of Conservation Concern 2018.
- Protected species as listed under the Mpumalanga Nature Conservation Act (MNCA) (No. 10 of 1998), or the National Environmental Management: Biodiversity Act Threatened or Protected Species (NEMBA ToPS) (No. 10 of 2004).

Plants:

- List of all protected tree species, Government gazette, 2019.
- MTPA Minimum Criteria Guideline
- Vegetation Map for South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006).
- Riparian delineation and habitat evaluation was undertaken according to the DWAF Guidelines (2005) and DWAF updated manual (2008).
- Plants of South Africa (POSA) data from the South African National Biodiversity Institute (SANBI) (2021).
- SANBI Red List of South Africa 2021.

- Buffer Zone Tools (Macfarlane and Bredin, 2017).

Aquatic Macro-invertebrates

- Level I Ecoregion and the geomorphological zone, according to the method of Dallas (2007).
- SASS5 sampling technique (Dickens and Graham 2002).
- Aquatic habitat assessment (Kleynhans & Louw, 2008).

Fish:

- Fish distribution data sourced from the South African Institute for Aquatic Biodiversity (SAIAB), the Mpumalanga Tourism and Parks Agency (MTPA) 2020.
- Red Data: IUCN, 2019.
- Aquatic ecosystem classification, Ollis *et al.* (2013).
- MTPA Minimum Criteria Guideline.
- Fish reference Frequency of Occurrence (FROC) database (Kleynhans, Louw, & Moolman, 2007).
- Fish Response Assessment Index (FRAI) (Kleynhans 1999; Kleynhans *et al.* 2005).

Frogs:

- Red Data: IUCN, 2019.
- Du Preez, L. & Carruthers, V. 2009.
- Frog atlas project (Minter *et al* 2004).
- Detailed frog distribution records (Jacobsen 1989).

Reptiles:

- Reptile Atlas Project - Animal Demographic Unit (ADU), 2010.
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland: Bates, et al, 2014.
- Red Data: IUCN, 2019.

Birds:

- Red Data: IUCN, 2019.
- Harrison, et al. 1997.
- MTPA Minimum Criteria Guideline
- Important bird areas of southern Africa (Barnes, K.N. (ed.), 1998)

Mammals:

- Red list: Child *et al*, 2016.
- Red Data: IUCN, 2019.
- MTPA Minimum Criteria Guideline.

Rivers

- Desktop Present Ecological State, Ecological Importance and Ecological Sensitivity per sub-Quaternary reaches in South Africa (DWS 2014).
- Ecoregion - Water Resource Classification System (DWS, 2005).
- DWS PESEIS documents (DWS, 2014).
- Identification and delineation of wetland and riparian areas – DWS 2005 and 2008, MacKenzie and Rountree, 2007.

General

- Google Earth coverage dated September 2020.
- MTPA. 2014. Mpumalanga Biodiversity Sector Plan Handbook.
- Mpumalanga LUDS maps (BGIS, 2015). Land-Use Decision Support Tool (LUDS) (2020).
- National Web based Environmental Screening Tool (2020).
- Protected areas: <https://www.environment.gov.za/> Register of Protected Areas (PAR).
- DWS Risk Matrix Impact Assessment method (GN 509).

1.5 Assumptions, Limitations and Knowledge gaps

Assumptions, Limitations and Knowledge gaps associated with this study include the following: The assumption has been made that:

- Project proponents will always strive to avoid and mitigate potentially negative project related impacts on the environment, with impact avoidance being considered the most successful approach, followed by mitigation. It further assumes that the project proponents will seek to enhance potential positive impacts on the environment.
- Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species.
- The lists of fauna for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. Due to the nature and habits of most faunal taxa it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations are compared with literature studies where necessary.
- Animal species, especially birds, are mostly highly mobile and often migrate seasonally. Any field assessment of relatively short duration is therefore unlikely to record anything more than the most common species that happen to be on site at the time of the survey. Such field surveys are generally a poor reflection of the overall diversity of species that could potentially occur on site.
- The author is not involved with the decision regarding the construction of the dam related to the permit/license requirements of the National Water Act, 1998 (Act No. 36 of 1998).

1.6 Details of the Author

Dr Andrew Deacon (PhD Zoology) worked as a researcher at Scientific Services, South African National Parks (SANParks, 1989 - 2012). He was initially employed as an Aquatic ecologist to coordinate the multidisciplinary KNP Rivers Research Programme, but later was tasked to manage the monitoring and research programmes for small vertebrate ecology in 15 South African National Parks (including Addo-, Kalahari- and Kruger NP).

As a recognised scientist in the fields of Ichthyology and Terrestrial Ecology, he is currently engaged as a specialist consultant regarding ecological studies. He was involved in numerous research programmes and projects and produced EIA specialist reports (aquatic or terrestrial ecology) for 82 projects. Additionally, he also participated in Aquatic ecosystem projects, Environmental Water Requirement Studies and Faunal and ecosystems monitoring projects.

Apart from multiple environmental projects in South Africa, he has worked on assignments in the Democratic Republic of the Congo, Zambia, Mozambique, Zimbabwe, Namibia and Swaziland. He completed: Wetland Introduction and Delineation Course – Centre for Environmental Management: University of the Free State. He is a registered Professional Natural Scientist (Pr. Sci. Nat.) in the fields of Ecological Science (Reg. no. 116951).

2. Methodology

Methods and approach

This project, and this report, is based on the guidelines provided in the Mpumalanga Biodiversity Sector Plan Handbook (MTPA, 2014). According to the MBSP, “it is important to note that all decisions regarding land-use applications in Mpumalanga are going to be evaluated by the authorities using the CBA maps and data, so it makes sense to consider these proactively, either prior to, or during, the EIA process.”

The methods used in this report were undertaken in accordance with to the MTPA Minimum Criteria Guideline with special emphasis on Protected Species.

Baseline Data

Baseline data were collected during a single field survey undertaken during the dry season (July 2020). During the field survey detailed ecological data were collected and the following fields were covered:

2.1 Riverine Vegetation

2.1.1 Riparian delineation

It is important to differentiate between wetlands and riparian habitats. Riparian zones are not wetlands, however, depending on the ecosystem structure, wetlands can also be classified as riparian zones if they are located in this zone (e.g. valley bottom wetlands). Although these distinct ecosystems will be interactive where they occur in close proximity it is important not to confuse their hydrology and eco-functions.

Riparian delineations are performed according to “A practical field procedure for identification and delineation of wetlands and riparian areas” as amended and published by the Department of Water Affairs and Forestry (2005); (Henceforth referred to as DWAF Guidelines (2005).

Aerial photographs and land surveys were used to determine the different features and riparian areas of the study area. Vegetation diversity and assemblages were determined by completing survey transects along all the different vegetation communities identified in the riparian areas.

Riparian areas are protected by the National Water Act (Act 36 of 1998), which defines a riparian habitat as follows:

- “Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.”
- Riparian areas include plant communities adjacent to and affected by surface and subsurface hydrologic features, such as rivers, streams, lakes, or drainage ways. Due to water availability and rich alluvial soils, riparian areas are usually very productive.
- Tree growth rate is high and the vegetation is lush and includes a diverse assemblage of species. The delineation process requires that the following be considered:
 - Topography associated with the watercourse;
 - Vegetation;
 - Alluvial soils and deposited material.

A typical riparian area according to the DWAF Guidelines (2005) is illustrated in Figure 7.

In addition to the DWAF Guidelines (2005) and DWAF updated manual (2008), the unpublished notes: *Draft riparian delineation methods prepared for the Department of Water Affairs and Forestry, Version 1* (Mackenzie & Rountree, 2007) were used for classifying riparian zones encountered on the property according to the occurrence of nominated riparian vegetation species.

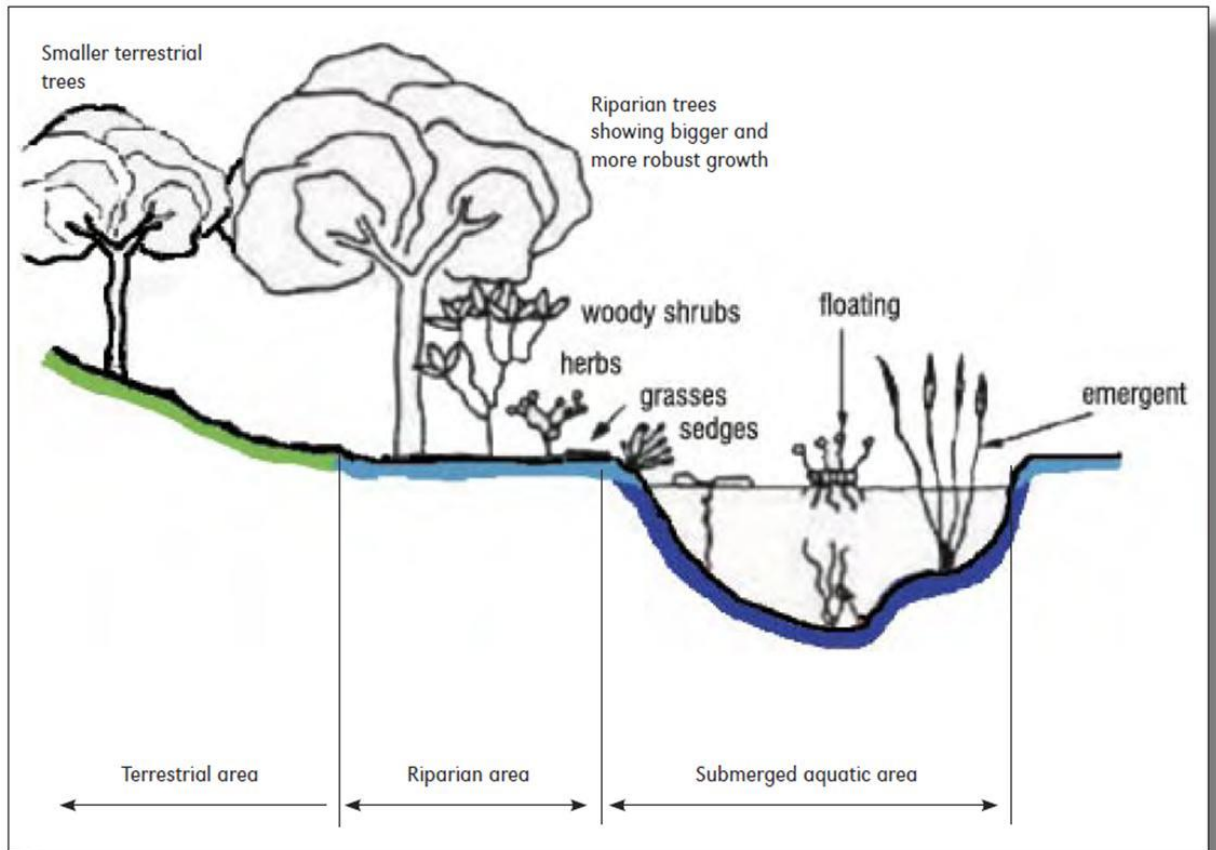


Figure 7: A cross section through a typical riparian area (DWAF Manual, 2008).

2.1.2 Buffers

Aquatic buffer zones are typically designed to act as a barrier between human activities and sensitive water resources thereby protecting them from adverse negative impacts. Buffer zones associated with water resources have been shown to perform a wide range of functions, and on this basis, have been proposed as a standard measure to protect water resources and associated biodiversity (Macfarlane et al, 2015). These functions include:

- Maintaining basic aquatic processes;
- Reducing impacts on water resources from upstream activities and adjoining land uses;
- Providing habitat for aquatic- and semi-aquatic species;
- Providing habitat for terrestrial species; and
- A range of ancillary societal benefits.

Due to their positioning adjacent to water bodies, buffer zones associated with streams and rivers will typically incorporate riparian habitat. Riparian habitat, as defined by the NWA,

includes the physical structure and associated vegetation of the areas associated with a watercourse. These areas are commonly characterised by alluvial soils (deposited by the current river system) and are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas (Macfarlane et al, 2015).

However, the riparian zone is not the only vegetation type that lies in the buffer zone as the zone may also incorporate stream banks and terrestrial habitats depending on the width of the aquatic impact buffer zone applied. A diagram indicating how riparian habitat typically relates to aquatic buffer zones defined in this guideline is provided in Figure 8.

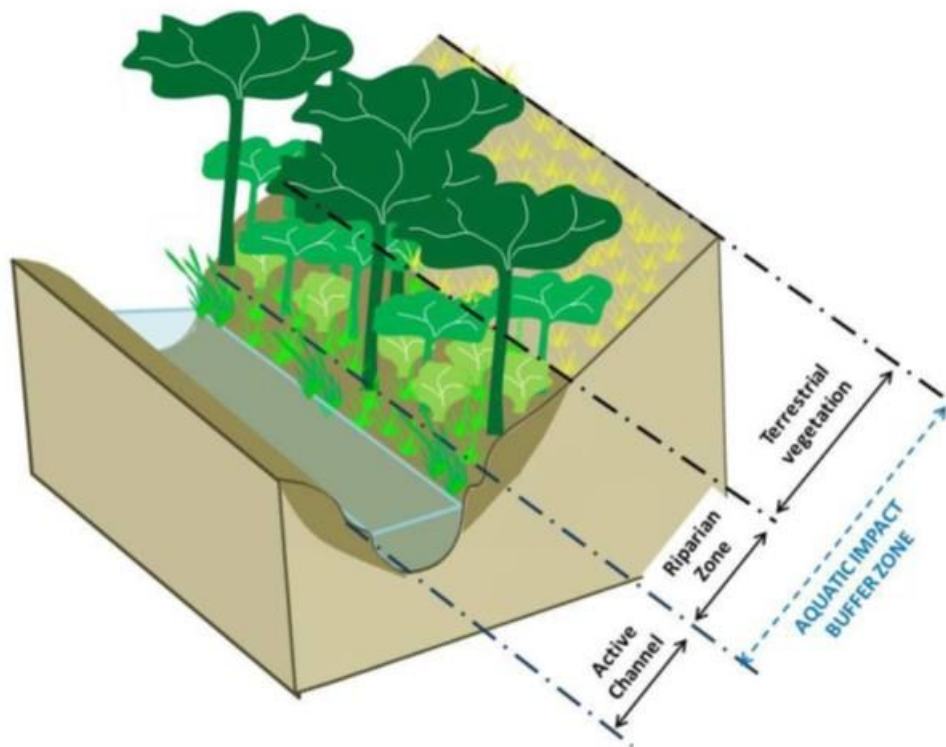


Figure 8: Schematic diagram indicating the boundary of the active channel and riparian habitat, and the areas potentially included in an aquatic impact buffer zone (Macfarlane et al, 2015).

Once an aquatic impact buffer zone has been determined, management measures need to be tailored to ensure buffer zone functions are maintained for effective mitigation of relevant threat/s. Management measures must therefore be tailored to ensure that buffer zone functions are not undermined. Aspects to consider include:

- Aquatic impact buffer zone management requirements;
- Management objectives for the aquatic impact buffer zone; and
- Management actions required to maintain or enhance the aquatic impact buffer zone in line with the management objectives. Activities that should not be permitted in the aquatic impact buffer zone should also be stipulated.

Determining appropriate management and monitoring of buffer zones

A series of Excel based Buffer Zone Tools have been developed to help users determine suitable buffer zone requirements (Macfarlane and Bredin, 2017). These include a rapid desktop tool for determining potential aquatic impact buffer zone requirements together with three site-based tools for determining buffer zone requirements for rivers, wetlands and estuaries.

Central to these tools is a buffer model, which is populated automatically from the data capture sheets provided. This is based on best available science and is used to generate buffer zone recommendations as part of the assessment process. The Overview of the stepwise assessment process for buffer zone determination (Macfarlane and Bredin, 2017) is illustrated in Figure 9.

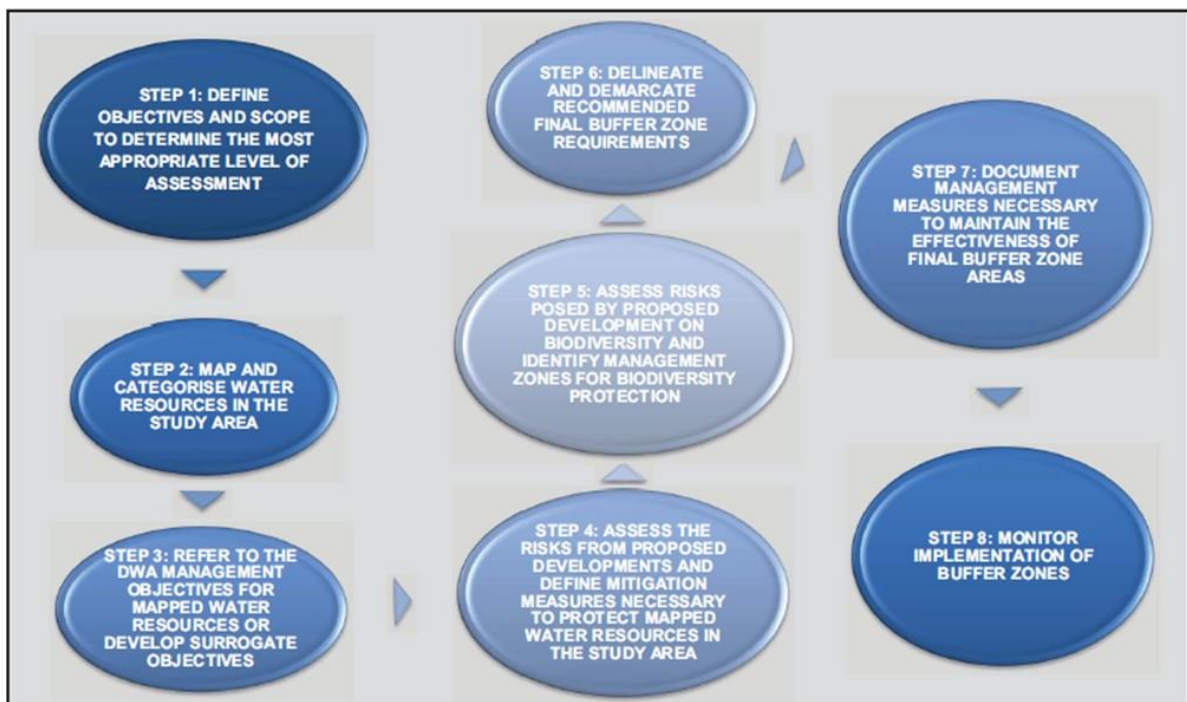


Figure 9: Overview of the stepwise assessment process for buffer zone determination (Macfarlane and Bredin, 2017).

Once a final buffer zone area has been determined, appropriate management measures should be documented to ensure that the water quality enhancement and other buffer zone functions, including biodiversity protection, are maintained or enhanced. Key aspects addressed include:

- Demarcating buffer zones.
- Defining suitable management measures to maintain buffer functions.
- Reviewing the need to integrate protection requirements with social and development imperatives.
- Monitoring to ensure that buffer zones are implemented and maintained effectively.

2.1.3 Riparian habitat surveys (Riparian Vegetation Index — VEGRAI)

The general components of the VEGRAI are specified as following:

- It is a practical and rapid approach to assess changes in riparian vegetation condition.
- It considers the condition of the different vegetation zones separately but allows the integration of zone scores to provide an overall index value for the riparian vegetation zone as a unit.
- The vegetation is assessed based on woody and non-woody components in the respective zones and according to the different vegetation characteristics which include, inter alia:
 - Cover
 - Abundance
 - Recruitment
 - Population structure
 - Species composition
- It provides an indication of the causes for riparian vegetation degradation.
- It is impact based. This means that the reference condition will only be broadly defined and based on the natural situation in the absence of impacts. Where possible, however, reference conditions should be derived based on reference sites or sections.

The index is based on the interpretation of the influence of riparian vegetation structure and function on in-stream habitat.

Although biodiversity characteristics are used in assessing the riparian vegetation condition, it is not a biodiversity assessment index *per se*.

For this study, the Level 3 VEGRAI will be used as Level 3 is applied by the River Health Programme (RHP) and for rapid Ecological Reserve purposes. This level will be aimed at general aquatic ecologists.

2.2 Specialist assessment: Aquatic Studies

2.2.1 Aquatic Ecosystem Classification

Aquatic ecosystems were classified according to a hierarchical system described by Ollis *et al.* (2013).

2.2.2 Aquatic biota surveys

Macro-invertebrates and fish are good indicators of river health. By making use of established and accepted survey methods (SASS5 for invertebrates and FRAI-based surveys for fish) and incorporating the habitat aspects, a proper basis for biological diversity can be obtained.

The different components of the proposed development and its impact on the aquatic environment will be assessed for the river in the project area. The following recognised bio-parameters and methods will be used:

- Aquatic invertebrates: South African Scoring System version 5 (SASS5).
- Fish communities: Fish Response Assessment Index (FRAI). Applicable fish habitat assessments such as the Habitat Cover Ratings (HCR) and Site Fish Habitat Integrity Index (SHI) will be used to assess the habitat potential and condition for fish assemblages.

2.2.2.1 Aquatic invertebrate assessment

Benthic macro-invertebrate communities of the selected sites were investigated according to the South African Scoring System, version 5 (SASS5) approach. An invertebrate net (30cm x 30cm square with 0.5mm mesh netting) was used for the collection of the organisms. The available biotopes at each site will be identified on arrival. Each of the biotopes was then sampled separately and by different methods. Sampling of the biotopes was done as follows:

Stones in current (SIC): Movable stones of at least cobble size (3 cm diameter) to approximately 20 cm in diameter, within the fast and slow flowing sections of the river. Kick-sampling is used to collect organisms in this biotope. This is done by placing the net on the bottom of the river, just downstream of the stones to be kicked, in a position where the current will carry the dislodged organisms into the net. The stones are then kicked over and against each other to dislodge the invertebrates (kick-sampling) for ± 2 minutes.

Stones out of current (SOOC): Where the river is calm, such as behind a sandbank or ridge of stones or in backwaters. Collection is again undertaken using the kick-sampling method, except in this case the net is swept across the area sampled to catch the dislodged biota. Approximately 1 m² is sampled in this way.

Sand: These include sandbanks within the river, small patches of sand in hollows at the side of the river or sand between the stones at the side of the river where flow was slow or no flow was recorded. This biotope is sampled by stirring the substrate, shuffling or scraping of the feet is done for half a minute, whilst the net is continuously swept over the disturbed area.

Gravel: Gravel typically consists of smaller stones (2-3 mm up to 3 cm). Sampling similar to that of sand.

Mud: It consists of very fine particles, usually as dark-coloured sediment. Mud usually settles to the bottom in still or slow flowing areas of the river. Sampling similar to that of sand.

Marginal vegetation (MV): This represents the overhanging grasses, bushes, twigs and reeds from the riverbank. Sampling is undertaken by holding the net perpendicular to the vegetation (half in and half out of the water) and sweeping back and forth in the vegetation (± 2 m of vegetation).

Aquatic vegetation (AQV): Rooted, submerged or floating waterweeds such as *Potamogeton*, *Aponogeton* and *Nymphaea*. Sampled by pushing the net (under the water) against and amongst the vegetation in an area of approximately one square meter.

The organisms sampled in each biotope were identified and their relative abundance is also noted on the SASS5 datasheet. Habitat assessments, according to the habitats sampled, were performed due to the fact that changes in habitat can be responsible for changes in SASS5 scores. This was achieved by applying the SASS orientated habitat assessment indices. The indices used are the Integrated Habitat Assessment System (IHAS) score sheet and the Habitat Quality Index (HQI).

The SASS5 method was used to establish the macro-invertebrate integrity in all three of the main habitat assemblages: stones, vegetation and sand/mud/gravel. The associated habitat types were determined with the Invertebrate Habitat Assessment System (IHAS) and the Habitat Quality Index (HQI).

Although the SASS5 method was used as prescribed by DWS, it must be kept in mind that this method was designed for water quality purposes. Therefore, the macro-invertebrate integrity scores may vary throughout the year as water quality changes, due to flow variation, as should be the case in the pre- and post-construction phases of the monitoring project.

Aquatic invertebrates were sampled using a standard SASS net and identified to at least family level according to the SASS5 sampling technique (Dickens and Graham 2002). The SASS5 results were classified into one of six Present Ecological State categories, ranging from Natural (Category A), to very Critically Modified (Category F). The limits for each category varied depending on the Level I Ecoregion and the geomorphological zone, according to the method of Dallas (2007) (Figure 10).

The quality of each instream habitat where macro-invertebrates were sampled was assessed in terms of the suitability for aquatic macro-invertebrates using a simple, five-point scale (0 = absent; 1=very poor; 5=highly suitable). Each habitat category was assigned weighted importance value that varied according to the geomorphological stream type. The weighted values were multiplied by the suitability rating (0-5), and the results were expressed as a percentage, where 100% = all habitats highly suitable. The percentage values were converted to a category (A to F), to allow easy comparison among sites or sampling events.

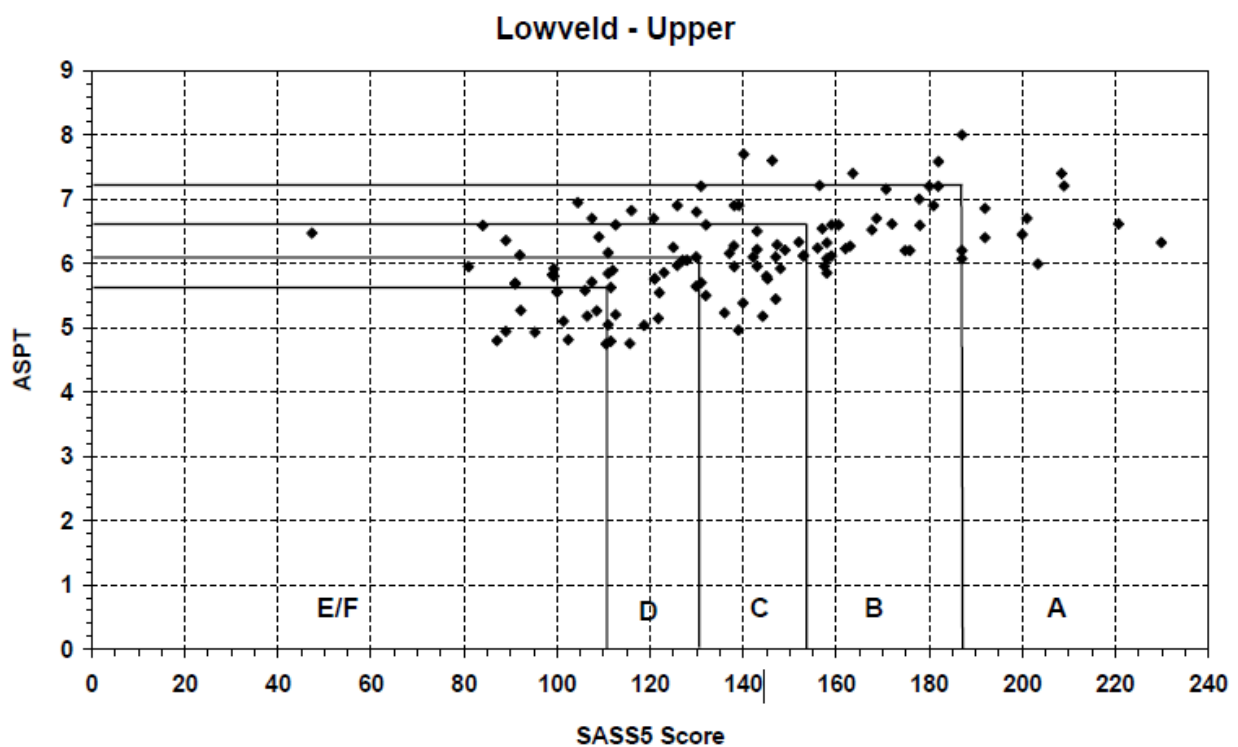


Figure 10. Guidelines used to delineate the Present Ecological State Categories in terms of SASS5 biomonitoring results in the upper portions of the Lowveld Ecoregion (Dallas 2007).

2.2.2.2 Fish communities - Fish Response Assessment Index (FRAI)

The biotic assessment method uses a series of fish community attributes related to species composition and ecological structure to evaluate the quality of an aquatic biota. Data on distribution, richness, length frequency and abundance will be collected. The sampling methods include fish traps, seine nets, mosquito nets and electro-fishing.

Fish segment identification, species tolerance ratings, abundance ratings, frequency of occurrence and health status techniques are applied during this survey to determine the integrity of the fish communities.

On arrival at the site a basic on-site visual appraisal is made of the habitat types available on that particular day at that particular flow. A site diagram is compiled indicating the different habitat types and the various components thereof. Sampling takes place in each of the

different habitat types. These different habitat types are sampled separately using different methods.

a) Electro-shocking

Electro-shocking commences in the downstream component of the habitat. One person uses a backpack electro-shocker for shocking, using a scoop net to catch the stunned fish. The researcher progresses upstream, keeping the fish caught in a bucket until that particular habitat is surveyed. Each habitat shocked is timed. It is necessary to take care (as far as possible) when shocking so as not to disturb the remainder of the habitat still to be surveyed. As each habitat is completed the fish species caught, are identified, recorded and released back into their respective habitat types.

Any fish species that cannot be identified at the time is preserved in 10% formalin (in a sample bottle with label inside) for later identification by experts. The data sheet is completed for that particular habitat – recording every fish, its age class (adult, sub-adult, juvenile) and whether any fish is diseased (e.g. visible ecto-parasites). Each habitat type is recorded (e.g. shoot, riffle or pool etc.), as well as the width, depth, substrate, the extent sampled, the percentage of algae on substrate, whether there was any vegetation and the turbidity. The flow of that particular habitat is classified into one of five flow classes (no flow, slow flow, medium flow, fast and very fast flow).

The electro shocking device is used to sample certain habitat types: shoots, riffles, rapids, shallow- medium depth pools in stream and off stream, runs and back waters.

b) Cast net

A cast net (a weighted circular net that is thrown into the water) is used in pool type or slower flow and deeper habitat types. As with method (a) all aspects of the habitat type are recorded including the fish species, numbers, age class and health. The number of throw efforts per habitat is also recorded.

2.3 Specialist assessment of terrestrial vegetation for the project

In accordance with the accepted proposal for this study, the botanical specialist study presented in the current report was to assess the footprint of the KMAE development. The scope of work will include the Terrestrial- and Riparian Components as per the MTPA Minimum Criteria Guideline with special emphasis on Protected Species, including GPS coordinates for encountered species to facilitate obtaining the necessary permits.

Minimum requirements guidelines from the Mpumalanga Tourism and Parks Agency:

1. A map indicating the total area (ha) of disturbance/transformation on the property, including the proposed development.
2. A map indicating vegetation communities and sensitive areas on the property. The map should include the delineation of a 30m buffer zone around any sensitive areas.
3. A map indicating all surrounding land use on adjacent properties.
4. A list of threatened plants species (Red Data Listed) that may potentially occur in the area should be submitted.
5. A floristic survey should be conducted during the growing season with at least two visits undertaken (\pm November and \pm February). Visits during other seasons will be determined by the flowering and fruiting times of species that do not occur during the summer season.
6. The MTPA should be supplied with a list of all plant taxa encountered during the surveys. The following should be investigated: threatened species (Red Data Listed), important medicinal species, protected species (Mpumalanga Conservation Act, 1989) as well as endemic taxa.

7. Plants that have been surveyed and which may be of conservation importance should be identified down to species level.
8. The MTPA should be supplied with a detailed list of all threatened species, including their locality information as well as details regarding date, GPS location and spatial resolution.
9. A list of threatened species that could potentially occur but were not found during site visits should be provided separately. In respect of each such species an opinion on the likelihood of that species occurring on the site and the reason for that opinion should be provided.
10. A list of alien plant species occurring on the property should be provided.
11. The invasion extent of category 1 & 2 plants (CARA: Act 43 of 1983, Regulation 15) should be investigated.
12. Any existing or planned eradication programmes of alien vegetation should be indicated in the report.
13. Relocation plans of plants of conservation importance should be included and this relocation should be undertaken by specialists that have expertise in the area of environmental concern (EIA Guideline Document).

Desktop

Vegetation communities and general land use patterns were identified prior to fieldwork using satellite imagery on Google Earth. Conservation-important plant species listed for the quarter-degree grid 2531CB in the Mpumalanga Tourism & Parks Agency's (MTPA) threatened species database, as well as the Plants of South Africa (POSA) data from the South African National Biodiversity Institute (SANBI), were used to produce a list of the most likely occurring species, which were searched for during fieldwork.

Conservation-important plants include those listed as species of conservation concern by the SANBI Red List of South Africa or protected species as listed under the Mpumalanga Nature Conservation Act (MNCA) (No. 10 of 1998), or the National Environmental Management: Biodiversity Act Threatened or Protected Species (NEMBA ToPS) (No. 10 of 2004).

Fieldwork

In accordance with the accepted proposal for this study, the botanical specialist study presented in the current report was to assess the footprint of the KMAE proposed development.

Vegetation communities identified in the desktop phase were ground-truthed during a field visit during July 2020. The project area as well as the surrounding environment was surveyed on foot and dominant plant species were listed according to each of the vegetation communities.

The study area was broadly stratified into major classes on the basis of gradient, aspect, terrain units (e.g. crest, mid-slope and foot slope), rock cover, soils, land-use and vegetation physiognomy.

A total of 8 sites were surveyed and floristic data is summarised in Table 9. Environmental parameters recorded at each stand included the following:

- locality coordinates using a Global Positioning System (GPS) receiver;
- terrain unit (midslope, foot slope, etc.);
- estimated percentage surface rock cover; and
- any visible disturbances (e.g. grazing, fire, old lands).

This floristic classification was used only to guide the identification of the robust 'vegetation units' described in this report, which are based on qualitative and semi-quantitative floristic and habitat data gathered at the sites surveyed during the study.

Parameters such as geology, topography, etc. were also obtained from the relevant topographical-, geological- and soils maps.

For the purposes of this study, the most recent version of the Mpumalanga Biodiversity Conservation Plan (MBCP) map of ecological sensitivity was obtained from the Mpumalanga Tourism and Parks Agency, and the boundaries of the study area were superimposed on this map. The MBCP divides the entire province into the following categories of importance in terms of biodiversity conservation value: 'Irreplaceable', 'Highly Significant', 'Important and Necessary', 'Least Concern' and 'No Natural Habitat Remaining'. **No 'Irreplaceable' or 'Important and Necessary' areas occur within the study area.**

2.4 Specialist assessment of terrestrial fauna

A detailed desktop study on all faunal species recorded in the past was completed and includes a description of red data and protected status according to the IUCN red data list and the National Environmental Management Biodiversity Act (TOPS List). All applicable literature was reviewed and extensive background studies regarding species distributions, habitat preferences and species status were updated accordingly. The potential occurrence of threatened species was also evaluated from historical records, available literature, habitat availability and personal experience. The fauna species list thus represent the majority of species occurring in the study area and provide a solid basis from which the project can continue to develop a comprehensive species list. The following detailed desktop studies and baseline animal assessment were conducted:

- Identification of all animal species expected to be present according to desktop studies of all relevant animal groups, namely birds; herpetofauna (amphibians and reptiles); and mammals. Potential occurrence of fauna in the study area was predicted based on knowledge of known habitat requirements of local fauna species.
- Lists of conservation-important mammals, birds, reptiles and frogs potentially occurring within the proposed agricultural development were prepared using data from the MTPA's threatened species database and applicable literature. The above data was captured mostly at a quarter-degree spatial resolution, but was refined by excluding species unlikely to occur within the study area, due to unsuitable habitat characteristics (e.g. altitude and land-use).
- Identification of all red data protected and conservation important species per animal group and the compilation of distribution maps and GPS coordinates where recorded.
- Design management and monitoring programmes to successfully monitor and manage all red data and protected and/or conservation important species.
- The assessment includes a review of all relevant literature, completion of field surveys, production of specialist reports and development of management recommendations.

The current status of the faunal environment and an evaluation of the extent of site-related effects were determined using selected ecological indicators. At the same time, all rare and endangered species, protected species, sensitive species and endemic species (conservation important faunal species) were identified and used to update and supplement existing studies. Ideally faunal surveys should cover the summer season, stretching from October to February. The surveys were conducted during January 2021. The surveys included the following faunal groups:

Amphibians, reptiles, birds and mammals were surveyed in pre-selected units. Emphasis was placed on fauna with high conservation value and their probability of occurrence in the

unit. These include meticulous searches on fixed transects in all the representative biotopes to assess the presence/absence of amphibians, reptiles, birds and mammal species. Where necessary, special methods were implemented to augment the chances of finding species, including traps, nocturnal spotlight searches and identifying tracks and scats. Special emphasis is placed on finding threatened species.

Minimum requirements guidelines from the Mpumalanga Tourism and Parks Agency:

2.4.1 MTPA: Mammals/Birds

1. The Mpumalanga Biobase Report should be consulted for obtaining background on the conservation value of land and areas of sensitivity within the Mpumalanga Province. This report is obtainable from the Mpumalanga Tourism and Parks Agency (MTPA).
2. A list of all potential species should be submitted. The following should be highlighted for threatened (Red Data) species.
 - i. International Red Data status (Latest version of IUCN Red Data List)
 - ii. National Red Data status (Latest version)
 - iii. Endemic status of each species
 - iv. Protection status of each species (Mpumalanga Nature Conservation Act 10 of 1998)
3. A full survey to determine species richness should be undertaken. The time of year to conduct surveys should depend on the activity pattern of the species. The survey area should not be restricted to the proposed site of development but should include all habitat types over the entire property as well as adjacent areas. These surveys should be performed by specialists with expertise in the area of environmental concern (EIA Guideline document).
4. A list of all species recorded during the survey should be supplied to the MTPA. Species data (GPS point locality, species name and date) should be forwarded to the MTPA.
5. Where total destruction is going to take place:
 - i. Specified faunal species must be captured and relocated to suitable habitat in the area.
 - ii. The operations must be handled by specialists with expertise in the area of environmental concern (GIS Guideline document).
 - iii. Species data (GIS point locality, species name and date) must be forwarded to the MTPA.
6. Maps indicating
 - i. Areas of sensitivity
 - ii. Areas already disturbed/transformed and size (ha)
 - iii. Proposed development and size
 - iv. Land-use on surrounding properties.
 - v. Location of important species as well as roosting and hibernation sites e.g. caves of ecological importance, in relation to the proposed development.
7. Recommendations on buffer zones will only be made once comprehensive species lists have been received and reviewed in the EMP/Scoping Reports.
8. A list of threatened species that can potentially occur but were not found during site visits or surveys should be provided. In respect of each such species an opinion on the likelihood of that species, occurring on the site and the reason for that opinion should be provided.
9. A list of exotic/introduced vertebrate species occurring on the property should be provided.
10. An ethically accepted plan for the eradication or removal of any exotic/introduced species posing a threat to indigenous species should be included in the report.
11. Any existing and/or planned actions to prevent free movement/roaming of domestic animals such as dogs, cats, goats and pigs should be provided.

