

DRAFT BASIC ASSESSMENT REPORT:

**THE CONSTRUCTION AND OPERATION
OF A PIG GENE TRANSFER CENTRE (GTC)
ON THE REMAINING EXTENT OF
PORTION 24 OF THE FARM
KLEINFONTEIN 432 JS,
MIDDELBURG**

Report prepared for: Alzu Pig Genetics (Pty) Ltd.

Report dated: August 2018 (draft)

Report number: BA 2017/03

DARDLEA ref: 1/3/1/16/1N-138

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PROJECT INFORMATION SUMMARY

PROJECT TITLE	The construction and operation of a pig Gene Transfer Centre (GTC) on the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, Middelburg
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DARDLEA REFERENCE NO.	1/3/1/16/1N-138
AdiE REFERENCE NO.	BA 2017/03

REPORT VERSION	Basic Assessment Report - Draft
DATE	August 2018
REPORT VERSION	
DATE	

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UNDERTAKING BY EAP

as required in terms of Section 2(j) of Appendix 2 of the Environmental Impact Assessment Regulations, 2014.

Project: The Construction and Operation of a pig Gene Transfer Centre (GTC) on the Remaining Extent of Portion 24 of the Farm Kleinfontein 432 JS, Middelburg.

I,, hereby confirm that:

- the information provided in this Draft Basic Assessment Report is, to the best of my knowledge, correct as at the time of compilation thereof;
- comments and inputs obtained from stakeholders and interested and affected parties through the public participation process conducted to date have been included in this Draft Basic Assessment Report;
- information provided to interested and affected parties (to date) has been included in this Draft Basic Assessment Report;
- inputs and recommendations from the specialist reports are included in this Draft Basic Assessment Report.

Signed at..... on this day of.....
of 2018.

Signature:.....

Company:.....

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of 2018.

Signature:.....

Company:.....

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- Appendix 8: Background information document
 Appendix 9: Correspondence with the authorities and interested and affected parties
 Appendix 10: Engineering Services Report
 Appendix 11: Standard Operating Procedures (SOP) - GTC

LIST OF ABBREVIATIONS

°C	Degrees Celsius
BA	Basic Assessment
CBA	Critical Biodiversity Area
COGTA	Department of Co-operative Governance and Traditional Affairs
DAFF	Department of Agriculture, Forestry and Fisheries
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
ESA	Ecological Support Area
GTC	Gene Transfer Centre
ha	hectares
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
km	kilometer
kl	kiloliter
ℓ	liter
l/s	liters per second
m	meters
mamsl	meters above mean sea level
mbgl	meters below ground level
mm	millimeter
MBSP	Mpumalanga Biodiversity Sector Plan
MTPA	Mpumalanga Tourism and Parks Agency
NFEPA	National Freshwater Ecosystem Priority Areas
PIA	Palaeontological Impact Assessment
PES	Present Ecological State
SOPs	Standard Operating Procedures
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SANS	South African National Standards
TRAC	Trans African Concessions



SECTION 1: INTRODUCTION

Alzu Pig Genetics (Pty) Ltd (t/a PIC South Africa) intends to relocate the existing Gene Transfer Centre (GTC) from the farm Rockdale, Middelburg, to the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, Middelburg. The site is located north of the N4 national road between Middelburg and Wonderfontein, ±2km northwest of the Alzu Petroport.

According to the applicant, approximately 6 ha will be utilized for the new GTC facility, which will comprise of boar pens, a laboratory, offices, manure dam and associated facilities. The intention is to initially house 200 boars at the new facility, with eventual expansion to house 400 boars.

The Minister of Environmental and Water Affairs listed in terms of Sections 24(2), 24(5), 24D and 44, read with section 47A(1)(b) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), a number of activities that require an environmental impact assessment (either a Basic Assessment or a full Environmental Impact Assessment) before undertaking these activities.

The ultimate aim of an environmental impact assessment is to *"identify, predict and evaluate the actual and potential risks for and impacts on the geographical, physical, biological, social, economic and cultural aspects of the environment, in order to find the alternative and options that best avoid negative impacts altogether, or where negative impacts cannot be avoided, to minimise and manage negative impacts to acceptable levels, while optimising positive impacts, to ensure that ecological sustainable development and justifiable social and economic development outcomes are achieved."* (DEA, 2017).

The proposed activity would require a Basic Assessment process since the following listed activities (as identified in the Environmental Impact Assessment Regulations, 2014 (as amended)) are triggered:

Listing	Activity
Listing Notice 1 (GN R327 of 7 April 2017) Listed Activity 4	The development and related operation of facilities or infrastructure for the concentration of animals in densities that exceed (i) 20 square metres per large stock unit and more than 500 units per facility; (ii) 8 square meters per small stock unit and; a. more than 1 000 units per facility excluding pigs where (b) applies; or b. more than 250 pigs per facility excluding piglets that are not yet weaned; (iii) 30 square metres per crocodile and more than 20 crocodiles per facility (iv) 3 square metre per rabbit and more than 500 rabbits per facility; (v) 250 square metres per ostrich or emu and more than 50 ostriches or emus per facility.
Listing Notice 1 (GN R327 of 7 April 2017) Listed 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: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.

AdiEnvironmental cc. was appointed as independent environmental consultant to conduct the required Basic Assessment and compile the necessary documentation.

The objective of the Basic Assessment process is to, through a consultative process:



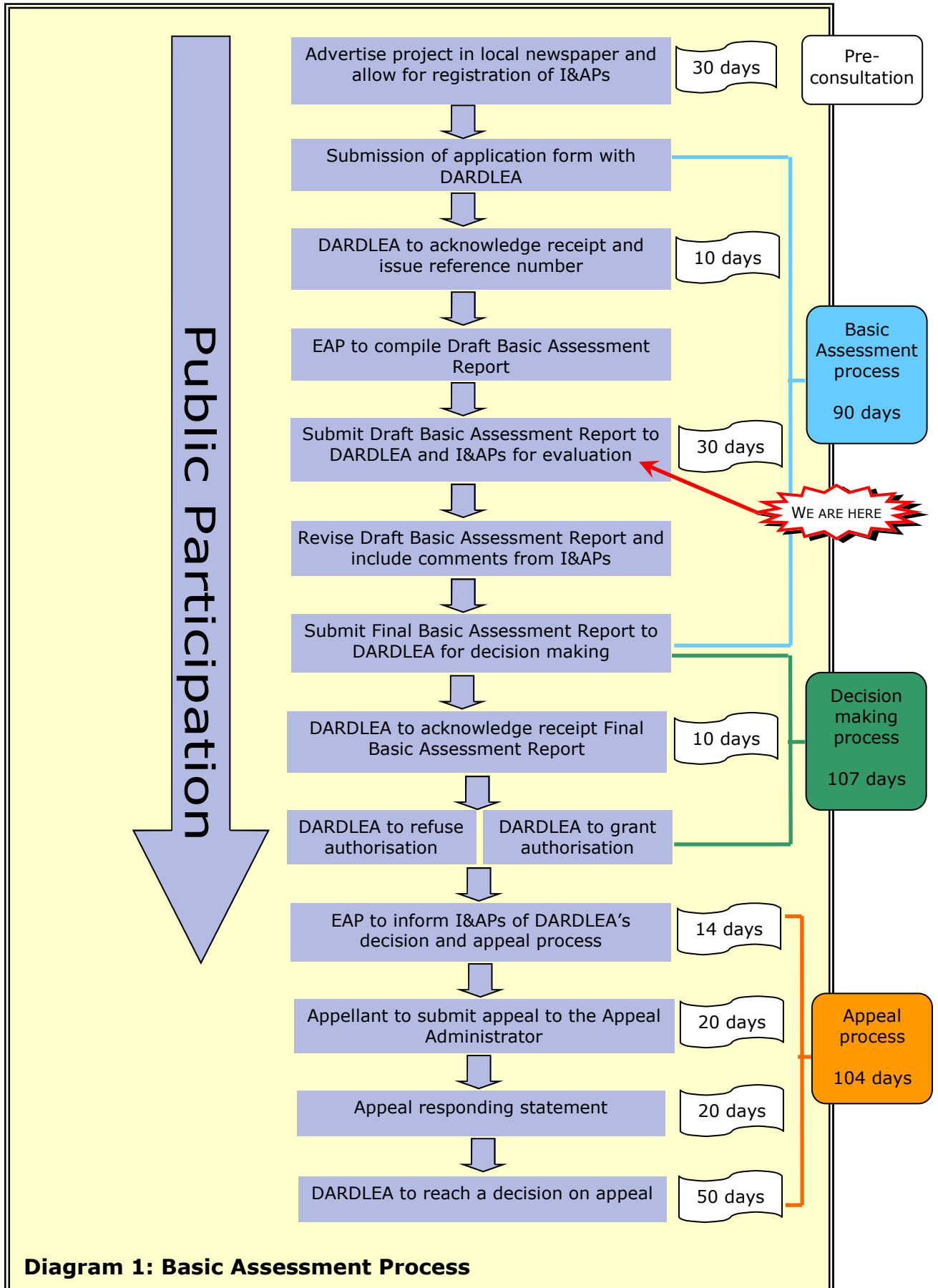
- a) *Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;*
- b) *Identify the alternatives considered, including the activity, location, and technology alternatives;*
- c) *Describe the need and desirability of the proposed alternatives;*
- d) *Through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the sites and locations and the risk of impact of the proposed activity and technology alternatives on these aspects to determine: (i) the nature, significance, consequence, extent, duration and probability of the impacts occurring; and (ii) degree to which these impacts (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated.*
- e) *Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to: (i) identify and motivate a preferred site, activity and technology alternative; (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and (iii) identify residual risks that need to be managed and monitored.*

The overall aim of the process is to provide the competent authority with adequate information to make an informed decision regarding the proposed activity, thereby ensuring that activities with an unacceptable degree of negative impacts are not authorized and that authorized activities are undertaken in a manner where environmental impacts are managed to acceptable levels.