2.4.2 Field surveys and habitat evaluation.

Terrestrial vertebrate surveys

Amphibians, reptiles, birds and mammals were surveyed in pre-selected units. Emphasis was placed on fauna with high conservation value and their probability of occurrence in the unit. These include meticulous searches on fixed transects in all the representative biotopes to assess the presence/absence of amphibians, reptiles, birds and mammal species. Where necessary, special methods were implemented to augment the chances of finding species, including traps, nocturnal spotlight searches and identifying tracks and scats. Special emphasis is placed on finding threatened species.

- **Amphibian surveys**

Visual encounter surveys and audio monitoring are appropriate techniques for both inventory and monitoring of amphibian species. Both visual and auditory surveys were conducted along all transects, in plots, along streams and around ponds. Most amphibians are detectable in this manner. To ensure a comprehensive inventory, all possible microhabitats were also searched, namely: soil, water, tree trunks and beneath rocks, during both the day and at night.

- **Reptile surveys**

The most practical way to monitor reptiles, over large areas, is to sample along transects and systematically search encountered refuge areas. Transects were surveyed in different habitats and all “cover” objects within a specified distance of the line turned over and checked. One particular strength of transect monitoring is that it can be used to relate reptile abundance to habitat variables, such as vegetation and cover. The main objective of the survey is not to find as many reptiles as possible, but to get a reliable estimate of available habitat and quality of shelter and to compare these with expected reptiles and their required suite of habitat types.

- **Bird surveys**

Transects are probably the most widely used method of estimating the number of bird species in terrestrial habitats. Traditionally, observers will move along a fixed route undertaking surveys and recording the birds they see on either side of the route. For small birds, which are usually relatively numerous, a transect width of 10m on either side of the route (or 20-30m in open habitats) was found to be suitable for this study.

Transects were placed in such a way that all dominant soil and associated habitat types were adequately covered. Birds outside the transect band or those flying over were noted. Surveys always commenced at first light when avian activity was at its peak. Bird calls are equally important in bird surveys and especially important during point counts in rugged terrain and dense bush where visual observations are limited. Point surveys can also be used within wide open areas where birds can be spotted from a distance, for example pans and grassland flats.

- **Mammal surveys**

The same line-transects were surveyed on foot to monitor diurnal mammal species. Each sighting as well as the related vegetation features were recorded to establish habitat preferences. All major habitat types were assessed. Visual sightings, as well as all signs of mammal presence (tracks and scats) were used as indicators of presence for some species.

- **Habitat surveys**

Representative habitat transects within the study area were surveyed. Macro- and micro-habitat surveys were conducted to assess the quality of habitat and its potential to support various faunal species.

In assessing the habitat profiles in conjunction with the distribution data per species, accurate information on the probability of the species occurring in the relevant biotopes was obtained. Thus, a list of expected species for the different biotopes in the survey area was compiled and compared with the fauna observed during monitoring surveys.

The information obtained from the micro-habitat surveys was used to support the prediction abilities of the process. To this end, quality and quantity of habitat aspects provide an indication of species abundance, while presence or absence of habitat aspects indicates the probability of species occurrence. Habitat quality classifications could be a useful indication of resource utilisation (especially in adjacent areas).

The quality of baseline data is considered reasonable and appropriate for the purposes of this report.

2.4 Impact Assessment methodology

2.4.1 Mpumalanga Biodiversity Sector Plan (MBSP) and Threatened Ecosystems

It is important to note that all decisions regarding land-use applications in Mpumalanga are going to be evaluated by the authorities using the CBA maps and data (Figures 39 to 31), so it makes sense to consider these proactively, either prior to, or during, the EIA process (MBSP Handbook, 2014).

The following are extracts from the MBSP Handbook (2014) provided as background to our approach: “Environmental assessment is used to determine the broad ‘environmental fit’, and ecological sustainability of proposed land-use changes. It also establishes the biodiversity context within which a change in land-use is being contemplated and against which its likely impacts (both site-based and cumulative) must be assessed. CBA maps and their associated land-use guidelines provide a proactive and scientific basis for assessing the potential impacts of proposed land-uses and play an important role in providing a biodiversity-sensitive perspective in this process.”

Preliminary systematic biodiversity plans will help ascertain whether any habitat modification will contribute to cumulative impacts and compromise biodiversity targets for specific ecosystems or species, or by contributing to habitat fragmentation and degradation of ecological processes.

<p>1</p> <p>Prepare for the site visit</p>	<p>Purpose: To determine the biodiversity context of the proposed land-use sites (using CBA maps, land-use guidelines and underlying GIS layers)</p>	
	<p>Establish how important the site is for meeting biodiversity targets? (Is it in a CBA or ESA)</p>	
	<p>Assess if the proposed land-use is consistent with the desired management objectives for the site (Use the land-use guidelines)</p>	
	<p>Find out if threatened or other red data-listed species or ecosystems are present</p>	
<p>2</p> <p>Conduct the site visit</p>	<p>Purpose: To Ground-truth the CBA maps and conduct additional biodiversity assessments</p>	
	<p>Compare mapped land cover with observed land cover at the site</p>	<p>Record observed features in site assessment report</p> <p>Further planning to proceed using ground-truthed land cover</p>
	<p>Compare mapped CBA or ESA features with ground-truthed ones</p>	<p>Verify biodiversity features, paying special attention to locality and ecosystem threat status of CBA wetlands, and functionality of ecological corridors; report any discrepancies between mapped and observed features to MTPA</p>
	<p>Identify compromises and solutions that minimise impacts on biodiversity and conflicts in land-use</p>	<p>Retain natural habitat and connectivity in CBAs and ESAs</p>
		<p>Apply the mitigation hierarchy</p>
		<p>Secure priority biodiversity in CBAs and ESAs through biodiversity stewardship</p>
		<p>Remedy degradation and fragmentation through rehabilitation</p>
<p>Promote long-term persistence of taxa of special concern</p>		
<p>3</p> <p>Assess impact on biodiversity</p>	<p>Purpose: To make recommendations regarding the impacts of the proposed land-use development on biodiversity</p>	
	<p>When impacts are likely to be insignificant</p>	<p>Biodiversity specialist to write a brief report that: demonstrates that MBSP has been meaningfully consulted; describes the state of biodiversity at the preferred and alternative sites; describes what the impacts will be (local and landscape-scale); includes a map/maps and interpreted photographs that illustrate likely impacts on biodiversity</p>
	<p>When significant impacts are unavoidable</p>	<p>CBAs and ESAs: Treat as 'red flags' and avoid any irreversible loss of habitat; biodiversity specialist, with detailed ToR, to conduct detailed surveys and advise on layout of development; find alternative sites if possible</p> <p>ONAs: biodiversity specialist to survey site for presence of special habitats and species of special concern and take these into account in recommendations</p>

Figure 11: A summary of the first three steps to be followed in using the CBA maps proactively in environmental impact assessments.

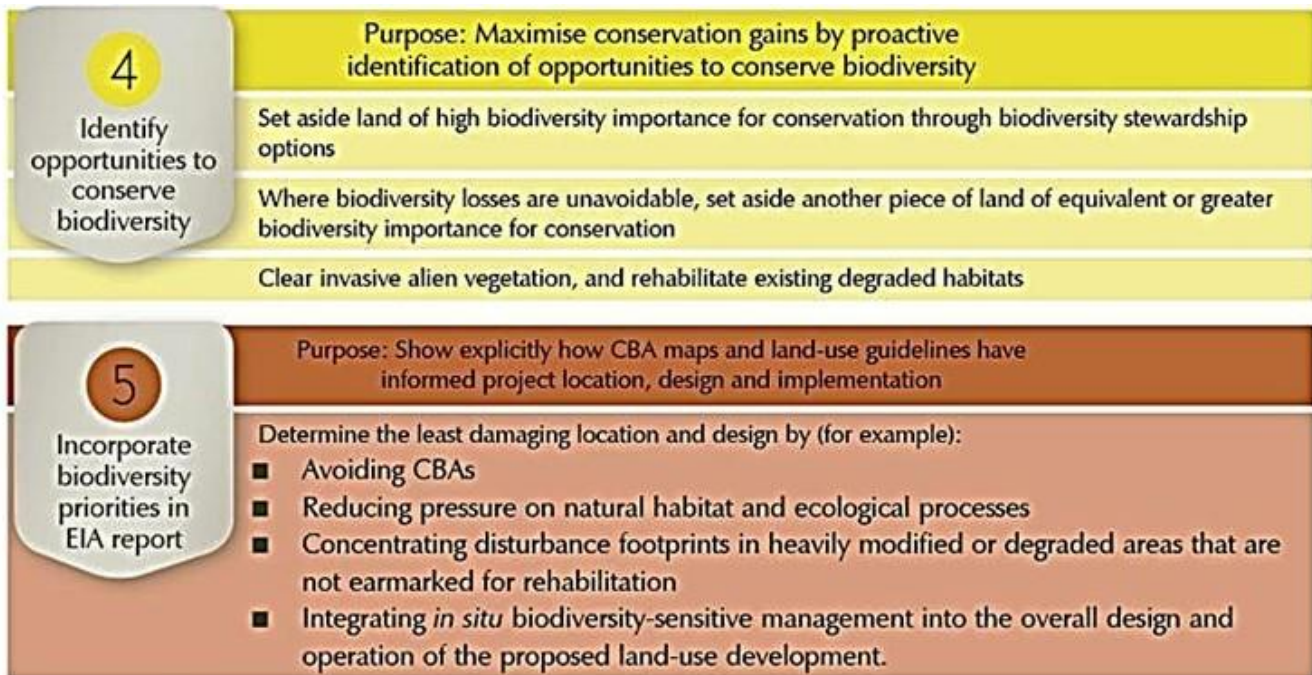


Figure 12: A summary of steps 4 and 5 to be followed in using the CBA maps proactively in environmental impact assessments.

Explanation of the Mitigation hierarchy

Identify the best practicable environmental options by avoiding loss of biodiversity and disturbance to ecosystems, especially in CBAs, by applying the **mitigation hierarchy** and the land-use guidelines (Figure 13).



Figure 13: The Mitigation Hierarchy consists of 4 steps: avoid and prevent, minimise, rehabilitate and offset.

Spatial data sets that indicate Critical Biodiversity Areas

To establish how important the site is for meeting biodiversity targets, a number of resources and tools are used as prescribed by the Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Biodiversity Sector Plan, 2014). Specifically, the Land-Use Decision Support Tool (LUDS) and the MBCP are extensively used to compile the LUDS Report (BGIS, 2016). LUDS was developed to facilitate and support biodiversity planning and land-use decision-making at a national and provincial level. Its primary objective is to serve as a guideline for biodiversity planning but should not replace specialist ecological assessments.

Critical Biodiversity Areas (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. If these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

Land-Use Decision Support Tool (LUDS)

To establish how important the site is for meeting biodiversity targets, it is necessary to answer the following three simple but fundamentally important questions:

- How important is the site for meeting biodiversity objectives (e.g. is it in a Critical Biodiversity Areas (CBA) or Ecological Support Area (ESA)?
- Is the proposed land-use consistent with these objectives or not (to be checked against the land-use guidelines)?
- Does the sensitivity of this area trigger the requirements for assessing and mitigating environmental impacts of developments, or in terms of the listed activities in the EIA regulations?

2.4.2 Habitat sensitivity assessment

Much of the current conservation effort in South Africa is focused on promoting land-use practices that reconcile development opportunities and spatial planning at a landscape scale, with the over-arching goal of maintaining and increasing the resilience of ecosystems. This 'landscape approach' to biodiversity conservation involves working within and beyond the boundaries of protected areas to manage biodiversity within a mosaic of land-uses (MBSP: Lötter et al, 2014).

Initially an ecological sensitivity map of the project area was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various relevant reports. This includes delineating the different vegetation and habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties. Additionally, values and potential presence of vegetation and fauna species diversity, as well as species of conservation concern, were evaluated.

A three-step methodology was used to identify ecosystems:

- Step 1: Identify clusters of very high Irreplaceability planning units from the systematic biodiversity plan.
- Step 2: Delineate ecosystems using ecological, topographical and/or geological features.
- Step 3: Assess the threat value (high to low) for each ecosystem based on data Included In the systematic biodiversity planning process, to categorise as critically endangered, endangered or vulnerable respectively.

Five, broad-scale botanical biodiversity 'sensitivity' categories were identified and were developed for practical mapping purposes (Table 1). They are intended as a summary of the perceived botanical biodiversity value and sensitivity, of mapped broad-scale vegetation and land-cover type units. Based on the assessment, the sensitivity of the project footprint can be divided into five categories of sensitivity: Very high, High, Moderate, Low and Negligible.

The purpose of producing a habitat sensitivity map is to provide information on the location of potentially sensitive biodiversity features in the study area, including areas of natural vegetation, habitat types supporting important biodiversity features or high diversity, areas supporting important ecological processes and habitat suitable for any species of conservation concern.

An explanation of the different sensitivity classes is given in Table 1. Areas containing untransformed natural vegetation of conservation concern, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

Table 1: Explanation of sensitivity ratings.

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
VERY HIGH	<ul style="list-style-type: none"> • Indigenous natural areas that are highly positive for any of the following: • Presence of threatened species (Critically Endangered, Endangered, Vulnerable) and/or habitat critical for the survival of populations of threatened species. • High conservation status (low proportion remaining intact, highly fragmented, habitat for species that are at risk). • Protected habitats (areas protected according to national/provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEMBA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act) • And may also be positive for the following: • High intrinsic biodiversity value (high species richness and/or turnover, unique ecosystems) • High value, ecological goods & services (e.g. water supply, erosion control, soil formation, • carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value) • Low ability to respond to disturbance (low resilience, dominant species very old). 	<ul style="list-style-type: none"> • CBA areas. • Remaining areas of vegetation type listed in Draft Ecosystem List of NEMBA as Critically Endangered, Endangered or Vulnerable. • Protected forest patches. • Confirmed presence of populations of threatened species.
HIGH	<ul style="list-style-type: none"> • Indigenous natural areas that are positive for any of the following: • High intrinsic biodiversity value (moderate/high species richness and/or turnover). Presence of habitat highly suitable for threatened species (Critically Endangered, Endangered, Vulnerable species). • Moderate ability to respond to disturbance (moderate resilience, dominant species of intermediate age). • Moderate conservation status (moderate proportion remaining intact, moderately fragmented, habitat for species that are at risk). • Moderate to high value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value). • And may also be positive for the following: 	<ul style="list-style-type: none"> • Habitat where a threatened species could potentially occur (habitat is suitable, but no confirmed records). • Confirmed habitat for species of lower threat status (near threatened, rare). • Habitat containing individuals of extreme age. • Habitat with low ability to recover from disturbance. • Habitat with exceptionally high diversity (richness or turnover). • Habitat with unique species composition and narrow distribution. • Ecosystem providing high value ecosystem goods and services.

	<ul style="list-style-type: none"> Protected habitats (areas protected according to national / provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEMBA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act). 	
MEDIUM-HIGH	<ul style="list-style-type: none"> Indigenous natural areas that are positive for one or two of the factors listed above, but not a combination of factors. 	<ul style="list-style-type: none"> Corridor areas. Habitat with high diversity (richness or turnover). Habitat where a species of lower threat status (e.g. (near threatened, rare) could potentially occur (habitat is suitable, but no confirmed records).
MEDIUM	<ul style="list-style-type: none"> Other indigenous natural areas in which factors listed above are of no particular concern. May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural habitat is still ecologically functional. 	
MEDIUM-LOW	<ul style="list-style-type: none"> Degraded, secondary or disturbed indigenous natural vegetation. 	
LOW	<ul style="list-style-type: none"> No natural habitat remaining. 	

A Biodiversity Sector Plan can be used to guide conservation action (such as identifying priority sites for expansion of protected areas), or to feed spatial biodiversity priorities into planning and decision-making in a wide range of cross-sectoral planning processes and instruments such as provincial and municipal integrated development plans and spatial development frameworks, land-use management schemes, environmental management frameworks and environmental management plans (MBSP: Lötter et al, 2014).

2.4.3 Impact Rating Methodology

It is the goal of the impact assessment process to determine the significance of potential environmental impacts associated with the proposed development. The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur. Each impact was evaluated individually, however the possibility of a cumulative impact was also considered and evaluated accordingly.

The potential impacts or risks associated with the proposed development were assessed based on the following criteria:

- Applicable phase: Construction, Operational, (Decommissioning)
- Nature of impact: Provides a description of the expected impacts (Negative, neutral or positive)

The criteria used to determine impact consequence are presented in the table below.

Table 2: Criteria used to determine the consequence of the impact.

Rating	Definition of Rating	Score
A. Extent - the area over which the impact will be experienced		
Site	Confined to the site, or part thereof	1
Local	Effect limited to 3 to 5km of the site	2
Regional	Effect will have an impact on a regional scale.	3
B. Intensity - the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration - the timeframe over which the impact will be experienced and its reversibility		
Short-term	Up to 2 years	1
Medium-term	2 - 15 years	2
Long-term	>15 years	3

The scores are then combined (A+B+C) to determine the Consequence Rating (Table 3).

Table 3: Calculation of the consequence score.

Combined Score (A+B+C)	3-4	5	6	7	8-9
Consequence Rating	Very low	Low	Medium	High	Very high

The probability of the impact occurring needs to be considered in order for the final significance rating to be informed by the specific context.

Table 4: Probability Classification.

Probability - the likelihood of the impact occurring	
Improbable	<40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	>70%- 90% chance of occurring
Definite	>90% chance of occurring

The significance of the impact is attained by cross-referencing probability against consequence, as is listed below.

- Significance:
- Low: Where the impact will have a relatively small effect on the environment and will not have an influence on the decision
- Medium: Where the impact can have an influence on the environment and the decision and should be mitigated
- High: Where the impact definitely has an impact on the environment and decision regardless of any possible mitigation.

Table 5: Status and Confidence classification.

Status of Impact	
Indication whether the impact is adverse (negative) or beneficial (positive)	+ ve
	- ve
Confidence of Assessment	
The degree of confidence in predictions based on available information, the EAP's judgement and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **INSIGNIFICANT:** the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.
- **VERY LOW:** the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.
- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.
- **MEDIUM:** the potential impact **should** influence the decision regarding the proposed activity/development.
- **HIGH:** the potential impact **will** affect the decision regarding the proposed activity / development.
- **VERY HIGH:** The proposed activity should only be approved under special circumstances.

Significance post mitigation: Describes the significance after mitigation.

Mitigation: Provides recommendations for mitigation measures.

3. Description of the study area

3.1 Present Ecological State of the study area

This report covers an area on the Portions 8, 13 & 14 of the Farm Malelane Estate 140- JU in the Malalane area, Mpumalanga. The study area is located within the quarter degree grid 2531CB. The site is located within the Ehlanzeni District Municipality, Mpumalanga Province.

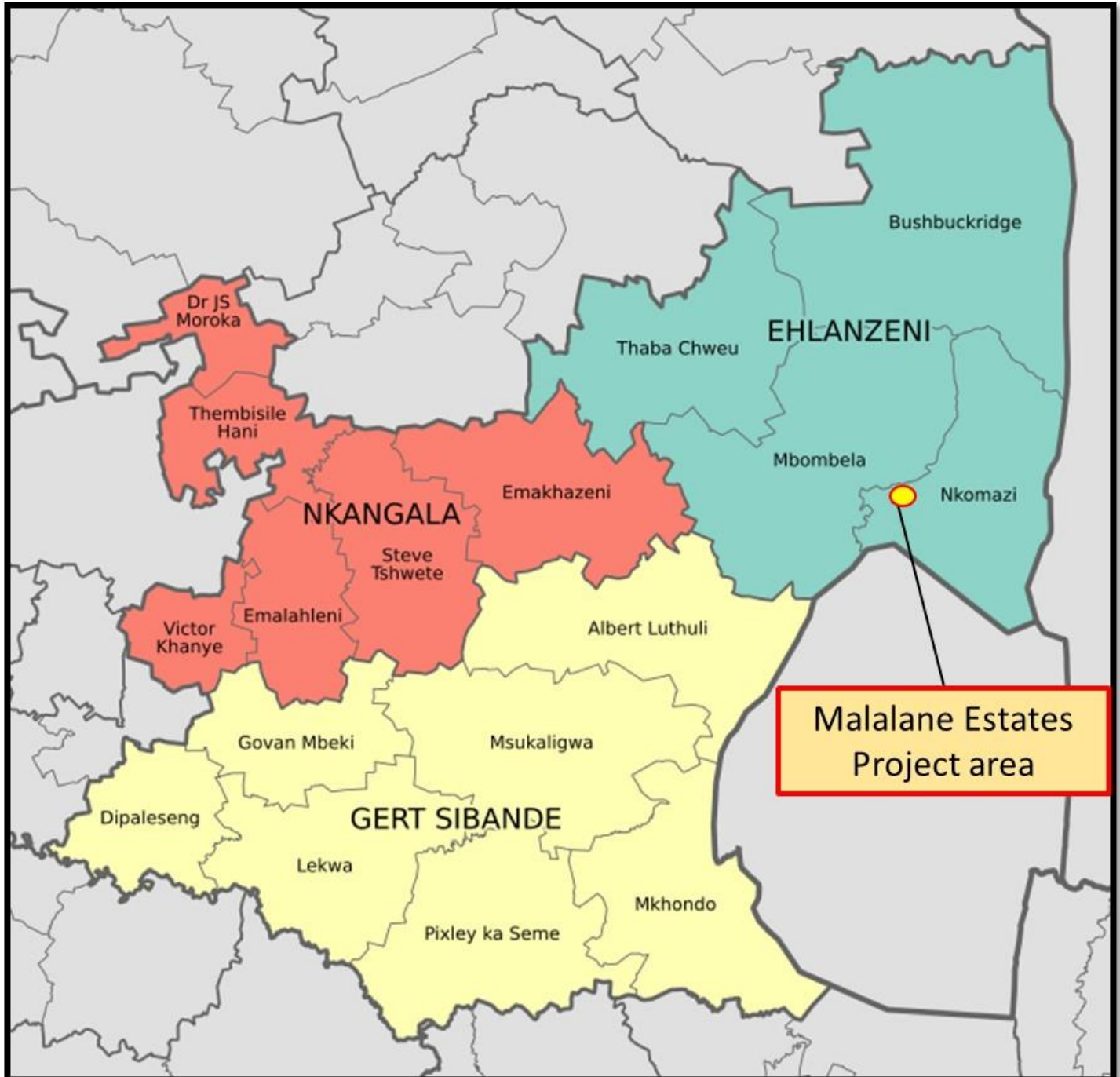


Figure 14: Location of the KMAE project area.

Local Municipality

The Ehlanzeni District Municipality is located in the Komati River catchment of the Inkomati WMA. There are a number of towns and rural villages that make up the Municipality. The Ehlanzeni District Growth and Development Plan is of relevance and it describes the importance of the Maputo Development Corridor as it provides Ehlanzeni specifically Mbombela with the status of being classified as an economic development node.

According to Statistics South Africa's September 2005 labour force survey, Agriculture was the fourth highest formal employer in the province: 11.5% of the province's formal employment. Forestry and other agricultural activities provide jobs far in excess of their contributions to Provincial GGP – the sector comprises 6.1% of total GGP yet provides 18.1% of the employment opportunities in the province. Although resources in this sector are constrained, agriculture holds significant employment potential for the province.

The Nkomazi Local Municipality is characterised by farms, manufacturing and tourism, as the main source of employment and economic activity. The employment sector or industries in which the people of Nkomazi are involved shows that the Agriculture Sector employs 22% of the work force. (Nkomazi Local Municipality, 2013). In the Mpumalanga Province the agriculture sector contributes about 14% to the economic activity. Associated land uses in the area include agriculture, nature conservation, cattle ranching, game breeding, tourist facilities and hunting (Nkomazi Local Municipality, 2013).

The original Malalane Estates farm was an agricultural venture which was used to produce perennial summer and winter crops. The only existing infrastructure consists of a number of residential structures which are located in the north-eastern portion of the farm and an agricultural irrigation system with water sourced from the Crocodile River. The study area is bordered by a non-perennial drainage feature to the east, by a railway line to the south, a wholesale nursery to the west and by the Crocodile River to the north (Figure 1).

The area bordering the farm is totally developed with agriculture (Figure 15). Main land uses within a 10km radius of the property are as follows:

- Sugar cane is the dominant crop;
- Orchards are found along the river;
- Nurseries directly adjacent;
- Field crops;
- Malelane is about 4km east and a small township directly south;
- The Kruger National Park is directly north of the site.

Farming potential

Although the soil is rocky, it is suitable for orchards. It was recently used for seed production of maize and sunflowers, with the balance under instant lawn. The land is too small for livestock.

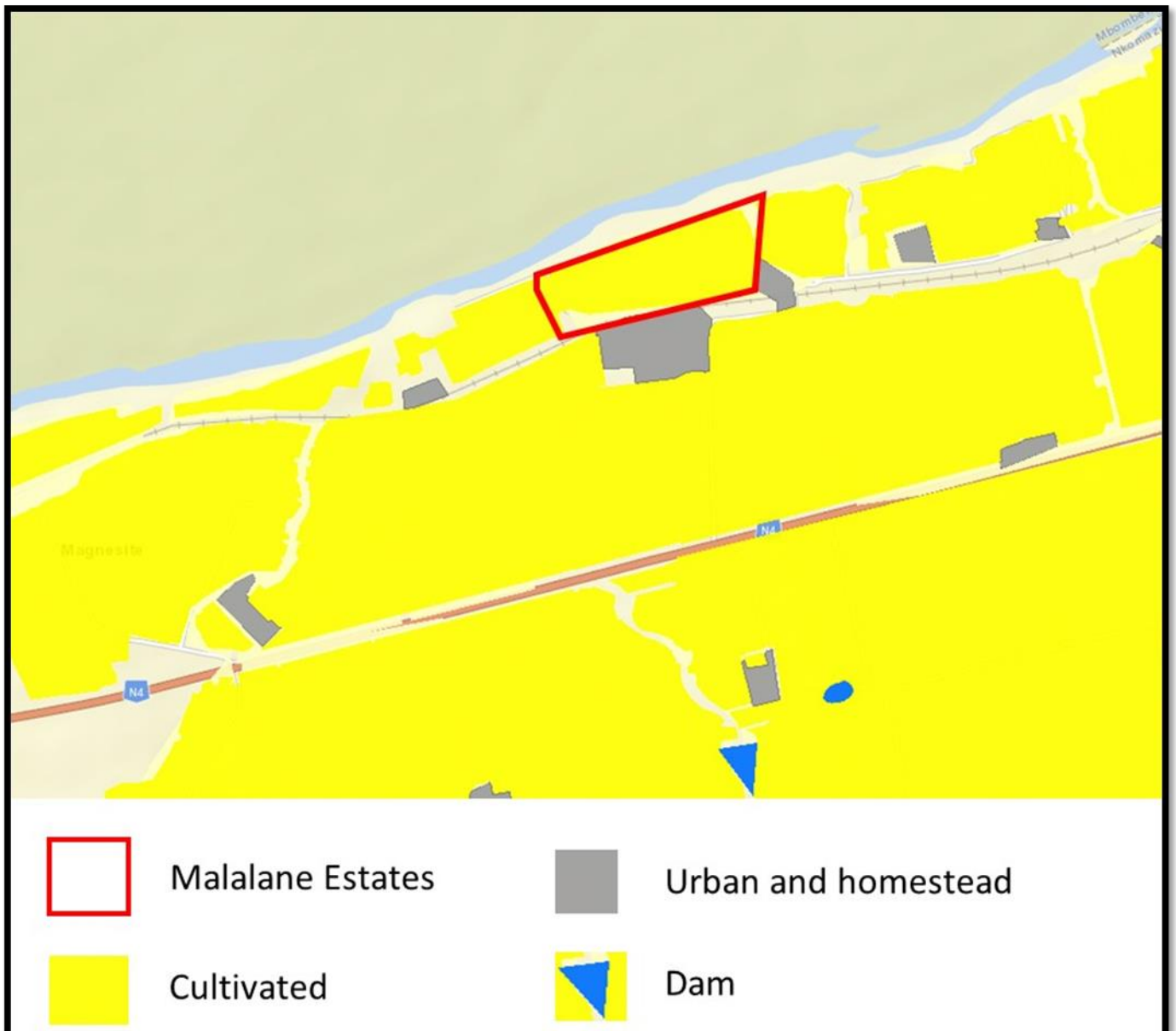


Figure 15: The land cover for the KMAE project area as per the Mpumalanga LUDS maps (BGIS, 2015).

The historic land use of the Malelane Estate is summarised in Table 6.

Table 6: The land use on the farm pre-2020 (Gouws, 2017).

Land use	Area (ha)
Cultivated	18.5
Housing	2.2
Industry (Packing shed)	0.3
Instant lawn	5.9
Vacant	6.2
TOTAL	33.1



Figure 16: The land use classes for the KMAE project area (Gouws, 2017).

The property consists of 27 hectares that was used for seed production of crops and for instant lawn. Approximately 14.9 hectare is classified as high potential agricultural land. The balance is either too rocky or under infrastructure. Availability of irrigation allowed for moderate potential land to become productive. Instant lawn was produced on most of the high potential land.

The composite Figure 17 illustrates the following:

- Figure 17a presents a screen grab from Google Earth (the year 2004), showing dense vegetation on the embankment between the river and the fence, probably reeds and shrubs.
- Figure 17b presents the same area, however 16 years later (the year 2020);
- note the lack of vegetation on the embankment between the river and the fence;
- also note the colour of the soil on the embankment between the river and the fence;
- and the brown circles mark the formation of erosion gulleys forming on the slope below the farming area and the fence.
- Figure 17c indicates the distinct colour difference of the embankment between the river and the fence in front of the farming area and the rest of the upstream and downstream embankment.

Although the change in vegetation cover cannot be explained initially (it might be owing to the extended drought), but the red soil colour most probably comes from topsoil washed from the farm and deposited below the lands. The erosion gulleys also indicate concentrated flows from areas channelled between croplands, also transporting the red, well-drained Hutton soils to the area below.



Figure 17:

17a: A screen grab from Google Earth going back to 2004.

17b: Another screen grab from Google Earth, 16 years later (2020). Note the changes in bank vegetation and ground cover and erosion gullies emanating from the farm property.

17c: Note the red colour of the soil in front of the farm portion in comparison with the adjacent embankment areas.

3.2 Physiography of the study area

Ecoregion and River Characteristics

The vegetation type of the project area consists of Granite Lowveld (SVI 3; Mucina & Rutherford, 2006).

Distribution: A north-south belt on the plains east of the escarpment from Thohoyandou in the north, with an eastward extension to Mica and Hoedspruit to the area east of Bushbuckridge. Substantial parts are found in the Kruger National Park spanning areas east of Orpen Camp southwards through Skukuza and Mkuhlu, including undulating terrain west of Skukuza to the basin of the Mbyamiti River. Altitude 250-700 m.

Vegetation & Landscape Features: Consists of tall shrubland with few trees to moderately dense low woodland on deep sandy uplands. Also includes dense thicket to open savanna in the bottomlands and a dense herbaceous layer on fine-textured soils.

Geology & Soils: From north to south, the Swazian Goudplaats Gneiss, Makhutswi Gneiss and Nelspruit Suite (granite gneiss and migmatite), and further south still, the younger Mpuluzi Granite (Randian) form the major basement geology of the area. Archaean granite and gneiss weather into sandy soils in the uplands and clayey soils with high sodium content in the lowlands.

The property is located on alluvium close to the river and residual towards the south. The topography consists of mid-slopes that slopes towards the north. The higher lying morphological units consist of red well-drained Hutton soils with loose stone in places (Figure 18). Most of the soils have abundance of stones and is the main impediment to land use capability; more than half of the site was found to have more than 40% stone in the soil matrix, but certain portion contains more than 70%.

Conservation: Vulnerable but Least Concern according to the MBSP Handbook. Target 19%. Some 17% statutorily conserved in the Kruger National Park. About the same amount conserved in private reserves, mainly the Selati, Klaserie, Timbavati, Mala Mala, Sabi Sand and Manyeleti Reserves. More than 20% already transformed, mainly by cultivation and by settlement development. Erosion is low to moderate.

The vegetation type represents tall shrubland with few trees to moderately dense low woodland on the deep sandy uplands. Dense thicket to open savanna occurs in the bottomlands. The dense herbaceous layer contains the dominant *Digitaria eriantha*, *Panicum maximum* and *Aristida congesta* on fine-textured soils, while brackish bottomlands support *Sporobolus nitens*, *Urochloa mosambicensis* and *Chloris virgata*. At seep lines where convex topography changes to concave, a dense fringe of *Terminalia sericea* occurs with *Eragrostis gummiflua* in the undergrowth.

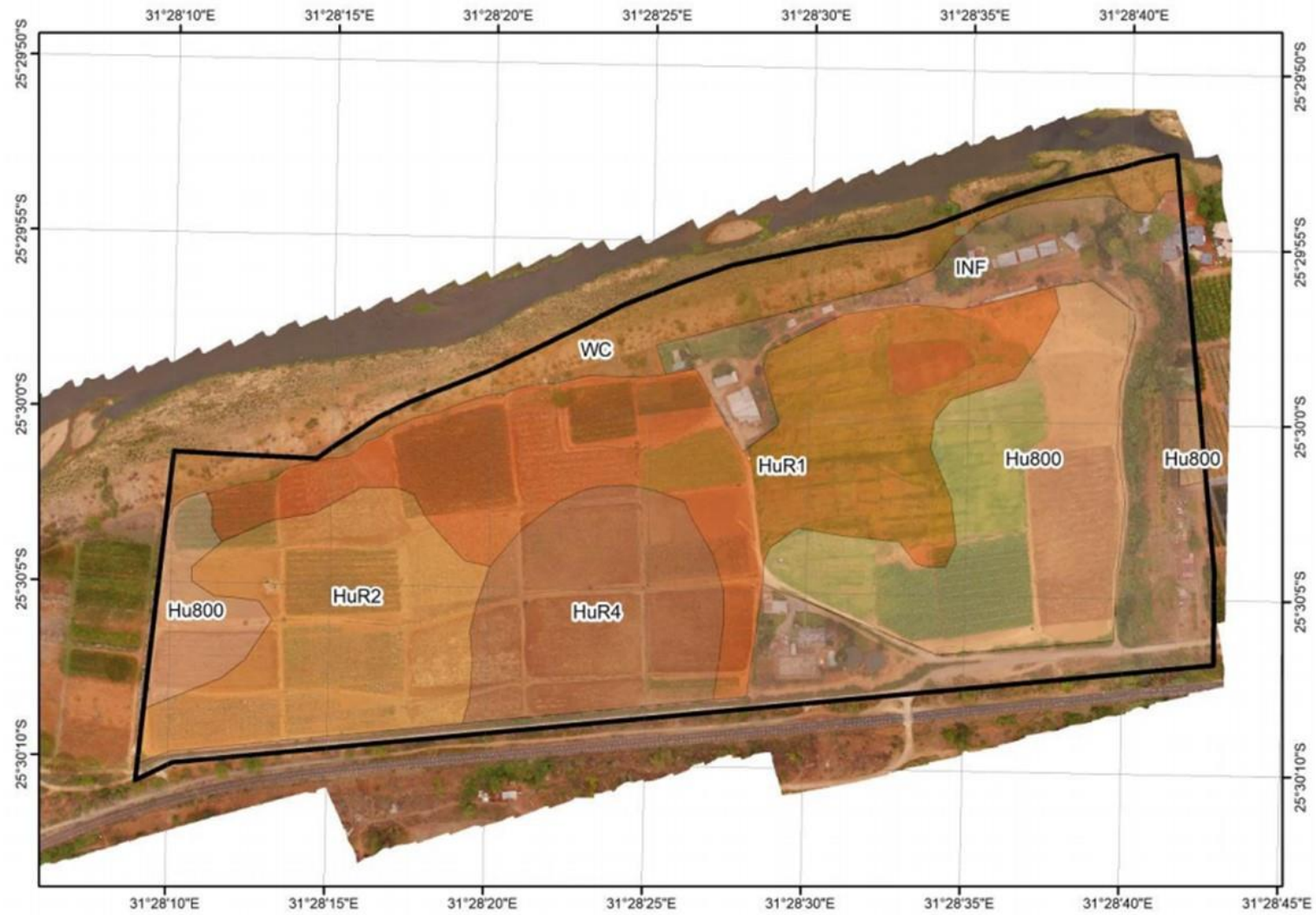


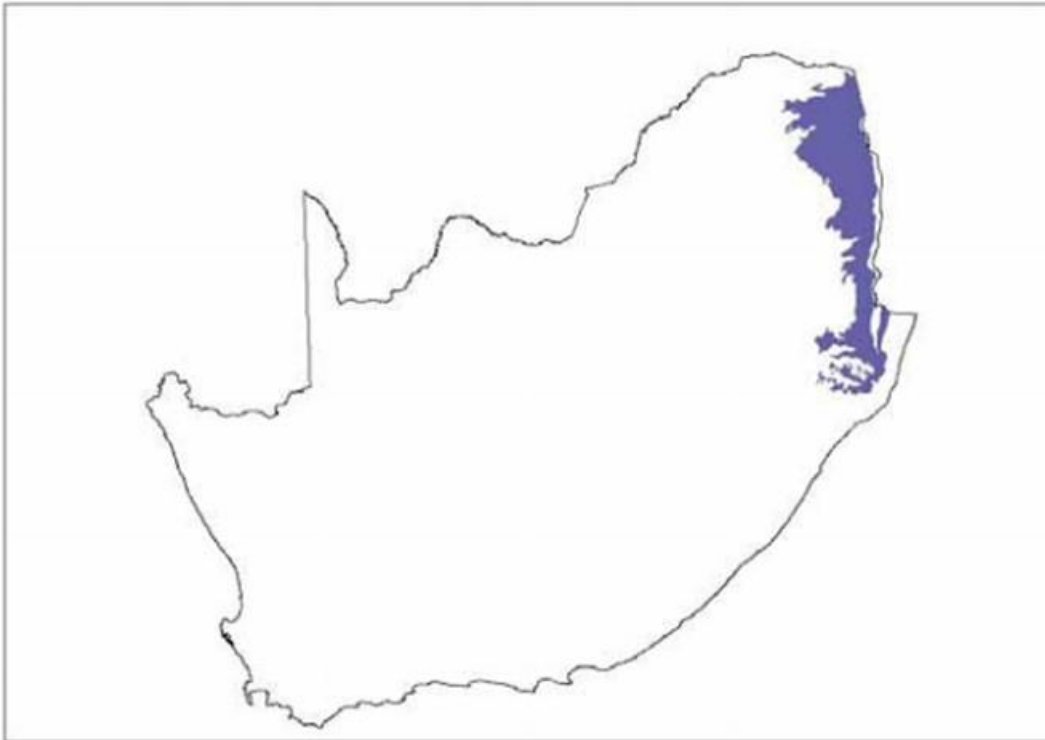
Figure 18: Soil properties on the KMAE project area (Gouws, 2017).