The decision making authority is the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA). This Department will decide to grant or refuse the approval of the project. On approval, an Environmental Authorisation and Record of Decision will be issued in the name of the project applicant.

Diagram 1 provides a schematic description of the Basic Assessment process followed and the current status of the process.





SECTION 2: CONTACT DETAILS

As per Appendix 1 of the EIA Regulations, 2014 (as amended), this section provides the following details:

- (i) the EAP who prepared the report; and
 (ii) the expertise of the EAP, including a curriculum vitae.

In addition, the contact details of the applicant and the specialists who conducted the required specialist studies are also provided.

2.1 Details of the project applicant

Alzu Pig Genetics (Pty) Ltd (t/a PIC South Africa) is a franchise of PIC International, which produces and multiplies superior PIC boars and gilt products in South Africa. The GTC (Gene Transfer Centre) facility in Middelburg supplies liquid genetics (i.e. semen) to pork producers in South Africa for the artificial insemination of sows.

Name of Applicant	Alzu Pig Genetics (Pty) Ltd. (trading as PIC South Africa)
Company Registration number	2013/054544/07
Address	Private Bag X251875 Middelburg 1050
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Telephone number	013-249 8900
Cell number	082 885 9741
E-mail	elizma@picrsa.co.za

2.2 Details of the Environmental Assessment Practitioner (EAP)

Alzu Pig Genetics (Pty) Ltd. appointed AdiEnvironmental cc, an independent environmental consultancy, to undertake the Basic Assessment process for the proposed development in accordance with the Environmental Impact Assessment Regulations (EIA), 2014 (as amended).

Name of company	AdiEnvironmental cc
Company registration number	CK99/036174/23
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Ms. A. Erasmus has an M.Sc with more than 20 years environmental management experience. She is a Professional Natural Scientist (Botanical and Ecological Science) registered with South African Council for Natural Scientific Professions. Ms. R. Janse van Rensburg has an M. Env. Mgt with more than 16 years environmental management experience.

Ms. Erasmus and Ms. Janse van Rensburg have been involved in the management and execution of numerous environmental assessments. The Curriculum Vitae of the Environmental Assessment Practitioners (EAPs) are provided in Appendix 2 together with a list of projects completed to date.

Both EAPs comply with the requirements as stipulated in Regulation 13 of the EIA Regulations, 2014 (as amended) in terms of independence, expertise, objectivity, etc. The declaration and affirmation by the EAPs is included in the front of this document.

AdiEnvironmental cc has no vested interest (other than fair remuneration) in the approval of this project, and hereby declares its independence as required by the EIA Regulations, 2014 (as amended).

2.3 Details of the specialists

Specialist studies were undertaken as part of the Basic Assessment process to address issues that required further investigation. The following specialists were appointed by the EAP:

Specialist Study	Consultant	Qualifications
Engineering Services Report	Anna Hlasane (BTW & Associates (Pty) Ltd.)	<ul style="list-style-type: none"> • BEng. Civil Engineering • AutoCAD Advanced <i>Candidate Engineer (ECSA): 201751260</i> <i>SAICE Associate Member: 201500968</i>
Wetland Assessment	Ina Venter (Kyllinga Consulting)	<ul style="list-style-type: none"> • M.Sc (Botany) • B.Sc Hons (Botany) • B.Sc (Environmental Sciences) <i>SACNASP Accreditation: 400048/08</i>
Groundwater Assessment	C. Gouws (Geo Pollution Technologies - Gauteng (Pty) Ltd.)	<ul style="list-style-type: none"> • B.Sc Geology • B.Sc (Hons) Geoinformatics <i>SACNASP Accreditation: 117342</i>
Heritage Assessment	Prof Anton van Vollenhoven (Archaetnos Culture and Cultural Consultants)	<ul style="list-style-type: none"> • BA • BA (HONS) Archaeology • MA Archaeology • Post-Graduate Diploma in Museology • Diploma Tertiary Education • DPhil Archaeology • MA Cultural History • Management Diploma • DPhil History <i>ASAPA Accreditation: 166</i> <i>SASCH Accreditation: CH001</i>
Palaeontological Assessment	Dr Heidi Fourie (Heidi Fourie Consulting)	<ul style="list-style-type: none"> • B.Sc Geology and Zoology • Ph.D Palaeontology <i>Member: Palaeontological Society of SA.</i>

The Curriculum Vitae and declarations of independence of the above-mentioned specialists are provided in Appendix 2.



SECTION 3: DESCRIPTION OF THE ACTIVITY

The purpose of this section is to present sufficient project information to interested and affected parties, stakeholders and government departments in terms of the design parameters applicable to the project.

This section therefore provides information on the following as per Appendix 1 of the EIA Regulations, 2014 (as amended):

- ◆ *A description of the scope of the proposed activity;*
- ◆ *A description of the activities to be undertaken including associated structures and infrastructure;*
- ◆ *A plan which locates the proposed activity as well as associated structures and infrastructure (i.e. conceptual design/layout plan).*

It should be noted that the project description details are preliminary at this early stage of the project life-cycle. It is thus possible that some of the design parameters may change during the detailed design phase. However, the project description used in this Basic Assessment Report assumes a worst-case scenario, where the maximum development footprint and all associated infrastructure are taken into account.

3.1 Description of the site, design, size and scale of the development

3.1.1 Introduction

Alzu Pig Genetics (Pty) Ltd (t/a PIC South Africa) is a franchise of PIC International, which produces and multiplies superior PIC boars and gilt products.

A Gene Transfer Centre (GTC) was established in Middelburg to supply pork producers in South Africa with liquid genetic material. Semen from quality pig lines are collected from boars, processed and packaged, and distributed to various customers across the country for artificial insemination of sows.

The existing GTC facility (Figure 3.1) is located on the Remaining Extent of the farm Rockdale 442 JS, which is registered to Rockdale Industrial (Pty) Ltd. The landowner, Rockdale Industrial (Pty) Ltd, recently decided to develop the Rockdale property for residential purposes and requested Alzu Pig Genetics (Pty) Ltd. to find an alternative site for the GTC facility.

The Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, Middelburg, was subsequently identified for the relocation of the facility. Figure 3.1 indicates the location of the existing and proposed GTC facility in relation to Middelburg.

The existing Rockdale GTC facility can currently house ± 200 boars. Due to increased market demand, the applicant also decided to expand the GTC facility as part of the relocation project. The intention is to eventually house 400 boars at the new facility. Photo 3.1 provides an indication of the existing facility.





Photo 3.1: A view of the existing GTC facility located on the farm Rockdale.

The new GTC facility will comprise of boar pens, a laboratory, offices, guardroom, laundry, kitchen, manure dam, workshop, feed silos and parking area. All the buildings will be located in a fenced security area with access only possible through locked gates and with permission from management. The main reason for keeping the facility secure is for the prevention of diseases (bio-security).

3.1.2 Location of site

The proposed GTC facility will be located on the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, Middelburg. This site is located north of the N4 national road between Middelburg and Wonderfontein, ± 2 km northwest of the Alzu Petroport (Figure 3.1).

The entire property is 234 ha in extent, of which ± 6 ha will be utilized for the GTC facility.

Figure 3.1 indicates the location of the site and Table 3.1 the property details.

Table 3.1: Details of the property

Farm	Kleinfontein 432 JS
Portion	Remaining Extent of Portion 24
Title Deed Number	T4085/2001
21 Digit SG Code	T0JS00000000043200024
Registered Landowner	Statutis Trading (Pty) Ltd.
Size of property	234.50 ha
Size (footprint) of site	6 ha
Centre Co-ordinates of site	25°49'07.02"S 29°46'40.25"E.
Magisterial District	Steve Tshwete Local Municipality Nkangala District Municipality
Closest Town	Middelburg - ± 30 km