Catchment and Wetland Setting

The Farm Malelane Estate is situated in the Crocodile River Sub-Water Management Area which form part of the Inkomati drainage system. The project site is located in quaternary catchment X24D and the Crocodile River is the northern boundary of the farm (Figure 1).

K1.1.1 Ecoregion 3: Lowveld (Figure 19)

This hot and dry region is characterised by plains with a low to moderate relief and vegetation consisting mostly of Lowveld Bushveld types. Open hills with high relief and low mountains with high relief are present towards the west on the boundary with the North Eastern Highlands. In the north Mopane Bushveld and Mopane Shrubveld occur (Kleynhans et al., 2005).



K1.1.2 Figure 19: Preliminary Level I River Ecoregional classification System for South Africa: Ecoregion 3.07: Lowveld Ecoregion.

General: Although several large perennial streams traverse this region, e.g. White and Black Umfolozi, Mkuze, Pongolo, Great Usutu, Komati, Crocodile, Sabie, Olifants, Letaba and Luvuvhu, few perennial streams originate here.

- Mean annual precipitation: Tends to be moderate towards the west, but low over most of the region.
- Coefficient of variation of annual precipitation: Mostly moderate.
- Drainage density: Mostly low, but high in some of the central areas.
- Stream frequency: Mostly low to medium but high in some of the central areas.
- Slopes 80% of the area.
- Median annual simulated runoff: Mostly low/moderate, but moderate in areas.
- Mean annual temperature: High to very high.

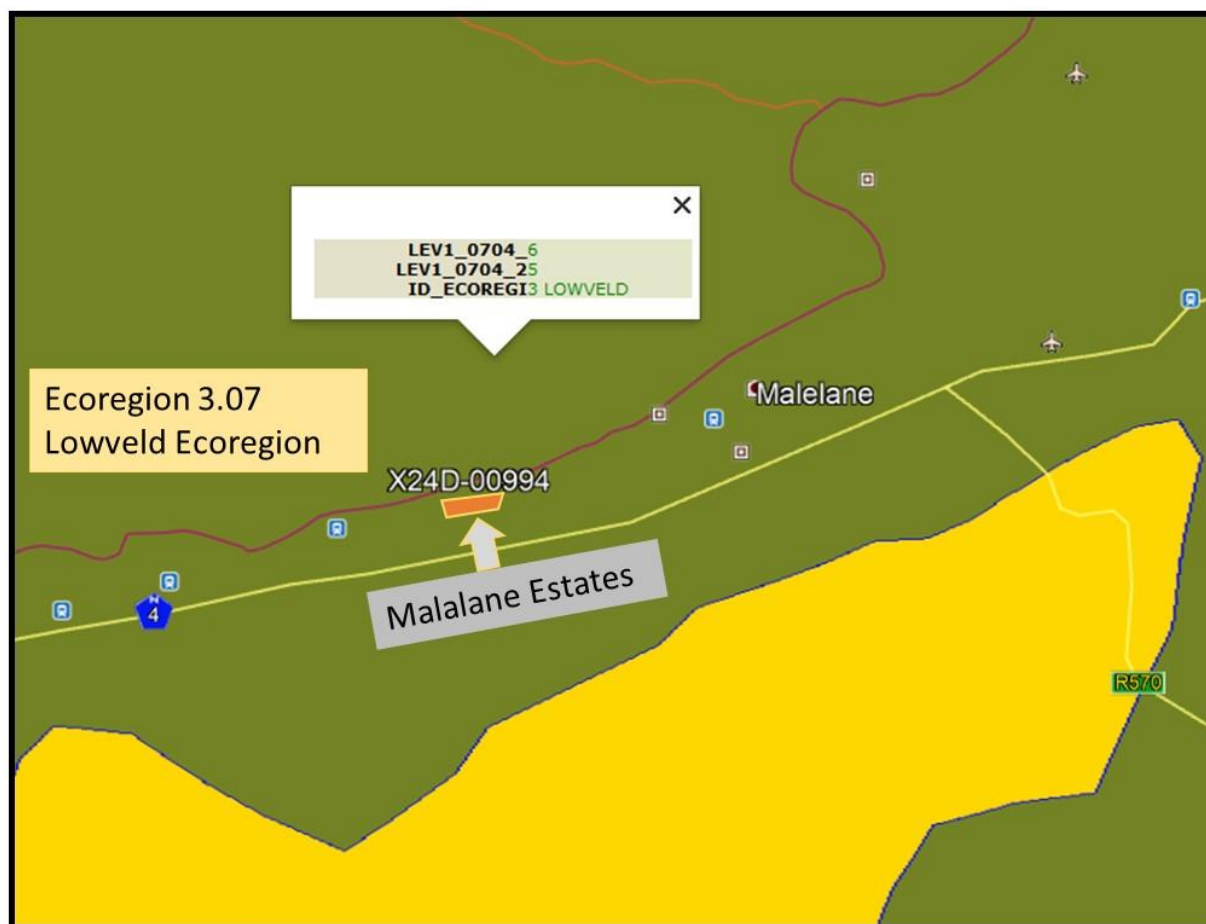


Figure 20: The project site is located in the Lowveld (3.07) Ecoregion according to the Water Resource Classification System (DWS, 2005).

Table 7: Main attributes of the Lowveld Ecoregion.

MAIN ATTRIBUTES	NORTH EASTERN HIGHLANDS
Terrain Morphology: Broad division (dominant types in bold) (Primary)	Plains; Low Relief; Plains; Moderate Relief; Lowlands, Hills and Mountains; Moderate and High Relief (limited)
Vegetation types (dominant types in bold) (Primary)	Mopane Bushveld; Mopane Shrubveld; Mixed Lowveld Bushveld; Sour Lowveld Bushveld
Altitude (m a.m.s.l) (primary)	0-700; 700-1300 limited
MAP (mm) (modifying)	200 to 1000
Coefficient of Variation (% of annual precipitation)	<20 to 35
Rainfall concentration index	30 to >65
Rainfall seasonality	Early to late summer
Mean annual temp. (°C)	16 to >22
Mean daily max. temperature (°C): February	24 to 32
Mean daily max. temperature (°C): July	18 to >24
Mean daily min. temperature (°C): February	14 to >20
Mean daily min temperature (°C): July	4 to >10
Median annual simulated runoff (mm) for quaternary catchment	10 to >250

The catchment reference numbers were obtained from the DWS PESEIS documents. The Google Earth image in Figure 21 indicates the location of the Kruger Malelane Agri Estate in the X24D catchment. The project area is situated along the banks of the Crocodile River within the X24D-00994 subcatchment.

The water quality in the lower Crocodile River (downstream from the Kaap River confluence) is poor due to agricultural runoff, which is associated with pesticides, increased trace metals, nutrients and electrical conductivity. Hyacinth infestation is very common in parts of this section and this section has been associated with sporadic fish mortalities (probably due to low dissolved oxygen concentrations).

The Kaap River has a potential impact on the lower Crocodile River due to agricultural runoff (increase in pesticides, trace elements and nutrients). Mining activities in the Kaap have a high impact on water quality in this river during low flows (increase in sulphate, electrical conductivity, iron, zinc, arsenic and cyanide, and a decrease in pH.)

In the lower sections, increased sediment loads as well as elevated dissolved salt concentrations have also been associated with stressed aquatic ecosystems. The capacity of the Crocodile River, in terms of its ability to cope with anthropogenic disturbances without suffering adverse effects, is inversely related to the existing water quality and directly related to the volume of water available (Kleynhans (1999)).

Summarized description of the modifications: Cultivated lands common along some sections (water abstraction). Weirs in some parts. Removal of bank vegetation in sections. Some erosion in sections. Runoff from urban areas and industries. Flow regulation by Kwena Dam – somewhat dampened by Nels River. Water hyacinth common during most years (Kleynhans (1999)).

Crocodile River Reach, X24D-00994, which includes the river reach adjacent to the KMAE project area, reaches from the confluence of the Nsikazi to the confluence of the Matjulu tributary. This section of the Crocodile River forms the Kruger National Park border with the northern bank in the KNP and the southern bank impacted by the town of Malelane, low density housing and tourism accommodation as well as irrigated agriculture, mostly sugarcane (18%) and citrus (cultivated orchards 1.6%).

The Instream IHI for the SQ reach X24D-00994 was calculated at 78.08% rating this SQ reach as a BC category indicating that the instream habitat integrity is close to largely natural with few modifications most of the time. Flow regime has been slightly to moderately modified and pollution is limited to sedimentation. A small change in natural habitat types may have taken place. However, the ecosystem functions are essentially unchanged (Roux, et al., 2018).

This EWR site (X2CROC-MALEL) within this river reach falls within the Kruger National Park and the habitat found is typical of the Lowveld reaches and is characterised as a low gradient stream consisting of large sandy pools with isolated riffles and runs. The substrate consists primarily of sand with some rocks and cobbles including aquatic macrophytes. No slow deep habitat was available and a side channel with some backwaters was also present. The fish velocity depth classes present was slow shallow, fast deep and fast shallow, all moderately abundant. Most of the rocky substrate was covered with thick algae (Roux, et al., 2018).

A Fish Ecstatus rating of 78.3% was calculated for this monitoring point based on all available information, placing it in an ecological Category BC (close to largely natural with low diversity and abundance of species). Stream conditions based on SASS methodology for aquatic macro-invertebrates rated as moderately impaired (Category C).

The Vegetation Conditions derived from the PES-EIS model for this reach is calculated at 72.5% and is consistent with a Category C – moderately modified indicating a loss and change of natural habitat. The Riparian IHI was calculated at 81.04% rating this reach as a Category BC indicating a close to largely natural reach with few modifications most of the time. The overall Riparian Ecostatus consisting of a combination of the Vegetation Condition and the Riparian IHI was therefore determined as a Category C (72.5%) indicating that the riparian vegetation for this SQ reach is moderately modified (Roux, et al., 2018).

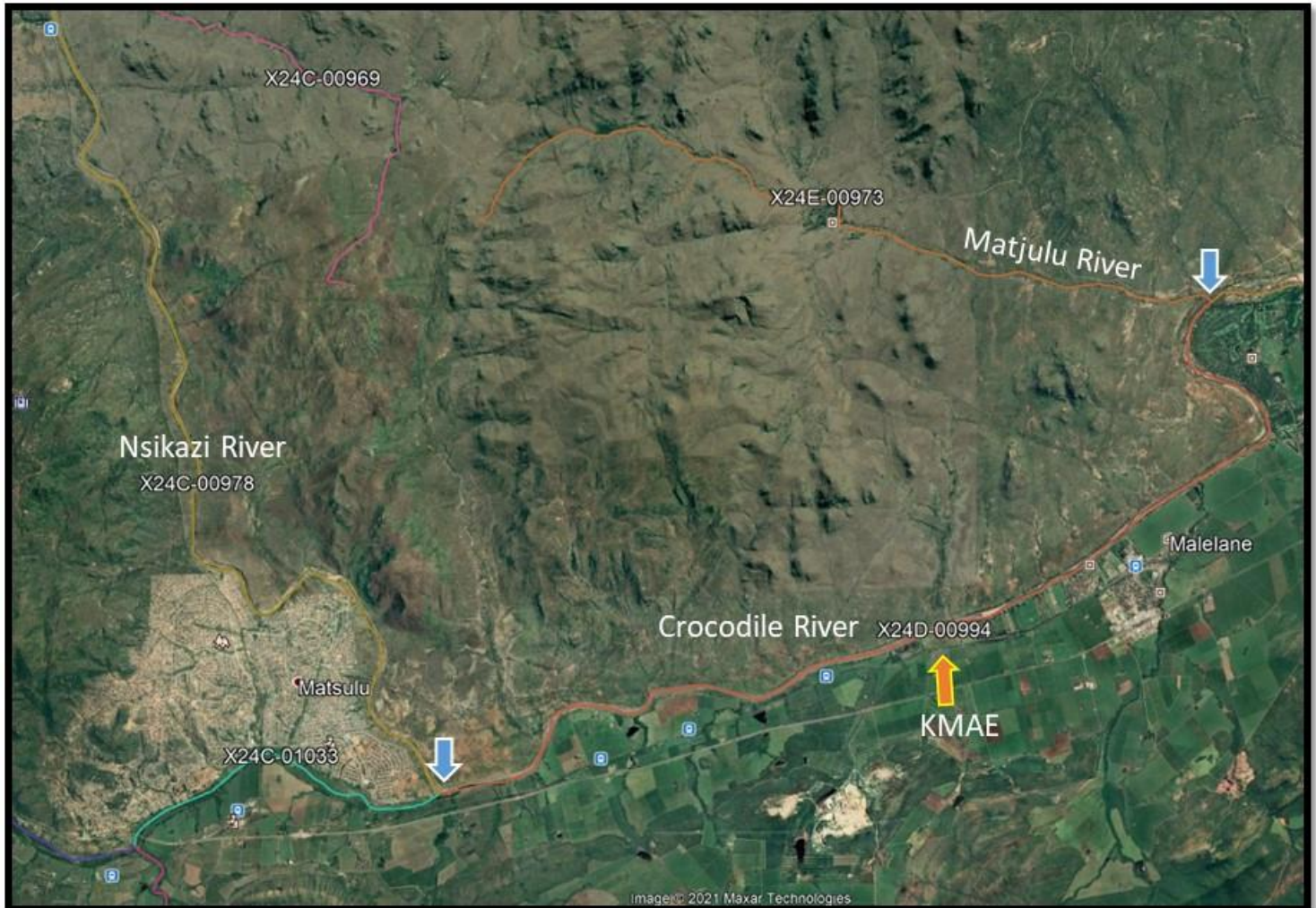


Figure 21: The Crocodile River Reach, X24D-00994, which includes the river reach adjacent to the KMAE project area, reaches from the confluence of the Nsikazi to the confluence of the Matjulu tributary.

4. Results

4.1 Vegetation units and land cover types within the study area

The most recent vegetation map for South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2007), places the entire study area (Figure 22) within Granite Lowveld (SVI 3).

Vegetation/habitat types are mapped based on available information (aerial photography, soil types, geology) and will consist of structurally distinct vegetation units (wetland, grasslands, woodland) as well as transformed areas (cultivated land, areas of alien vegetation). Vegetation/habitat units will be graded according to biodiversity value and conservation status.

Figure 22: The KMAE study area is situated within the Granite Lowveld.

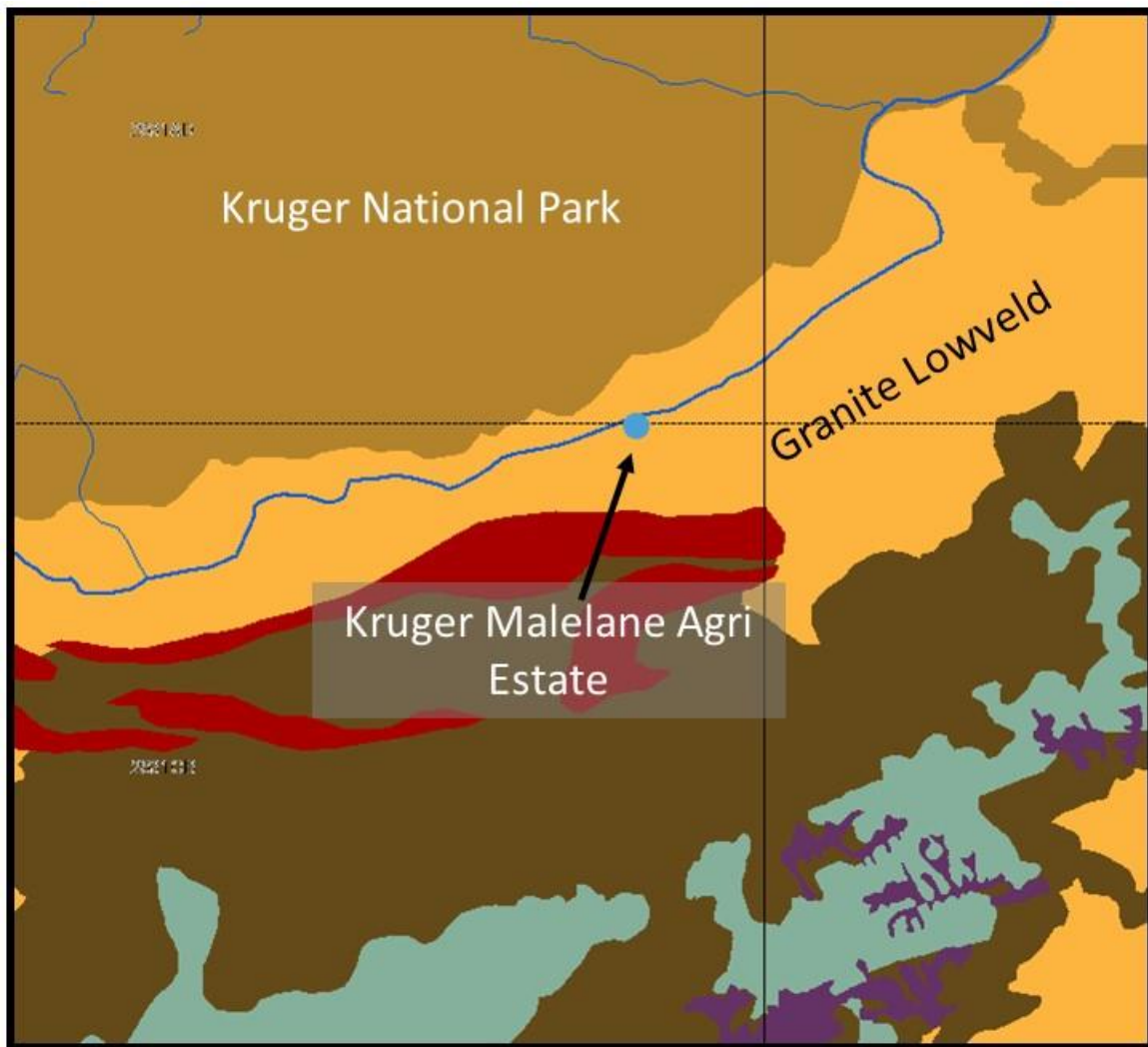


Figure 23 illustrates the land cover surrounding the KMAE project area. Most of the project area is transformed by cultivation and old lands.

The following broad-scale vegetation units are simply practical units that combine various plant communities which share structural and functional characteristics and have common management requirements.

The broad-scale vegetation units consist of two units of transformed vegetation/habitat and one unit comprising untransformed riverine habitat (Figure 23). These three units are listed below, and each unit is later described in more detail.

Vegetation units and land cover type:

Untransformed vegetation/habitat

1. Untransformed Riverine – Riparian and aquatic
 - 1a. Adjacent Crocodile River
 - 1b. Small stream on the eastern boundary

Transformed vegetation/habitat

2. Agriculture – Fallow lands
3. Infrastructure – housing

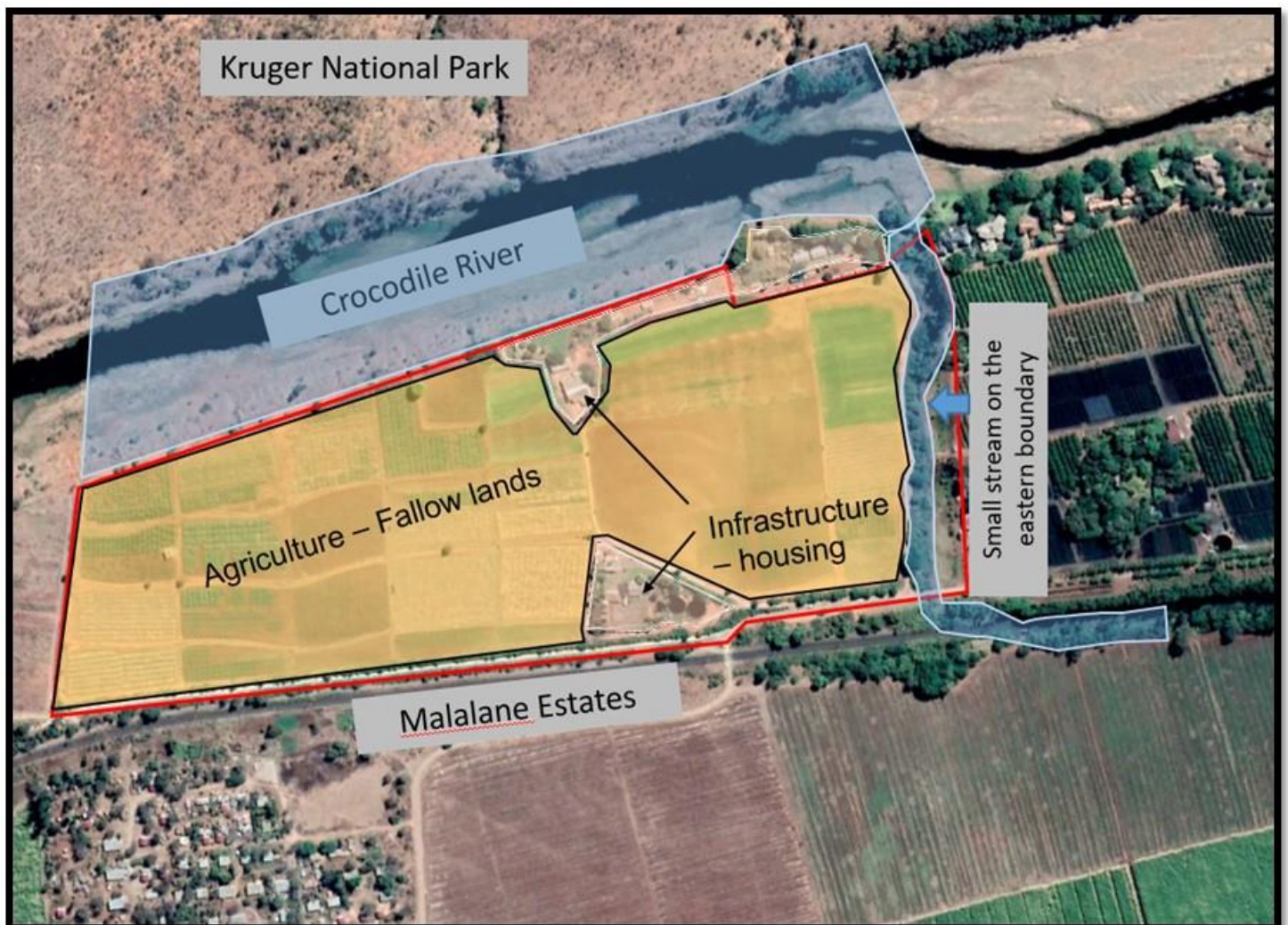


Figure 23: The broad-scale vegetation units or ground cover of the KMAE project area.

1. Untransformed Riverine – Riparian and aquatic

1a. Adjacent Crocodile River

The untransformed (primary) riverine habitat adjacent to the project area is confined to the macro-channel of the Crocodile River streambed and associated riparian zone.

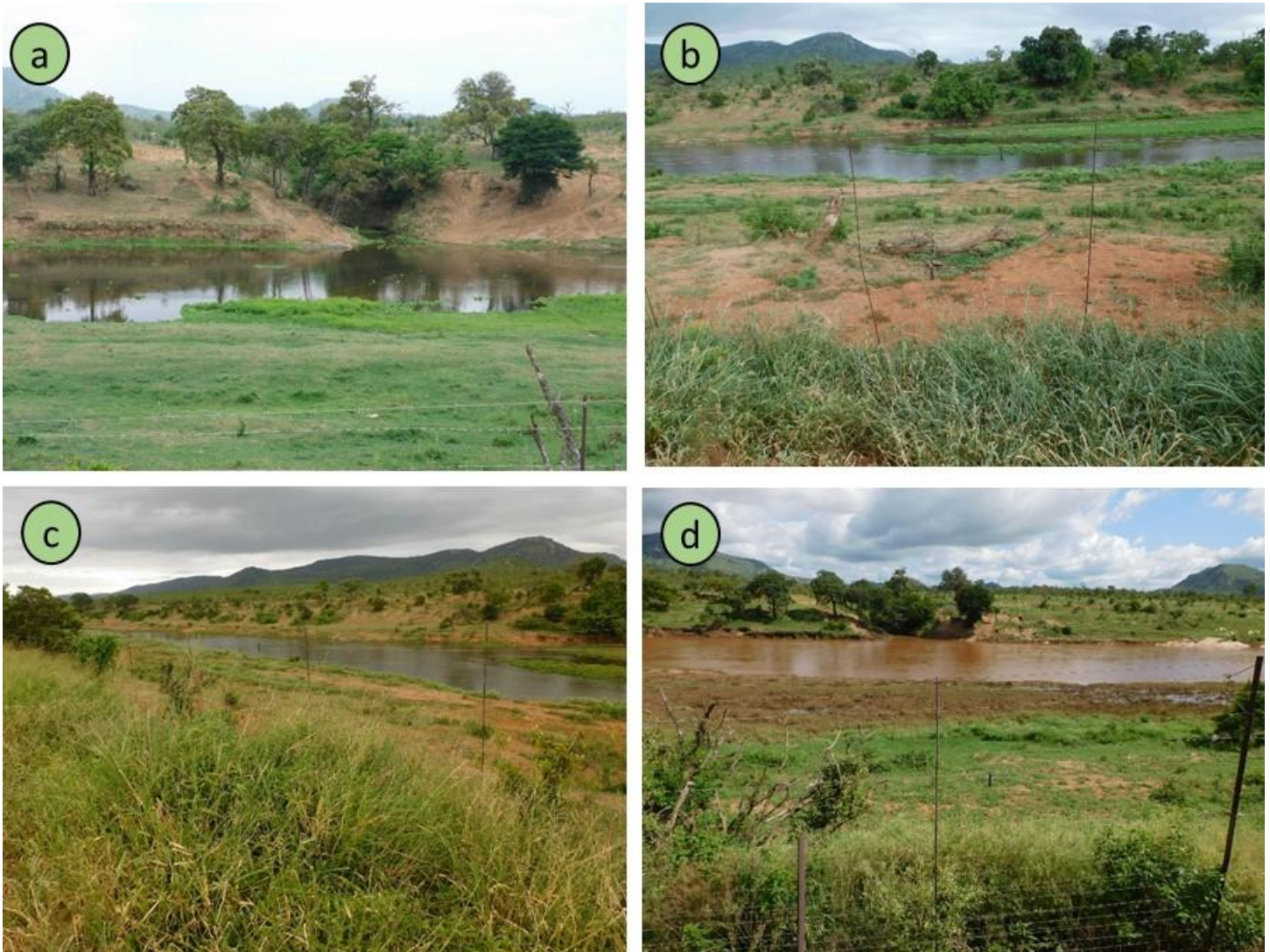


Figure 24:

24a. A view from the project area to the northern bank of the Crocodile River.

24b. A view through the current fence into the Kruger Park.

24c. An upstream view of the bordering Crocodile River.

24d. The receding flood waters of the Crocodile River after the January 2021 floods.

The Crocodile River forms the southern boundary of the Kruger Park. The macro-channel bank of the farm therefore also forms the northern boundary of the KMAE project area. Although there are some tall riparian trees on the opposite bank, most of the southern bank is without any woody vegetation. The soil on the upper riverbank has a reddish colour.

1b. Small stream on the eastern boundary

A small stream which enters the project area from the south-eastern boundary, originates on a sugarcane farm south of the railway and flows mostly through sugar cane fields.

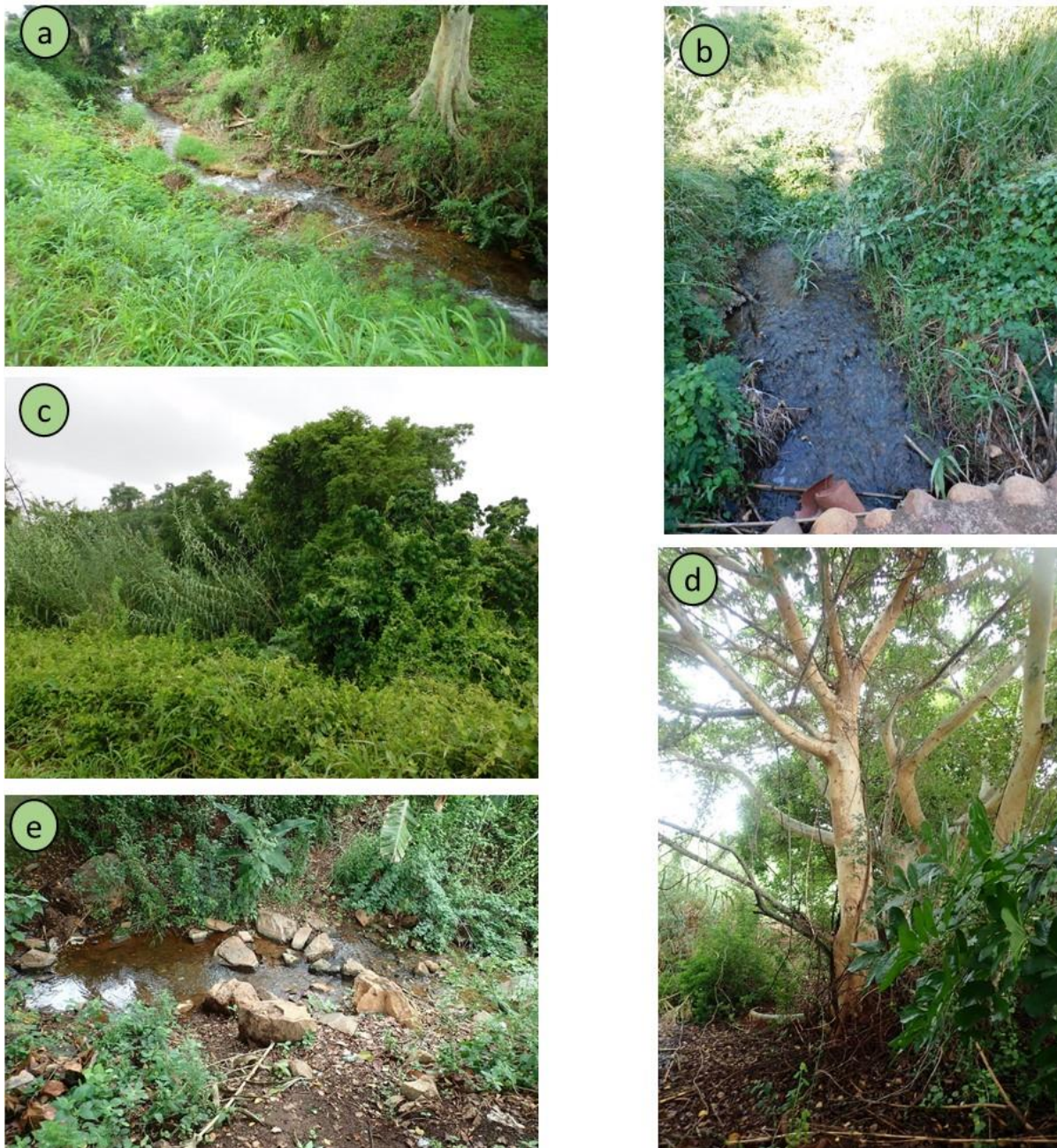


Figure 25:

25a: The small river reach close to the confluence with the Crocodile River.

25b: The stream is small, mostly not more than 2m wide and 30 cm deep.

25c: Dense riparian zone with an abundance of alien Spanish reed and other invasive plants.

25d and 25e: Despite the small size of the stream, large riparian trees are present on the edges.

The small stream is a drainage line running through the project area, and it is flanked by its riparian zone which is the interface between the terrestrial- and aquatic ecosystems. Despite the small size of the stream, large riparian trees are present on the edges and the dense riparian zone is riddled with alien and invasive plants.

Although the stream has been placed with Untransformed habitats, there are a number of aspects that classifies this habitat less natural, such as alien invading plants, removal of riparian vegetation and inflow of fertilizers.

Transformed vegetation/habitat

2. Agriculture – Fallow lands

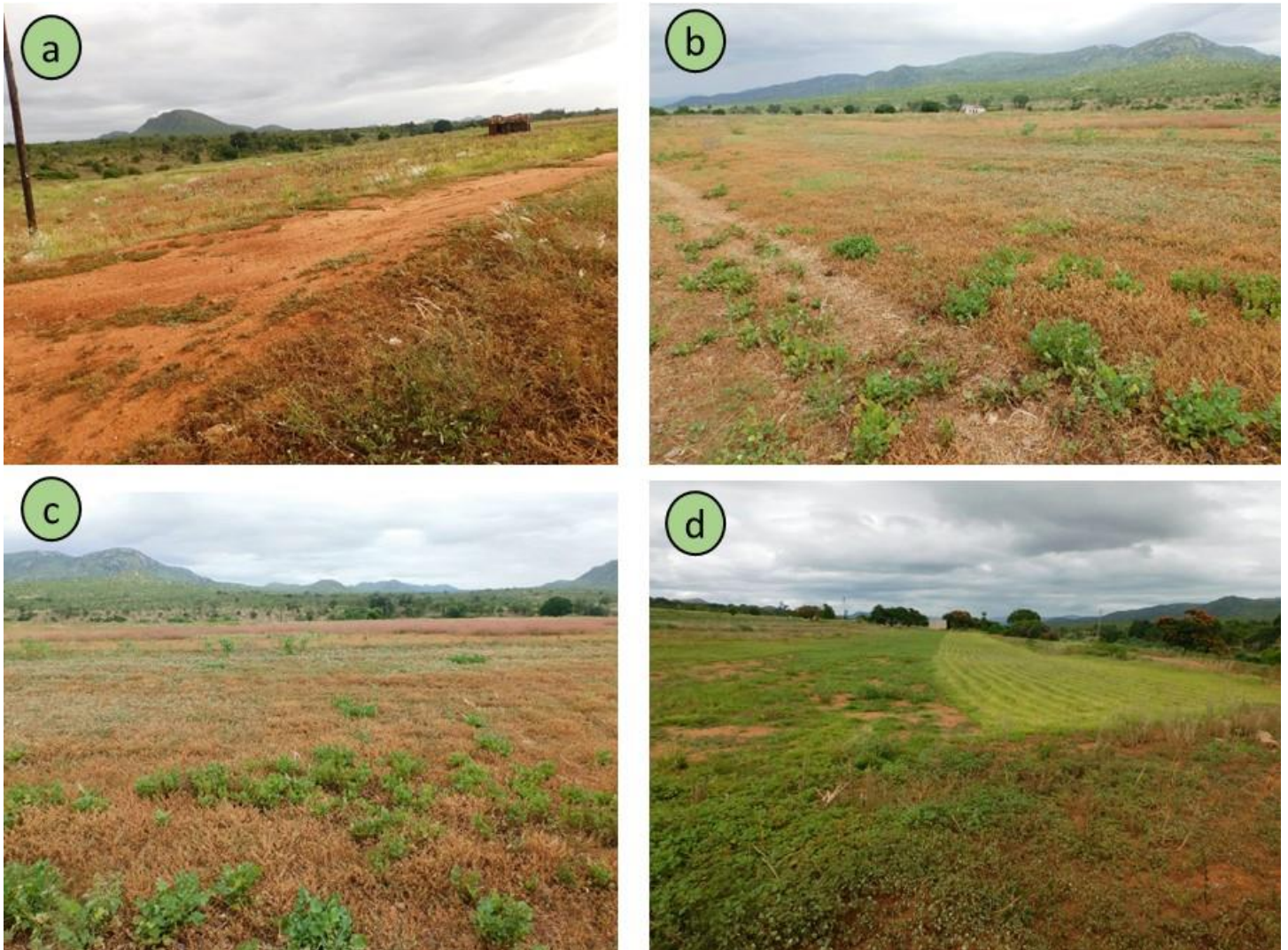


Figure 26 a - d: Most of the project area is transformed by agriculture; fallow lands cover 90.0% of the project area.

3. Infrastructure – housing

There are some houses and derelict buildings on the farm.



Figure 27:

27a-b: Housing of the Irrigation Board and farm accommodation.

27c: There are some dirt tracks and roads on the farm.

27d: An old house will be evaluated for its historic importance.

27e: The old farm house will remain as accommodation for the farm manager.

4.2 Ecological survey transects in the KMAE project area.

A major component of this study is the characterisation of habitat types and associated fauna (obtained from regional distribution records) of the available landscape/environment. This information is used as a basis for predicting the potential impacts of the proposed project, and other human-induced activities, on the composition of threatened fauna in the study area. Representative survey sites were selected in all prominent vegetation types of the study area. Extensive transects (400-800m) were then surveyed for prevailing habitat and all associated fauna. GPS readings provide fixed locations of these transects for future monitoring (Table 8; Figure 28).