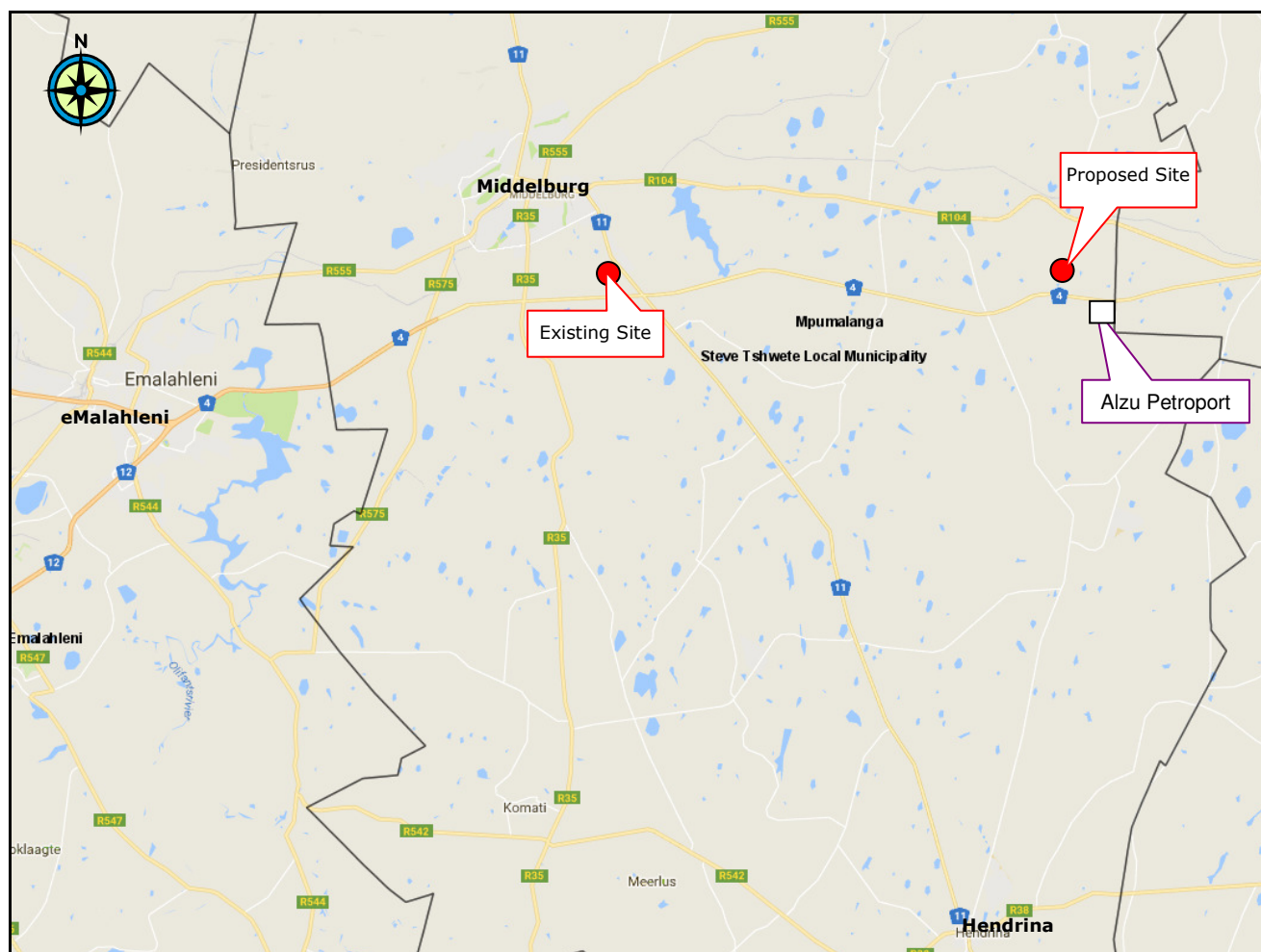


Figure 3.1: Location of existing and proposed GTC facility sites

3.1.3 Layout plan

Figure 3.2 provides an indication of the conceptual layout plan for the GTC facility. In essence, the proposed GTC facility will comprise of the following (Figure 3.2):

- ❖ 4 platforms with one building (boar house) on each platform;
- ❖ 100 pens per building with a total of 400 pens;
- ❖ Storm water system (i.e. vegetated storm water channel between each building with a total of 5 channels);
- ❖ Feeder system (i.e. feeders, feed silos, etc.);
- ❖ Water system (i.e. boreholes, water tank and pipes, water nozzles for drinking)
- ❖ Heating/ventilation system (i.e. diesel burners, fans, curtains, etc.);
- ❖ Waste management system (i.e. manure drainage system to manure dam with catchpit);
- ❖ Laboratory, office, ablutions and laundry;
- ❖ Workshop;
- ❖ Semen collection area;
- ❖ Biosecurity spray booth;
- ❖ Staff and visitors parking area;
- ❖ Access road;
- ❖ Double fencing.

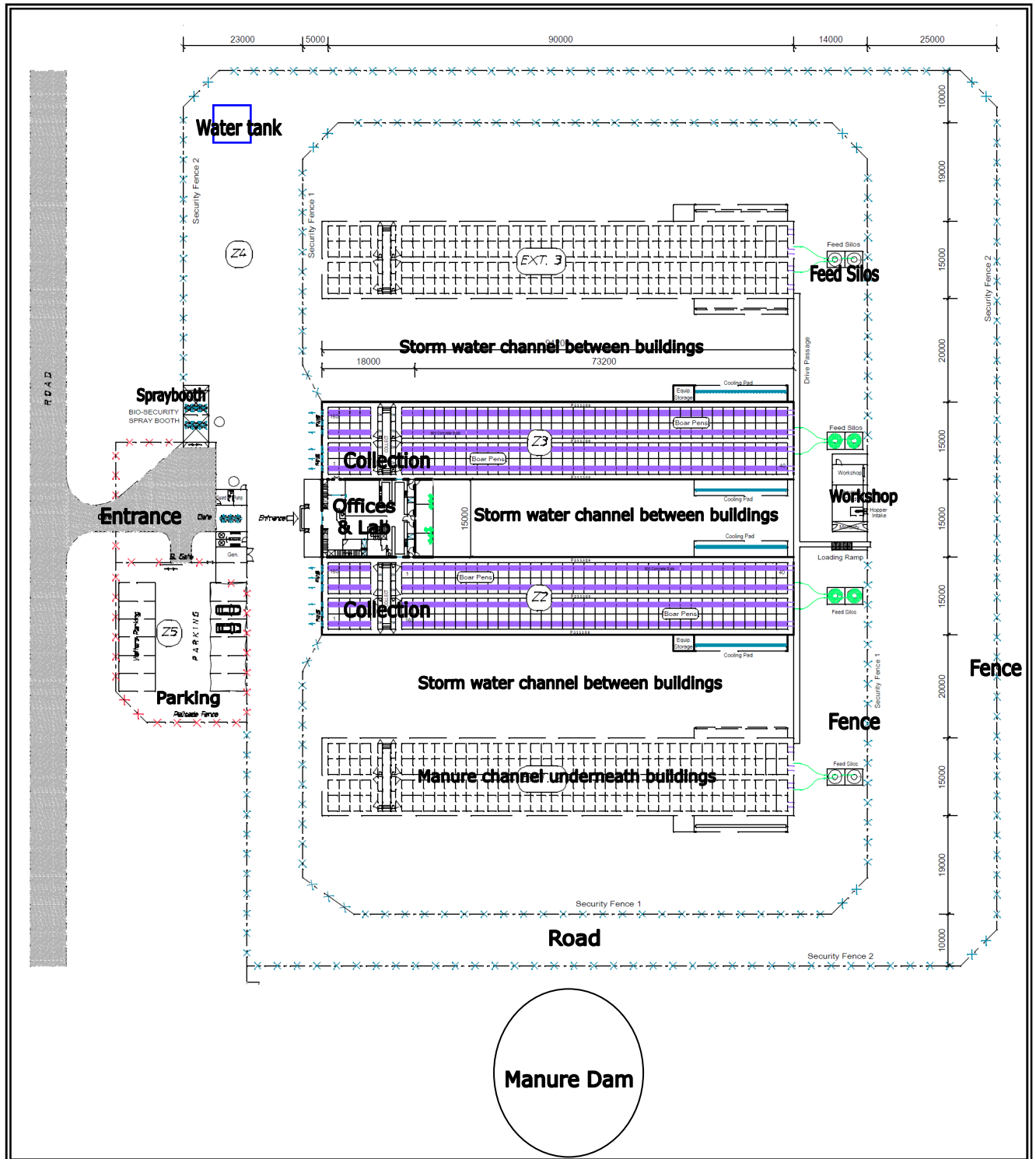


Figure 3.2: Layout plan of the proposed facility (designed by Dalein Plaasbou, 2017)

Entrance to the site would be obtained from an existing gravel road located on the western boundary of the site (Figure 3.2). Any vehicles entering the site will be required to go through a biosecurity spray booth before driving to the parking area or delivering feed.



The entire facility (including buildings, parking area and storm water infrastructure) will be double fenced with a gravel road between the two fences.

The laboratory, offices and ablution facilities will be located near the entrance to the site between the two central platforms (Figure 3.2).

The proposed piggery will comprise of 4 north facing platforms on which buildings containing boar pens will be constructed. The platforms will be built up using the material excavated from the storm water trenches located between the platforms (Figure 3.2).

An open space of $\pm 15\text{m}$ will be left between each platform/building for storm water management purposes (Figure 3.2). Storm water channels will also be provided around the facility. More information regarding storm water management is provided in Section 3.2.

A feed silo will be provided at the end of each building near the fence (Figure 3.2). The feed delivery trucks will utilize an access road located on the outside of the fenced area to refill the silos from the outside. This will minimize traffic within the facility and decrease the risk of disease.

Wash water, manure and urine will be contained in manure compartments located underneath the boar pens and channelled to a single manure dam (Figure 3.2). A separate entrance will be provided to the manure dam for the tractors and tankers. More information w.r.t. manure handling is provided in Section 3.1.4 and Section 7 (alternatives).

A water reservoir will be located in the north western corner of the site (Figure 3.2) to ensure that sufficient water is always available at the facility. A generator will also be provided should there be an electricity outage.

It should be noted that various layout plans were drafted for the proposed facility, to allow for the selection of the most suitable layout in terms of the environmental features of the site, economical factors and operational considerations. A detailed description of the alternative layouts investigated (including the preferred alternative) is provided in Section 7 of this report.

3.1.4 Boar housing

As indicated above, the proposed GTC facility will comprise of 4 buildings (Figure 3.2), which can each accommodate 100 boars. A total of 400 boars could thus be accommodated.

Boars will be obtained from two different pig lines. Terminal line sires will be obtained from a piggery located in Magaliesburg and Dam line sires from a piggery in Heidelberg. Both these piggeries belong to the applicant. The type of boar ordered for the GTC facility will depend on customer needs.

New boars that arrive will be kept in quarantine for at least 4 weeks and vaccinated before entering the boar house. After entering the boar house, each boar will be allocated a unique "GTC boar number".

To ensure that the boars do not fight and to minimize the potential spread of disease, each boar will be accommodated in a separate pen. The pens will be constructed in rows, with passage ways in-between (Figure 3.2).



Each pen will be fitted with a gate, feeder system and drinking water nozzle. Photos 3.2 and 3.3 provide a photographic view of the interior of the existing facility. The new pens will be constructed in a similar fashion.

The entire building will be climate controlled.

The boar houses will be washed on a regular basis with a pressure washer and biodegradable disinfectant. This includes cleaning the boar pens, walkways, manure channels and fans. All surfaces will be treated with a disinfectant before and after washing with the pressure washer. Each boar pen will be left empty for 12 hours after it has been disinfected.



Photo 3.2: A view of the pens inside the existing facility.



Photo 3.3: A view of the inside of a pen at the existing facility.

Feeder system

The boars will be fed a special mash ration formulated by PIC International to enhance sperm production.

The feed will be purchased and transported to the facility by truck, where it will be stored in feed silos adjacent to the buildings (Figure 3.2). In order to prevent the spread of disease, the delivery trucks will not be allowed inside the fenced area and will refill the silos by means of a hose. The feed in the different silos will not be mixed.

All feed trucks will follow the Vehicle Access and Delivery Standard Operating Procedure (SOP) before offloading. A sample of every load delivered will be kept for 3 months after delivery in case there are issues at a later stage as a result of the feed. A copy of the applicable SOPs are provided in Appendix 11.

From the silos, the food will be distributed to each pen by means of an automatic stop feed system. Each boar will be fed 2.5 kg per day at 10 am. The feeding system will be inspected everyday for blockages and repaired immediately if faulty.

Water system

A 40 000 l water storage tank will be provided in the north western corner of the site (Figure 3.2), from where water will be distributed to the various buildings.

Each pen will be provided with a water nozzle (Photo 3.4) to ensure that the boars always have access to water. The water nozzles will be tested upon cleaning the pens and the nozzle-filter will be cleaned on the first Tuesday of every month.



Photo 3.4: A view of the inside of a pen at the existing facility.

Heating/ventilation system

The climatologic environment in a piggery is very important, since the temperature and humidity within a piggery affects the health of the pigs. A pig is extremely vulnerable to heat stress, bodily exhaustion and sunstroke at temperatures higher than 30°C.

According to the applicant, the ideal temperature in the boar house is between 14°C and 21°C. Temperatures during the summer months should not be higher than 25°C and in the winter months, not lower than 9°C. Diesel

heaters will be used during the winter months for heating. During summer, fans and a spraying system will be used.

Piggeries also require a ventilation system to manage air quality/odours as a result of manure, feed and the pigs themselves. Different reactions take place inside the buildings which may lead to the build up of harmful gasses such as carbon dioxide (CO₂), methane gas (CH₄), ammonia (NH₄) and hydrogen sulphide (H₂S) (Breedt, 2005).

The objective of ventilation is the control of the ambient temperature and humidity, the provision of fresh air, the removal of harmful gases and the movement of air.

A proper ventilation system (fans) will be installed as part of the GTC facility. The ventilation system will include the following:

- Meticulous control of ventilation vents and fans.
- Monitoring of the temperature and relative humidity in the building.
- Removal of dust, gases and pathogens by means of sufficient air replacement.

All fans (including parts such as pulleys and belts) will be checked on the last Wednesday of every month to ensure that they are in good working order.

Waste management system

The main by-products of the proposed GTC facility will be manure (solid and liquid) and wastewater from cleaning.

According to the applicant, a deep pit storage system will be installed at the GTC facility to deal with manure (solid and liquid) and wastewater from cleaning.

The four buildings (boar houses) will be fitted with slotted floors. All urine, manure and wash water will fall through the slotted floor into manure compartments (510 mm deep) located beneath the floor. Photo 3.5 provides an example of the slotted floors and manure compartment.



Photo 3.5: Example of the slotted floor system (obtained from www.stockyardindustries.com).

All the waste in the manure compartment will be left to mix together and ferment. Once the manure compartment is nearly full, the manure (i.e. the



mixed waste products) will be flushed and channeled via a pipeline (250 mm diameter) to a central manure dam.

The boar houses will be washed on a regular basis with a pressure washer and biodegradable disinfectant. The wash water will be left in the manure compartment to prevent new manure from drying and caking on the manure compartment floor and within the pipes.

In order to prevent the level of the manure rising above the floor into the boar pens, a pipe (which is lower than the floor level) will be connected to the drainage system. If the level in the manure compartment rises unexpectedly (e.g. broken water pipe), the manure will overflow into the channel and not rise through the floor.

The manure will be stored temporarily in a manure dam/pit and spread by means of a tractor and tanker onto nearby cultivated lands as fertilizer.

Detailed information regarding the waste management system (e.g. engineering diagrams, dam sizes, etc.) as well as the various alternatives investigated are provided in Section 7 of this report.

3.1.5 Semen collection procedure

As indicated previously, the purpose of the Gene Transfer Centre (GTC) is to supply pork producers in South Africa with liquid genetic material. Semen from quality pig lines are collected from boars, processed and packaged, and distributed to various customers across the country for artificial insemination of sows.

Semen will be collected from mature boars through the use of a dummy sow (Photo 3.6). The dummy sow will be kept in a separate collection pen in the boar house (Figure 3.2). The collection pen will be divided into two compartments, separated by a strong steel plate. The one compartment will contain the dummy sow and the other compartment will serve as a warm-up pen.

The design of the dummy sow is such that it will be safe and comfortable for the boar. Adequate space will be provided within the collection pen to allow room for the boar and collector to move with ease. A non-slick floor mat will also be provided to prevent slippage and leg injury. Most dummy sows are adjustable to facilitate the size of the boar.



Photo 3.6: Examples of dummy sows used for collection.

New boars will first be trained to use the dummy sow. The majority of boars can be trained easily, but a small number may refuse indefinitely. Boars older than 7 months are preferred since it is very difficult to train boars that are not yet sexually mature. Younger boars are also more prone to injury and therefore have to be culled at a much younger age.

A 'runner' will be responsible for fetching the boar identified for collection. The boar will be led from his pen via the walkways to the collection pen. Here, the boar will mount the dummy sow and his semen will be collected by a 'collector' in a collection beaker. The first part of the ejaculate will not be collected since it is highly contaminated with bacteria. Collection will only start when the sperm rich fraction is ejaculated.

Once the semen has been collected, the collector will record his initials, the boar number and rectal temperature of the boar on the collection bag.

A warm box will be provided in the collection pen for collection beakers, gloves and bags. New gloves and collection bags will be used for every collection. The collector will be required to wash his hands between every collection.

Once the boar has been collected (this usually takes a few minutes), he is taken back to his pen and the boar in the second (warm-up) chamber is led through to the dummy sow. This process continues until all the identified boars have been collected for the day.

Depending on the boar's age, the same boar can be collected every 5th or 8th day.

The dummy sows will be washed and disinfected after every collection day. FAM 30 will be used during the winter months (April – September) and GTPC 8 during the summer months (October – March). Once a month, the floor surface at the collection area will be covered with Stalosan F.

The dummy sows will also be checked regularly and kept in good condition to ensure that there are no sharp edges that can cause injury to the boars.

3.1.6 Laboratory

A laboratory will be provided as part of the facility (Figure 3.2), where the semen will be processed and information on the boars will be kept.

Figure 3.3a and 3.3b provides a conceptual layout plan of the laboratory, offices, kitchen and ablution facilities. It is envisaged that the laboratory/offices will comprise of two storeys (floors).

The reception area, laboratory, semen store and laboratory showers will be located on the ground floor (Figure 3.3a). The upper floor (Figure 3.3b) will comprise of the boardroom, offices, store room, kitchen and worker's showers.