Table 8: Description of transects or point counts conducted for habitat, micro-habitat, influences and impacts, birds, mammal signs and herpetofauna (November 2020 to April 2021).

Habitat	Coordinates		Length (m)	Total (m)
	Start	End		
Untransformed vegetation/habitat				
1. Untransformed Riverine – Crocodile River				
Transect 1	25°30'2.57"S 31°28'9.89"E	25°29'55.96"S 31°28'33.09"E	682	
2. Untransformed Riverine – Unnamed stream				
Transect 2	25°29'55.60"S 31°28'39.55"E	25°30'5.50"S 31°28'39.18"E	305	
Transformed vegetation/habitat				
Transect 3	25°30'5.98"S 31°28'38.69"E	25°30'6.16"S 31°28'9.80"E	830	
Transect 4	25°30'3.25"S 31°28'9.70"E	25°30'7.82"S 31°28'27.58"E	253	
Transect 5	25°30'8.07"S 31°28'20.79"E	25°29'59.88"S 31°28'20.29"E	772	
Transect 6	25°30'4.07"S 31°28'28.60"E	25°29'55.45"S 31°28'37.87"E	488	
			Total	3330

GPS coordinates, acquired in the field (Table 8), were added to Google Earth to illustrate and demarcate the study area and survey transects. Six transects were completed to assess resident biota and their associated habitats. Specific habitat features were identified to provide an indication of available habitat for different animals favouring a specific biotope (specifically medium-sized fauna across all vertebrate groups).

In addition to the 6 terrestrial transects, two riparian transects were surveyed through the unnamed drainage line. The site information is summarized in Figures 31 to 32.

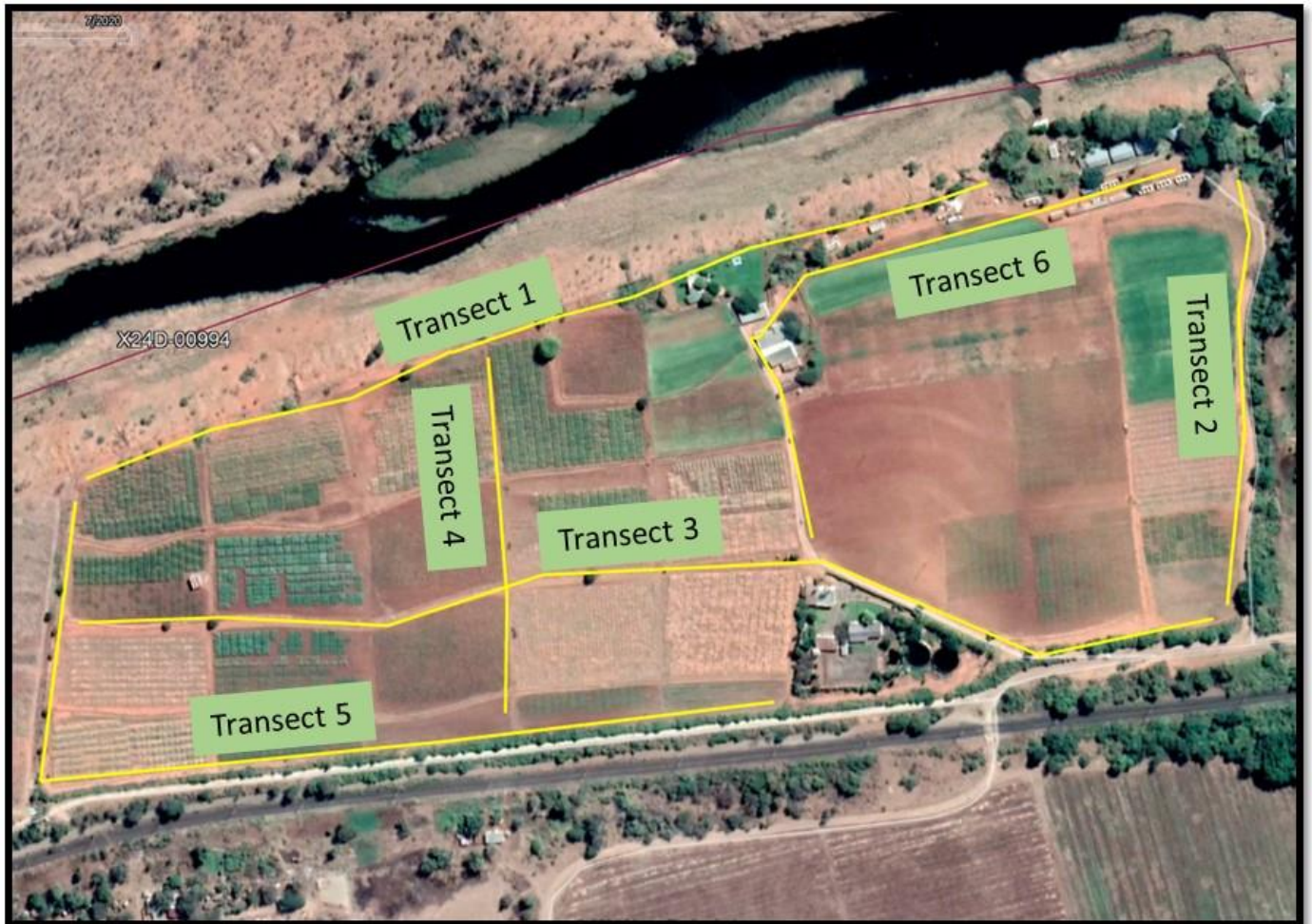


Figure 28: A Google Earth image, indicating the survey transects undertaken on the farm.



Figure 29: The transformed fallow lands have very little viable habitat available for any fauna.

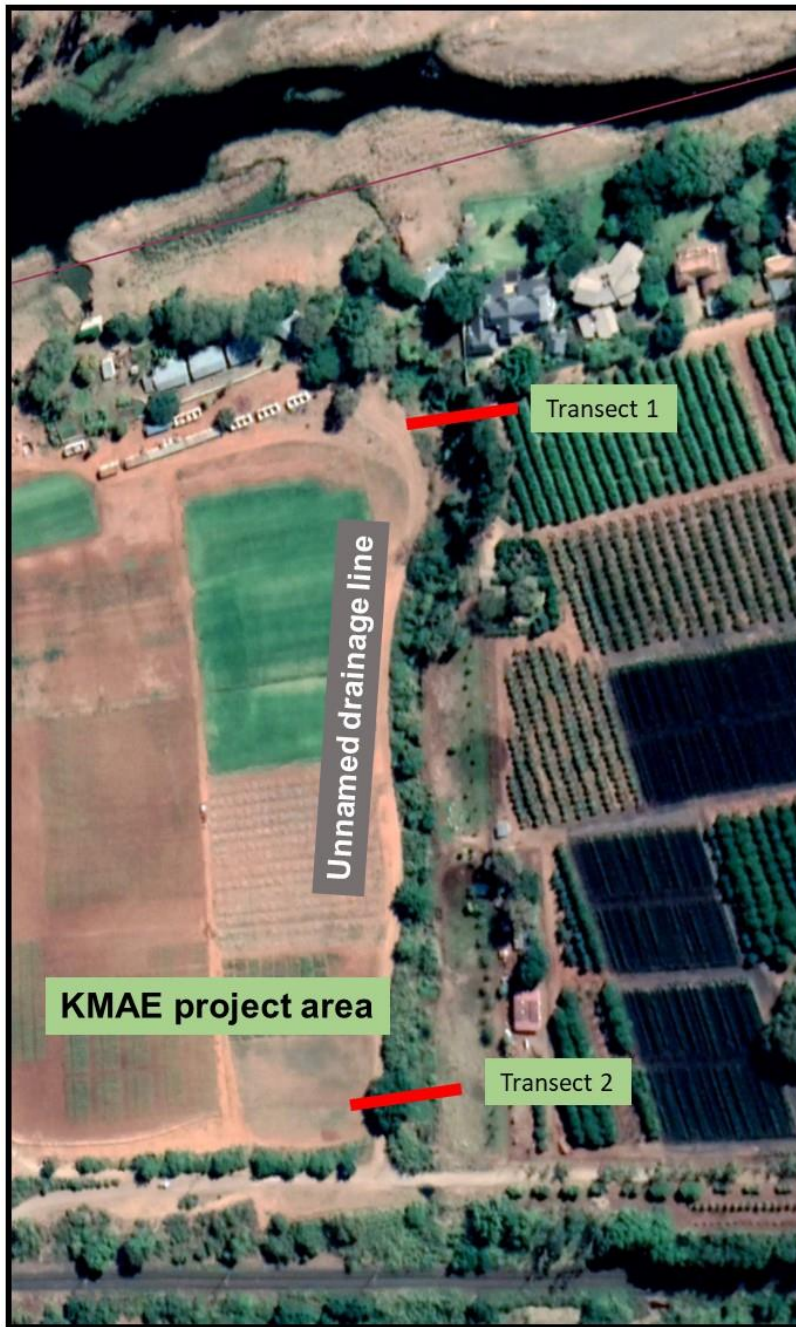


Figure 30: A Google Earth image, indicating the survey transects undertaken through the drainage line.

4.3 Biodiversity assessments

The fieldwork component of this study was conducted in the period November 2020 to April 2021. The survey methods described herein make use of a habitat surrogate technique, where habitat type and availability are used as a baseline assessment, with species' presence used to verify habitat integrity. The specialist report includes detailed species lists obtained from an extensive background review and the field monitoring results, with emphasis on the following:

- Probability of occurrence of species with high conservation value and assessment of the availability of their habitat on the property, as well as potential risks or threats to these species.
- Detailed overview on the current biodiversity status of the area in terms of terrestrial and wetland biota.
- Status of habitat, habitat preference and probability of occurrence.

During the biodiversity assessments of the KMAE environment, different vegetation and land cover units were identified. By definition, ecosystem status reflects the ecosystem's ability to function naturally, at a landscape scale and in the long-term. Vegetation types provide a good representation of terrestrial biodiversity because most animals, birds, insects and other organisms are associated with specific vegetation types (Table 9).

In order to establish a baseline of faunal occurrence, an assessment was made of the ecosystem template. The ecosystem template is a function of the geomorphology (abiotic) and the vegetation (biotic) structure of the area. By using species occurrence data from the current surveys (November 2020 to April 2021) and expected occurrence records of known species distributions and preferred habitat type, the baseline integrity of the study is established.

Ecosystem status reflects the ecosystem's ability to function naturally, at a landscape scale and in the long-term. The single biggest cause of biodiversity loss in South Africa is the loss and degradation of natural habitat. Vegetation types provide a good representation of terrestrial biodiversity, as they often reflect specific habitat types and associated animals, birds, insects and other organisms. The vegetation/land cover types were thus classified on the basis of structural and functional characteristics with the following objectives in mind:

- To assess the status of vegetation/land cover types impacted by development: due to either historical and/or present farming practices, residential occupation and/or mining practices;
- To assess the status of faunal assemblages in the study area, with emphasis on Species of Special Concern.

The next step is to establish the likelihood of Species of Special Concern, occurring in the vicinity (include degree of confidence). For this report, the category "Species of Special Concern" is considered to include all threatened taxa listed by South African Red Data lists (Species of Conservation Concern), Threatened or Protected Species (NEMBA) and all South African endemic taxa.

Conservation-important plant species listed for the quarter-degree grid 2531CB in the Mpumalanga Tourism & Parks Agency's (MTPA) threatened species database were used to produce a list of the most likely occurring species, which were searched for during fieldwork. Due to their limited distribution and range in South Africa, endemic species are also included as species of special interest. Traditionally, an endemic species will have a global distribution restricted to >90% of the atlas region.

Species of special concern are those that have particular ecological, economic or cultural importance and include: those that are rare, endemic or threatened; species with unusual distributions; and medicinal and other indigenous species that are exploited commercially or for traditional use. A 'Species of Special Concern' is any species or subspecies of biota, native to the province that has entered a long-term state of decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. These are species that are threatened, or, if not, their population number is a special concern of the following ecological foundations:

- Occur in small, isolated populations or in fragmented habitat, and are threatened by further isolation and population reduction;
- Show marked population declines. Population estimates are unavailable for the vast majority of taxa. Species that show a marked population decline, yet are still abundant, do not meet the Special Concern definition, whereas a marked population decline in uncommon or rare species is an inclusion criterion;
- Depend on a habitat that has shown substantial historical or recent declines in size. This criterion infers the population viability of a species based on trends in the habitat types upon which it specialises;
- Occur only in or adjacent to an area where habitat is being converted to land uses incompatible with the animal's survival;
- Have few records, or which historically occurred here but for which there are no recent records; and
- Occur largely on public lands, but where current management practices are inconsistent with the species persistence.

Threatened faunal species represent a decline in biological diversity because of their numbers decrease and their genetic variability is severely diminished. Rare species, as well as those of special concern carry challenges different to most other large and common species; characteristics of these species are:

- extremely small or localised range
- requiring a large territory
- having low reproductive success
- needing specialised breeding areas
- needing specialised feeding areas
- habitat specificity
- life-histories not captured completely in the area (migrants)

4.4 Biota assemblages of the KMAE project areas

4.4.1 Vegetation communities

The vegetation communities of the KMAE study area are classified as the Granite Lowveld.

Only one untransformed vegetation community (two sub-sets) (Figure 23) and one viable transformed habitat were identified within the study area on the basis of distinctive vegetation structure (grassland, wetland, thicket, etc), floristic composition (dominant and diagnostic species) and position in the landscape (mid-slopes, terrace, crest, etc). The detail of the species found in the riverine community and different morphological levels are listed in Table 9.

Plant surveys

A total of 39 indigenous plant species were recorded during fieldwork (Table 9); as well as 11 exotic species, some declared alien invaders.

Table 9: Vegetation assemblages and relevant plant species in the identified landscapes of the project footprint. Vegetation types: 1= Crocodile River; 2= Unnamed drainage line; 3= Fallow land (Shaded cells indicate presence of the species).

Plant species	1	2	3
Trees			
Apple-leaf (<i>Philenoptera violacea</i>)			
Brown ivory (<i>Berchemia discolor</i>)			
Buffalo-thorn (<i>Ziziphus mucronata</i>)			
Common false-thorn (<i>Albizia harveyi</i>)			
Common spike thorn (<i>Gymnosporia buxifolia</i>)			
Common wild currant (<i>Searsia pyroides</i>)			
Fever tree (<i>Vachellia xanthophloea</i>)			
Flame climbing bushwillow (<i>Combretum microphyllum</i>)			
Flame thorn (<i>Acacia ataxacantha</i>)			
Knob thorn (<i>Vachellia nigrescens</i>)			
Jackal berry (<i>Diospyros mespiliformis</i>)			
Knob thorn (<i>Vachellia nigrescens</i>)			
Leadwood (<i>Combretum imberbe</i>)			
Magic guarri (<i>Euclea divinorum</i>)			
Mallow raisin (<i>Grewia villosa</i>)			
Mitzeeri (<i>Bridelia micrantha</i>)			
Natal guarri (<i>Euclea natalensis</i>)			
Natal mahogany (<i>Trichelia emetica</i>)			
Pigeonwood (<i>Trema orientalis</i>)			
Potato bush (<i>Phyllanthus reticulatus</i>)			
Red ivory (<i>Berchemia zeyheri</i>)			
Russet bushwillow (<i>Combretum hereroense</i>)			
Sandpaper -bush (<i>Ehretia amoena</i>)			
Sausage tree (<i>Kigelia africana</i>)			
Sickle bush (<i>Dichrostachys cinerea</i>)			
Sycamore fig (<i>Ficus sycamorus</i>)			
Umbrella thorn (<i>Vachellia tortilis</i>)			
Velvet raisin (<i>Grewia flava</i>)			
White-berry bush (<i>Flueggea virosa</i>)			
Woolly caper-bush (<i>Capparis tomentosa</i>)			
Forbs			
Mountain aloe (<i>Aloe marlothii</i>)			
Grass and sedges			
Bushveld signal grass (<i>Urochloa mossambicensis</i>)			
Common carrot-seed grass (<i>Tragus berteronianus</i>)			
Common crowfoot (<i>Dactyloctenium aegyptium</i>)			
Feathered chloris (<i>Chloris virgata</i>)			
Guinea grass (<i>Panicum maximum</i>)			
Natal red top (<i>Melenis repens</i>)			

Alien invading plants			
Bougainvillea (<i>Bougainvillea glabra</i>)			
*Bugweed (<i>Solanum mauritianum</i>)			
*Castor oil bush (<i>Ricinis communis</i>)			
*Christmas berry (<i>Lantana camara</i>)			
*Demoina shrub (<i>Parthenium hysterophorus</i>)			
*Flamboyant tree (<i>Delonix regia</i>)			
*Large cocklebur (<i>Xanthium strumarium</i>)			
*Mango (<i>Mangifera indica</i>)			
*Pigweed (<i>Amaranthus hybridus</i>)			
*Spanish reed (<i>Arundo donax</i>)			
*Triffid weed (<i>Chromolaena odorata</i>)			

Due to the total transformation of the project area from savannah woodland to fallow land, it will be futile to list threatened plant species that could occur on the transformed land. During the surveys on the project site, very little natural vegetation occurred on the entire site because all natural vegetation was completely removed when the farm was established.

However, it will be important to provide a list of indigenous vegetation to establish in the gardens of the residential development. There are a number of plant nurseries in the area that sell indigenous plants. See Table 10 for a list of indigenous plants adapted to the area.

Table 10: A list of indigenous trees and shrubs which are adapted to the area and should be planted in the residential gardens.

Common coral tree (*Erythrina lysistemon*)
Common num-num (*Carissa bispinosa*)
Common wild fig (*Ficus burkei*)
Flame climbing bushwillow (*Combretum microphyllum*)
Hedge euphorbia (*Euphorbia tirucalli*)
Jackal berry (*Diospyros mespiliformis*)
Jacket plum (*Pappea capensis*)
Kudu lily (*Pachypodium saundersii*)
Large-leaved false-thorn (*Albizia versicolor*)
Natal mahogany (*Trichelia emetica*)
Pigeonwood (*Trema orientalis*)
Potato bush (*Phyllanthus reticulatus*)
Pride-of-De Kaap (*Bauhinia galpinii*)
Puzzle bush (*Ehretia rigida*)
Quinine tree (*Rauvolfia caffra*)
Rhino-coffee (*Kraussia floribunda*)
River bushwillow (*Combretum erythrophyllum*)
Sagewood (*Buddleja salviifolia*)
Sausage tree (*Kigelia africana*)
Southern Chinese hats (*Karomia speciosa*)
Sycamore fig (*Ficus sycamorus*)
Tree wistaria (*Bolusanthus speciosus*)
Weeping boer-bean (*Schotia brachypetala*)
Weeping lavender tree (*Heteropyxis natalensis*)
Wild pear (*Dombeya rotundifolia*)

4.4.2 Riverine Ecology

4.4.2.1 The extent of the riparian habitat

KMAE drainage system and associated riparian zone

The unnamed drainage line which runs on the eastern boundary of the property, will be incorporated into the development. It will form a natural feature with most of the natural riparian vegetation intact and protected by a 10 m buffer. Near the confluence with the Crocodile River an existing bridge crossing will be upgraded to provide access to the stand in the north-eastern corner, and this bridge will be constructed in such a way that is also will dam the water in the drainage line.

During the riparian study of the unnamed drainage line, the riverine environment was surveyed by completing two transects in the project area. Figure 30 consists of a map which was compiled using a Google Earth image which indicates these two surveys transects in the waterway.

The riparian zone is relatively narrow (5 to 8 metres wide) and the stream width between 1.5 and 2.0 metres. The drainage line changes from a rather shallow U-shaped channel (Figure 31) to a 7m deep V-shaped channel (Figure 32) closer to the confluence with the Crocodile River.

The vegetation in the riverine area consists of larger trees in the marginal areas, especially Natal mahogany and sycamore figs, while the non-marginal areas are covered by semi-wetland and terrestrial species. Reeds, both indigenous (thatching reed) and alien (Spanish reed) are found along the lower portions of the riparian zone. Numerous species of alien plants have invaded the drainage line.

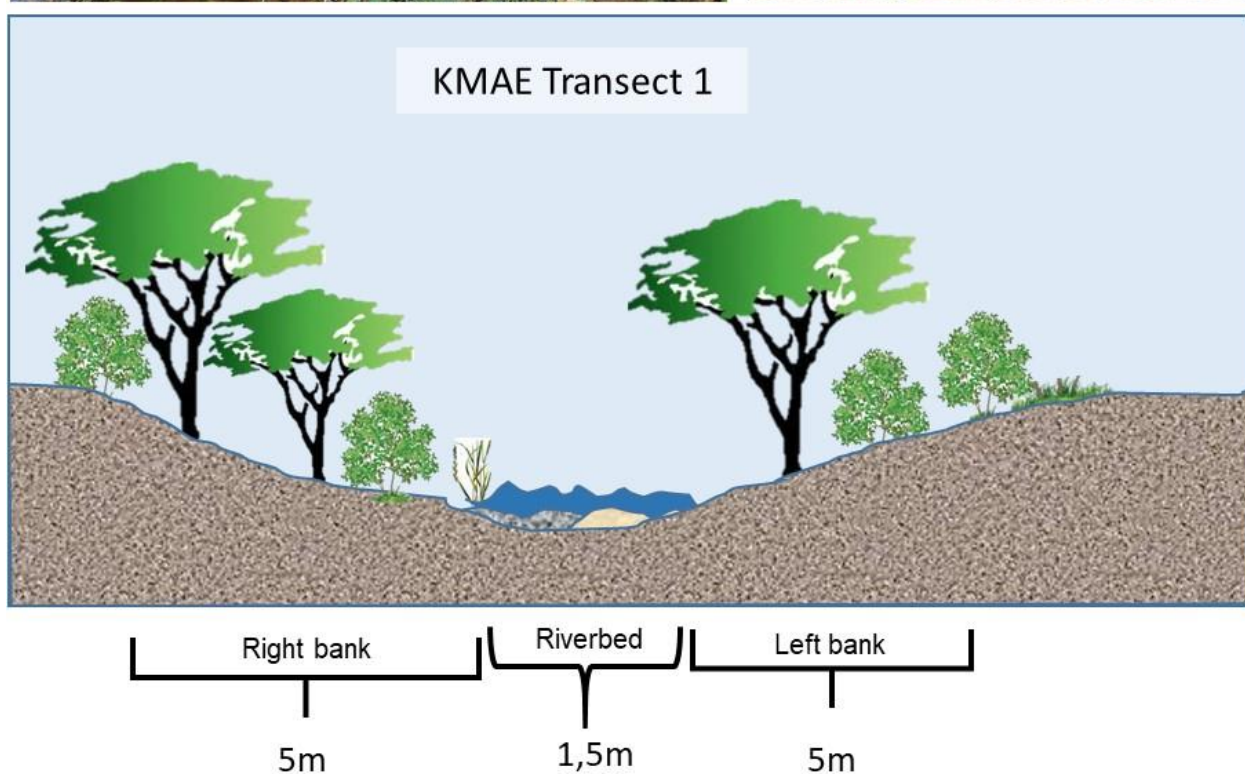
Of the all the tree species on the stream banks, two riparian indicator species, sycamore fig and leadwood were observed, as well as eight alien plant species. Two trees, the leadwood and apple-leaf, are listed as protected species.

The stream itself is a small system (1.5 to 2.0 m wide) with a rock cobble bed in steeper areas. Pools are rare.

Table 11: Riparian indicator plant species observed in the riparian zone along the stream reach during the survey.

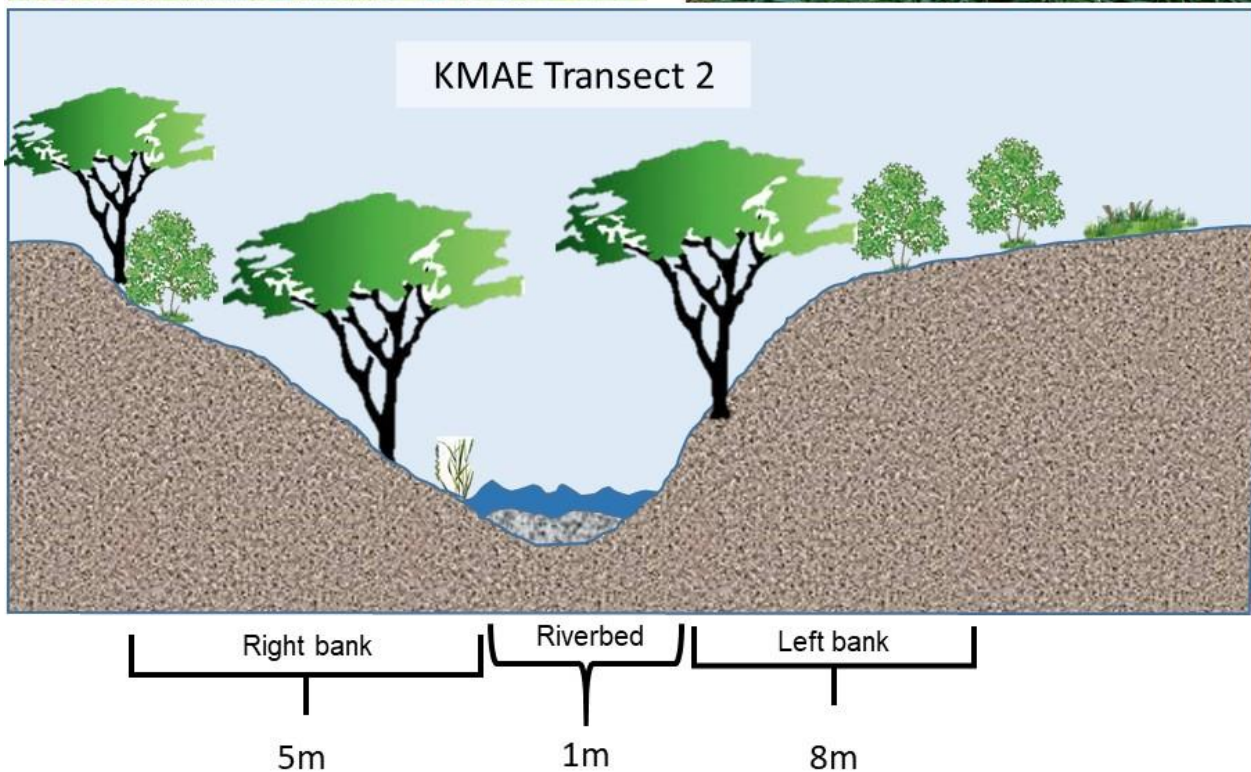
FAMILY	TAXON	HABITAT
MORACEAE	Sycamore fig (<i>Ficus sycamorus</i>)	Frequently along river banks, forming a distinctive part of the riverine thicket; also in mixed woodland
COMBRETACEAE	Leadwood (<i>Combretum imberbe</i>)	Medium to low altitudes, in mixed woodland, often along rivers or dry watercourses, particularly on alluvial soils.

During the site visit to the KMAE project area, two survey sites were earmarked for assessment. At each of these survey sites, a transect was surveyed: from the edge of the riparian area (left and right bank), and through the streambed to the other side. The site information is summarized in Figures 31 and 32.



Riparian width		Riverbed		Transect	#T1
Left bank	5m	Width	1.5m	Transect length	
Right bank	5m			12m	
Riparian vegetation - Left bank		Riverbed cover		Riparian vegetation - Right bank	
Natal mahogany (<i>Trichelia emetica</i>)		Cobble and sand		Sycamore fig (<i>Ficus sycamorus</i>)	
Potato bush (<i>Phyllanthus reticulatus</i>)				Pigeonwood (<i>Trema orientalis</i>)	
Brown ivory (<i>Berchemia discolor</i>)				Flame thorn (<i>Acacia ataxacantha</i>)	
Flame climbing bushwillow (<i>Combretum microphyllum</i>)				*Castor oil bush (<i>Ricinis communis</i>)	
Terrestrial					
Common spike thorn (<i>Gymnosporia buxifolia</i>)				Sickle bush (<i>Dichrostachys cinerea</i>)	
Flame thorn (<i>Acacia ataxacantha</i>)				White-berry bush (<i>Flueggea virosa</i>)	
				Russet bushwillow (<i>Combretum hereroense</i>)	

Figure 31: Transect 1: Unnamed drainage line - Properties of the upstream section.



Riparian width		Riverbed		Transect	#T2
Left bank	8m	Width	1m	Transect length	15m
Right bank	5m				
Riparian vegetation - Left bank		Riverbed cover		Riparian vegetation - Right bank	
Sycamore fig (<i>Ficus sycamorus</i>)		Cobble and rock		Sycamore fig (<i>Ficus sycamorus</i>)	
Flame climbing bushwillow (<i>Combretum microphyllum</i>)				*Christmas berry (<i>Lantana camara</i>)	
*Spanish reed (<i>Arundo donax</i>)				Flame climbing bushwillow (<i>Combretum microphyllum</i>)	
*Castor oil bush (<i>Ricinis communis</i>)				Mitzeeri (<i>Bridelia micrantha</i>)	
Terrestrial					
Common spike thorn (<i>Gymnosporia buxifolia</i>)				*Triffid weed (<i>Chromolaena odorata</i>)	
Flame thorn (<i>Acacia ataxacantha</i>)				Flame thorn (<i>Acacia ataxacantha</i>)	
				Russet bushwillow (<i>Combretum hereroense</i>)	

Figure 32: Transect 2: Unnamed drainage line - Properties of the downstream section.

4.4.2.2 Aquatic habitat assessment

Aquatic surveys and biomonitoring are essential components of the system ecology and aim to measure present biological conditions and trends in the aquatic ecosystem. It attempts to relate the observed variation to changes in available habitat, as dictated by physical system drivers of the system such as water quality, geomorphology, and hydrology (Kleynhans & Louw, 2008).

During the survey, aquatic habitats surveyed at Transect 1 consisted of moderate deep water (30cm) over mud and rock. Abundant root wad habitat is created by sycamore fig roots, and there is some overhanging vegetation habitat.



Figure 33: The lower survey site (at Transect 2) consists of a narrow cobble and rock channel with shallow water flowing in the channel.

Aquatic habitats surveyed at Transect 2 consisted of a narrow cobble and rock channel flanked by forbs, reeds and large riparian trees, with shallow water flowing in the narrow channel. In areas of steeper slopes, small cobble riffles are washed open and, in some areas, small pools of deeper water are formed.



Figure 34: The lower survey site (at Transect 2) consists of a narrow cobble and rock channel with shallow water flowing in the channel.

During the monitoring survey in December 2020 the following parameters were measured - IHAS (Integrated Habitat Assessment System) and HQI (Habitat Quality Index) with the results summarised in Table 12.

Table 12: The habitat parameters as measured at the survey sites in the unnamed drainage line.

SITE	IHAS%	CATEGORY	HQI%	CATEGORY
TRANSECT 1 SITE	61	Fair	68	Fair
TRANSECT 2 SITE	65	Fair	71	Fair

The IHAS and HQI scores were mostly moderate due to the lack of deep-water habitats and good overhang, thus classified as a “Fair” category at both transect sites (Table 16).

4.4.2.3 Surveys of Aquatic Invertebrates and Fish

Macro-invertebrates and fish are good indicators of river health. By making use of established and accepted survey methods (SASS5 for invertebrates and FRAI-based surveys for fish) and incorporating the habitat aspects, a proper basis for biological diversity can be obtained.

Aquatic invertebrate assessment

The macro-invertebrates were sampled according to the SASS5 method at the two sites, and Table 13 lists the macro-invertebrates sampled at the sites and reflects the SASS5 scores for the December 2020 survey.

Table 13: SASS5 scores of the different habitat types at the Transect 1 sampling site (a complete table of this summarized version can be viewed in Appendix 3).

TAXON	Stones	Vegetation	GSM	Total
Atyidae (Shrimp) 8		A		A
Baetidae 2 spp 6	A	A		B
Caenidae 6			A	A
Coenagrionidae 4		A		A
Veliidae 5		A	1	A
Hydropsychidae 1= 4	A			A
Dytiscidae 5		1		1
Hydrophilidae 5		1		1
Chironomidae 2			A	A
Simuliidae 5	1			1
Tabanidae 5	1			1
Thiaridae 3			B	B
SASS Score	20	43	16	58
No of families	4	6	4	12
ASPT	5.0	7.1	4.0	4.8

Estimated abundance: 1=1; A=2-10; B=11-100; C=101-1000; D=>1000

According to Table 16, the macro-invertebrate scores, resulted in “Fair” SASS scores and a moderate number of families. The Fair score can be attributed to lack of good riffles and some moderate overhang.

Table 14: SASS5 scores of the different habitat types at the Transect 2 sampling site (a complete table of this summarized version can be viewed in Appendix 3).

TAXON	Stones	Vegetation	GSM	Total
Potamonautidae 3	A			A
Atyidae (Shrimp) 8		A		A
Baetidae 2 spp 6	B	A		B
Calopterygidae 10		1		1
Chlorocyphidae 10		1		1
Coenagrionidae 4		A		A
Veliidae 5		A	1	A
Hydropsychidae 1= 4	A			A
Philopotamidae 10	1			1
Dytiscidae 5		1		1
Helodidae 12		1		1
Hydrophilidae 5		1		1
Chironomidae 2			A	A
Simuliidae 5	A			A
Tabanidae 5	1			1
Thiaridae 3	A		B	B
SASS Score	36	65	10	97
No of families	7	9	3	16
ASPT	5.1	7.2	3.3	6.0

Estimated abundance: 1=1; A=2-10; B=11-100; C=101-1000; D=>1000

According to Table 14, the presence of shallow, well aerated riffles, as well as some overhanging vegetation were also reflected in the macro-invertebrate scores, resulting in “Good” SASS scores and a relative high number of families.

Table 15: A summary of the IHAS, HQI and SASS scores in the KMAE project area.

SURVEY SITE	Habitat scores		SASS5 Scores		
	IHAS %	HQI %	SASS score	Number of families	ASPT
TRANSECT 1 SITE	61	68	58	12	4.8
TRANSECT 2 SITE	65	71	97	16	6.0

Judging from Table 15, the habitat scores at both the sites are moderate and are thus categorized as “Fair” (Table 16). On the other hand, the SASS scores represent a “Good” integrity and relative high number of families, which can be attributed to shallow, well aerated riffles, as well as some overhanging vegetation.

Table 16: Categories used to classify Habitat, SASS and ASPT values:

HABITAT	SASS4	ASPT	CONDITION
>100	>140	>7	Excellent
80-100	100-140	5-7	Good
60-80	60-100	3-5	Fair
40-60	30-60	2-3	Poor
<40	<30	<2	Very poor

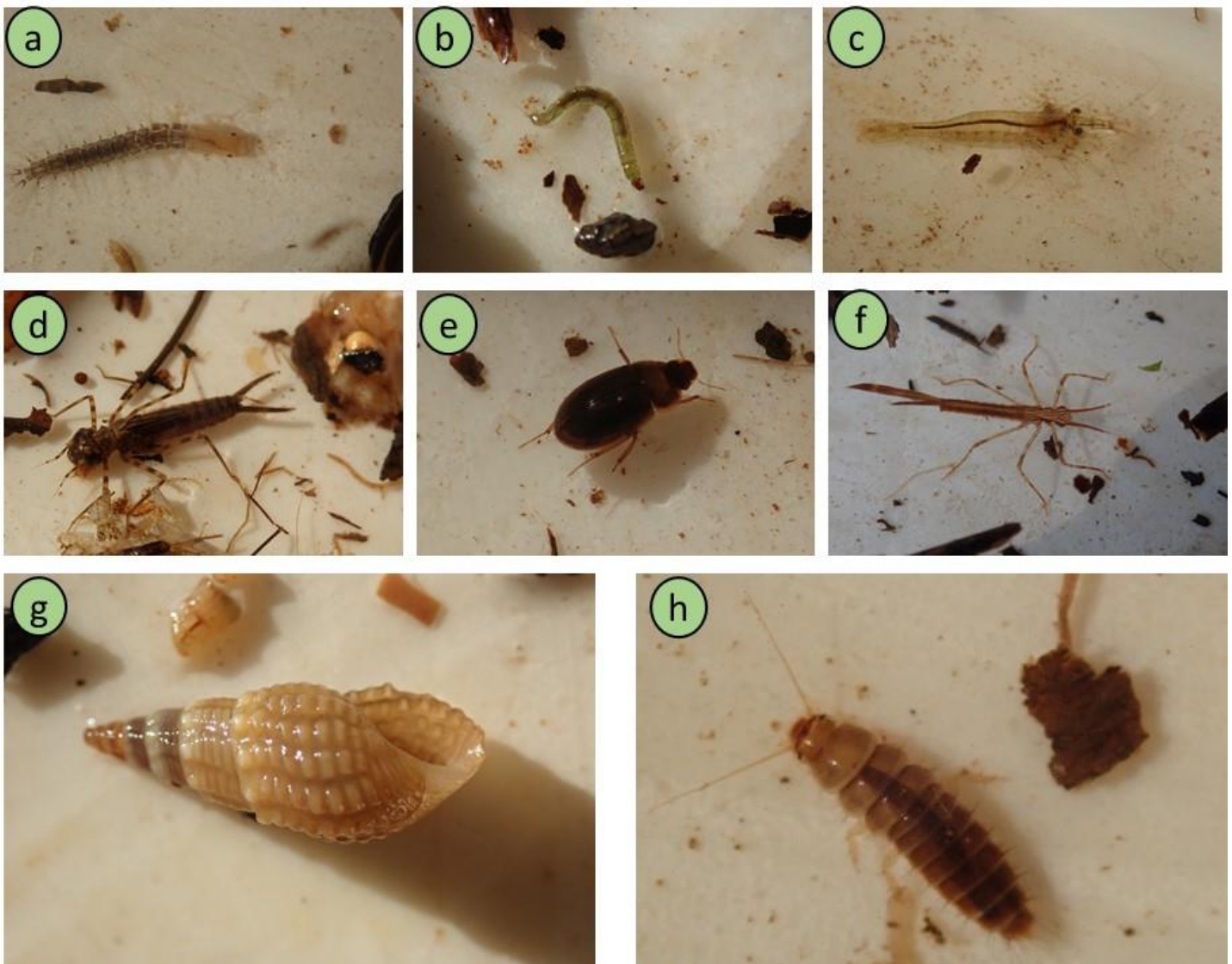


Figure 35: Some of the aquatic invertebrate taxa observed during the SASS5 process.