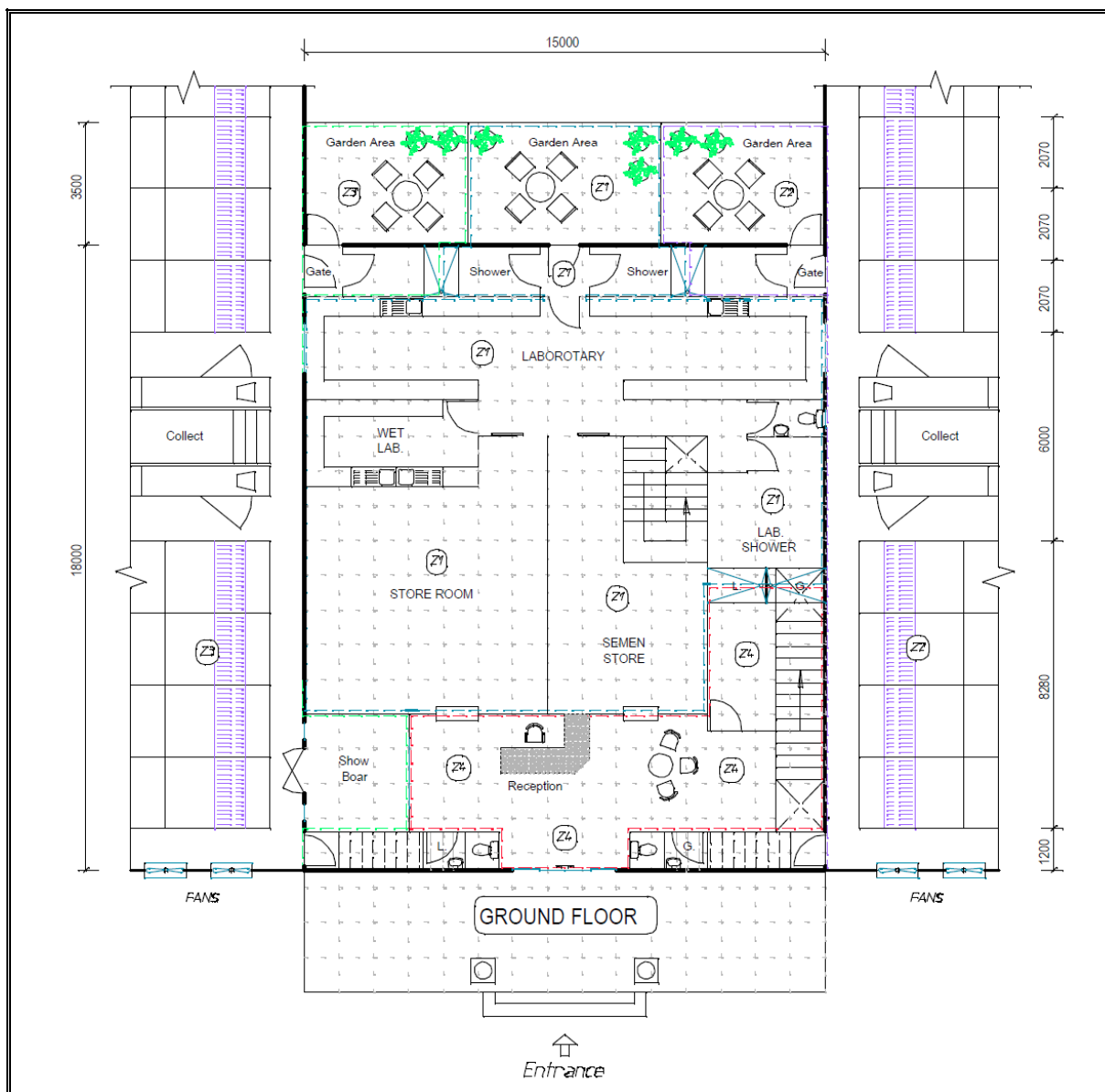


Figure 3.3a: Proposed ground floor layout for the offices and laboratory (designed by Dalein Plaasbou, 2017)



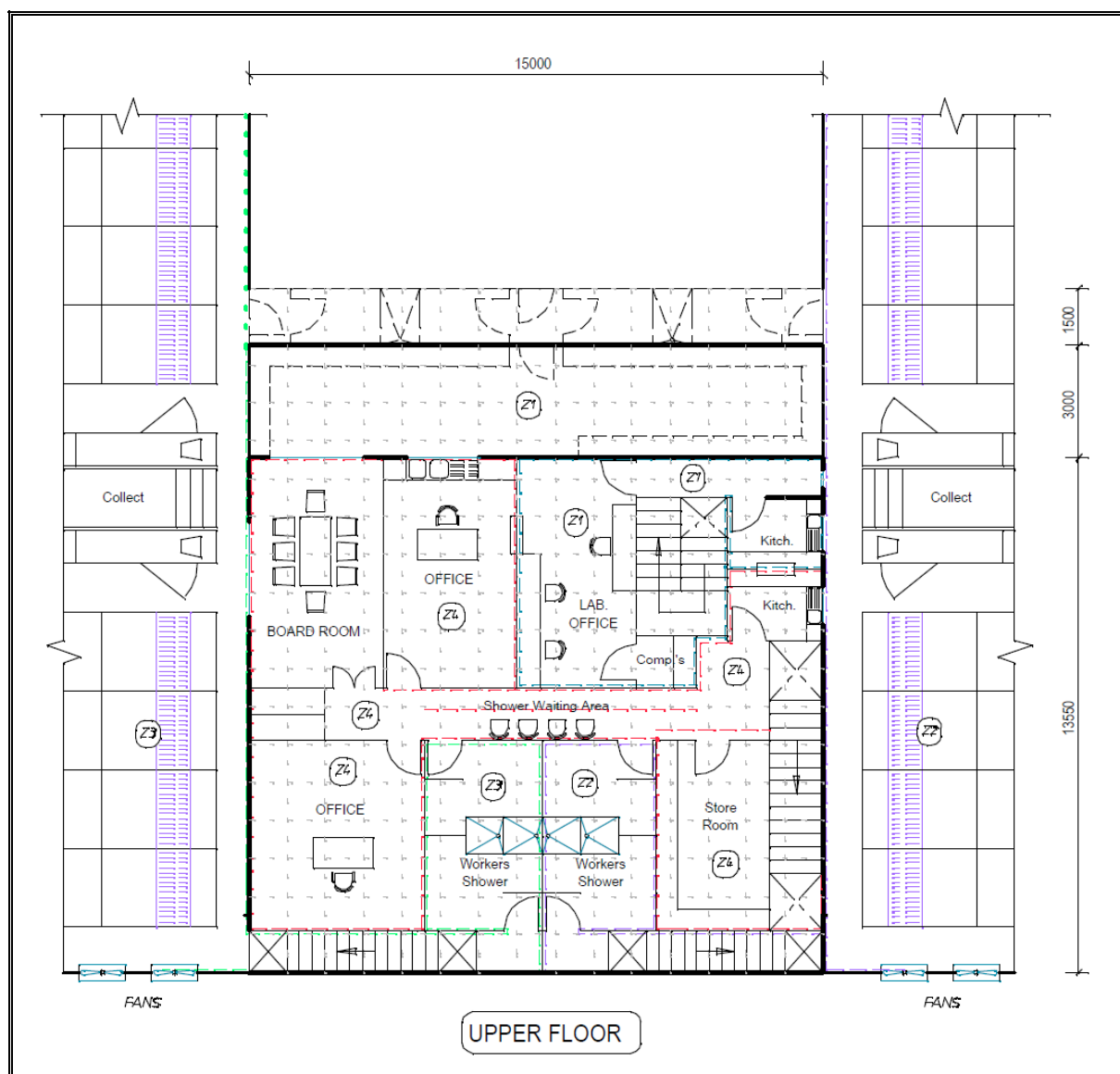


Figure 3.3b: Proposed upper floor layout of the offices and laboratory (designed by Dalein Plaasbou, 2017)

Information management

The same information system (pedigree system) that is used at the existing facility will be utilized at the new facility. The pedigree system keeps record of every collection and when a boar becomes available to be collected again. It also allows for the volume and concentration of every ejaculate to be recorded and automatically calculates the number of doses that can be made from the collection as well as how much extender should be added.

Semen preparation process

According to the applicant, the most critical factor during the processing of semen is the temperature of the laboratory (20-22°C), cold room (17°C) and extender (34-36°C). The temperature is monitored with minimum and maximum thermometers on a daily basis and logged on a weekly basis.

An extender is used to dilute the semen and protect its viability during the processing, packaging and shipping process. The extender usually contains antibiotics and a buffering system to maintain the pH of the medium.



Alzu Pig Genetics (Pty) Ltd. uses only one long term (7 day) extender during processing. The extender is purchased externally and delivered to the laboratory. On arrival, it is weighed into smaller bags (which are tightly sealed to prevent any moisture from entering) and stored in an industrial fridge.

The extender needs to be processed before it can be added to the semen. Firstly, water is heated to 30°C in a sterilized heated vat. Only double distilled reverse osmosis water (purified within the laboratory) is used. The water is tested bi-annually and the filters of the water purification system replaced regularly.

Once the water reaches the required heat, the extender is added and mixed using an elbow length glove and magnetic stirrer. The extender can only be used 20 minutes after the mixing process.

There is no set ratio for adding the extender to the sperm, since the sperm concentrations of each boar is different. Thus, a small amount of each boar's semen is firstly mixed with extender at a specific ratio. This sample is then placed under a microscope and analysed using a quality system called Spermvision. A total of seven analyses are made to determine the average concentration and percentage forward motility of each sample.

This information is then used to calculate the number of doses each boar can provide and how much extender should be added to obtain the required number of doses. Each dose has a volume of 80ml after dilution.

The extender is added to the sperm by means of an automatic dispenser, whereafter a Mini-BSP is used to automatically feed the tubes, fill, seal and label them, before it gets cooled down to 17°C and dispatched to customers.

For quality control purposes, a sample of each boar is held back for tests on day 1 and 3 after collection.

3.1.7 Care and management of boars

Alzu Pig Genetics (Pty) Ltd. participates in the Pork 360 quality assurance system (controlled by the South African Pork Producers' Organisation [SAPPO]), which ensures food safety and the welfare of the animals. In accordance with Pork 360, the producer must have an accredited veterinary consultant who frequently visits, advises and evaluates the facility and operational processes. The systems, practices and documentation are also continuously audited to ensure the highest standards.

Participants to the system must develop an in-house Standard Operating Procedure (SOP), complying with the Pork 360 standards.

The following SOPs regarding bio-security and cleaning are currently implemented at the existing facility and will be adapted for the proposed facility:

- PIC SA Unit Entry Procedures;
- SOP 1.3 - Showering (Personnel and Visitors);
- SOP 1.4 - Vehicle Access;
- SOP 1.5 - Animal Access;
- SOP 1.6 - Deliveries;
- SOP 3.1 - Pest Plan;
- SOP 7.1 - House Cleaning Procedures.



A copy of the these SOPs is provided in Appendix 11.

Stringent bio-security measures and meticulous cleaning will be implemented at the GTC facility in order to control diseases and enhance animal welfare.

Bio-security

The facility will be double fenced and all gates will be locked with clear signs indicating that the facility is a restricted area.

No vehicles will be allowed within the inner fence. Vehicles will only be able to enter the outer fence after the required approvals have been obtained and the vehicles have been decontaminated.

Once inside the facility, all personnel and visitors will be required to follow the entry and showering procedures before they will be allowed inside the boar houses.

Foot baths filled with Stalosan F will be present at every entrance to the boar houses, quarantine area and laboratory.

Each worker will also have to sign a declaration every day stating that they have not been in contact with any other pigs within the last 48 hours.