- a. Philopotamidae
- b. Chironomidae
- c. Atyidae
- d. Chlorocyphidae
- e. Hydrophilidae
- f. Calopterygidae
- g. Thiaridae
- h. Helodidae

Fish communities - Fish Response Assessment Index (FRAI)

The purpose of the Fish Response Assessment Index (FRAI) is to provide a habitat-based cause-and-effect interpretation underpinning the deviation of the fish assemblage from the reference condition.

The application of the FRAI is based on the following:

- The FRAI is an assessment index based on the environmental intolerances and preferences of the reference fish assemblage and the response of the constituent species of the assemblage to particular groups of environmental determinants or rivers.
- These intolerance and preference attributes are categorised into metric groups with constituent metrics that relates to the environmental requirements and preferences of individual species.
- Assessment of the response of the species metrics to changing environmental conditions occur either through direct measurement (surveys) or are inferred from changing environmental conditions (habitat). Evaluation of the derived response of species metrics to habitat changes are based on knowledge of species ecological requirements. Usually, the FRAI is based on a combination of fish sample data and fish habitat data.
- Changes in environmental conditions are related to fish stress and form the basis of ecological response interpretation.

Determine reference fish assemblage: species and frequency of occurrence (FROC)

The fish reference Frequency of Occurrence (FROC) database (Kleynhans, Louw, & Moolman, 2007), which provides consistent reference frequency of occurrence for more than 700 fish sites in South Africa, was used to establish the baseline data for this report.

Fish are considered to be one of the important indicators of river health and their responses to modified environmental conditions are measured in terms of the Fish Response Assessment Index (FRAI) (Kleynhans 1999; Kleynhans *et al.* 2005). This index is based on a combination of fish species habitat preferences as well as intolerance to habitat changes, and the present frequency of occurrence of species compared to the reference frequency of occurrence (Kleynhans, Louw, & Moolman, 2007).

The list of species is based on species that are expected to be present or to have been present under close to reference habitat conditions. Species that are derived to have been present under relatively recent reference habitat conditions are also identified. The resulting species reference list is a combination of both of the above approaches.

The rating of the FROC refers to the reference fish frequency of occurrence (FROC) in a particular ecologically defined reach of a river. Ratings are scored from 1 to 5. This means that FROC ratings are derived based on conditions at the particular site as well as the available habitat in the reach for species expected under reference conditions.

Basic habitat conditions that were considered in terms of the FROC of species are based on intolerance and a preference rating as defined in the FRAI (Kleynhans *et al.* 2005). The presence and abundance of habitat features such as velocity-depth classes, cover types (including substrate) and the characteristics of the natural flow regime (especially the degree of pereniality) in the river reach under reference conditions formed the basis for the expert judgement of the FROC (Kleynhans, Louw, & Moolman, 2007).

There is no FROC Data available for the unnamed drainage line on the KMAE project area (project reach). On the other hand, fish data for the Crocodile River, X24D-00994 is available and will be used as an indication of the species with the potential to migrate up the small tributary and inhabit the habitat types available (FROC & PESEIS data bases - DWS).

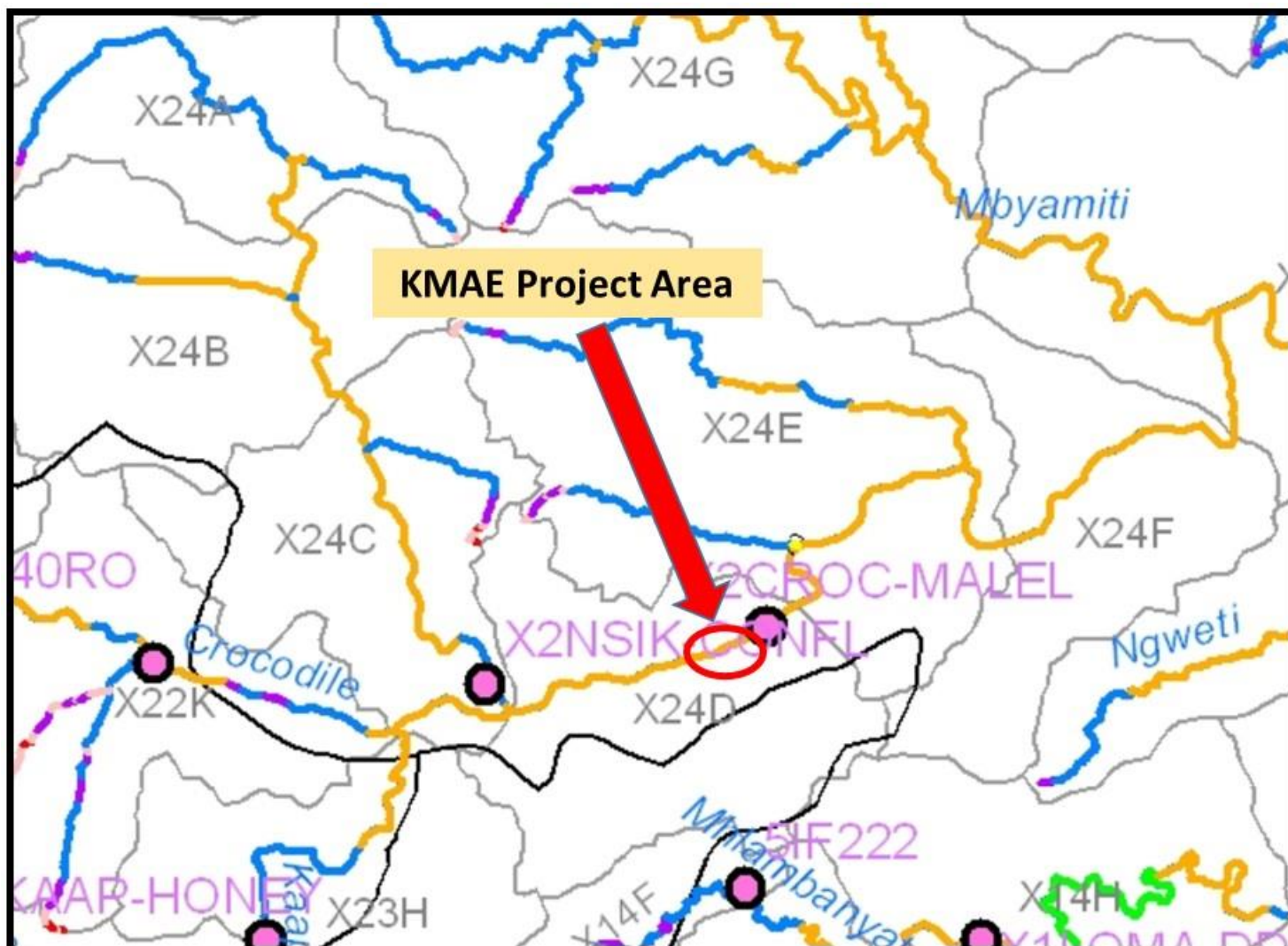


Figure 36: KMAE stream is situated in the X24D catchment as recorded in the DWS FROC & PESEIS data bases.

Table 17: The PESEIS fish list (and their potential to migrate) up the KMAE stream. Migration potential is listed as follows:

5. Migration critical for survival of species (large scale migrations undertaken for reproduction, avoidance, feeding and dispersal).
4. Migration critical for survival of species (large scale migrations undertaken for reproduction, avoidance, feeding and dispersal. Migrate into floodplains & seasonal rivers confirmed).
3. Migration moderately important for survival of species (uncertain).
2. Migration not important for survival of species (migration mostly undertaken for dispersal).
1. Migration not important for survival of species (migration mostly undertaken for dispersal).

Fish Species	Migration potential	Potential to migrate up the KMAE unnamed tributary (Likely/Unlikely)
Migration critical (4-5):		
Longfin eel (<i>Anguilla mossambica</i>)	5	Likely
Giant mottled eel (<i>Anguilla marmorata</i>)	5	Unlikely
Largescale yellowfish (<i>Labeobarbus marequensis</i>)	5	Likely
Hamilton's barb (<i>Enteromius afrohamiltoni</i>)	5	Likely
Broadstriped barb (<i>Enteromius annectens</i>)	5	Likely
Orangefin barb (<i>Enteromius eutaenia</i>)	4	Likely
Straightfin barb (<i>Enteromius paludinosus</i>)	4	Likely
Three-spot barb (<i>Enteromius trimaculatus</i>)	4	Likely
Beira barb (<i>Enteromius radiatus</i>)	4	Likely
East-coast barb (<i>Enteromius toppini</i>)	4	Likely
Longbeard barb (<i>Enteromius unitaeniatus</i>)	4	Likely
Bowstripe barb (<i>Enteromius viviparus</i>)	4	Likely
Southern barred minnow (<i>Opsaridium peringueyi</i>)	4	Unlikely
Red-eye labeo (<i>Labeo cylindricus</i>)	4	Likely
Leaden labeo (<i>Labeo molybdinus</i>)	4	Likely
Purple labeo (<i>Labeo congoro</i>)	4	Unlikely
Silver labeo (<i>Labeo ruddi</i>)	4	Likely
Rednose labeo (<i>Labeo rosae</i>)	4	Likely
Tigerfish (<i>Hydrocynus vittatus</i>)	4	Unlikely
Imberi (<i>Brycinus imberi</i>)	4	Likely
Silver robber (<i>Micralestes acutidens</i>)	4	Likely
River sardine (<i>Mesobola brevinialis</i>)	4	Likely
Migration moderately important (3):		
Bulldog (<i>Marcusenius macrolepidotus</i>)	3	Likely
Churchill (<i>Petrocephalus wesselsi</i>)	3	Likely
Migration not important (1-2):		
Sharptooth catfish (<i>Clarias gariepinus</i>)	2	Likely
Silver catfish (<i>Schilbe intermedius</i>)	2	Unlikely
Brown squeaker (<i>Synodontis zambezensis</i>)	2	Unlikely
Sawfin suckermouth (<i>Chiloglanis paratus</i>)	2	Unlikely
Shortspine suckermouth (<i>Chiloglanis pretoriae</i>)	2	Unlikely

Lowveld suckermouth (<i>Chiloglanis swierstrai</i>)	2	Unlikely
Mozambique tilapia (<i>Oreochromis mossambicus</i>)	2	Likely
Redbreast tilapia (<i>Tilapia rendalli</i>)	2	Unlikely
Banded tilapia (<i>Tilapia sparrmanii</i>)	2	Unlikely
Orange-fringed largemouth (<i>Chetia brevis</i>)	1	Unlikely
Southern mouthbrooder (<i>Pseudocrenilabrus philander</i>)	1	Unlikely
Tank goby (<i>Glossogobius giuris</i>)	1	Unlikely

Determine present state for drivers

The purpose is to provide information on the fish response and associated habitat condition and *vice versa* (i.e. fish responses that are possible, given certain habitat conditions). This assessment considers the whole river section to be studied. If information on the drivers is available, these should be used.

In the project area, the KMAE unnamed tributary seems to be a semi-perennial stream as it also receives water from irrigation return-flows in the upstream catchment.

Sampling site selection

During the survey, aquatic habitat types which were surveyed at Transect 1 and 2. The sites are described in Section 4.4.2.1.

Due to the terrain and flows in the river only the electro-shocking method was applied.

Table 18: Habitat types sampled and the sampling effort made per survey site.

HABITAT TYPES SAMPLED AND EFFORT

SAMPLING EFFORT	SLOW DEEP	SLOW SHALLOW	FAST DEEP	FAST SHALLOW
Electro shocker (min)		10 minutes		20 minutes
Small seine (mesh size, length, depth, efforts)				
Large seine (mesh size, length, depth, efforts)				
Cast net (dimensions, efforts)				
Gill nets (mesh size, length, time)				

Table 19: Fish sampled during the survey.

SPECIES SAMPLED	SLOW DEEP	SLOW SHALLOW	FAST DEEP	FAST SHALLOW
Largescale yellowfish (<i>Labeobarbus marequensis</i>)		1		2
Orange-fin barb (<i>Enteromius eutaenia</i>)				8
Sharptooth catfish (<i>Clarias gariepinus</i>)		1		3
Red-eye labeo (<i>Labeo cylindricus</i>)				4
Leaden labeo (<i>Labeo molybdinus</i>)				5
Three-spot barb (<i>Enteromius trimaculatus</i>)		1		6

Execute the FRAI model

The FRAI model makes use of the fish intolerance and preference database that was compiled in 2001 (Kleynhans 2003). This information was included into the FRAI. The approach followed included the ranking, weighting and rating of metric groups. A large component of the FRAI is based on an automated calculation of rankings, weights and ratings. Table 20 indicates the weights of the different metric groups for fish at the KMAE stream site.

Table 20: The weight allocated to the different metric groups in the model.

Weight of metric groups	
Metric group	Weight (%)
Velocity-depth	100,00
Cover	85,71
Flow modification	97,14
Physico-chemical	48,57
Migration	88,57
Impact of introduced	20,00

The Velocity-depth metric carries the most weight due to improved water supply situation, while Flow modification indicates the effects of the catchment impacts.

Table 21: The FRAI results at the study sites during the current surveys with the expected and observed fish species and the resultant ecological class.

AUTOMATED	
FRAI (%)	52.3
EC: FRAI	D
ADJUSTED	
FRAI (%)	55.6
EC: FRAI	D

Abbreviations: reference species (introduced species excluded)	Scientific names: reference species (introduced species excluded)	Reference frequency of occurrence	EC: observed & habitat derived frequency of occurrence
BEUT	BARBUS EUTAENIA BOULENGER, 1904	3,00	1,00
BMAR	LABEOBARBUS MAREQUENSIS SMITH, 1841	2,00	1,00
BFRI	BARBUS AFROHAMILTONI CRASS, 1960	2,00	1,00
BANN	BARBUS ANNECTENS GILCHRIST & THOMPSON, 1917	2,00	1,00
BPAU	BARBUS PALUDINOSUS PETERS, 1852	3,00	1,00
BTRI	BARBUS TRIMACULATUS PETERS, 1852	3,00	2,00
BRAD	BARBUS RADIATUS PETERS, 1853	2,00	1,00
BTOP	BARBUS TOPPINI BOULENGER, 1916	2,00	1,00
BUNI	BARBUS UNITAENIATUS GÜNTHER, 1866	2,00	1,00
BVIV	BARBUS VIVIPARUS WEBER, 1897	3,00	2,00
LCYL	LABEO CYLINDRICUS PETERS, 1852	2,00	1,00
LMOL	LABEO MOLYBDINUS DU PLESSIS, 1963	2,00	1,00
MACU	MICRALESTES ACUTIDENS (PETERS, 1852)	2,00	1,00
MBRE	MESOBOLA BREVIANALIS (BOULENGER, 1908)	2,00	1,00
MMAC	MARCUSENIUS MACROLEPIDOTUS (PETERS, 1852)	2,00	1,00

PCAT	PETROCEPHALUS WESSELSI KRAMER & VAN DER BANK, 2000	2,00	1,00
CGAR	CLARIAS GARIEPINUS (BURCHELL, 1822)	4,00	4,00
OMOS	OREOCHROMIS MOSSAMBICUS (PETERS, 1852)	3,00	2,00
BEUT	BARBUS EUTAENIA BOULENGER, 1904	3,00	1,00

The relative FRAI score of 52.3% at this reach in the KMAE places this reach within the limits of an ecological state category Class D (40 to 59%), in other words "Largely modified" as described in Table 22.

Table 22: Ratings for the fish integrity classes

FRAI ASSESSMENT CLASSES		
Class rating	Description of generally expected conditions for integrity classes	Relative FRAI score (% of expected)
A	Unmodified, or approximate natural conditions closely.	90 to 100
B	Largely natural with few modifications. A change in community characteristics may have taken place but species richness and presence of intolerant species indicate little modification.	80 to 89
C	Moderately modified. A lower-than-expected species richness and presence of most intolerant species. Some impairment of health may be evident at lower limits of this class.	60 to 79
D	Largely modified. A clearly lower than expected species richness and absence or much lowered presence of intolerant and moderate intolerant species. Impairment of health may become more evident at the lower limit of this class.	40 to 59
E	Seriously modified. A strikingly lower than expected species richness and general absence of intolerant and moderately intolerant species. Impairment of health may become very evident.	20 to 39
F	Critically modified. An extremely lowered species richness and an absence of intolerant and moderately intolerant species. Only tolerant species may be present with a loss of species at the lower limit of the class. Impairment of health generally very evident.	0 to 19

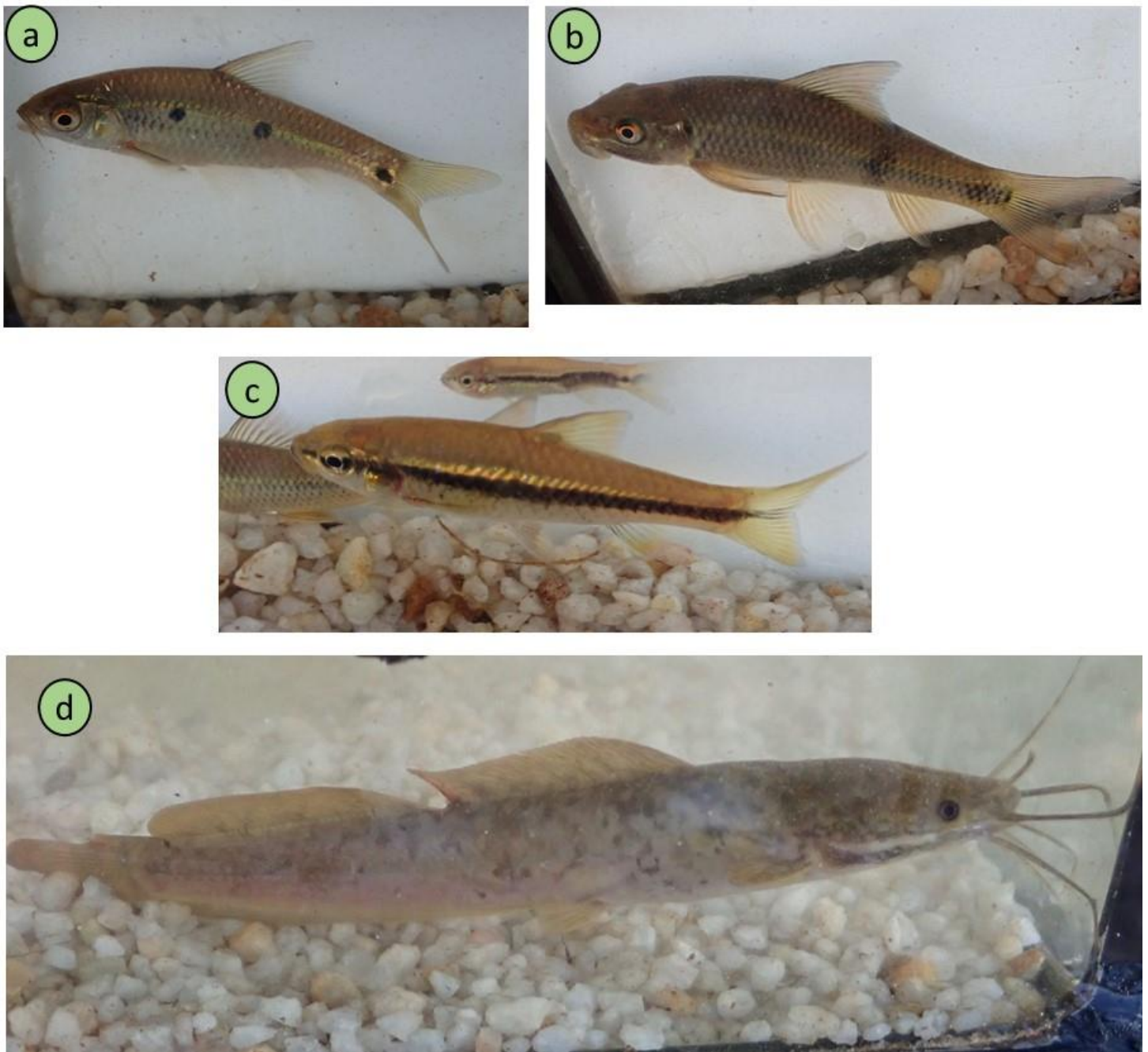


Figure 37: Some of the fish species collected during the FRAI process.

- a. Three-spot barb (*Enteromius trimaculatus*)
- b. Red-eye labeo (*Labeo cylindricus*)
- c. Orangefin barb (*Enteromius eutaenia*)
- d. Sharptooth catfish (*Clarias gariepinus*)

4.4.3 Terrestrial ecology

Customarily this section of the report incorporates lists of habitat types and all species of fauna and flora with emphasis on threatened status and distribution. This data would then be analysed in order to establish the impact that the implementation of the proposed project will have on the surrounding ecology.

In the case of the KMAE project area, **no natural terrestrial habitat is present in the project area**. Surveys relating to the biodiversity presented a few species that now utilise the transformed habitat, but this relation is far from natural. Also, the fact that a large portion of the area will remain for agriculture, compounds this issue. It was therefore decided not to include lists of species which occurred there historically.

It is true that the report must address the possibility of the impacts of the development on the adjacent ecosystem of the Crocodile River and the Kruger Park biodiversity. Lists of observed faunal species compiled by the author (the period 2004 to 2021) along this reach of the river are available in the Appendix 5 and the Red Data species will be highlighted and listed in the section below.

4.4.3.1 Frogs

According to the 2004 Frog Atlas (Minter, *et al* 2004), the project area is situated in the Bushveld District. The Bushveld District has a relatively high species richness (>30 species per grid cell), decreasing westwards, but is moderate in endemic species (7-10 species) (Minter *et al*, 2004). The associated frog distribution maps, confirms 29 frog species are expected to be present in the region. During surveys of the frog species, 2 of the 29 expected species were encountered in the KMAE project area:

- African common toad (*Sclerophrys gutturalis*)
- Painted reed frog (*Hyperolius marmoratus taeniatus*)

A total of 19 observed frog species were listed for a property 160 metres downstream of the KMAE project area. No threatened species are on the list.

4.4.3.2 Reptiles

Current knowledge of reptiles within the study area is derived from the Reptile Atlas Project (Bates, *et al*. 2014). According to the distribution of reptiles in South Africa, 61 species have distribution ranges extending into the region. During the surveys of reptile species 3 of the 61 were encountered in the KMAE project area:

- Common dwarf gecko (*Lygodactylus capensis capensis*)
- Striped skink (*Trachylepis striata*)
- Water monitor (*Varanus niloticus niloticus*)

A total of 25 observed reptile species were listed for a property 160 metres downstream of the KMAE project area, which include two threatened reptile species:

- Southern African python (*Python natalensis*). NEMBA TOPS (2015): Protected,
- Nile crocodile (*Crocodylus niloticus*) - Regional: Vulnerable (2014). NEMBA TOPS (2015): Protected, suggested Vulnerable; SARCA (2014): Vulnerable.

The Nile crocodiles were observed inside the KNP boundary.

4.4.3.3 Birds

During the period November 2020 to April 2021 the KMAE project site was surveyed for bird species. A total of 332 bird species were observed in this region during the Bird Atlas project (Harrison *et al.* 1997). During the surveys of bird species, 49 of the 332 species were encountered in the KMAE project area:

1. Egyptian goose (*Alopochen aegyptiaca*)
2. Natal spurfowl (*Francolinus natalensis*)
3. Helmeted Guineafowl (*Numida meleagris*)
4. African Wattled plover (*Vanellus senegallus*)
5. Blacksmith plover (*Vanellus armatus*)
6. Black-headed heron (*Ardea melanocephala*)
7. African Harrier-Hawk (*Polyboroides typus*)
8. Laughing dove (*Spilopelia senegalensis*)
9. Red-eyed Dove (*Streptopelia semitorquata*)
10. Purple-crested Turaco (*Tauraco porphyreolophus*)
11. Burchell's Coucal (*Centropus burchellii*)
12. Diederik Cuckoo (*Chrysococcyx caprius*)
13. Speckled mousebird (*Colius striatus*)
14. Red-faced Mousebird (*Urocolius indicus*)
15. Brown-hooded Kingfisher (*Halcyon albiventris*)
16. Woodland Kingfisher (*Halcyon senegalensis*)
17. White-fronted bee-eater (*Merops bullockoides*)
18. European Bee-eater (*Merops apiaster*)
19. Lilac-breasted Roller (*Coracias caudatus*)
20. Lesser Striped Swallow (*Cecropis abyssinica*)
21. African Palm-Swift (*Cypsiurus parvus*)
22. Barn Swallow (*Hirundo rustica*)
23. Fork-tailed Drongo (*Dicrurus adsimilis*)
24. Black-headed Oriole (*Oriolus larvatus*)
25. Arrow-marked Babbler (*Turdoides jardineii*)
26. Dark-capped Bulbul (*Pycnonotus tricolor*)
27. Sombre Greenbul (*Andropadus importunus*)
28. Kurrichane Thrush (*Turdus libonyana*)
29. White-browed robin-chat (*Cossypha heuglini*)
30. White-browed Scrub Robin (*Erythropygia leucophrys*)
31. Green-backed Camaroptera (*Camaroptera brachyura*)
32. Long-billed Crombec (*Sylvietta rufescens*)
33. Rattling Cisticola (*Cisticola chiniana*)
34. Red-faced Cisticola (*Cisticola erythrops*)
35. Tawny-flanked prinia (*Prinia subflava*)
36. African Paradise Flycatcher (*Terpsiphone viridis*)
37. Yellow-throated Longclaw (*Macronyx croceus*)
38. African Pipit (*Anthus cinnamomeus*)
39. Orange-breasted Bushshrike (*Chlorophoneus sulfureopectus*)
40. Brown-crowned Tchagra (*Tchagra australis*)
41. Cape Starling (*Lamprotornis nitens*)
42. Common Myna (*Acridotheres tristis*)
43. Cape white-eye (*Zosterops capensis*)
44. Spectacled Weaver (*Ploceus ocularis*)
45. Village weaver (*Ploceus cucullatus*)
46. Pin-tailed Whydah (*Vidua macroura*)
47. White-winged Widowbird (*Euplectes albonotatus*)

48. Blue Waxbill (*Uraeginthus angolensis*)
 49. Yellow-fronted Canary (*Crithagra mozambicus*)

A total of 249 observed bird species were listed for a property 160 metres downstream of the KMAE project area, which include 19 threatened bird species (many of these birds were observed in the adjacent KNP environment):

1. Yellow-billed stork (*Mycteria ibis*) - SA Red Data (Taylor 2015): Endangered. IUCN 2016 Status: Least concern.
2. Black stork (*Ciconia nigra*) - SA Red Data (Taylor 2015): Vulnerable, TOPS (2007): Vulnerable. IUCN 2016 Status: Least concern. Mpumalanga: Vulnerable.
3. Saddle-billed stork (*Ephippiorhynchus senegalensis*) - SA Red Data (Taylor 2015): Endangered. NEMBA (TOPS): Endangered. IUCN 2014 Status: Least concern.
4. Marabou Stork (*Leptoptilos crumeniferus*) - SA Red Data (Taylor 2015): Near threatened. IUCN 2014 Status: Least concern.
5. African Finfoot (*Podica senegalensis*) - SA Red Data (Taylor 2015): Vulnerable. Mpumalanga: Vulnerable. IUCN 2015: Least concern.
6. White-backed Night-Heron (*Gorsachius leuconotus*) - SA Red Data (Taylor 2015): Vulnerable. IUCN 2015 Least concern.
7. African White-backed Vulture (*Gyps africanus*) - IUCN 2015: Critically Endangered; SA Red Data (Taylor 2015): Critically Endangered. NEMBA TOPS (2015 - Endangered)
8. Hooded Vulture (*Necrosyrtes monachus*) - IUCN (2015): Critically Endangered; NEMBA TOPS (2015): Endangered species; SA Red Data (Taylor 2015): Critically Endangered.
9. White-headed Vulture (*Trionoceps occipitalis*) - IUCN 2015: Critically Endangered; Endangered species; SA Red Data (Taylor 2015): Critically Endangered.
10. Lappet-faced Vulture (*Torgos tracheliotus*) - IUCN 2010 Endangered; NEMBA TOPS (2015): Endangered species; SA Red Data (Taylor 2015): Endangered.
11. Tawny Eagle (*Aquila rapax*) - SA Red Data (Taylor 2015): Endangered; NEMBA TOPS (2015): Endangered species; IUCN 2015 Status: Least concern.
12. Martial Eagle (*Polemaetus bellicosus*) - IUCN 2015 Status: Near-threatened; SA Red Data (Taylor 2015): Endangered; NEMBA TOPS (2015): Endangered species.
13. African Crowned Eagle (*Stephanoaetus coronatus*) - IUCN 2015 Status: Near-threatened. SA Red Data (Taylor 2015): Vulnerable. NEMBA (TOPS 2007): Vulnerable species. Mpumalanga: Vulnerable.
14. Bateleur (*Terathopius ecaudatus*) - IUCN 2015 NT: Near-threatened. SA Red Data (Taylor 2015): Endangered. NEMBA TOPS (2015): Endangered species.
15. Lanner Falcon (*Falco biarmicus*) - SA Red Data (Taylor 2015): Vulnerable. IUCN 2017 Status: Least concern.
16. Southern Ground-Hornbill (*Bucorvus leadbeateri*) - IUCN (2014) VU Vulnerable. SA Red Data (Taylor 2015): Endangered; NEMBA TOPS (2015): Endangered species.
17. Half-collared Kingfisher (*Alcedo semitorquata*) - SA Red Data (Taylor 2015): Near-threatened. Mpumalanga: Near-threatened. IUCN 2015 Status: Least concern.
18. European Roller (*Coracias garrulus*) - SA Red Data (Taylor 2015): Near-threatened; IUCN 2018 Least concern.
19. Greater Painted snipe (*Rostratula benghalensis*) - SA Red Data (Taylor 2015): Near-threatened.

4.4.3.4 Mammals

According to the distribution of mammals in South Africa, 100 species have distribution ranges extending into the region. During the surveys for mammal species 3 of the 100 were encountered in the KMAE project area:

- African savannah hare (*Lepus victoriae*)
- Common Molerat (*Cryptomys hottentotus*)
- Vervet monkey (*Cercopithecus aethiops*)

A total of 35 observed mammal species were listed for a property 160 metres downstream of the KMAE project area, which include 11 threatened species (most of these mammals were observed in the adjacent KNP environment):

1. Spotted hyaena (*Crocuta crocuta*) - NEMBA (TOPS 2015): Protected species. SA Red Data (Child 2016) Near-threatened.
2. Cheetah (*Acinonyx jubatus*) - IUCN 2015: Vulnerable; NEMBA (TOPS 2015): Vulnerable species. SA Red Data (Child 2016) Vulnerable.
3. Leopard (*Panthera pardus*) - IUCN (2016): Vulnerable. SA Red Data (Child 2016) Vulnerable. NEMBA (TOPS 2015): Protected species.
4. Lion (*Panthera leo*) - IUCN (2012): VU Vulnerable. NEMBA (TOPS 2015): Vulnerable species. SA Red Data (Child 2016) Vulnerable.
5. Wild dog (*Lycaon pictus*) - IUCN 2012: EN Endangered; NEMBA (TOPS 2015): Endangered species. SA Red Data (Child 2016) Endangered.
6. Cape clawless otter (*Aonyx capensis*) - IUCN (2016): NT Near-threatened; SA Red Data (Child 2016): Near-threatened; NEMBA (TOPS 2007): Protected species.
7. Honey badger (*Mellivora capensis*) - NEMBA (TOPS) 2007: Protected species. IUCN (2014) Least concern. SA Red Data (Child 2016): Least concern.
8. African elephant (*Loxodonta africana*) - IUCN (2010): Vulnerable. NEMBA (TOPS 2015): Protected species; SA Red Data (Child 2016): Least concern.
9. South central black rhinoceros (*Diceros bicornis minor*) - IUCN (2016): Endangered; SA Red Data (Child 2016): Endangered; NEMBA (TOPS 2015): Vulnerable species.
10. Southern white rhinoceros (*Ceratotherium simum*) - IUCN (2014): NT Near-threatened. SA Red Data (Child 2016): Near-threatened; NEMBA (TOPS 2015): Protected species.

5. Impact Assessment

5.1 Screening Report

The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to submit an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity. It also provides site specific EIA process and review information and allows for the generation of a Screening Report referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended.

Following is an abstract from the original Screening Tool application:

Cadastral details of the proposed site

Table 23: Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	MALELANE ESTATE	140	0	25°29'49.6S	31°29'15.7E	Farm
2	STRATHMORE	214	0	25°32'16.24S	31°26'6.53E	Farm
3		585	0	25°29'57.13S	31°29'29.34E	Farm Portion
4	STRATHMORE	214	112	25°30'12.29S	31°27'54E	Farm Portion
5	MALELANE ESTATE	140	13	25°30'0.94S	31°28'27.87E	Farm Portion

Table 24: Property details: Nearby developments and Environmental Management Frameworks (EMF) areas.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area	No nearby wind or solar developments found.
Environmental Management Frameworks relevant to the application	No intersections with EMF areas found.

Environmental screening results and assessment outcomes

The following sections include a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development footprint as well as the most environmental sensitive features on the footprint based on the footprint sensitivity screening results for the application classification that was selected.

Table 25: A summary of any development incentives, restrictions, exclusions or prohibitions.

Application classification	Agriculture - Forestry – Fisheries Crop Production Fisheries - Crop Production
Relevant development incentives, restrictions, exclusions or prohibitions	No intersection with any development zones found.

Proposed Development Area Environmental Sensitivity

The following summary of the development footprint 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.

Table 26: The development footprint environmental sensitivities (Figure 38).

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme		X		
Animal species		X		
Aquatic Biodiversity Theme				X
Archaeological and Cultural Heritage Theme		X		
Civil Aviation Theme			X	
Plant Species Theme			X	
Defence Theme				X
Terrestrial Biodiversity Theme	X			

The following section with maps represents the results of the screening for environmental sensitivity of the proposed site for selected environmental themes associated with the project classification.



Figure 38: Maps of relative theme sensitivity for important selected themes (Table 26).

Table 27: Sensitivity features of the project area.

Theme	Sensitivity	Feature
Agriculture Theme	High	Land capability; 09. Moderate-High/10. Moderate-High
Animal species theme	Medium	Mammalia - <i>Lycaon pictus</i> Mammalia- <i>Acinonyx jubatus</i> Reptilia- <i>Kinixys natalensis</i> Insecta- <i>Lepidochrysops swanepoeli</i> Insecta- <i>Orachrysops violescens</i>
Aquatic biodiversity	Low	
Archaeological and Cultural Heritage Theme	High	Within 500 m of an important river Within 1 km of a protected area
Plant Species Theme	Medium	<i>Caesalpinia rostrata</i>
Terrestrial Biodiversity Theme	Low	Low sensitivity

5.2 Sensitivity mapping

Sensitivity assessments identify those sections of the study area that have a high conservation value or that may be sensitive to disturbance. Sensitivities could be determined based on:

- areas containing untransformed natural vegetation and associated faunal habitat;
- irreplaceability of the vegetation type and associated faunal habitat;
- ecological importance of vegetation and faunal habitat;
- high diversity or complexity of faunal habitat;
- observations of the abundance and diversity of floral and faunal species present at the time of the assessment;
- occurrence of Species of Conservation Concern (SCC);
- systems vital to sustaining ecological functions;
- presence or absence of CBAs and ESAs;
- degree of disturbance encountered as a result of historical activities.

In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to have a low sensitivity.

An ecological sensitivity map of the project area was produced by integrating the information collected on-site with the available ecological- and biodiversity information available in the literature and various relevant reports. This includes delineating the different vegetation and habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties. Additionally, values and potential presence of vegetation and fauna species diversity, as well as species of conservation concern, were evaluated.

Five, broad-scale botanical biodiversity 'sensitivity' categories were identified and were developed for practical mapping purposes. They are intended as a summary of the perceived botanical biodiversity value and sensitivity, of mapped broad-scale vegetation and land-cover type units. Based on the assessment, the sensitivity of the project footprint can be divided into five categories of sensitivity: Very high, High, Moderate, Low and Negligible. These categories are listed as biodiversity sensitivity categories in Table 28.

Table 28: Important parameters relating to faunal diversity and landscape sensitivity listed in the different vegetation and land cover types in order to establish the biodiversity sensitivity and value of the project area.

Vegetation/ Land cover type unit	Status and sensitivity of vegetation type	CBA Category	Biota: Species of special concern (SSC)	Biodiversity value and sensitivity	Overall ecological value and sensitivity
Crocodile River	Granite Lowveld - Vulnerable	ESA: Protected area buffer	SSC: 2 reptiles; 19 birds; 10 mammals	Very high	High
Small stream on the eastern boundary	Granite Lowveld - Vulnerable	ESA Protected Area Buffer	SSC: 1 reptiles 2 birds; 2 mammals	Moderate	Moderate
Agriculture – Fallow lands	Granite Lowveld - Vulnerable	ESA: Protected area buffer	SSC: None	Negligible	Negligible
Infrastructure – housing	Granite Lowveld - Vulnerable	ESA Protected Area Buffer	SSC: None	Negligible	Negligible

The Crocodile River and its riparian zone are situated entirely in the confines of the Kruger National Park. Due to its protected status and very high biodiversity value, which includes a number of Species of Conservation concern, this biotope has a “**High**” overall ecological value and sensitivity status. Edge effects of the developments on the southern bank of the river are the reason why it does not reach the status of “Very High” (Table 28).

The small KMAE drainage line is part of a landscape changed completely by agricultural activities. These drainage lines fulfil an important function in maintaining the narrow riparian zones which acts as migration corridors and to buffer these riparian habitats. The drainage line also provides connectivity with the important Crocodile River system. The project area is situated in a Protected Area Buffer of the Kruger National Park.

Even though most of the project area consists of cultivated area and old lands (Figure 23), the drainage line and its associated riparian characteristics of this vegetation unit has a **Moderate** sensitivity and value in terms of biodiversity conservation.

The remaining cover types, fallow lands and infrastructure have no value in terms of biodiversity or sensitivity and therefore their status is categorised as **Negligible** (Table 28).

5.3 Land-use planning and Decision-making

5.3.1 The use of CBA maps in Environmental Impact Assessments

Ideally, all land-users and people who make decisions about land and the use of natural resources should be aware of spatial biodiversity priorities and should know how to take these into consideration in their planning and decision-making processes. This is so that they can proactively identify the ecological opportunities and constraints within a landscape and use these to locate different land-uses appropriately (Cadman *et al.*, 2010).

Systematic biodiversity planning provides a powerful set of tools (maps and land-use guidelines) that facilitate this in a wide range of sectors, at both the policy-making and operational decision-making levels. The Mpumalanga Biodiversity Sector Plan represents the biodiversity sector's input into a wide range of planning and decision-making processes, frameworks and assessments in multiple land-use sectors (MBSP Handbook, Lötter *et al.* 2014).

Mpumalanga Biodiversity Sector Plan (MBSP) and Threatened Ecosystems

The Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Tourism & Parks Agency, Mbombela (Nelspruit). provides maps of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) for the entire province, which is referred to as the CBA Map in the MBSP.

Critical Biodiversity Area (CBA) maps and their associated land-use guidelines are used to determine the biodiversity context of a proposed land-use site, ahead of making the first site visit. Although the CBA maps supply crucial guidelines for the assessment, additional background information is required to develop a broader understanding of the study area. A number of resources and tools are therefore used to establish how important the proposed development site is for meeting biodiversity targets. Specifically, the Land-Use Decision Support Tool (LUDS) and the Mpumalanga Biodiversity Sector Plan (MBSP) are extensively used to compile reports (BGIS, 2015). LUDS was developed to facilitate and support biodiversity planning and land-use decision-making at a national and provincial level.

The conservation status of the SVI3 Granite Lowveld is "Vulnerable" with a target of 19%. It has been greatly transformed (20%), **mainly by cultivation and by settlement** development. (Mucina & Rutherford 2006).

The KMAE project area resides within the planning domain of the Mpumalanga Biodiversity Sector Plan, developed by the Mpumalanga Tourism and Parks Agency (MTPA). The potential impact of the development on Critical Biodiversity Areas should be considered in detail as these areas have been identified through systematic conservation planning exercises and represent biodiversity priority areas which should be maintained in a natural to near natural state in order to safeguard biodiversity patterns and ecological processes.

This report made use of the Mpumalanga Biodiversity Sector Plan (MBSP), which was founded on an extensive biodiversity database compiled over the years by the province's conservation biologists. These detailed records, together with the latest mapping and remote sensing data on vegetation, land use and water resources, have been combined and subjected to sophisticated analyses. For the finer components of a conservation plan, the MBSP maps were consulted and the detail added to the sensitivity assessment of the study area.

The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Critical Biodiversity Areas (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services.

If these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

Its primary objective is to serve as a guide for biodiversity planning but should not replace specialist ecological assessments. To maintain an area in a 'natural' state, a variety of biodiversity-compatible land uses and resource uses should be followed.

The MBSP maps the distribution of the province's known biodiversity into seven categories. These are ranked according to ecological- and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature. The categories are:

- Protected areas - already protected and managed for conservation;
- Irreplaceable areas - no other options available to meet targets—protection crucial;
- Highly significant areas - protection needed, very limited choice for meeting targets;
- Important and necessary areas - protection needed, greater choice in meeting targets;
- Ecological corridors – mixed natural and transformed areas, identified for long term connectivity and biological movement;
- Areas of Least Concern – natural areas with most choices, including for development; and
- Areas with No Natural Habitat Remaining – transformed areas that make no contribution to meeting targets.

It must first be established how important the site is for meeting biodiversity targets. To do this, it is necessary to answer the following three simple but fundamentally important questions:

- How important is the site for meeting biodiversity objectives, e.g. is it in a CBA or Ecological Support Area (ESA)?
- Is the proposed land-use consistent with these objectives or not (to be checked against the land-use guidelines)?
- Does the sensitivity of this area trigger the MTPA requirements for assessing and mitigating environmental impacts of developments, or in terms of the listed activities in the EIA regulations?

Table 29: The key results of the LUDS Report as extracted for the KMAE project area from national datasets available from BGIS.

National Data Set	Aspect	Present
National terrestrial information: Portions 8, 13 & 14 of the Farm Malelane Estate 140- JU in the Malalane area, Mpumalanga		
South African District	Ehlanzeni	
South African municipal boundaries	Municipality name: Nkomazi	MP324
Quarter-degree grid square		2531CB
Terrestrial CBAs		
Bioregion	National vegetation map	Status
Savanna Biome (Lowveld)	SVI3 Granite Lowveld	Vulnerable but moderately protected in South Africa.
Ecological Support Areas	Protected area buffer	Kruger National Park
Aquatic Critical Biodiversity Areas		
Water Management Area (WMA)	Inkomati WMA	
Sub Water Management Area	Crocodile Catchment	
NFEPA River	Crocodile River	3_P_L Lowveld Group 3_Channelled valley-bottom wetland
	Fish support area	Tigerfish
Ecoregion 1	Lowveld Ecoregion	3.07

5.3.2 Critical Biodiversity Areas

Overlaying the BGIS Critical Biodiversity Areas map onto the KMAE project area, resulted in the compilation of Figures 37 to 39 and Table 29. With reference to these maps and LUDS Report (Table 29) the project area falls into the following sensitive areas:

- Terrestrial:
 - Ecological Support Area: Protected area buffer
 - Vulnerable Ecosystem Status: Granite Lowveld – Vulnerable
- Aquatic:
 - NFEPA River: Crocodile River

With these landscape properties, it is paramount to approach the construction- and operation phases of the entire project with caution.

Ecological Support Areas: Those areas that play a significant role in supporting ecological functioning of Critical Biodiversity Areas and/or delivering ecosystem services, as determined in a systematic biodiversity plan.

A CBA map of the study area was compiled by using the Biodiversity Geographic Information System (BGIS) maps as illustrated in Figure 39. Every attempt should be made during all phases of the project development not to have an impact on these areas. While determining the area and distribution of a core habitat is important, it is equally important that appropriate management measures be defined to ensure the core habitat continues to function effectively.

The goal is to maximise connectivity in CBAs and ESAs, the retention of intact natural habitat and avoid fragmentation: Design project layouts and select locations that minimise

loss and fragmentation of remaining natural habitat and maintain spatial components of ecological processes, especially in ecological corridors, buffers around wetlands, CBAs and ESAs. Activities that are proposed for CBAs must be consistent with the desired management objectives for these features and should not result in fragmentation.

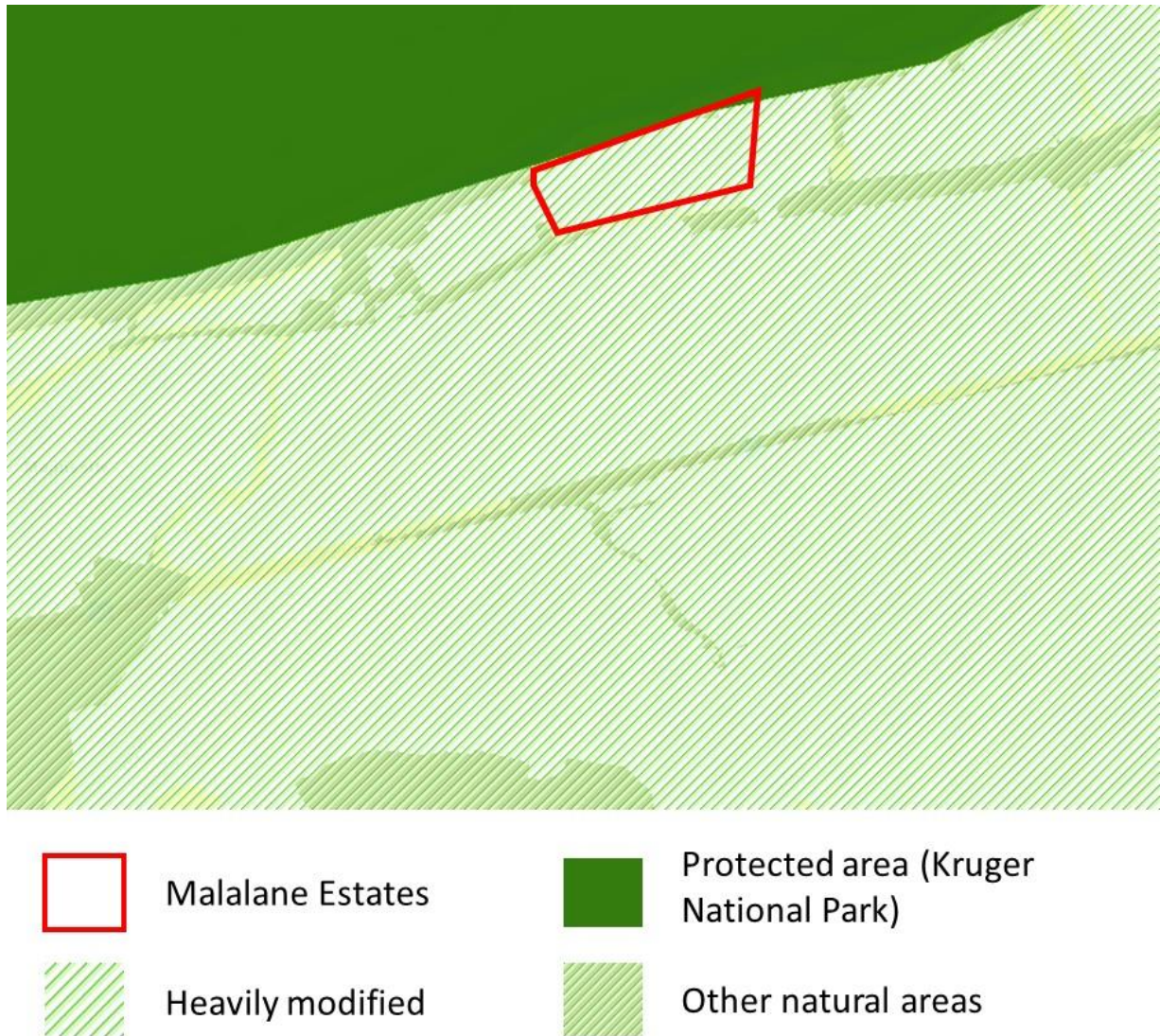


Figure 39: The Critical Biodiversity areas for the KMAE project area as illustrated by the LUDS programme (BGIS, 2015) for Mpumalanga.

Figure 23 illustrates the Present Ecological State of the project area as illustrated by the LUDS programme (BGIS, 2015) for Mpumalanga. It indicates the current and historically cultivated areas including the position of the proposed development.



Ecological Support Area: Protected Area Buffer

Figure 40: The Terrestrial Critical Biodiversity areas for the KMAE project area, illustrating the ESA Protected Area Buffer around the Kruger National Park, as per the LUDS programme (BGIS, 2015) for Mpumalanga.

Figures 40 and 41 illustrate the Critical Biodiversity areas for the KMAE project area as compiled from the LUDS programme (BGIS, 2015) for Mpumalanga and it shows most of the area has been transformed by agriculture (“Heavily Modified”). But even so, the entire farm is situated in a Protected Area Buffer which is part of the delineated buffer (distance of 10 km) around National Parks, in this case the Kruger National Park.

As the KMAE project area is located in an Ecological Support Area (ESA Protected Area Buffer), the Desired Management Objectives are to minimise habitat and species loss through judicious planning and maintain basic ecosystem functionality and ecological condition within the surrounding landscape (sub-catchment).

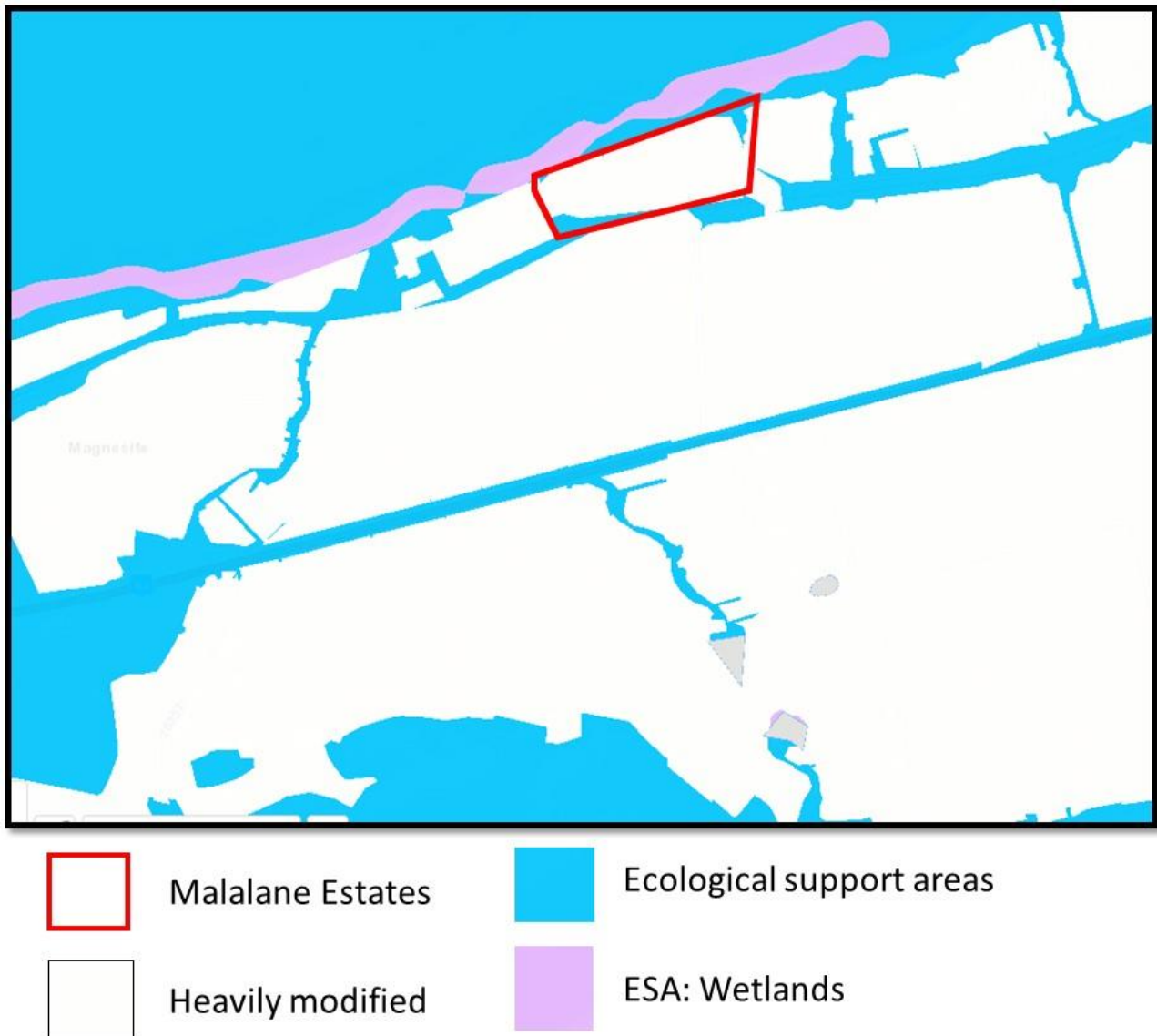


Figure 41: A map obtained from the 2014 Mpumalanga Biodiversity Sector Plan to indicate the Freshwater CBAs and ESAs in the project area, (red rectangle) (Mpumalanga Biodiversity Sector Plan, 2014).

Freshwater Ecosystem Priority Areas (FEPAs) are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries. The Crocodile River which flows past the project area is a FEPA river (Figure 41).

5.3.3 Corridors for Connectivity

The guidelines for land-use practices or activities that impact on water quantity in freshwater CBAs includes: Generic buffers should be established around streams within these catchments. These buffers can be refined based on a site visit and applying the DWS's wetland delineation tool.

Due to their positioning adjacent to water bodies, buffer zones associated with streams and rivers will typically incorporate riparian habitat. Riparian habitat, as defined by the NWA, includes the physical structure and associated vegetation of the areas associated with a watercourse (Macfarlane et al, 2015). However, the riparian zone is not the only habitat type that is present in the buffer as the zone may also incorporate stream banks and terrestrial habitat, depending on the width of the aquatic impact buffer zone applied. Therefore, the riparian zone must be delineated before the buffer zone is established.

5.3.4 Riparian delineation

During the process of riparian delineation, five transects were surveyed. A transect runs from the outer edge of one riparian zone (left bank), through the drainage line to the outer edge of the other riparian zone (right bank). The results of the surveys are illustrated in Figures 31 and 32 in the previous section.

Riparian delineation and habitat evaluation was undertaken according to the DWAF Guidelines (2005) and DWAF updated manual (2008) (see Methods Section 2.1 Vegetation). Figures 43 and 44 illustrate the KMAE project area with the Crocodile River and the small unnamed stream riparian zones delineated. The delineation shapefiles are available as Appendices 6 to 11.

5.3.5 Buffer zones

Landscape connectivity may be achieved through several main types of habitat configurations that function as linkages for species, communities or ecological processes. Linkages are used as pathways by animals undertaking a range of movements, including daily or regular movements, seasonal and migratory movements, dispersal movements and range expansion. Linkages also contribute to other ecological functions in the landscape and in particular, have an important role to play in providing habitat for plants and animals in human-dominated environments (Bennett, 2003).

The riparian zone along this reach of the Crocodile River and its tributaries classifies the river system as a CBA (refer to Section 5.3.1), and according to the Mpumalanga Biodiversity Sector Plan (2014), a buffer should be implemented around the delineated riparian area, measured from the top of bank. Buffer zones have been used in land-use planning to protect natural resources and limit the impact of one land-use on another.

Buffer zones associated with water resources have been shown to perform a wide range of functions, and on this basis, have been proposed as a standard measure to protect water resources and associated biodiversity. These functions include:

- Maintaining basic aquatic processes;
- Reducing impacts on water resources from upstream activities and adjoining land uses;
- Providing habitat for aquatic and semi-aquatic species;
- Providing habitat for terrestrial species; and
- A range of ancillary societal benefits.

Determining the required buffer width is largely an exercise of assessing the situation and linking it to an acceptable level of risk. Determining appropriate management measures for aquatic impact buffer zones is largely dependent on the threats associated with the proposed activity adjacent to the water resource. These threats include:

- Increases in sedimentation and turbidity;
- Increased nutrient inputs;
- Increased inputs of toxic organic and heavy metal contaminants; and
- Pathogen inputs.

Any potential risks must be managed and mitigated to ensure that no deterioration to the water resource takes place. Standard management measures should be implemented to ensure that any on-going activities do not result in a decline in water resource quality. One of the important control measures listed above, is the buffer zone protecting the adjacent KMAE drainage systems. Buffer zones will serve as a mitigating measure for impacts created by the construction- and operational phases of the proposed KMAE development.

The implementation of a buffer zone to emphasise the importance of the riparian zone and adjacent dry land will certainly augment the importance of the ecology in the project area. The area included in the buffer zone, as well as the core areas in the riverine zone, should have explicit and very strict biodiversity conservation management measures and the operating teams should be well aware of this.

Site-based assessment: Desktop threat ratings are used as a starting point for buffer zone determination. While desktop threat ratings provide an indication of the level of threat posed by different land uses/activities, there is likely to be some level of variability between activities occurring within a sub-sector. It is therefore important that these threat ratings be reviewed based on specialist input and that a justification for any changes is documented in the Buffer Zone Tools.

Determine the Risk Posed by Proposed Activities on Water Resources

Once both threats posed by potential land uses/activities and the inherent sensitivity of receiving water resources have been assessed, this information is used to evaluate the risks posed by such activities on the water resource under consideration (Tables 31 and 33). Risk scores are calculated by multiplying threat and sensitivity scores to obtain a risk score for each impact type evaluated as illustrated in Table 30.

Table 30: Risk classes used in this assessment.

Risk Class	Risk Score	Description
Very low	<0.3	The proposed development/activity poses a very low risk to the water resource under investigation for the threat type assessed.
Low	0.3-0.5	The proposed development/activity poses a low risk to the water resource under investigation for the threat type assessed.
Moderate	0.51-0.7	The proposed development/activity poses a moderate risk to the water resource under investigation for the threat type assessed.
High	0.71-0.9	The proposed development/activity poses a high risk to the water resource under investigation for the threat type assessed.
Very high	>0.91	The proposed development/activity poses a very high risk to the water resource under investigation for the threat type assessed.

The sensitivity of water resources to lateral impacts is another factor affecting the level of risk posed by a development. A more risk-averse approach is therefore required when proposed developments take place adjacent to water resources that are sensitive to lateral

impacts, as opposed to the same development taking place adjacent to a water resource which is inherently less sensitive to the impacts under consideration.

There are two stream systems to be delineated on the KMAE project area. The Crocodile River and a small unnamed drainage area that drains a catchment area from the south (mostly developed as sugar cane fields). This little stream seems perennial due to constant flows, but the water supply is most probably kept perennial due to irrigation return flows.

The Crocodile River section adjacent to the proposed development, is mostly devoid of woody vegetation. Due to this, no recognisable riparian zone could be delineated. In the case where no clear riparian zone is present, buffers should be delineated from the edge of the macro channel bank (Figure 1).

The active channel is the portion of a river that is inundated at sufficiently regular intervals to maintain channel form (i.e. the presence of distinct bed and banks) and to keep the channel free of established terrestrial vegetation. Active channels are typically filled to capacity during bankfull discharge (i.e. during the annual flood).

The riparian zone or riparian area of a river is the portion of land directly adjacent to the active channel (i.e. on the banks of the river), which is influenced by river-induced or river-related processes. These areas are commonly characterised by alluvial soils and by vegetation that is distinct from that of adjacent land areas in terms of its composition and physical structure. The riparian zone of a river is typically located between the outside edge of the active channel and the outside edge of the macro-channel.

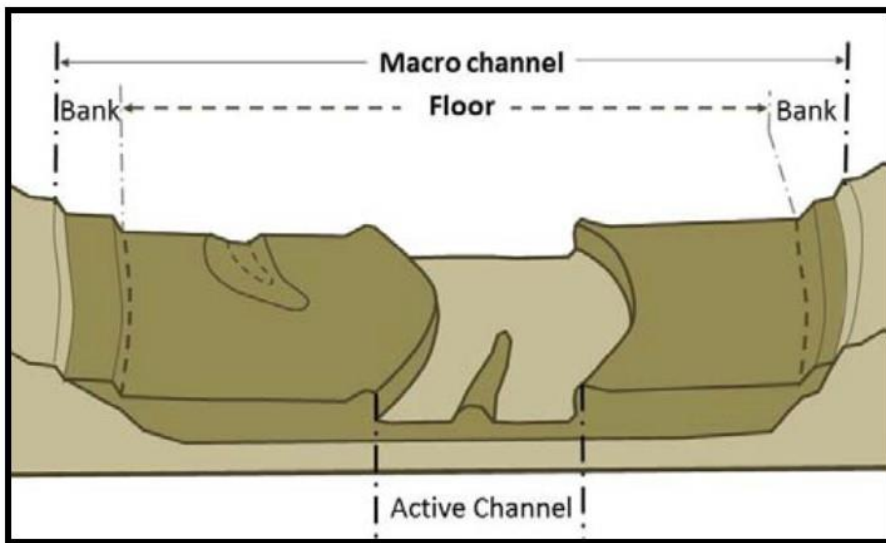


Figure 42: Guidance for a Buffer Zone Delineation: Buffer delineated from edge of macro channel floor (Macfarlane and Bredin, 2017).

The small unnamed tributary to the east of the project area, is a narrow stream (1-2m wide) confined to a steep V-shaped valley (3 - 7m deep). A few scattered large trees are present on the embankment, some of them terrestrial species, indicating that the stream was not always perennial. True riparian trees is limited to:

- Natal mahogany – 2 trees
- Sycamore figs – 6 trees
- Pigeonwood – 1 tree

All indications are there that this system never had an extensive riparian zone. Currently the stream channel is completely overgrown with the alien invasive Spanish reed. Should all the invasive vegetation be removed, the riverine environment will consist of the narrow stream bed and a few scattered riparian trees. Therefore, it was decided to implement the aquatic buffer from the edge of the active channel.

The aspects utilised to establish the KMAE project area riparian buffer zones for the Crocodile River and the small unnamed tributary, are listed in Tables 31 and 33.

Crocodile River buffer

Table 31: Site-based tool: Determination of buffer zone requirements for the Crocodile River.

Site-based tool: Determination of buffer zone requirements for the Crocodile River.	
Name of Assessor	Dr AR Deacon
Project details	KMAE project area
Date of Assessment	12/12/2020
Level of Assessment	Site-based
Approach used to delineate the riparian zone & active channel?	Site-based delineation
River type	Lowland river
Present Ecological State	"D" Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
Ecological importance & sensitivity	High: Features that are considered to be ecologically important and sensitive at a regional scale. The functioning and/or biodiversity of these features are typically moderately sensitive to anthropogenic disturbances. They typically play an important role in providing ecological services at the local scale.
Management Objective	Maintain status.
Sector	Residential: Provides for land and buildings for a variety of housing types, ranging from areas that are almost entirely residential to those areas having a mix of other compatible land uses, where the predominant land use is residential.
Sub-sector	Resort: Accommodation in the form of lodges, bush camps, cultural villages and bed and breakfast establishments within a rural setting.
MAP Class	801 – 1000mm
Rainfall intensity	Zone 4
Stream order	5 th order
Channel width	>20m
Perenniality	Perennial system (>9 months)

Average slope of rivers catchment	3%
Inherent runoff potential of the soil in the river's catchment	Low (A & A/B)
Longitudinal river zonation	Lowland river
Inherent erosion potential (K-factor) of catchment soils	0.25-0.50
Retention time	Generally free flowing
Inherent level of nutrients in the landscape	Moderate base status
Inherent buffering capacity	Neutral pH
Natural salinity levels	Non-saline (<200mS/m)
River depth to width ratio	>0.25
Mean annual temperature	Zone 5 (19.5 - 24.2 ^o C)
Level of domestic, livestock and contact recreational use	Moderately low
Buffer attributes	
Slope of the buffer	Gentle (2.1 - 10%)
Vegetation characteristics (Construction phase)	Very poor: Vegetation either very short (<2cm) offering little resistance to flow or sparse and providing poor interception (e.g. degraded grasslands with very poor basal cover).
Vegetation characteristics (Operational phase)	Good: Moderately robust vegetation with good interception potential (e.g. good condition tufted grass stands).
Soil permeability	Moderately low: Deep moderately fine textured soils (e.g. loam & sandy clay loam) OR shallow (<30cm) moderately drained soil.
Micro-topography of the buffer zone	Dominantly uniform topography: Dominantly smooth topography with few/minor concentrated flow paths to reduce interception.
Additional mitigation measures to consider	
3. Increase in sediment inputs & turbidity	Manage storm water and prevent any sediment to enter the drainage line
Final aquatic impact buffer requirement	
Construction Phase	20m
Operational Phase	23m

Identify Additional Mitigation Measures Where Appropriate and Refine the Aquatic Impact Buffer Width Accordingly.

Where appropriate, identify additional mitigation measures and refine aquatic impact buffer width accordingly (Tables 32 and 34). Although buffer zones are advocated as standard mitigation measure to address a range of threats, they are only one of a suite of mitigation measures that can be used to reduce potential impacts. Pollution prevention, on-site mitigation (such as water treatment/water reuse and reclamation) and effective storm water management controls are regarded as critical for effective mitigation instead of simply relying on buffer zones as a last form of defence. An opportunity is therefore provided for the assessor to identify suitable supplementary mitigation measures that will reduce the threats posed by the development/activities and in so doing, reduce associated buffer zone requirements.

Table 32: Revised aquatic impact buffer requirements (including additional mitigation measures) – Crocodile River:

Threat posed by the proposed land use activity	Specialist threat rating	Specialist justification for refined threat ratings
Increase in sediment input and turbidity	Low	Manage storm water and prevent any sediment to enter the drainage line
Increased nutrient input	Low	Make use of Best Practice Guidelines and Specifications (re agricultural fertilisers).

Storm water management is a critical element of urban planning. Without appropriate planning and management, storm water can have significant impact on water resources. However, carefully designed and managed buffer zones can contribute to a highly effective storm water management system.

Final aquatic impact buffer requirements (including practical management considerations) for the Crocodile River:

- Construction Phase: 20 m
- Operational Phase: 23 m
- Final aquatic impact buffer requirement: 23 m

The final buffer zone requirements are not only dictated by requirements for minimising impacts of pollutants on the water resource. No development is typically permitted within the water resource boundary. Therefore, final buffer zone requirements are effectively determined by the maximum distance of the water resource boundary (including riparian habitat), or the aquatic impact buffer zone required to protect the water resource.

Unnamed tributary to the Crocodile River

Table 33: Site-based tool: Determination of buffer zone requirements for the small unnamed tributary to the Crocodile River.

Site-based tool: Determination of buffer zone requirements for river systems.	
Name of Assessor	Dr AR Deacon
Project details	KMAE project area
Date of Assessment	12/12/2020
Level of Assessment	Site-based
Approach used to delineate the riparian zone & active channel?	Site-based delineation
River type	Lowland river
Present Ecological State	"E" Seriously modified.
Ecological importance & sensitivity	Low: Features are not ecologically important and sensitive at any scale. The biodiversity of these areas is typically ubiquitous with low sensitivity to anthropogenic disturbances and play an insignificant role in providing ecological services.
Management Objective	Maintain status.
Sector	Residential
Sub-sector	Residential low impact
MAP Class	801 – 1000mm
Rainfall intensity	Zone 4
Stream order	4 th order
Channel width	<1m
Perenniality	Seasonal system (3-9 months)
Average slope of rivers catchment	3%
Inherent runoff potential of the soil in the river's catchment	Low (A & A/B)
Longitudinal river zonation	Lowland river
Inherent erosion potential (K-factor) of catchment soils	0.25-0.50
Retention time	Generally slow moving
Inherent level of nutrients in the landscape	Moderate base status
Inherent buffering capacity	Neutral pH
Natural salinity levels	Non-saline (<200mS/m)
River depth to width ratio	0.25 – 0.75
Mean annual temperature	Zone 5 (19.5 - 24.2 ^o C)
Level of domestic, livestock and contact recreational use	Moderately low
Buffer attributes	
Slope of the buffer	Gentle (2.1 - 10%)
Vegetation characteristics (Construction phase)	Very poor: Vegetation either very short (<2cm) offering little resistance to flow or sparse and providing poor interception (e.g. degraded grasslands with very poor basal cover).
Vegetation characteristics (Operational phase)	Poor: Vegetation either short (<5cm) (e.g. maintained lawns) or robust but widely spaced plants with poor interception (e.g. trees or shrubs with poorly vegetated understory).

Soil permeability	Moderately low: Deep moderately fine textured soils (e.g. loam & sandy clay loam) OR shallow (<30cm) moderately drained soil.
Micro-topography of the buffer zone	Dominantly uniform topography: Dominantly smooth topography with few/minor concentrated flow paths to reduce interception.
Additional mitigation measures to consider	
3. Increase in sediment inputs & turbidity	Prevent any sediment to enter the drainage line
Final aquatic impact buffer requirement	
Construction Phase	10m
Operational Phase	10m

Identify Additional Mitigation Measures Where Appropriate and Refine the Aquatic Impact Buffer Width Accordingly.

An opportunity is provided for the assessor to identify suitable supplementary mitigation measures that will reduce the threats posed by the development/activities and in so doing, reduce associated buffer zone requirements.

Table 34: Revised aquatic impact buffer requirements (including additional mitigation measures) - Unnamed tributary:

Threat posed by the proposed land use activity	Specialist threat rating	Specialist justification for refined threat ratings
Increase in sediment input and turbidity	Very Low	Mitigation and management measures are to be specified in order to ensure that areas susceptible to potential erosion are protected both during the construction and operational phase of the development.
Increased nutrient input	Very Low	Make use of Best Practice Guidelines and Specifications (re agricultural fertilisers and sewerage systems). Refrain from releasing grey water into the stream.

Final aquatic impact buffer requirements (including practical management considerations) for the small stream:

- Construction Phase: 10 m
- Operational Phase: 10 m
- Final aquatic impact buffer requirement: 10 m

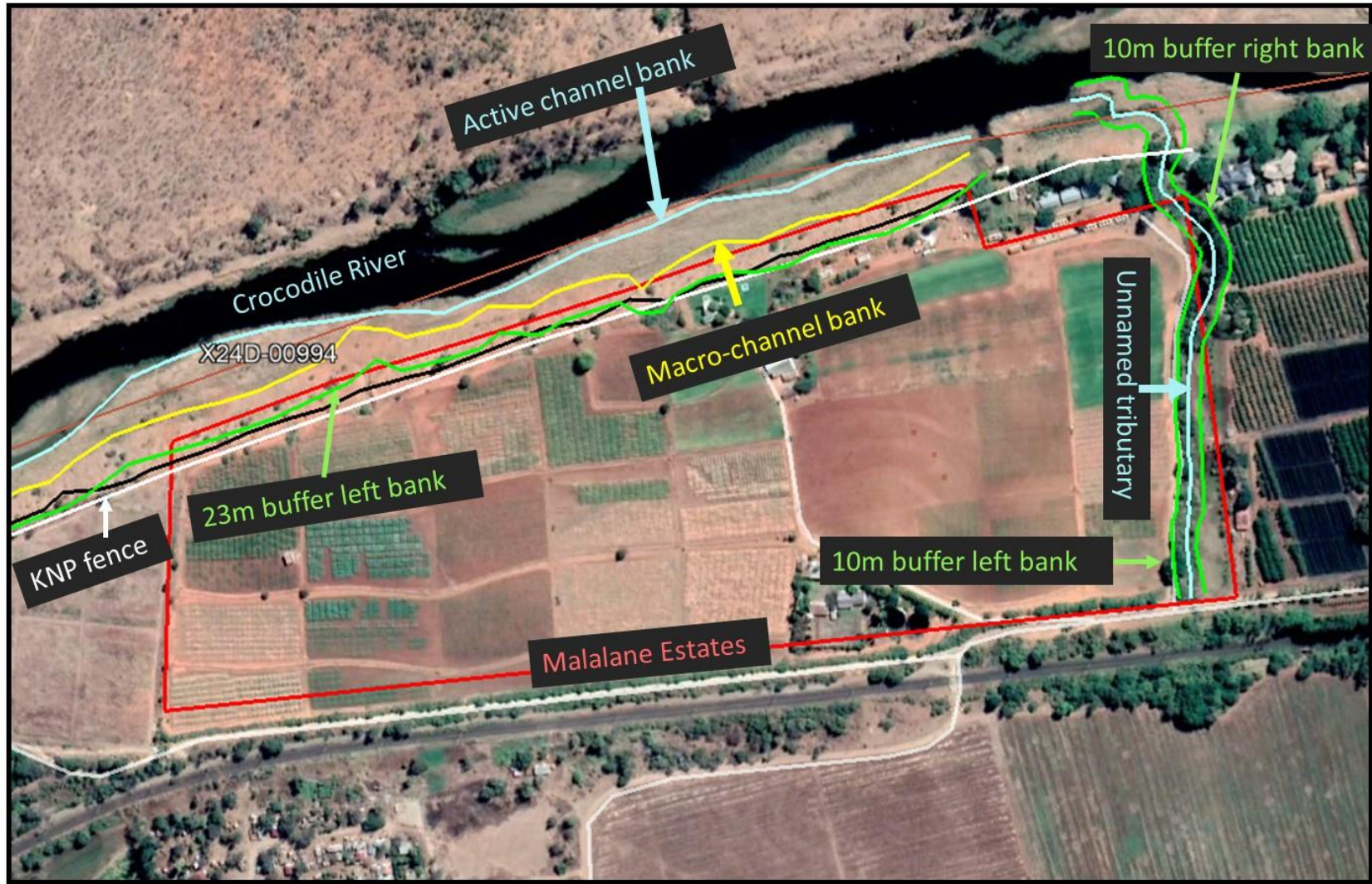


Figure 44: The KMAE project area lay-out, illustrating the stream morphology and riverine buffer zones of the Crocodile River and the unnamed tributary to the east of the proposed development.

5.3.6 Land-use guidelines

The following section outlines land-use activity descriptions and it includes a summary of the circumstances under which any of these land-use activities can be regarded as biodiversity compatible and outlines additional biodiversity-related management practices and controls.

Maintaining biodiversity patterns and ecological processes and the ecosystem services derived from these, requires integrated management over large areas of land. Although a system of well-managed, strategically located protected areas is the most secure long-term strategy for conserving biodiversity, it is generally acknowledged that protected areas alone will never be adequate to conserve a representative sample of biodiversity and maintain ecosystem functioning – it is both impractical and undesirable to secure all biodiversity priority sites through formal protection, protected areas can be expensive to establish and manage and carry high opportunity costs. It is also difficult to conserve ecological processes in isolated protected areas alone.

There remains a need to safeguard biodiversity beyond the boundaries of protected areas to maintain the integrity of ecosystems across broader landscapes and for all who live and work in these landscapes to play a part in managing them sustainably. This is the essence of the ‘landscape approach’ to conservation, in which protected areas are embedded in a matrix of land-uses that strives for biodiversity compatibility and in which biodiversity management objectives are integrated into the plans, decisions and practices of a wide range of land users. These land-use guidelines are designed to help achieve this.

In broad terms, the biodiversity priority areas need to be maintained in a healthy and functioning condition, whilst those that are less important for biodiversity can be used for a variety of other land-use types (Lötter et al, 2014).

Table 35: The different categories on the CBA maps have specific management objectives, according to their biodiversity priority (MBSP Handbook 2014).