Serological tests (i.e. blood tests) will be conducted once a year. A health plan will also be in place. Rat stations will be placed at the corners of every building to control vermin and minimize the spread of disease.

Boar health

The boars will be vaccinated bi-annually in March and September. Every new batch of boars will also be vaccinated as soon as they arrive at the GTC facility.

The supervisor will check the boars on a daily basis and report any injury to a boar or signs of illness to the managers in the laboratory. The managers will make a decision regarding the treatment of the boar, after which the supervisor will administer the medication.

Meticulous logs will be kept of medicine and treatments given in order to reconcile the medication stock at the end of each month.

Logs will also be kept of fly/rat poison used, disinfectant and death of pigs. These logs will be checked by the veterinarian on a regular basis. The veterinarian will also take swabs of the boar pens, showers, food and water for analysis.

3.2 Services required

The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. Water, electricity, waste removal, etc. would therefore have to be provided by the applicant.

BTW & Associates (Pty) Ltd. (hereafter referred to as Hlasane, 2018) was appointed to investigate the water and wastewater services required for the proposed GTC facility. A copy of the engineering report is provided in Appendix 10.



3.2.1 Water

During the construction and operational phases, water will be obtained from boreholes.

During the operational phase, potable water needs to be provided to the employees and boars for drinking purposes. Water will also be required for cleaning purposes (pressure washer) and to help keep the boars cool during the summer months (overhead water sprinklers).

According to Hlasane (2018), 6 172.1 m³/annum or **16 909.75 liters per day** of groundwater will be required for the proposed GTC facility as set out in Table 3.2.

Table 3.2: Estimated water usage (taken from Hlasane, 2018)

Requirement	Livestock Category	Livestock numbers	Average Demand	Average Water Use (l/day)
Potable requirement for animals	Boars	400	13 l/d per boar	5 200
Animal flushing and cleaning	Boars	400	24.61 l/d per boar	9 844
Total for animal consumption per day				15 044 l/day
Total for animal consumption per year				5 491.1 m³/annum
Requirement	Category	Numbers	Average Demand	Average Water Use (l/day)
Potable requirement for staff	Full-time	30	50 l/c/d	1 500
Laundry	Full-time	30	10 l/c/d	300
Laboratory	Full-time	-	65.75 l/d	65.75
Total for staff member consumption per day				1 865.75 l/day
Total for staff member consumption per annum				681 m³/annum
TOTAL PER DAY				16 909.75 l/day
TOTAL PER ANNUM				6 172.1 m³/annum

According to Hlasane (2018), approximately 33.82 m³ of potable water should be stored on site to ensure a water supply for 48 hours. A storage tank of 40m³ will therefore be provided in the north western corner of the site (Figure 3.2) for the storage of potable water.

The groundwater quality was tested by Gouws (2018) and can be described as freshly recharged, unpolluted bicarbonate water. The water quality will be tested bi-annually to ensure that it is suitable for domestic purposes. More information with regards to the water quality is provided in Section 5.10 and Table 5.11 of this report.

3.2.2 Electricity

During the construction and operational phases, electricity will be provided by Eskom.

The GTC facility will connect to an existing transformer and power line located on the northern boundary of the site (Figure 5.2).

In case of a power outage, a generator will be utilized.



3.2.3 Sewage

During the construction phase, the contractors will utilize the existing ablution facilities at the old farmstead.

During the operational phase, proper ablution facilities (i.e. showers, toilets, lockers, etc.) will be provided at the offices and laboratory (Figures 3.3a and 3.3b). Due to the necessity for biosecurity, the personnel will have to adhere to strict rules w.r.t. cleanliness/hygiene. The personnel will have to shower and change on site. In addition, their work clothes will be kept and washed on site in the laundry.

According to Hlasane (2018), 607.29 m³/annum or **1663.81 liters per day** of wastewater will be produced by staff at the proposed GTC facility as indicated in Table 3.3.

Table 3.3: Estimated wastewater produced by staff (taken from Hlasane, 2018)

Requirement	Category	Average Potable Use	Average Water Use (l/day)
Wastewater treatment requirements for staff	30 x full-time staff	1500 l/d based on 50 l/c/d	1350 l/d based on 90%
	Laboratory	-	13.81l/d based on 420 l/month
	Laundry	-	300 l/d based on 10 l/c/d
Total for wastewater treatment demand for staff per day			1 663.81 l/d
Total for wastewater treatment demand for staff per annum			607.29 m³/annum

The wastewater from the ablution facilities, laundry and laboratory will be disposed by means of a conservancy tank. Hlasane (2018) recommended that a conservancy tank of 10 m³ be provided. Given the wastewater production of 1663.81 l/day, the conservancy tank will need to be emptied every 4 days, which would leave a 2 m³ reserve for unforeseen circumstances.

3.2.4 Waste management

Construction phase

During the construction phase, building rubble and a small amount of domestic waste will be generated. The contractor will have to provide adequate containers for the collection of waste. The applicant will have to ensure that the contractors remove the said building rubble and domestic waste to a licensed waste disposal site. Any hazardous waste (e.g. soil contaminated with fuel/oil, paint tins, etc.) will have to be disposed at a suitable waste disposal facility by a company e.g. Enviroserv.

Operational phase

During the operational phase, the main by-products from the GTC facility will be manure (solid and liquid), wastewater from cleaning, medical waste, mortalities and domestic waste.

Manure (solid and liquid) and wastewater from cleaning:

A deep pit storage system will be installed at the piggery to deal with the manure (solid and liquid) and wastewater from cleaning as indicated in Section 3.1.4.



According to Hlasane (2018), it is estimated that **12 036 liters/day (i.e. 4 393.1 m³ per annum) of wastewater will be produced at the GTC facility as depicted in Table 3.4.**

Table 3.4: Estimated wastewater produced at the GTC facility (taken from Hlasane, 2018)

Requirement	Livestock Category	Average Wastewater Production	Raw Wastewater Production
Animal flushing and cleaning water	Boars	24.61 l/day/boar	9 844 l/d
Animal excreta production	Boars	5.48 l/d/boar	2 192 l/d
Total wastewater for animal operation per day			12 036 l/d
Total wastewater for animal operation per annum			4 393.1 m³/annum

The biodegradable manure will be stored temporarily in a manure dam/pit and spread onto cultivated lands. Designs of the manure dam/pit and the various alternatives investigated are provided in Section 7 of this report.

Medical waste:

Syringes, medicine bottles, packaging, disinfectant containers and pesticides will be placed in sealed box and removed by the consulting vet. Used needles will be stored in a sharps bin, which will also be removed by the consulting vet and disposed of at a dedicated medical waste disposal facility.

Mortalities:

According to the applicant, boars are culled for the following reasons:

- Severe injury or illness of which they do not recover after a pre-decided duration of treatment;
- Semen quality (forward motility <70% over a period of at least 6 weeks);
- Low Estimated Breeding Values (EBV/Index). This information is sent through by the PIC Genetics Services Manager once a month.

No boars will be slaughtered on site. Boars that die at the GTC facility (perhaps one every two months) will be disposed off immediately and taken to the overall Alzu composting pit.

Domestic waste:

Domestic waste produced by the personnel will be disposed of in waste bins/skips. All waste bins will be emptied on Thursdays by Easy Skip. In general, waste avoidance will be a priority, followed by reuse and recycling. Disposal of general/domestic waste will be a last resort.

3.2.5 Storm water control measures

Large, grassed storm water trenches (Figure 3.2) will be provided between each platform to capture runoff from the roofs of the buildings and the surrounding area. This area will be planted with natural grass (*Eragrostis curvula* - Weeping Love Grass), which will be cut on a regular basis using lawnmowers. The natural grass will reduce runoff speed and increase infiltration into the soil, lowering the risk for erosion. Photo 3.7 provides an example of the storm water trenches proposed.

The water will be channelled to culverts and dispersed at low velocity into the adjacent field.



Storm water from the surrounding area will be diverted around the facility and away from the manure dam/pit and roads.

The clean storm water system and wastewater system (i.e. manure and cleaning water) will be kept entirely separate with no risk of contamination.

Designs of the proposed storm water system are provided in Section 7 of this report.

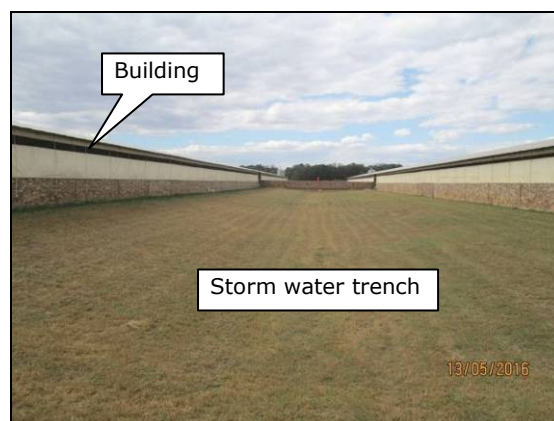


Photo 3.7: An example of a vegetated storm water trench.

3.2.6 Access road

The site will be accessed from an existing gravel road, which extends from Alzu Petroport, across the N4 national road (an existing bridge crossing) in a northerly direction towards the proposed site (Figure 5.21).

An access road will also be provided along the boundary of the site for the delivery of feed (Figure 3.2).

3.2.7 Fire fighting

All fire-fighting controls will have to be in accordance with the National Building Regulations, the SANS Code of Practice (related to Community Protection against Fire) and with "Red Book" standards.

3.2.8 Energy efficiency

In the pig farming industry, energy is mainly used to see to the animal's welfare in terms of environmental requirements.