Map Category	Definition	Desired management objectives
Critical Biodiversity Areas (CBAs)	Areas that are required to meet biodiversity targets, for species, ecosystems or ecological processes.	Must be kept in a natural state, with no further loss of habitat. Only low-impact, biodiversity-sensitive land-uses are appropriate.
Ecological Support Areas (ESAs)	Areas that are not essential from meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services.	Maintain in a functional, near-natural state, but some habitat loss is acceptable. A greater range of land-uses over wider areas is appropriate, subject to an authorisation process that ensures the underlying biodiversity objectives are not compromised.
ESA: Protected Area Buffer	A buffer distance of either 10 km for National Parks; 5 km for all other PAs; and 1 km for Protected Environments.	Maintain or improve ecological and tourism functionality of a PA, ensuring none of the PA objectives are compromised by activities or land-use changes in the buffer zone.
Other Natural Areas (ONAs)	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions. Although they have not been prioritised for	An overall management objective should be to minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. These areas offer the greatest flexibility in terms of management objectives and permissible land-uses, but some

	biodiversity, they are still an important part of the natural ecosystem.	authorisation may still be required for high-impact land-uses.
Heavily or Moderately Modified Areas	Areas that have been modified by human activity to the extent that they are no longer natural and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructural functions, even if they are never prioritised for conservation action.	Such areas offer the most flexibility regarding potential land-uses, but these should be managed in a biodiversity-sensitive manner, aiming to maximise ecological functionality and authorisation is still required for high-impact land-uses. Moderately modified areas (old lands) should be stabilised and restored where possible, especially for soil carbon and water-related functionality.

5.3.7 Desired Management Objective

The following section outlines land-use activity descriptions and it includes a summary of the circumstances under which any of these land-use activities can be regarded as biodiversity compatible and outlines additional biodiversity-related management practices and controls.

Tables 36 summarises the final permissible land-uses that are proposed for the identified landforms on the KMAE project area. The demarcated map is found in Figures 39 to 41. The area is listed and rated as follows:

Critical Biodiversity Areas (CBAs): ESA Protected Area Buffer (KNP)

ESA: Protected Area Buffers are areas around protected areas where changes in land-use may affect the ecological functioning or tourism potential of the adjacent protected area. The purpose of buffer zones is to reduce the impacts of undesirable land-uses on the environment, and to provide opportunities for tourism.

Modification of the natural habitat within the buffer zones may have negative impacts on the zonation and management plan of the adjacent protected area. Only low-impact, biodiversity-sensitive land-uses are appropriate.

Table 36: Permissible land-uses that are set for the identified landforms on the KMAE project area.

Permissible land-uses that are unlikely to compromise the biodiversity objective.	Land-uses that may compromise the biodiversity objective and that are only permissible under certain conditions.	Land-uses that will compromise the biodiversity objective and are not permissible.
Livestock & Game Ranching	Arable Lands	Residential
Conservation / Stewardship	Agricultural Infrastructure	Urban Influence
Open Space	Forestry	Low Impact & General Industry
Low Impact Tourism	Municipal Commonage	High Impact Industry
Eco-estates	High Impact Tourism	Quarrying / Opencast Mining
	Rural Residential	
	Roads & Rail	
	Water Works, Sewerage Works, Catchment Transfers	
	Prospecting / Underground Mining	
	Transport Services	
	Linear Structures: Pipelines, Canals, Power lines	
	Other Utilities	

CBAs and listed activities in terms of the EIA Regulations.

Depending on specific activities, CBAs (and ESAs) trigger the need for basic assessments in terms of the EIA regulations, and should inform the development of Terms of Reference for the biodiversity specialists appointed in the EIA process.

The specific activities requiring an environmental authorisation are listed in three notices, reflected in Government Notice R 544, R 545 and R546, as follows:

Listing Notice 1: This states that a Basic Assessment (BA) is required for those activities with known impacts that can be avoided or reduced.

Listing Notice 2: This refers to activities with unknown impacts that require specialist studies to be worked out. Such activities require a comprehensive scoping/environmental impact assessment.

Listing Notice 3: This applies to activities in sensitive geographic areas, requiring a basic assessment and environmental authorisation before commencement of any land-use activity.

In Mpumalanga, these sensitive geographic areas are CBAs and ESAs as defined in the MBSP.

The activities covered by all three of these listing notices conflict with the desired management objective for CBAs.

Protected area buffers

When assessing the impacts of proposed land uses in protected area buffers, consideration needs to be given to both direct (e.g. plantation forestry blocking view-sheds and reducing water flows into a Protected Area) and indirect impacts (e.g. light and noise pollution).

Land-use change applications within the buffer zone may be referred to the protected area manager or ecologist for evaluation. The fact that the land use change only involves the development of the front portion of the demarcated project area, and the change is in line with the permissible land-uses as listed in Table 36 under "Permissible land-uses that are unlikely to compromise the biodiversity objective", which is Low Impact Tourism and Eco-estates.

A viewshed analysis of the potential visual impact of the proposed land-use on adjacent protected areas should be undertaken where necessary. In the case of this project, a viewshed analysis was done and will be added to the final EIA report.

5.4 Assessment of impacts

The potential impacts of the project on the biodiversity of the study area are assessed under the following broad categories, namely:

Activity 1. Construction of the lifestyle units.

1.1 Storm water and erosion/siltation

1.2 Pollution

1.2.1 Sewerage

1.2.2 Hazardous substances associated with construction activities

1.2.3 Solid waste

Activity 2. Construction of a dam in an unnamed drainage line.

2.1 Inundation of the stream

2.2 Migration barrier

Activity 3. Establishment of the orchards

3.1 Storm water and erosion/siltation

Activity 4. Human wildlife conflict – fences, elephants and orchards; scavenging; lighting, etc.

Activity 5. Alien invasive vegetation.

The impact assessment of all the perceived impacts provided below, describes each broad impact, determines the significance of the impact and lists summarised mitigation- and monitoring measures for each impact.

Activity 1: Construction of the lifestyle units.

Impact 1.1: Stormwater and erosion/siltation

Applicable Phase: Construction- and Operational phase.

Applicable activity: Surface flows from residential areas will be released as stormwater into the receiving environment, which may cause erosion and siltation

Nature of impact: A development, such as the KMAE development implies that areas of natural vegetation are replaced with housing units, roads, and other forms of impervious surfaces in the residential areas. The effect of this is that water runs from the new hard ground surfaces and enters streams or watercourses in greater volumes and over a shorter period of time. However, the KMAE development can be considered as a very low density development which directly implies that runoff will not increase impermeable areas significantly.

Mitigation of Impact 1.1:

Mitigation Description: Modern stormwater management practices are aimed at considering stormwater as part of the water cycle, a strategy which is increasingly being known as Water Sensitive Urban Design (WSUD) with the stormwater management component being known as Sustainable Drainage Systems (SuDS). A number SuDS options are available and for this development Source and Local controls will be implemented for both the agriculture and the residential areas (ConSolv, 2020).

Source Controls include the following and are normally specified by the estate architect as part of the Architectural Guidelines for the development:

- Rainwater Harvesting refers to the temporary storage and reuse of rooftop and/or surface runoff.

- Soakaways are usually excavated pits that are packed with coarse aggregate and other porous media and are used to detain and infiltrate stormwater runoff from a single source.
- Permeable pavements consist of load bearing, durable and pervious surfaces such as concrete block pavers (CBPs) on top of a granular or stone base that can temporarily store stormwater runoff.

Local Controls include the following and

- Filter strips are vegetated areas of land that are used to manage shallow overland stormwater runoff through filtration;
- Swales are shallow grass-lined channels with flat and sloped sides that are used to convey stormwater from one place to another. They typically remain dry between rainfall events;
- Infiltration trenches are excavated trenches which are lined with a geotextile and backfilled with rock or other relatively large granular material. They are typically designed to receive stormwater runoff from adjoining residential properties;
- Rio-retention areas are landscaped depressions used to manage stormwater runoff through several natural processes such as filtration, adsorption, biological uptake and sedimentation.

Certainly not all of these examples of controls will be installed at each unit, but a mix of most appropriate controls should be considered to prevent any further damage to the receiving environment (the KNP in this case).

It is proposed that soakaways be used within the residential sites to lessen the impact of runoff from the roofs combined with permeable paving, both source control measures. Another source control which could be considered is rainwater harvesting (ConSolv, 2020). It is further proposed that swales be constructed adjacent to all the access roads as the primary local control. See the detail of a standard vegetated swale in Figure 45 below:

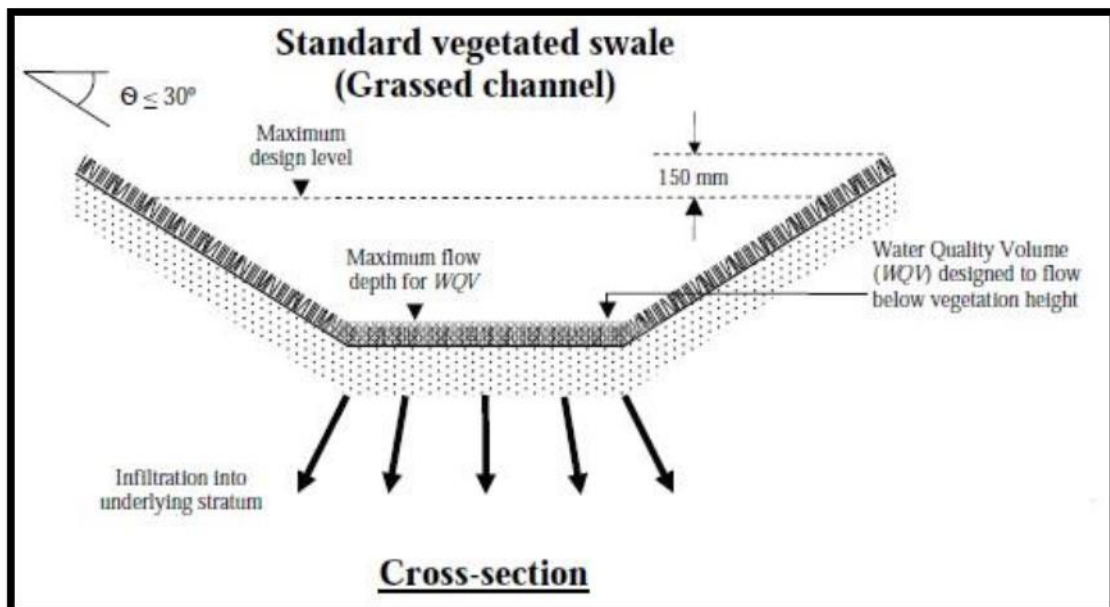


Figure 45: Detail of a standard vegetated swale.

Should water be channelled in any event from the property, it is suggested that the water should be slowed down before it reaches the KNP fence/boundary with a slowdown system such as infiltration trenches.

It is envisaged that the current open, erosion prone fallow lands will rapidly be transformed into lush gardens of local indigenous vegetation as soon as construction is completed. Some indigenous trees have already been planted as part of the initial rehabilitation. These gardens will each act as slowdown systems for stormwater generated by paved surfaces and roofs on the unit.

Table 37: Impact Rating of Activity 1.1: Stormwater flows resulting in erosion and siltation.

ISSUE:	Stormwater flows - erosion and siltation.
Project Phase	Construction and Operational
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short term (1)
Consequence	Very low (3)
Probability	Improbable
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	High
Significance Pre- Mitigation	Medium (-ve)
Significance Post Mitigation	Low (-ve)
Degree of Mitigation	Medium

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact 1.2 Pollution

1.2.1 Sewerage

Applicable Phase: Operational phase.

Applicable activity: Wastewater treatment.

Nature of impact: Poorly maintained septic tanks can result in nutrient-rich runoff being discharged. These waste waters create unfavourable conditions for natural vegetation and encourage growth of weeds. When nutrients such as nitrogen and phosphorus are discharged from septic systems into the groundwater, they represent a potentially important nonpoint source of pollution to the Crocodile River.

This could also negatively affect the unnamed watercourse on the eastern boundary due to inter alia inadequately treated effluent, a risk associated with the passive biological treatment process of septic tanks.

Mitigation of Impact 1.2.1:

Mitigation Description: In order to improve the level of wastewater treatment at the Waste Water Treatment Works (WWTW) and minimise the 'amount of disease organisms, nutrients, and chemicals that enter ground and surface waters, the system must be in proper working order, follow simple maintenance procedures, and conserve water.

A waterborne sewerage system will thus be installed with a Maskam Fusion WWTW package which will be situated centrally, at this stage on proposed Portion 20. The outflow from this system will conform to General Standards and will be used for irrigation of the Macadamia orchards. One pump station (situated on proposed portion 19) will feed the WWTW.

All the sewerage from the reticulated sites within the development will be treated at the treatment plant. The Waste Water Treatment Plant will be constructed next to the water treatment plant and the treated water will be used for irrigation. The treated effluent will comply with the general standards required by the Department of Water and Sanitation and will be of such quality that the treated water can be used for irrigation purposes.

The project area drains towards the north-east, and the lowest point is next to the Crocodile River. It is proposed that the sewer lines be placed outside the riparian buffer. No reticulation lines will be constructed within the 1:100-year flood line and one sewer pump station will be required to pump sewer to the proposed sewer treatment plant. The total Annual Average Dry Weather Sewerage Flow is estimated at 21.66 kl/day. It is recommended that some spare capacity in the sewerage treatment plant be provided to cater for storm water ingress.

Table 38: Impact Rating of Activity 1.2.1: Sewerage - Wastewater treatment.

ISSUE:	Sewerage - Wastewater treatment.
Project Phase	Operational
Nature	Negative
Extent	Site (1)
Intensity	Medium (2)
Duration	Medium term (2)
Consequence	Low (5)
Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	Medium
Significance Pre- Mitigation	Medium (-ve)
Significance Post Mitigation	Low (-ve)
Degree of Mitigation	Medium

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

1.2.2 Hazardous substances associated with construction activities

Applicable Phase: Construction phase.

Applicable activity: Alterations to water quality due to pollution from hazardous chemicals released through effluents, storm water runoff or accidental spillages from the project area into the receiving aquatic environment.

Nature of impact: Oil, fuel, lime-containing (high pH) construction materials (concrete, cement and grouts), and chemicals such as hydrocarbons, PCB's, carbonaceous sediments, flushed-out pesticides, house-hold detergents.

A range of hazardous chemicals, some of which are lethal to in-stream biota (fish and invertebrates) could contaminate the watercourses during various stages of this project if due precautions are not taken. Hazardous chemicals can leak or be accidentally spilled by construction vehicles during construction and might contaminate the soil, ground water and receiving wetlands. It is essential to prevent pollution of the waters of the Kruger National Park and the resulting poisoning of fish, birds and other animals.

Mitigation of Impact 1.2.2:

Mitigation Description: The buffers for the water courses as assessed with the DWS buffer tool must be implemented between the development and surrounding environment. These buffers around the riparian zones and wetlands were calculated as follows:

- Crocodile River: 23m wide
- Small stream on the eastern boundary (valley bottom wetland): 10m wide

These buffers will protect the riverine area from the following potential sources of pollution:

- Construction camps, storage areas, soil stockpile areas and laydown areas must be located outside the riparian or wetland buffer zones.
- Prohibit the dumping of waste material within the riparian or wetland buffer zones. Spoil material must be appropriately disposed of at a registered waste disposal facility.
- Portable toilets must be located outside the riparian or wetland buffer zones.

The following issues relating to potential pollution of the watercourses and wetlands should be addressed by the management:

- Fuel storage and engine fuel - leakage and spillage.
- Hazardous substances storage and handling of these substances.
- Servicing and/or repairs of construction equipment on site.
- Mixing of cement within the construction footprint.
- An emergency protocol and accidental spill response equipment.
- Stockpiling of construction materials.
- Approved insecticides.
- Ablution facilities.

Table 39: Impact Rating of Activity 1.2.2: Hazardous substances.

ISSUE:	Hazardous substances.
Project Phase	Construction
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short term (1)
Consequence	Very low (3)
Probability	Improbable
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	Medium
Significance Pre- Mitigation	Medium (-ve)
Significance Post Mitigation	Low (-ve)
Degree of Mitigation	Medium

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

1.2.3 Solid waste

Applicable Phase: Construction and Operational phases.

Applicable activity: Solid waste disposal and management.

Nature of impact: Improper solid waste disposal and management causes all types of pollution: air, soil, and water. Uncontrolled burning of solid waste and improper incineration contributes significantly to urban air pollution.

Health and safety issues also arise from improper solid waste management. Insect and rodent vectors are attracted to the waste and can spread diseases. The availability of household trash can alter the composition of wildlife communities by providing food for animal populations that thrive on trash (such as rats, baboons and monkeys) to the detriment of those that do not, e.g. small mammals and birds.

Mitigation of Impact 1.2.3:

Mitigation Description: Refuse removal will be provided by the KMAE Management. Waste will be collected weekly by the Nkomazi Municipality.

It is proposed that solid waste be taken daily in municipal refuse bags to a holding facility at the entrance gate to the development. A surfaced area with screening walls will be constructed at the entrance gate to accommodate a number of “skips”. The holding facility must be constructed with brick and concrete. The facility will include a concrete floor, washing and drainage facilities.

Table 40: Impact Rating of Activity 1.2.3: Solid waste.

ISSUE:	Solid waste.
Project Phase	Construction and Operational phases
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short term (1)
Consequence	Very low (3)
Probability	Possible
Degree to which impact cannot be reversed	Low
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	Medium
Significance Pre- Mitigation	Medium (-ve)
Significance Post Mitigation	Low (-ve)
Degree of Mitigation	Medium

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Activity 2. Construction of a dam in an unnamed drainage line.

2.1 Inundation of the stream

Applicable Phase: Construction phase.

Applicable activity: Drowning of a section of the riparian zone.

Nature of impact: This impact refers to the permanent loss of untransformed habitat, especially the interruption of the riparian corridor.

Mitigation of Impact 2.1:

Mitigation Description: Very little mitigation will be available during the flooding of the riparian zone. Establish a 10m buffer zone around the full-water mark and replant some of the key riparian tree species from the basin onto the dam margin border.

Currently there are some intact riparian zones upstream and downstream of the proposed dam basin along the stream banks of the drainage line. The riparian zone of the designated drainage line should be protected and excluded from any further development in order to maintain the integrity of the remaining riparian corridor. In order to protect this remaining riparian zone, a 10m buffer had been established with the DWS Buffer Tool.

In order to re-establish the link between the riparian corridors upstream and downstream of the dam basin, a riparian buffer should also be established along the new marginal zone around the dam.

Table 41: Impact Rating of Activity 2.1: Drowning of the riparian zone.

ISSUE:	Drowning of the riparian zone
Project Phase	Construction phase
Nature	Negative
Extent	Site (1)
Intensity	Moderate (2)
Duration	Long term (3)
Consequence	Medium (6)
Probability	Definite
Degree to which impact cannot be reversed	Moderate
Degree to which Impact may cause irreplaceable loss of resources	Moderate
Confidence level	High
Significance Pre- Mitigation	Medium (-ve)
Significance Post Mitigation	Medium (-ve)
Degree of Mitigation	Medium

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **MEDIUM:** the potential impact **should** influence the decision regarding the proposed activity/development.

2.2 Migration barrier

Applicable Phase: Operational phase.

Applicable activity: Dams prevent the free passage of aquatic animals and fish and thus disrupt riverine migration routes.

Nature of impact: The disruption of migratory routes affects the lifecycle of migratory aquatic species as dam barriers and prevent brood stock from reaching their spawning grounds during the breeding season, resulting in a failure of recruitment and eventual extinction of the stock above the dam.

Mitigation of Impact 2.2

Mitigation Description: The catchment area is small and 90% transformed (sugar cane fields). Only approximately 650m of transformed and artificially created river is available for utilisation (negligible).

Potentially, as fish may be attracted to migrate upstream and after spending energy to cross the barrier (potential fishway), there is no to limited suitable habitat available upstream. The proposed dam may furthermore create suitable habitat (pool) for colonization of high abundance of predatory sharptooth catfish (and potential other unwanted species such as alien largemouth bass). These species will prey on and potentially eradicate all small and juvenile fish species that may enter the dam.

An assessment as to the necessity for providing a fishway at the said barrier (bridge-dam) was completed by Dr Pieter Kotze (Kotze, 2021). Based on the results of this assessment, it was concluded that a fishway will add little, if any ecological benefit at the proposed dam site and therefore no fishway is required for installation at the proposed dam. This recommendation is based on ecological considerations.

Table 42: Impact Rating of Activity 2.2: Dams prevent the free passage of aquatic animals and fish, and thus disrupt riverine migration routes.

ISSUE:	The disruption of migratory routes
Project Phase	Operational
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Long term (3)
Consequence	Low (5)
Probability	Improbable
Degree to which impact cannot be reversed	Medium
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	Medium
Significance Pre- Mitigation	Low (-ve)
Significance Post Mitigation	Low (-ve)
Degree of Mitigation	Low

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **MEDIUM:** the potential impact **should** influence the decision regarding the proposed activity/development.

Activity 3. Establishment of the orchards

3.1 Storm water and erosion/siltation

Applicable Phase: Construction- and Operational phases.

Applicable activity: Erosion and siltation due to channelled and thus concentrated stormwater deriving from the orchards.

Nature of impact: Whether the stormwater arrives via non-point sources or via storm-water systems, it inevitably discharges directly to the receiving waters without any prior treatment. Even moderate runoff volumes and velocities give rise to a wide variety of water quality problems that are linked to flooding and wash-off. The typical categories of problems that arise are sedimentation, erosion (channel widening and streambed alteration) and habitat changes, as well as loss of aquatic- or riparian habitats.

Referring to Figure 46 (as well as Figure 15), it is clear, that historical land uses resulted in concentrated stormwater channelling between croplands and where this channelled water was released on the other side of the KNP fence, visible erosion took place, leaving the scars of erosion dongas on the floodplain.



Figure 46: The scars of erosion dongas left by historical stormwater channelling between croplands.

It is also clear by the colour of the soil below the property on the KNP side of the fence (Figure 46), that sheet erosion through the years transported a great deal of soil from the agricultural lands into the Park.

Both the loss of good agricultural soil and the deposition of washed-out alluvial sediment into the KNP must be considered a significant adverse impact. Perhaps the change of vegetation cover from 2006 to 2020 may even be a result of the silt deposition in the Park?

Mitigation of Impact 3.1:

Mitigation Description: Proper storm water management is essential to ensure protection of life and property from flood hazards and that the natural environment is protected. Storm water drainage systems will be designed to accommodate a 1:2-year flood frequency.

The objectives of storm water management can be summarised as follow:

- to provide a storm water drainage system for the protection of the property from damage by runoff from frequent storms;
- to prevent loss of life and reduce damage of the property from severe storms;
- to prevent land and watercourse erosion;
- to protect water resources from pollution;
- to preserve natural watercourses and their eco-systems;
- to achieve the foregoing objectives at optimal total cost.

The storm water channels and structures will be designed for a 1:2-year storm recurrence, except at the piped crossings where a 1:5 year storm recurrence is catered for. The infrastructure will be located within the road servitudes.

The introduction of efficient stormwater drainage systems to deal with the erosion and siltation problem implies that the runoff must be conveyed as efficiently as possible to the natural watercourses. This has the effect of decreasing the time runoff takes to reach the natural watercourses. The result is a reduction of overland flow, meandering watercourses and the like, through a system which drains runoff to the watercourses as quickly as possible. The flood problem is therefore transferred downstream.

It is suggested that Best Practice Guidelines and Specifications relating to stormwater management should be used to implement measures to slow down flows channelled through the orchards, right from where the orchards start at the southern boundary.

Figure 47 illustrates the layout of the proposed stormwater servitudes in the project area. It is clear that this system will mainly serve the agricultural stormwater emanating from the orchards. It therefore comes down to the fact that each residential unit must be able to manage the stormwater on its own property.

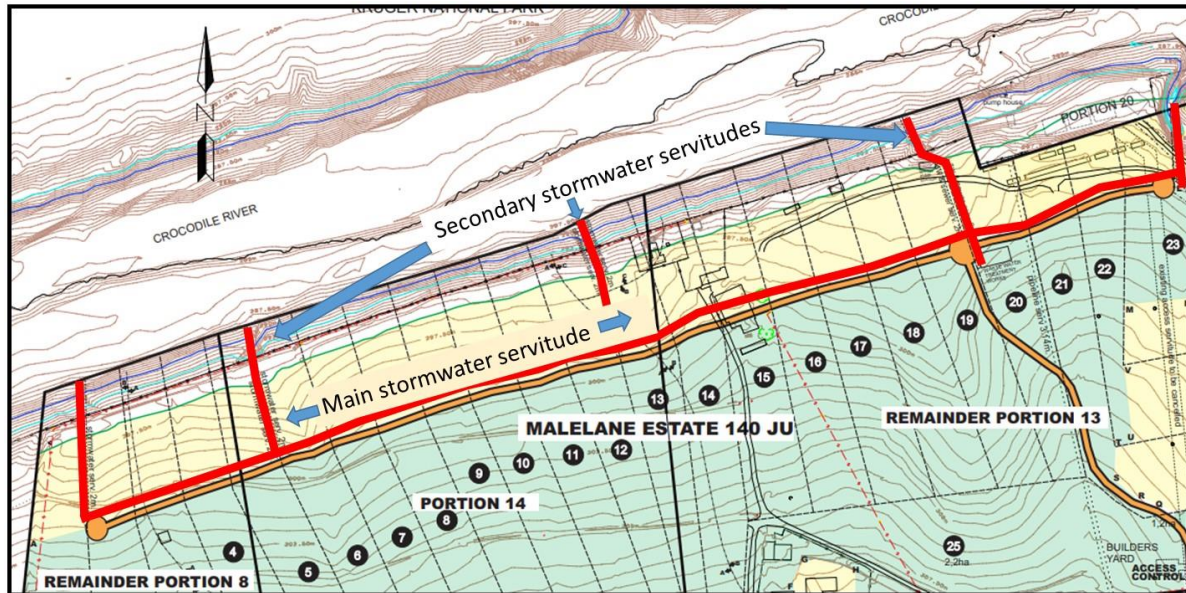


Figure 47: The layout of the planned stormwater servitudes.

The main stormwater servitude runs parallel along the east to west road servitude, and five secondary stormwater servitudes run from the main stormwater servitude directly to the northern boundary of the project area. The most eastern line will release its volume of stormwater into the unnamed drainage line, a natural drainage system for rain water.

This layout predicts that the main stormwater line will collect most of the stormwater draining from the orchards, and then relayed via the secondary stormwater lines to be released at the KNP boundary.

It is clear that if all the stormwater is released equally through the secondary stormwater lines, the impact of erosion will not be alleviated. The dongas will remain or even deteriorate due to the concentrated stormwater flows during high rainfall events. To mitigate for this impact, the following are suggested:

- The main stormwater channel should be a few centimetre deeper than the secondary stormwater channels, in order for most of the initial inflows to be diverted to the natural stream outlet and no erosion is expected to occur here;
- It may be appropriate to release the stormwater below the dam wall in order to protect the structure from higher than usual flood peaks;
- When the main stormwater channel fills up, more water will be released into the secondary stormwater channels and the water diverted towards the northern boundary of the project area and KNP fence;
- In order to prevent high volumes of stormwater being released straight into the downstream environment, it is suggested that the stormwater channels first let the water flow into a system of drains and rock-filled sumps to slow down the flows and dissipate the released water to prevent further erosion and siltation on the KNP side of the fence.

Table 43: Impact Rating of Activity 3.1: Stormwater flows resulting in erosion and siltation.

ISSUE:	Stormwater flows - erosion and siltation.
Project Phase	Construction and Operational
Nature	Negative
Extent	Local (2)
Intensity	Moderate (2)
Duration	Long term (3)
Consequence	High (7)
Probability	Possible
Degree to which impact cannot be reversed	Moderate
Degree to which Impact may cause irreplaceable loss of resources	Moderate
Confidence level	Moderate
Significance Pre- Mitigation	High (-ve)
Significance Post Mitigation	Medium (-ve)
Degree of Mitigation	Medium

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **MEDIUM:** the potential impact **should** influence the decision regarding the proposed activity/development.

Impact 4: Human wildlife conflict.

Applicable Phase: Construction and operational phases.

Applicable activity: Human-animal conflict.

Nature of impact: Human-animal conflict is often caused by learned behaviour. The eradication of the problem animal is often the result.

Situations might arise where certain animals and their behaviour become problematic to the management of a place bordering a wilderness area or so close to a Big Five location (Kruger Park).

Human-animal conflict is often caused by learned behaviour. It is therefore important to design the facilities in a way that prevents this undesirable learnt behaviour. The most common problem animals in this regard are; elephants, hyenas, baboons, vervet monkeys and badgers.

Although there is a strong barrier between KMAE and the park, animals are opportunists and will sometimes find a way to get past the barrier. Smaller species such as baboons, vervet monkeys and badgers can easily climb through or over the fence.

Mitigation of Impact 4:

It will be expected from the KMAE management to implement the necessary preventative measures to avoid the development of problem animals. A Problem Animal Policy for the owners may include the following strategy:

Potential food sources

- It is important to avoid the animals associating humans with easy food, therefore food should never be left visible, unattended and/ or accessible.
- Educate and sensitise contractors, owners, guests and visitors on the issues related to problem animals.
- Fences around waste storage facilities must be functional.
- It must be made clear to owners and their guests that the feeding of any animals, even birds, is unacceptable.
- Fruit trees, such as oranges, should not be planted. Plant indigenous trees.

Interfering with biota:

- No person shall disturb or destroy any fauna or flora.
- Disturb any animal inside the project area.
- Remove, cut or damage a plant inside the project area.
- Feed any animal inside the project area.
- No snake (poisonous or non-poisonous) may under any circumstances be killed unless a human life is at stake.
- No trapping, snaring, hunting, fishing or killing of any animal may occur inside the project area.
- Baiting of wildlife to enhance viewing is not permitted.

General

- Strict lighting controls will be enforced to limit light pollution. No floodlights and open lighting will be allowed for night lighting. The number and wattage of outdoor lights will be limited, and shields used to direct lighting downwards.
- No fires may be lit except in designated areas.
- No loud noise or disturbance will be permitted.

Table 44: Impact Rating of Activity 4: Human-animal conflict.

ISSUE:	Interactions with wildlife
Project Phase	Construction and operational
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Medium-term (2)
Consequence	Very Low (4)
Probability	Possible
Degree to which impact cannot be reversed	Medium
Degree to which Impact may cause irreplaceable loss of resources	Low
Confidence level	Medium
Significance Pre- Mitigation	Low (-ve)
Significance Post Mitigation	Low (-ve)
Degree of Mitigation	Low
Preferred Alternative	

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact 5. The introduction and spread of alien vegetation.

Applicable Phase: Construction and operational phases.

Applicable activity: Invasive, non-native plants often establish in vacant niches, such as cleared or eroded areas and subsequently compete with indigenous plant species for space and thus further transform the natural habitat.

Nature of impact: One of the main threats to the biodiversity is considered to be the introduction and spread of alien vegetation.

Mitigation of Impact 5:

Mitigation Description: The control methods of alien invasive plants can be broadly classified into three categories: mechanical, chemical or biological.

- mechanical control methods involve the physical destruction or total removal of plants (e.g. felling, strip-barking; ring-barking, hand-pulling and mowing);
- chemical control of invasive alien plants includes the foliar spraying of herbicides to kill targeted plants and
- biological control or bio-control methods involves the release of natural enemies that will reduce plant health and reduce population vigour to a level comparable to that of the natural vegetation.

It is often necessary to use a combination of at least two of these methods to control or remove invasive alien plants. With repeated follow-up, mechanical and chemical control methods tend to be short-term activities suitable for smaller plant invasions that can result in the complete removal of the target species. After the implementation of the methods, it is

important to evaluate the effectiveness of the methods and to monitor the cleared areas on a regular basis to identify emergent seedlings and to remove those immediately.

A list of indigenous plants should be available to owners so that no alien invading plants are planted in gardens and become escapees to the KNP. There should be strict controls regarding this aspect.

Table 45: Impact Rating of Activity 5: The introduction and spread of alien vegetation.

ISSUE:	Alien invasive vegetation.
Project Phase	Operational
Nature	Negative
Extent	Site (1)
Intensity	Low (1)
Duration	Short term (1)
Consequence	Very low (3)
Probability	Probable
Degree to which impact cannot be reversed	Low
Degree to which impact may cause irreplaceable loss of resources	Medium
Confidence level	High
Significance Pre- Mitigation	Medium (-ve)
Significance Post Mitigation	Low (-ve)
Degree of Mitigation	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

LOW: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

Impact Assessment Summary

Table 46: A summary of the impact assessment post mitigation.

Impact No	Issue and aspect	Phases	Significance without mitigation	Significance with mitigation
1.1	Stormwater flows resulting in erosion and siltation.	Construction / Operational	Medium (-ve)	Low (-ve)
1.2.1	Sewerage - Wastewater treatment.	Operational	Medium (-ve)	Low (-ve)
1.2.2	Hazardous substances.	Construction	Medium (-ve)	Low (-ve)
1.2.3	Solid waste disposal and management.	Construction / Operational	Medium (-ve)	Low (-ve)
2.1	Flooding of the riparian zone.	Construction	Medium (-ve)	Medium (-ve)
2.2	Migration barrier.	Construction / Operational	Low (-ve)	Low (-ve)
3.1	Storm water and erosion/siltation – orchards.	Construction / Operational	High (-ve)	Medium (-ve)
4	Human wildlife conflict.	Construction / Operational	Low (-ve)	Low (-ve)
5	The introduction and spread of alien vegetation.	Construction / Operational	Medium (-ve)	Low (-ve)

5.5 Conditions for inclusion in the environmental authorisation

These conditions are based on the identification of mitigation measures and solutions that minimise impacts on biodiversity and conflicts in land-uses by making use of CBA maps in the Environmental Impact Assessment (see Table 46). The steps used in this section correspond with the steps which are obtained from the Mpumalanga Biodiversity Sector Plan (2014). Step 2.3 listed in the Land-use planning and Decision-making table (Table 36), lists compromises and solutions that minimise impacts on biodiversity and conflicts in land-use, which are supported by the following five steps:

Step 2.3.1 Retain natural habitat and connectivity in CBAs and ESAs: The avoidance of environmentally sensitive areas identified during the Sensitivity Mapping exercise is regarded as the single most effective possible mitigation measure for mitigating impacts on the ecology of the project area.

- The riparian corridor will be inundated by the small dam water and the riparian link will thus be affected. The increased moisture from the higher water levels in the dam will enhance plant growth and probably create a secondary riparian zone which will link up with the original upstream and downstream riparian corridors.
- The project team should protect this riparian corridor by incorporating a rehabilitated buffer around the periphery of the dam high level mark.
- By establishing a 10m buffer around the dam high level mark, the new perimeter could be rehabilitated with vegetation removed and replanted from the dam basin.
- This measure of mitigation is consistent with the desired management objectives for riparian corridors and could prevent fragmentation.

Step 2.3.2: Apply the mitigation hierarchy: The mitigation hierarchy for dealing with negative impacts on biodiversity, consists of four activities (Figure 11):

- **Avoid and prevent:** Consider options in land-use location, siting, scale, layout, technology and phasing to avoid impacts on biodiversity, ecosystem services and people. This is the best option but not always possible.
- Identify the best practicable environmental options by avoiding loss of biodiversity and disturbance to ecosystems, especially in CBAs.
- Four options for small dam locations were proposed, but all four were in the same river reach and none of them having a lower predicted impact on the system. The preferred dam will act as an access bridge over the stream.
- **Minimise:** Consider alternatives in land-use location, siting, scale, layout, technology and phasing to minimise impacts on biodiversity, ecosystem services and people.
- Minimise unavoidable impacts: Manage and mitigate impacts where possible, such as clearing of vegetation, erosion of soil, siltation of the river and control alien vegetation.
- **Rehabilitate:** If impacts have been unavoidable, take measures to return impacted areas to a condition like the pre-impact or natural state — although this is important and necessary, rehabilitation can never replicate the diversity and complexity of an un-impacted natural site.
- Replanting the new riparian zone will form part of this process.
- Owners will replant the fallow soil with indigenous vegetation which will successfully mimic a riparian zone absent for decades.
- **Offset:** As a last resort, compensate for remaining unavoidable negative impacts on biodiversity. When every other effort has been made to minimise or rehabilitate impacts to a degree of 'no net losses of biodiversity against biodiversity targets, offsets can compensate for unavoidable negative impacts.
- Unfortunately, due to the level of development on the farming property, there is no untransformed land left to set aside as an offset area.

- The “rehabilitation” or re-establishment of a riparian zone in the gardens of the residential units will improve a rather sterile environment, as adjacent properties downstream of the KMAE have proven.

Step 2.3.3 Secure priority biodiversity in CBAs and ESAs through biodiversity stewardship: Set aside land of high biodiversity importance for conservation through biodiversity stewardship options. Where biodiversity losses are unavoidable, set aside another piece of land of equivalent or greater biodiversity importance for conservation:

- Unfortunately, due to the level of development on the farming property, there is no untransformed land left to set aside land of high biodiversity importance for conservation. The remaining riverine and riparian corridors should be left intact and protected from further development. Should the riparian zone around the dam re-establish and the corridor regained, this zone should be managed and protected in order to link up with the downstream Crocodile River environment.
- The “rehabilitation” or re-establishment of a riparian zone in the gardens of the residential units will link up with existing riparian corridors quite successfully.

Step 2.3.4 Remedy degradation and fragmentation through rehabilitation: Design project layouts and select locations that minimise loss and fragmentation of remaining natural habitat and maintain spatial components of ecological processes, especially in ecological corridors, buffers around rivers and wetlands, CBAs and ESAs. Activities that are proposed for CBAs must be consistent with the desired management objectives for these features and should not result in fragmentation.

- The project should re-establish the riparian corridors along the Crocodile River embankment and establish a rehabilitated buffer of 10 m around the periphery of the dam/bridge high level mark. This measure of mitigation is consistent with the desired management objectives for riparian corridors and should not result in fragmentation.