According to the Energy Consumption Guide (Carbon Trust, 2005), energy use can be minimised and costs reduced through sensible selection of system components (fans, light bulbs, pumps, etc.), wise use of insulation, attention to design and operation of control systems. In addition, north-facing buildings are also advisable for maximum utilization of air and heat (South African Pork Producers' Organisation, 2004).

The following measures will be taken to ensure the efficient use of energy at the proposed GTC facility:

- The buildings will be north facing;
- Heat retaining material will be used (e.g. polyurethane);
- Energy efficient lighting will be installed where possible.



3.3 Reason for project

As indicated in Section 1, the existing GTC facility is located on the farm Rockdale, which is registered to Rockdale Industrial (Pty) Ltd. Rockdale Industrial recently decided to develop the Rockdale property for residential purposes and requested Alzu Pig Genetics (Pty) Ltd. to find an alternative site for the GTC facility. The Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, Middelburg, was subsequently identified for the relocation of the facility.

According to the applicant, the transportation of breeding pigs between farms and across provincial borders has become increasingly risky in terms of bio-security. The production of superior quality semen at one facility and distributing this to various customers is thus preferable. All movement of live animals is avoided as the customers can use semen on the farm to produce their own parent gilts.

Due to an increased market demand, the applicant decided to also expand the GTC facility as part of the relocation project. The existing Rockdale GTC facility can currently house ± 200 boars. The intention is to eventually house 400 boars at the new facility.

The expansion of the GTC facility will also lead to additional employment opportunities during the construction (± 40) and operational ($\pm 13-17$) phases.



SECTION 4: APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

The primary legal requirement for this project stems from the need for a Basic Assessment (BA) and Environmental Authorisation (EA) in terms of National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998) and the Environmental Impact Assessment Regulations, 2014 (as amended).

The Minister of Environmental and Water Affairs listed in terms of Sections 24(2), 24(5), 24D and 44, read with section 47A(1)(b) of NEMA, 1998 (Act 107 of 1998), a number of activities that require an environmental impact assessment (either a Basic Assessment (BA) or a full Environmental Impact Assessment (EIA)) before undertaking these activities.

The proposed activity would require a Basic Assessment process since the following listed activities (as identified in the Environmental Impact Assessment Regulations, 2014 (as amended)) are triggered:

Listing	Activity
Listing Notice 1 (GN R327 of 7 April 2017)	
Listed Activity 4	The development and related operation of facilities or infrastructure for the concentration of animals in densities that exceed (i) 20 square metres per large stock unit and more than 500 units per facility; (ii) 8 square meters per small stock unit and; a. more than 1 000 units per facility excluding pigs where (b) applies; or b. more than 250 pigs per facility excluding piglets that are not yet weaned; (iii) 30 square metres per crocodile and more than 20 crocodiles per facility (iv) 3 square metre per rabbit and more than 500 rabbits per facility; (v) 250 square metres per ostrich or emu and more than 50 ostriches or emus per facility.
Listed 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: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.
Listing Notice 2 (GN R325 of 7 April 2017)	
	N/A
Listing Notice 3 (GN R324 of 7 April 2017)	
	N/A. The site does not fall within a Critical Biodiversity Area (CBA) or Ecological Support Area (ESA) as identified in the Mpumalanga Conservation Plan (2006).

Appendix 1 of the EIA Regulations, 2014 (as amended) prescribes the content of the Basic Assessment Report and supporting documentation that must be submitted to the competent authority in order to obtain an EA. Table 4.1 provides an overview of where the requirements of Appendix 1 of the EIA Regulations (2014) are addressed in this BA Report.



Table 4.1: Content of the Basic Assessment Report in accordance with Appendix 1 of the EIA Regulations, 2014 (as amended)

APPENDIX 1 OF GN 326 OF 7 APRIL 2017	SECTION IN BA REPORT
3(1) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—	
(a) details of— (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	(i) Section 2 (ii) Section 2 and Appendix 2
(b) the location of the activity, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	(i) Section 5.1 (ii) Section 5.1 (iii) Section 5.1
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is— (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Figure 5.1 - Topographical map; Figure 5.2 - Aerial view
(d) a description of the scope of the proposed activity, including— (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure;	(i) Section 1.1 (ii) Section 3; Section 7
(e) a description of the policy and legislative context within which the development is proposed including— (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	(i) Section 4; Table 4.1 (ii) Section 4; Table 4.1
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 3; Section 7; Section 10
(g) a motivation for the preferred site, activity and technology alternative;	Section 7
h) a full description of the process followed to reach the proposed preferred alternative within the site, including— (i) details of all the alternatives considered;	(i) Section 7
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	(ii) Section 6; Section 11 and Appendices 7, 8 and 9
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	(iii) Section 6; Table 6.9
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	(iv) Section 5; Section 7
(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	(v) Section 8
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	(vi) Section 8
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	(vii) Section 8
(viii) the possible mitigation measures that could be applied and level of residual risk;	(viii) Section 9 (EMPr)
(ix) the outcome of the site selection matrix;	(ix) Section 7
(x) if no alternatives, including alternative locations for the activity were	(x) N/A



APPENDIX 1 OF GN 326 OF 7 APRIL 2017	SECTION IN BA REPORT
investigated, the motivation for not considering such; and	
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	(xi) Section 7.6
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 8
(j) an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	Section 8
(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Section 5; Section 9 (EMPr); Section 10
(l) an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	(i) Section 10 (ii) Section 9 (EMPr) and Figure 9.1 (iii) Section 7; Section 10
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Section 9 (EMPr)
(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 10
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 10
(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 10
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	N/A
(r) an undertaking under oath or affirmation by the EAP in relation to — (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	Front of Document
(s) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
(t) any specific information that may be required by the competent authority; and	N/A
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A



Table 4.2 provides a summary of the key policy and legislative requirements applicable to the proposed project, including how it was considered in the preparation of the report.

Table 4.2: Applicable legislation, policies and/or guidelines

Legislation/policies/guidelines	Aim of legislation, policy or guideline	Where considered in BA Report	Adherence of proposed activity
Environmental Management			
The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)	To establish a Constitution with a Bill of Rights for the RSA. It sets out of a number of fundamental environmental rights (Section 24).	Throughout the Basic Assessment process.	The development will not be harmful to the health or wellbeing of surrounding landowners/users. Mitigation measures will be implemented to ensure that the environment is not polluted or degraded.
National Environmental Management Act, 1998 (Act 107 Of 1998) and amendments	To provide for the integrated management of the environment. Chapter 1 sets out the national environmental principles. Chapter 5 deals specifically with integrated management. Chapter 7 deals with compliance and enforcement with specific reference to Section 28 (duty of care)	Throughout the Basic Assessment process.	Environmental management principles and general objectives of Integrated Environmental Management taken into account throughout the Basic Assessment process.
Environmental Impact Assessment Regulations, 2014 and amendments (GN 324, 325, 326, 327)	Regulations pertaining to environmental impact assessments.	Throughout the basic Assessment process. Listed Activities 4 and 28 of GN 327.	Basic Assessment process undertaken for the proposed development in accordance with the requirements of the Regulations.
Public Participation Guideline in terms of EIA Regulations, 2017	Guideline on the public participation process	Section 6 - Public participation	Adjacent landowner/users, relevant stakeholders and interested and affected parties were consulted to obtain input with regards to the proposed development and to resolve any queries or concerns with regards to the activity.
Guideline on Need and Desirability in terms of EIA Regulations, 2017	Guideline with regards to need and desirability of activities	Section 3 - Project description Section 7 - Alternatives Section 10 - Impact statement	The need and desirability of the proposed development was considered during the basic assessment process.
Biodiversity			
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) and amendments	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of	Section 5.7 - Vegetation Section 5.8 - Animal life	The proposed development will not impact on the biodiversity in the area. No vegetation is present on site.



Legislation/policies/guidelines	Aim of legislation, policy or guideline	Where considered in BA Report	Adherence of proposed activity
	indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African Biodiversity Institute; and for matters connected therewith.		
National Biodiversity Framework (NBF, 2008)	To co-ordinate and align the efforts of the organisations and individuals involved in conserving and managing South Africa's biodiversity	Section 5.7 - Vegetation Section 5.8 - Animal life	The proposed development will not impact on the biodiversity in the area. No vegetation is present on site.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): National List of Ecosystems that are threatened and in need of protection (9 December 2011).	The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value.	Section 5.7 - Vegetation	The proposed development is not located within any threatened ecosystems listed in the NEM: Biodiversity Act.
Threatened or Protected Species Regulations (GN 152 of 23 February 2007)	To further regulate the permit system in terms of restricted activities involving threatened or protected species.	Section 5.7 - Vegetation Section 5.8 - Animal life	No threatened or protected species are present on site.
List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998)	Provides a list of protected tree species.	Section 5.7 - Vegetation	No protected tree species are present on site.
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) and amendments	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.	Section 5.7 - Vegetation Section 5.8 - Animal life	The site is not located within or near any protected area listed in the NEM: Protected Areas Act.