Step 2.3.5 Promote long-term persistence of taxa of special concern

- Some bird species of special concern will utilise the riparian corridor once it is rehabilitated. Hooded Vulture, Martial Eagle and African Crowned Eagle have been observed in gardens of the adjacent properties.

Table 47: The use of CBA maps in Environmental Impact Assessment and the reference to relevant sections present in the report.

Land-use planning and Decision-making	Reference
Step 1: Prepare for the site visit: Purpose: To determine the biodiversity context of the proposed land-use sites (using CBA maps, land-use guidelines and underlying GIS layers)	
Step 1.1 Establish how important the site is for meeting biodiversity targets? (Is it in a CBA or ESA?)	Critical Biodiversity Areas (under 5.3)
<ul style="list-style-type: none"> ○ Step 1.1.1 Proposed land use 	Project description (under section 1.1)
<ul style="list-style-type: none"> ○ Step 1.1.2 Environmental Impact Assessments (EIA) and Freshwater Ecosystem Priority Areas (FEPA) 	Mpumalanga Biodiversity Sector Plan (MBSP) and Threatened Ecosystems (under 5.3)
<ul style="list-style-type: none"> ○ Step 1.1.3 Description of the biophysical environment 	3.2 Physiography of the study area
<ul style="list-style-type: none"> ○ Step 1.1.4 Present Ecological State of the New Project 	3. Description of the study area
<ul style="list-style-type: none"> ○ Step 1.1.5 Critical Biodiversity Areas 	Critical Biodiversity Areas (under 5.3)
<ul style="list-style-type: none"> ● Step 1.2 Assess if the proposed land-use is consistent with the desired management objectives for the site (Use the land-use guidelines) 	5.3.6 Land-use guidelines
<ul style="list-style-type: none"> ○ Step 1.2.1 Critical Biodiversity Area in the Project area 	Figures 37 to 39 (under 5.3)
<ul style="list-style-type: none"> ● Step 1.3 Find out if threatened or other red data-listed species or ecosystems are present <ul style="list-style-type: none"> ○ Vegetation ○ Fish ○ Frogs ○ Reptiles ○ Birds ○ Mammals 	4.4 Biota assemblages of the KMAE project areas
Step 2: Conduct the site visit: Purpose: To Ground truth the CBA maps and conduct additional biodiversity assessments in the study area	4.3 Biodiversity assessments
Step 2.1 Compare mapped land cover with observed land cover at the site	Figure 23: The broad-scale vegetation units or ground cover of the KMAE Dam project area.
<ul style="list-style-type: none"> ○ Step 2.1.1 Record observed features in site assessment report <ul style="list-style-type: none"> ▪ Ecological surveys - methods ▪ Aquatic habitat assessments ▪ Vegetation ▪ Aquatic biota ▪ Aquatic invertebrate assessment 	2. Methodology 4.4 Biota assemblages of the KMAE project areas Appendix 5

<ul style="list-style-type: none"> ▪ Fish communities ▪ Terrestrial fauna studies ▪ Amphibian surveys ▪ Reptile surveys ▪ Bird surveys ▪ Mammal surveys 	
○ Step 2.1.2 Results of Ecological Surveys	4. Results
Vegetation	4.1 Vegetation units and land cover types within the study area
<ul style="list-style-type: none"> ▪ Observed vegetation 	4.4.1 Vegetation communities
<ul style="list-style-type: none"> ▪ Riparian delineation 	5.3.4 Riparian delineation
○ Fauna surveys	4.4 Biota assemblages
<ul style="list-style-type: none"> ▪ Aquatic habitats and fauna 	4.4.2 Riverine Ecology
<ul style="list-style-type: none"> ▪ Aquatic habitat assessment 	4.4.2.2 Aquatic habitat assessment
<ul style="list-style-type: none"> ▪ Aquatic invertebrate assessment 	4.4.2.3 Surveys of Aquatic Invertebrates and Fish
<ul style="list-style-type: none"> ▪ Fish Response Assessment Index 	4.4.2.3 Surveys of Aquatic Invertebrates and Fish
<ul style="list-style-type: none"> ▪ Terrestrial fauna 	4.4.3 Terrestrial ecology
○ Frogs	4.4.3.2 Frogs
○ Reptiles	4.4.3.3 Reptiles
○ Birds	4.4.3.4 Birds
○ Mammals	4.4.3.5 Mammals
○ Step 2.1.3 Further planning to proceed using ground-truthed land cover	5.3 Land-use planning and Decision-making
Step 2.2 Compare mapped CBA or ESA features with ground-truthed ones	Vegetation and land cover types identified for the ecological surveys (under 4.1) – Figure 23: The broad-scale vegetation units or ground cover of the KMAE project area.
Step 2.3 Identify compromises and solutions that minimise impacts on biodiversity and conflicts in land-use	5.4 Assessment of impacts
○ Step 2.3.1 Retain natural habitat and connectivity in CBAs and ESAs	5.5 Conditions for inclusion in the environmental authorisation.
○ Step 2.3.2 Apply the mitigation hierarchy	Step 2.3.2: Apply the mitigation hierarchy
○ Step 2.3.3 Secure priority biodiversity in CBAs and ESAs through biodiversity stewardship	Step 2.3.3: Secure priority biodiversity in CBAs and ESAs through biodiversity

	stewardship
○ Step 2.3.4 Remedy degradation and fragmentation through rehabilitation	Step 2.3.4: Remedy degradation and fragmentation through rehabilitation
○ Step 2.3.5 Promote long-term persistence of taxa of special concern	Step 2.3.5: Promote long-term persistence of taxa of special concern
Step 3: Assess impact on biodiversity: Purpose: To make recommendations regarding the impacts of the proposed land-use development on biodiversity	5.4 Assessment of impacts
Step 3.1 When impacts are likely to be insignificant	5.4 Assessment of impacts
○ Step 3.2 When significant impacts are unavoidable	5.7.2 Reasoned opinion
○ Step 3.2.1 CBAs and ESAs	5.7.2 Reasoned opinion
○ Step 3.2.2 ONAs	5.7.2 Reasoned opinion
Step 4: Identify opportunities to conserve biodiversity: Purpose: Maximise conservation gains by proactive identification of opportunities to conserve biodiversity	5.3.2 Critical Biodiversity Areas
○ Step 4.1 Set aside land of high biodiversity importance for conservation through biodiversity stewardship options	5.3.2 Critical Biodiversity Areas
○ Step 4.2 Where biodiversity losses are unavoidable, set aside another piece of land of equivalent or greater biodiversity importance for conservation	5.3.2 Critical Biodiversity Areas
○ Step 4.3 Clear invasive alien vegetation and rehabilitate existing degraded habitats	5.4 Assessment of impacts
Step 5: Incorporate biodiversity priorities in EIA report: Purpose: Show explicitly how CBA maps and land-use guidelines have informed project location, design and implementation	5.3.2 Critical Biodiversity Areas
○ Step 5.1 Determine the least damaging location and design	5.3.2 Critical Biodiversity Areas
○ Step 5.1.1 Avoiding CBAs	5.3.2 Critical Biodiversity Areas
○ Step 5.1.2 Reducing pressure on natural habitat and ecological processes.	5.4 Assessment of impacts
○ Step 5.1.3 Concentrating disturbance footprints in heavily modified or degraded areas that are not earmarked for rehabilitation	5.4 Assessment of impacts
○ Step 5.1.4 Integrating <i>in situ</i> biodiversity-sensitive management into the overall design and operation of the proposed land-use development	5.4 Assessment of impacts

5.6 Monitoring requirements

Environmental performance monitoring should be designed to ensure that mitigation measures are implemented. The monitoring programme should clearly indicate the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions.

The applicant must appoint an independent ECO that will have the responsibility of monitoring and reporting on compliance with the conditions of the Environmental Authorisation (EA), as well as monitoring and reporting on the implementation of the approved EMPr.

A monitoring programme for the biodiversity associated with the project, would ideally be to record the reaction of the biota to changes in the environment due to the impacts of the project.

Aspect 1: Dam buffer and riparian corridor: It is vital to monitor the effectiveness of the maintenance plan which optimises the riparian plant species development and riparian habitat restoration (ensure integrity of wildlife corridor is retained and links between habitat types are enhanced). The restoration of the dam buffer area should be monitored throughout the duration of construction activities to ensure that the effectiveness of the final buffer zone areas is maintained, and that management measures are implemented appropriately. Regular inspections during the operational phase should also be undertaken to ensure that functions are not undermined by inappropriate activities.

Aspect 2: Vegetation clearing or disturbing soil: Establish an effective record keeping system for each area where soil is disturbed for whatever purposes. The monitoring will evaluate whether the erosion and sedimentation control techniques that are employed throughout the site preparation activities are effective in minimising erosion of exposed areas and sedimentation of site surface water.

Aspect 3: Water quality: It is recommended that the SASS5 method be implemented as part of the Biomonitoring Programme, specifically for the reaction of the sensitive species to water quality above and below the dam. Monitoring surveys (per year) are suggested as follows:

- One wet season survey at the established sites.
- One dry season survey when the impacts of reduced surface water and water quality issues become evident.

Aspect 4: Exotic- and alien invasive plants: To anticipate and evaluate imminent or potential risks to the project area regarding exotic- and alien invasive plants, as well as pathways of invasion, a monitoring programme should be developed in order to create effective mechanisms to manage or mitigate these. Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. It is important to evaluate the effectiveness of control methods and to monitor the cleared areas on a regular basis to identify emergent seedlings and to remove those immediately.

5.7 Recommendations

5.7.1 Summary of mitigation measures

The potential impacts of the project on biodiversity of the study area are assessed under 5 broad activities and 10 specific impacts (Section 5.4). The following list provides a summary of the impact assessment, indicating the changes from pre-mitigation to post mitigation.

Activity 1: Construction of the lifestyle units.

Impact 1.1: Stormwater and erosion/siltation

Construction and Operational Phases – Medium significance improves to Low significance.

Mitigation: It is proposed that soakaways be used within the residential sites to lessen the impact of runoff from the roofs combined with permeable paving, both source control measures. Another source control method which could be considered is rainwater harvesting. It is further proposed that swales be constructed adjacent to all the access roads as the primary local control method.

Impact 1.2 Pollution

Impact 1.2.1 Sewerage - Wastewater treatment.

Operational phase – Medium significance improves to Low significance.

Mitigation: A waterborne sewerage system will be installed with a Maskam Fusion a Waste Water Treatment Works package (WWTW) situated centrally - on proposed portion 20). The outflow from this system will conform to General Standards and will be used for irrigation of the Macadamia orchards. One pump station (situated on proposed portion 19) will feed the WWTW.

Impact 1.2.2: Hazardous substances.

Construction Phase – Medium significance improves to Low significance.

Mitigation: The buffers for the water courses as assessed with the DWS buffer tool must be implemented between the development and surrounding environment. Issues relating to potential pollution of the watercourses and wetlands should be addressed by the management.

Impact 1.2.3: Solid waste.

Construction and Operational Phase – Medium significance improves to Low significance.

Mitigation: Refuse removal will be undertaken daily by the KMAE Management. Waste will be collected weekly by the Nkomazi Municipality.

Activity 2. Construction of a dam in an unnamed drainage line.

Impact 2.1 Inundation of the stream.

Construction Phase – Medium significance improves to Low significance.

Mitigation: Create a 10m buffer zone around the full-water mark and replant some of the key riparian tree species from the basin onto the dam margin border.

Impact 2.2: Migration barrier

Operational phase– High significance improves to Medium significance.

Mitigation: Based on the results of a necessity protocol assessment for a fishway, it was concluded that such a structure will add little, if any ecological benefit at the proposed dam site and therefore no fishway is required. This recommendation is based on ecological considerations.

Activity 3. Establishment of the orchards**Impact 3.1** Stormwater flows resulting in erosion and siltation.

Construction and Operational Phase – High significance improves to Medium significance.

Mitigation: The introduction of efficient stormwater drainage systems to deal with the erosion and siltation problem implies that the runoff must be channelled as efficiently as possible to the natural watercourses. This has the effect of decreasing the time runoff takes to reach the natural watercourses. The result is a reduction of overland flow, meandering watercourses and the like, through a system which drains runoff to the watercourses as quickly as possible.

Impact 4: Human wildlife conflict.

Construction and Operational Phase – Low significance remains Low significance.

Mitigation: It will be expected from the KMAE management to implement the necessary preventative measures to avoid the development of problem animals.

5.7.2 Reasoned opinion

According to the General Requirements in terms of Appendix 6 (not an appendix to this report) of the EIA Regulations, 2014, a “Reasoned opinion” should include the rational as to whether:

- the proposed activity, activities or portions thereof should be authorised;
- regarding the acceptability of the proposed activity or activities;
- and 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 EMP, and where applicable, the closure plan.

The entire project area is situated in a Terrestrial CBA: Ecological Support Area - Protected Area Buffer (Figure 40), and the purpose of buffer zones is to reduce the impacts of undesirable land-uses on the environment, and to provide opportunities for tourism.

It is evident that a central concern regarding the development on the KMAE property is the deterioration of the ground cover on the farm and the resultant erosion and siltation of the receiving environment. Most of the problem can be attributed to the neglected stormwater management of the farm in the recent years. With the current planned development, there are two sources of potential erosion:

- a) the residential areas with housing units, roads, and other forms of impervious surfaces;
- b) and the current fallow land to be developed into macadamia orchards.

To prevent the continuation of donga formation and sediment deposition on the receiving Kruger Park landscape, a number of stormwater decelerating schemes are available to the engineers when developing the stormwater drainage system. A number of these schemes are discussed in the ConSolv Engineering Service Report (2020) and a combination of these methods can be implemented in both the residential and agricultural areas.

In the residential areas, soakaways could be used to lessen the impact of runoff from impervious surfaces, rainwater harvesting can receive some of the water and swales along all the access roads, can all serve as primary local control systems. All channelled water should be slowed down before it reaches the KNP fence/boundary with decelerating systems, such as infiltration trenches and vegetated swales. The planting of lush Lowveld gardens which will establish rapidly in the rich soils and controlled watering systems, will also be an effective control addition to slow down stormwater.

Different controls could be incorporated in the orchards, beginning from the southern boundary, all the way to the storm water channelling system along the main road. The stormwater decelerating methods could include filter strips, swales, infiltration trenches and retention areas (see ConSolv Engineering Service Report, 2020). These systems will be able to slow down stormwater before it reaches the storm water channelling system which will intercept the surface flows before it reaches the residential areas.

However, it is important to firstly divert most of the initial flows towards the natural drainage line to the east of the property, thereafter the increased flow may overflow into the secondary storm water channels. More importantly now is to slow down the water towards the point of release in order to prevent concentrated flows discharged into the receiving environment.

In order for that to happen, it is suggested that the stormwater channels release the water into a system of drains and rock-filled sumps to slow down the flows and dissipate the released water over a wider surface area to prevent further erosion and siltation on the KNP side of the fence.

Pollution of the drainage systems (including the channelled stormwater) on the farm and the adjacent Crocodile River, is another concern in developing the estate. If there is a pollution risk, it will persist into the operational phase. There are three aspects of concern relating to potential pollution, namely the sewerage system, solid waste and hazardous substances associated with construction and afterwards stemming from household tasks.

The wastewater treatment of effluent will be a waterborne sewerage system. The system will be installed with a Maskam Fusion WWTW which will ensure that the outflow from the system will conform to general standards required by the Department of Water and Sanitation and be used for the irrigation of the macadamia orchards.

In order to protect the riverine area from potential sources of pollution, the following mitigation are proposed:

- Implementation and maintenance of aquatic buffer zones around the local waterways,
- and adhering to Best Practice Guidelines and Specifications relating to all construction activities (camps, storage, dumping, ablution, servicing, mixing and stockpiling).

Solid waste will initially be managed effectively by the construction teams, and during operation the management of the estate development will fulfil this function. Refuse removal will be undertaken by the KMAE management and the stored waste will be collected weekly by the Nkomazi Municipality.

Building the dam/bridge structure over the small stream has a twofold function: i) damming water in the stream will create a small dam which will act as a water feature for the development; ii) the structure will also serve as a bridge to allow vehicles to cross the stream.

Based on the results of a necessity protocol assessment for a fishway, it was concluded that such a structure will add little, if any ecological benefit at the proposed dam site and therefore no fishway is required for installation at the proposed dam. This recommendation is based on ecological considerations.

As indicated in Section 5.4, "Assessment of impacts" (Table 46), most of the impacts can be mitigated to a certain degree. However, filling the dam and inundating the riparian vegetation are impacts that cannot be mitigated satisfactory as a relatively large surface area is inundated and eliminated from the ecosystem footprint, therefore the significance of this action is still listed in a "Medium" category.

To protect the remaining riparian zone of the stream, a 10m buffer around the riparian zone has been established with the DWS Buffer Tool. In order to re-establish the link between the riparian corridors upstream and downstream of the dam basin, a 10m riparian buffer should also be established along the new marginal zone around the dam.

It is thus anticipated that, in order to mitigate for the impacts of the proposed dam on the environment, the listed adverse influences should be managed to such a degree that the overall ecology in the project area will still be functional.

It is expected that aspects such as "Human wildlife conflict" and "Alien plant control" can be managed without difficulty through channels created by the KMAE Management and if maintained it should successfully mitigate these potential impacts.

By implementing all the mitigation measures and managing the system as prescribed on an ongoing basis, all the impacts will be alleviated to a satisfactory level. Therefore, it is proposed that the construction and operation of the project should be authorised with the provision that the mitigation measures prescribed in this document are included in the EMPr.

5.7.3 Consultation process

The input from the following parties:

- Mr Barend Marx - information relating to the dam wall;
- Dr Pieter Kotze - information relating to the fish-way;
- Dr Mervyn Lotter regarding the Mpumalanga Threatened Species Database is appreciated.

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Appendices

Appendix 1: Declaration of interest

The specialist appointed in terms of the Regulations

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

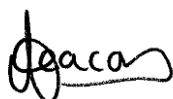
I ...Dr Andrew Richard Deacon..., as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
---	---

	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
--	--

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- 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 application;
- will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties 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 or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

Name of company: Andrew Deacon Environmental Consultant

Date: 10 June 2021

Appendix 2: Curriculum Vitae

CURRICULUM VITAE - DR ANDREW RICHARD DEACON

Born in Klerksdorp, South Africa in 1951. Matriculated at the Goudveld High School in 1969. South African citizen. Married and with one child.

FORMAL EDUCATION

Ph.D., Zoology (RAU 1987) Thesis: "The nutritional ecology and physiology of *Tilapia rendalli* and *Oreochromis mossambicus* in a warm, sewage-enriched habitat".

M.Sc., Zoology (RAU 1983) Thesis: "The occurrence and feeding habits of *Anguilla*-species in selected rivers of the Transkei".

B.Sc., Hons. in Zoology (RAU 1980)

B.Sc., majors Zoology and Botany (PU for CHE 1974)

PROFESSIONAL EXPERIENCE

2012-ongoing Environmental consultant

1989-2012 Scientific Services, Kruger National Park, SANParks

2000-2012 Programme Manager: Small vertebrates

1989-2000 Senior Scientist: Freshwater Ecologist.

1988 Consulting - Technikon of RSA; Berghoek Nature Reserve; Klaserie Nature Reserve.

1985-1987 Lecturer (Part-time) - Witwatersrand Technikon. Biology for the Food Technologists.

1984-1986 Lecturer - Department of Zoology at RAU. Biology and Taxonomy.

1983 Lecturer - Goudstad College of Education. Zoology.

1979-1982 Research assistant - Department of Zoology at RAU.

1978 Research technician - Onderstepoort Veterinary Institute. Helminthology - Taxonomy and physiology of South African helminths.

1975 – 1977 Teacher - Biology and Science

National Biomonitoring Programme - Project leader for River Health Programme (1998 - 2010)

Olifants River Forum - Vice Chairman (1994)

Research Unit for Terrestrial and Aquatic Ecology (RAU) (1991-1996)

Water Research Commission Steering Committee (30 projects) (1990 - 2011)

Lowveld Pollution Incident Committee – collaborator (1991-1998)

Mpumalanga River Health Programme - Project leader (1999 - 2005)

CONSULTING PROJECTS (112 projects)

Specialist fields for environmental studies (surveys and monitoring):

Specialist studies for:

Environmental Impact Assessments – Specialist studies (10 studies)

Reserve Determination – Environmental Water Requirements (13 projects)

Aquatic ecosystem

Hydro-electrical projects (5 projects)

Fish, macro-invertebrates and riparian (37 project)

Fish-ways (3 projects)

Wetland delineation (3 projects)

Terrestrial ecosystems (Mammals, birds, reptiles, frogs, plants)
Fauna specialist studies (40 projects)
Faunal and ecosystems monitoring: (6 projects)
Biodiversity and Habitat integrity: (30 projects)
Vegetation studies (2 projects)

Lecturing & Training: Ecology (10 projects)

OTHER

Initiated the Olifants River Forum. Received the trophy for the ORF Top Project of the Year competition and awarded honorary life membership of the Olifants River Forum.

Completed the Environmental Impact Assessment short course at the University of Cape Town.

Submitted a proposal for the Limpopo floodplains to be declared as a Ramsar site.

Accredited for SASS4 Macro-invertebrate Biomonitoring Methods.

Completed: Wetland Introduction and Delineation – Centre for Environmental Management: University of the Free State

Scientific Advisor: Leadership for Conservation in Africa

10 scientific papers in refereed journals

Appendix 3: The complete SASS 5 form.

TAXON	Stones	Vegetation	GSM	Total
Porifera 5				
Coelenterata 3				
Turbellaria 3				
Oligochaeta 1				
Leeches 3				
Amphipoda 15				
Potamonautidae 3				
Atyidae (Shrimp) 8				
Palaemonidae 10				
Hydracarinae 8				
Notonemouridae 14				
Perlidae 12				
Baetidae 1 spp 4				
2 spp 6				
>2 spp 12				
Caenidae 6				
Ephemeridae 15				
Heptageniidae 10				
Leptophlebiidae 13				
Oligoneuridae 15				
Polymitarcyidae 10				
Prosopistomatidae 15				
Teloganodidae 12				
Tricorythidae 9				
Calopterygidae 10				
Chlorocyphidae 10				
Chlorolestidae 8				
Coenagrionidae 4				
Lestidae 8				
Platycnemidae 10				
Protoneuridae 8				
Zygoptera 6				
Aeshnidae 8				
Cordulidae 8				
Gomphidae 6				
Libellulidae 4				
Belostomatidae 3				
Corixidae 3				
Gerridae 5				
Hydrometridae 6				
Naucoridae 7				
Nepidae 3				
Notonectidae 3				
Pleidae 4				
Veliidae 5				
Corydalidae 8				
Sialidae 6				
Dipseudopsidae 10				
Ecnomidae 8				
Hydropsychidae 1= 4				
2spp = 6				
>2spp =12				
Philopotamidae 10				

Polycentropodidae 12				
Psychomyiidae/Xip. 8				
Barbarochthonidae 13				
Calamoceratidae 11				
Glossosomatidae 11				
Hydroptilidae 6				
Hydrosalpingidae 15				
Lepidostomatidae 10				
Leptoceridae 6				
Petrothrincidae 11				
Pisuliidae 10				
Sericostomatidae 13				
Dytiscidae 5				
Elmidae/Dryopidae 8				
Gyrinidae 5				
Haliplidae 5				
Helodidae 12				
Hydraenidae 8				
Hydrophilidae 5				
Limnichidae 8				
Psephenidae 10				
Athericidae 13				
Blepharoceridae 15				
Ceratopogonidae 5				
Chironomidae 2				
Culicidae 1				
Dixidae 13				
Emphididae 6				
Ephydriidae 3				
Muscidae 1				
Psychodidae 1				
Simuliidae 5				
Syrphidae 1				
Tabanidae 5				
Tipulidae 5				
Ancylidae 6				
Bulininae 3				
Hydrobidae 3				
Lymnaeidae 3				
Physidae 3				
Planorbidae 3				
Thiaridae 3				
Viviparidae 5				
Corbiculidae 5				
Spaeridae 3				
Unionidae 6				
SASS Score				
No of families				
ASPT				

Estimated abundance: 1=1; A=2-10; B=11-100; C=101-1000; D=>1000

Appendix 4: The Nature of the Red Listed categories

All taxa listed as Critically Endangered qualify for Vulnerable and Endangered, and all listed as Endangered qualify for Vulnerable. Together these categories are described as 'threatened'. The threatened species categories form a part of the overall scheme. It will be possible to place all taxa into one of the categories (see Chart below).

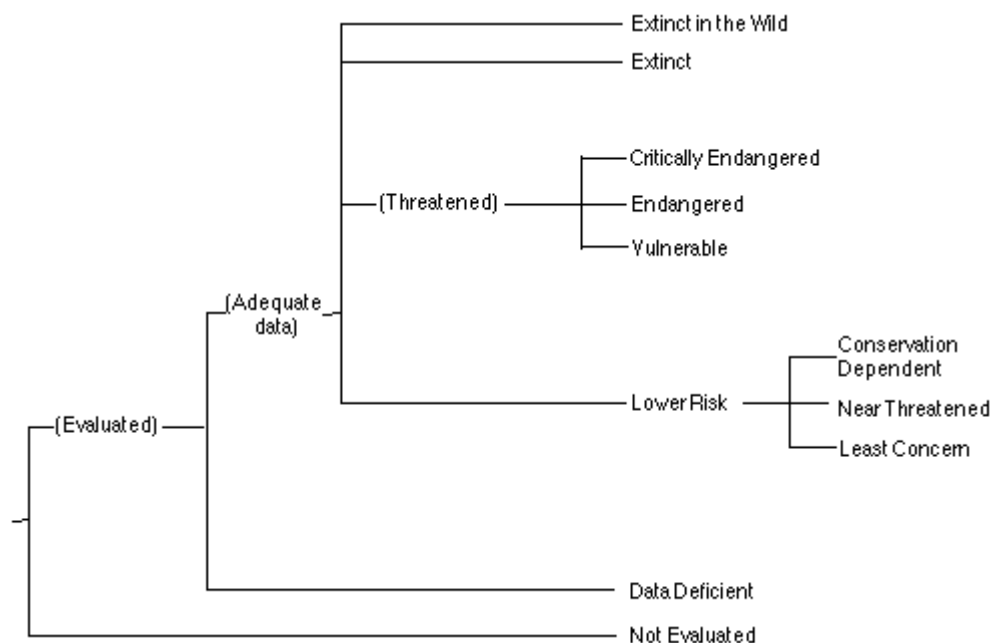


Chart: Red Listed categories

EXTINCT (EX) - A taxon is Extinct when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD (EW) - A taxon is Extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR) - A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the criteria (A to E) as described below.

ENDANGERED (EN) - A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria (A to E) as described below.

VULNERABLE (VU) - A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria (A to E) as described below.

LOWER RISK (LR) - A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1. **Conservation Dependent (cd).** Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. **Near Threatened (nt).** Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
3. **Least Concern (lc).** Taxa which do not qualify for Conservation Dependent or Near Threatened.

DATA DEFICIENT (DD) A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE) A taxon is Not Evaluated when it has not yet been assessed against the criteria.

Appendix 5: Lists of observed faunal species compiled by the author (the period 2004 to 2021) along this reach of the river with the Red Data species highlighted in **red font**.

Mammals

- | | | |
|-------------------------------|-----------------------------|--|
| 1. Banded Mongoose | 14. Greater Cane Rat | 26. Slender Mongoose |
| 2. Black Rhino | 15. Grey duiker
(common) | 27. Spotted Hyena |
| 3. Black rat | 16. Hippopotamus | 28. Thick-tailed Bushbaby |
| 4. Buffalo | 17. Honey Badger | 29. Tree Squirrel |
| 5. Burchell's Zebra | 18. Impala | 30. Vervet Monkey |
| 6. Bushbuck | 19. Kudu | 31. Wahlberg's/Peter's
Epauletted Fruit Bat |
| 7. Cape Clawless Otter | 20. Largespotted Genet | 32. Warthog |
| 8. Chacma Baboon | 21. Leopard | 33. Waterbuck |
| 9. Cheetah | 22. Lion | 34. White Rhino |
| 10. Civet (African) | 23. Nyala | 35. Wild Dog |
| 11. Egyptian slit-faced bat | 24. Pygmy Mouse | |
| 12. Elephant | 25. Scrub Hare | |
| 13. Giraffe | | |

Birds

- | | | |
|---|--|--|
| 1. Acacia Pied Barbet | 26. Bennett's
Woodpecker | 49. Bronze Mannikin |
| 2. African Black Duck | 27. Black Crane | 50. Brown Snake-Eagle |
| 3. African Crowned
Eagle | 28. Black Cuckoo | 51. Brown-headed Parrot |
| 4. African Cuckoo Hawk | 29. Black Cuckooshrike | 52. Brown-hooded
Kingfisher |
| 5. African Darter | 30. Black egret (heron) | 53. Brown-throated
Martin |
| 6. African Dusky
Flycatcher | 31. Black flycatcher
(southern) | 54. Brubru |
| 7. African Finfoot | 32. Black Saw-wing | 55. Burchell's Coucal |
| 8. African Fish-Eagle | 33. Black Sparrowhawk | 56. Cape batis |
| 9. African Goshawk | 34. Black Stork | 57. Cape Glossy Starling |
| 10. African Harrier-Hawk
(Gymnogone) | 35. Black / Amethyst
sunbird | 58. Cape Turtle-Dove |
| 11. African Hawk-Eagle | 36. Black-chested Snake-
Eagle | 59. Cape White-eye |
| 12. African Hoopoe | 37. Black-collared Barbet | 60. Cardinal Woodpecker |
| 13. African Jacana | 38. Black-crowned Night-
Heron | 61. Caspian tern |
| 14. African Openbill | 39. Black-crowned
Tchagra | 62. Cattle Egret |
| 15. African Pied Wagtail | 40. Black-eyed bulbul
(dark-capped) | 63. Chinspot Batis |
| 16. African Pygmy-
Kingfisher | 41. Black-headed Heron | 64. Collared Sunbird |
| 17. African Spoonbill | 42. Black-headed Oriole | 65. Comb Duck |
| 18. African Stonechat | 43. Black-shouldered Kite | 66. Common Myna |
| 19. African Wattled
Lapwing | 44. Blacksmith Lapwing
(plover) | 67. Common Sandpiper |
| 20. African Wood-Owl | 45. Black-winged Stilt | 68. Common Scimitarbill |
| 21. Arrow-marked
Babbler | 46. Bleating warbler | 69. Common Waxbill |
| 22. Ashy Flycatcher
(Blue-grey) | 47. Blue-billed firefinch
(African) | 70. Crested Barbet |
| 23. Barn Owl | 48. Blue Waxbill | 71. Crested Francolin |
| 24. Bateleur | | 72. Crowned Lapwing
(plover) |
| 25. Bearded Woodpecker | | 73. Cut-throat Finch |
| | | 74. Diederick Cuckoo |
| | | 75. Dusky Indigobird
(Black widowfinch) |

76. Eastern redfooted
kestrel
77. Egyptian Goose
78. Eurasian Golden
Oriole
79. European Bee-eater
80. European Nightjar
81. **European Roller**
82. European swallow
83. Fiery-necked Nightjar
84. Fork-tailed Drongo
85. Fulvous Duck
86. Gabar Goshawk
87. Garden Warbler
88. Giant eagle owl
(Verreaux's)
89. Giant Kingfisher
90. Glossy Ibis
91. Golden Weaver
(Holub's)
92. Golden-tailed
Woodpecker
93. Goliath Heron
94. Great Egret
95. Great Reed-Warbler
96. Greater Blue-eared
Starling
97. Greater Honeyguide
98. **Greater Painted-snipe**
99. Green pigeon
100. Green-backed
Heron
101. Greenshank
(Common)
102. Green-spotted
dove
103. Green twinspace
104. Green-winged
Pytilia (Melba finch)
105. Grey Go-away-
bird/lourie
106. Grey Heron
107. Grey hornbill
(African)
108. Grey Penduline-
Tit
109. Grey-headed
Bush-Shrike
110. Grey-headed Gull
111. Grey-headed
sparrow
112. Grey-rumped
Swallow
113. **Ground hornbill
(Southern)**
114. Groundscraper
Thrush
115. Hadedda Ibis
116. **Half-collared
Kingfisher**
117. Hamerkop
118. Helmeted
Guineafowl
119. Heuglin's robin
(white-browed robin-
chat)
120. **Hooded Vulture**
121. Horus Swift
122. House Sparrow
123. Icterine Warbler
124. Jacobin Cuckoo
125. Klaas's Cuckoo
126. Kurrichane Thrush
127. **Lanner Falcon**
128. **Lappet-faced
Vulture**
129. Laughing Dove
130. Lesser
Honeyguide
131. Lesser Masked-
Weaver
132. Lesser Striped
Swallow
133. Levaillant's
Cuckoo/ Striped
134. Lilac-breasted
Roller
135. Little Bee-eater
136. Little Egret
137. Little
Sparrowhawk
138. Little Swift
139. Long-billed
Crombec
140. Long-crested
Eagle
141. Long-tailed
Paradise-Whydah
142. Longtailed shrike
(magpie)
143. Malachite
Kingfisher
144. **Marabou Stork**
145. Marico Sunbird
146. **Martial Eagle**
147. Monotonous Lark
148. Mosque Swallow
149. Mourning dove
(African)
150. Namaqua Dove
151. Natal Francolin
152. Olive sunbird
153. Orange-breasted
Bush-Shrike
154. Osprey
155. Palm swift
(African)
156. Paradise-
Flycatcher (African)
157. Pearl-spotted
Owlet
158. Pied Crow
159. Pied Kingfisher
160. Pin-tailed Whydah
161. Plum-coloured
starling (violet-
backed)
162. Puffback (black-
backed)
163. Purple Heron
164. Purple-banded
Sunbird
165. Purple-crested
Turaco
166. Rattling Cisticola
167. Red-backed
Mannikin
168. Red-backed
Shrike
169. Red-billed
Firefinch
170. Red-billed
helmetshrike (Retz's)
171. Red-billed Hornbill
172. Red-billed
Oxpecker
173. Red-billed Quelea
174. Red-billed
woodhoopoe (green)
175. Red-breasted
Swallow
176. Red-chested
Cuckoo
177. Red-collared
Widowbird
178. Red-crested
Korhaan
179. Red-eyed Dove
180. Red-faced
Cisticola
181. Red-faced
Mousebird
182. Red-headed
Weaver

183. Red-shouldered widow
 184. Red-winged Starling
 185. Reed Cormorant
 186. Rock bunting (cinnamon-breasted)
 187. Sacred Ibis
 188. **Saddle-billed Stork**
 189. Scarlet-chested Sunbird
 190. Scops owl (African)
 191. Sharpbilled honeyguide
 192. Sombre Greenbul
 193. Southern Black Tit
 194. Southern Boubou
 195. Southern Masked-Weaver
 196. Southern Red Bishop
 197. Southern Yellow-billed Hornbill
 198. Speckled Mousebird
 199. Spectacled weaver
 200. Spotted-backed weaver
 201. Spotted Flycatcher
 202. Spur-winged Goose
 203. Squacco Heron
 204. Steppe Buzzard
 205. Swainson's Spurfowl
 206. Tambourine Dove
 207. **Tawny Eagle**
 208. Tawny-flanked Prinia
 209. Terrestrial Brownbul
 210. Thick-billed Weaver
 211. Three-banded Plover
 212. Three-streaked tchagra (brown-crowned)
 213. Trumpeter Hornbill
 214. Village Indigobird (Steelblue widowfinch)
 215. Little Swift
 216. Wahlberg's Eagle
 217. Water Thick-knee
 218. Wattled Starling
 219. Whiskered tern
 220. White Stork
 221. **White-backed Night-Heron**
 222. **White-backed Vulture**
 223. White-bellied Sunbird
 224. White-breasted Cormorant
 225. White-crowned shrike (Southern)
 226. White-faced Duck
 227. White-fronted Bee-eater
 228. **White-headed Vulture**
 229. White (crested) helmetshrike
 230. White-rumped Swift
 231. White-winged Widowbird
 232. Willow Warbler
 233. Wire-tailed Swallow
 234. Wood Sandpiper
 235. Woodland Kingfisher
 236. Woolly-necked Stork
 237. Yellow-billed Egret
 238. Yellow-billed Kite
 239. **Yellow-billed Stork**
 240. Yellow-breasted Apalis
 241. Yellow-breasted Pipit
 242. Yellow Bishop
 243. Yellow-crowned Bishop
 244. Yellow-eyed (fronted) Canary
 245. Yellow-fronted Sparrow
 246. Yellow-fronted Tinkerbird
 247. Yellow-rumped Tinkerbird
 248. Yellow-throated Longclaw
 249. Zitting cisticola

Reptiles

1. Boomslang
 2. Brown house snake
 3. Cape wolf snake
 4. Common dwarf gecko
 5. Eastern thread snake
 6. Eastern Tiger Snake
 7. Flapneck Chameleon
 8. Leopard Tortoise
 9. Mamba
 10. Marbled tree snake
 11. Moreau's Tropical House Gecko
 12. Mozambique spitting cobra
 13. **Nile crocodile**
 14. Olive Grass Snake
 15. Puff adder
 16. Red-lipped snake
 17. Serrated Hinged Terrapin
 18. **Southern African Python**
 19. Southern Tree Agama
 20. Speke's Hinged Tortoise
 21. Striped Skink
 22. Variegated bush Snake
 23. Wahlberg's Snake-eyed Skink
 24. Water Monitor
 25. Western Natal green snake

Frogs

1. Banded Rubber Frog
2. Broadbanded Grass Frog
3. Brownbacked Tree Frog
4. Bubbling Kassina
5. Bushveld Rain Frog
6. Common River Frog
7. Dwarf Puddle Frog
8. Flatbacked Toad
9. Foam-nest frog
10. Greater Leaf-folding Frog
11. Guttural Toad
12. Natal Sand Frog
13. Painted Reed Frog
14. Plain Grass Frog
15. Raucous Toad
16. Russet-backed sand frog
17. Snoring puddle frog
18. Tinker Reed Frog
19. Tremelo Sand Frog