Legislation/policies/guidelines	Aim of legislation, policy or guideline	Where considered in BA Report	Adherence of proposed activity
National Protected Areas Expansion Strategy (NPAES, 2008)	To achieve cost-effective expansion of the protected area network that enhances ecological sustainability and resilience to climate change	Section 5.7 - Vegetation	The site is not located within or near a proposed expansion area.
Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998) and amendments	To control nature conservation in Mpumalanga.	Section 5.7 - Vegetation Section 5.8 - Animal life	No conservation areas, CBA's or ESA's are indicated in the Mpumalanga Biodiversity Sector Plan (MBSP, 2013) on or near the site.
Conservation of the Agricultural Resources Act, 1983 (Act 43 of 1989) and amendments	To provide control over the utilization of the natural resources of the Republic in order to promote the conservation of soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.	Section 5 - Biophysical description Section 9 - EMPr	Mitigation measures to be implemented during construction and operation to ensure compliance with the CARA Act. Mitigation measures included in the EMPr, Section 9.
Alien and Invasive Species Regulations, 1 August 2014	Regulations regarding alien and invasive species.	Section 5.7 - Vegetation Section 5.8 - Animal life Section 9 - EMPr	Mitigation measures to be implemented during construction and operation to ensure that alien and invasive species are controlled. Mitigation measures included in the EMPr, Section 9.
Water			
National Water Act, 1998 (Act 36 of 1998) and amendments	To control water management aspects.	Section 3 - Storm water management Section 5.9 - Surface water and wetlands Section 9.5.7 - Water management	No surface water environments are present on site. Wetlands are however, present within a 500m radius of the site. Mitigation measures are indicated in Section 9. A water use license application will be submitted with DWS for the following water uses under Section 21 of the Act: <ul style="list-style-type: none"> ▪ 21(a) - Groundwater abstraction; ▪ 21 (c) and (i) - site located within 500m from a wetland; ▪ 21(e) - engaging in a controlled activity; ▪ 21(g) - disposing of waste.
National Freshwater Ecosystem Priority Assessment (NFEPA) of 2012 and implementation manual.	Provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources.	Section 5.8 - Animal life Section 5.9 - Surface water and wetlands	The site is not located within a NFEPA priority area.
Best Practice Guidelines published by the Department of Water Affairs and Forestry: G1 - Storm Water Management	Provides best practice principles and guidelines in terms of water management.	Section 3 - Storm water management Section 9.5.7 - Water management	The storm water plan drafted by Hlasane (2018) to be implemented on site to prevent pollution of the surface water environment. Mitigation measures are included in the EMPr, Section 9.
Waste			
National Environmental Management: Waste Act, 2008 (Act 59 of 2008) and amendments	To reform the law regulating waste management in order to protect health	Section 3 - Project description Section 9.5.9 - Waste management	A waste management license is not required for this project. Waste management measures will



Legislation/policies/guidelines	Aim of legislation, policy or guideline	Where considered in BA Report	Adherence of proposed activity
	and the environment by providing for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.		however, be implemented. Mitigation measures are included in the EMP, Section 9.
Nkangala District Municipality Integrated Waste Management Strategy	A strategy dealing with waste.	Section 3 - Project description Section 9.5.9 - Waste management	Waste management measures will be implemented during construction and operation. Management measures provided in Section 9.
Steve Tshwete Local Municipality Integrated Waste Management By-Laws	To regulate the management of waste within the Steve Tshwete Local Municipal area.	Section 9.5.9 - Waste management	Site is located outside of the urban area. Waste management measures will however, be implemented. Mitigation measures are included in the EMP, Section 9.
Development Planning			
Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013)	To provide a framework for spatial planning and land use management	N/A	The site does not have to be rezoned or subdivided.
Integrated Development Plan for the Steve Tshwete Local Municipality	Broad spatial framework guidelines for the Steve Tshwete Local Municipality.	N/A	The site is not indicated in the IDP.
Spatial Development Framework for the Steve Tshwete Local Municipality	Spatially based policy guidelines whereby changes, needs and growth in the region can be managed to benefit the whole community.	Section 5.17 - Sense of place Figure 5.23	In the SDF, the site is indicated as 'mining and agriculture'. The development is thus in line with the SDF.
Sub-division of Agricultural Land, 1970 (Act 70 of 1970)	To control the subdivision and, in connection therewith, the use of agricultural land.	N/A since the site will not be subdivided.	N/A since the site will not be subdivided.
National Framework for Sustainable Development (NFSD, 2008)	To enunciate South Africa's national vision for sustainable development and indicate strategic interventions to re-orientate South Africa's development path in a more sustainable direction. It proposes a national vision, principles and areas for strategic intervention that will enable and guide the development of the national strategy and action plan.	Throughout the Basic Assessment process.	Sustainable development principles taken into account throughout the Basic Assessment process.
National Development Plan 2030 (NDP, 2012)	The NDP aims to eliminate poverty and reduce inequality by 2030. These goals can be realized by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society.	Section 3.3 - Reason for development Section 10 - Impact statement	The proposed development will create employment opportunities during the construction and operational phases.



Legislation/policies/guidelines	Aim of legislation, policy or guideline	Where considered in BA Report	Adherence of proposed activity
Heritage Resources			
National Heritage Resources Act, 1999 (Act 25 of 1999) and amendments	This legislation aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations.	Section 5.13 - Sites of archaeological/cultural interest Section 9 - EMPr	A Heritage Impact Assessment and Palaeontological Impact Assessment were conducted. No site of archaeological/cultural sensitivity is present on site. Mitigation measures in terms of palaeontology are provided in Section 9.
Air Quality			
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) and amendments	To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures.	Section 5.11 - Air quality Section 9 - EMPr	An emissions license is not required. Mitigation measures to reduce odours provided in Section 9.
Highveld Priority Area Air Quality Management Plan, 2011	To achieve and maintain compliance with the ambient air quality standards across the HPA, using the Constitutional principle of progressive realisation of air quality improvements. The AQMP for the HPA provides the framework for implementing departments and industry to include AQM in business planning to ensure effective implementation and monitoring.	Section 5.11 - Air quality Section 9 - EMPr	The development is located within the Highveld Priority Area. Mitigation measures to reduce odours provided in Section 9.
Noise			
Noise Regulations (GN 154 of 1992)	To set out rules relative to the control of noise.	Section 5.12 - Noise Section 9 - EMPr	Mitigation measures to reduce noise provided in the EMPr, Section 9.
Steve Tshwete Local Municipality by-law with regards to noise and control.	To regulate noise with the Steve Tshwete Local Municipal area.	Section 5.12 - Noise Section 9 - EMPr	Site is located outside of the urban area. Mitigation measures to reduce noise provided in the EMPr, Section 9.
Health and Safety			
Health Act, 1977 (Act 63 of 1977) and amendments	To promote public health.	Section 9 - EMPr	Mitigation measures to reduce potential impacts on the site workers provided in the EMPr, Section 9.



Legislation/policies/guidelines	Aim of legislation, policy or guideline	Where considered in BA Report	Adherence of proposed activity
Occupational Health and Safety Act, 1993 (Act 85 of 1993) and amendments	To provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work and to establish an advisory council for occupational health and safety.	Section 9 - EMPr	Mitigation measures to reduce potential impacts on the contractors and employees provided in the EMPr, Section 9.
Animal Health Act (Act 7 of 2002)	To provide for measures to promote animal health and to control animal diseases.	Section 3.1 - Boar housing and care and management of boars Section 9 - EMPr	Mitigation measures to reduce potential impacts on animal health provided in the EMPr, Section 9.
Animal Diseases Act (Act 35 of 1984)	To control animal diseases	Section 3.1 - Boar housing and care and management of boars Section 9 - EMPr	Mitigation measures to reduce potential impacts on animal health provided in the EMPr, Section 9.
Pork 360. Quality Assurance and Traceability Standard. Pork 360 Farm Standards.	Quality Assurance and Traceability Standard.	Section 3.1 - Care and management of boars Section 9 - EMPr	The GTC facility will amend the existing Pork 360 accreditation.
National Building Regulations and Standards Act, 1977 (Act 103 of 1977) and amendments	To provide for the promotion of uniformity in the law relating to the erection of buildings in the areas of jurisdiction of local authorities; for the prescribing of building standards; and for matters connected therewith.	Section 3 - Project description	The buildings will be constructed according to the National Building Regulations.
National Veld and Forest Fire Act, 1998 (Act 101 of 1998) and amendments	To prevent and combat veld, forest and mountain fires throughout South Africa.	N/A	The site comprises cultivated land and no fire breaks are required.
General			
Protection of Personal Information Act, 2013 (Act 4 of 2013)	The purpose of this act is to give effect to the constitutional right to privacy by safeguarding personal information and to regulate the manner in which personal information may be processed.	Throughout process. Basic Assessment	Throughout Basic Assessment process.
Promotion of Access to Information Act, 2000 (Act 2 of 2000) and amendments	To give effect to the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights; and to provide for matters connected therewith.	Throughout process. Basic Assessment	Throughout Basic Assessment process.
Promotion of Administrative Justice Act, 2000 (Act 3 of 2000) and amendments	The Act aims to make the administration (e.g. Government and Parastatals) effective and accountable to people for its actions.	Throughout process. Basic Assessment	Throughout Basic Assessment process.



SECTION 5: BIOPHYSICAL DESCRIPTION

Appendix 1 of the EIA Regulations (2014, as amended) requires a description of "the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects".

This section provides an overview of the environmental features of the site and surrounding area, which includes the biophysical, socio-economic and cultural/heritage aspects. The aim of this section is to provide information on the current baseline conditions of the site, that will be used to identify potential impacts of the development on the environment and vice versa in Section 8 (Impact Assessment) of this report.

5.1 Location of the site

The proposed GTC development will be located on the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, Middelburg, which is located north of the N4 national road between Middelburg and Wonderfontein, ±2km northwest of the Alzu Petroport (Figure 5.1).

The co-ordinates for the centre of the site are:

Site	Latitude (S):			Longitude (E):		
24/432	25°	49'	25.10"S	29°	46'	32.33"E

The Surveyor-General 21 digit site reference number for the proposed project is:

T	O	J	S	0	0	0	0	0	0	0	0	0	4	3	2	0	0	0	2	4
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The said property falls under the jurisdiction of the Steve Tshwete Local Municipality (MP313) and the Nkangala District Municipality.



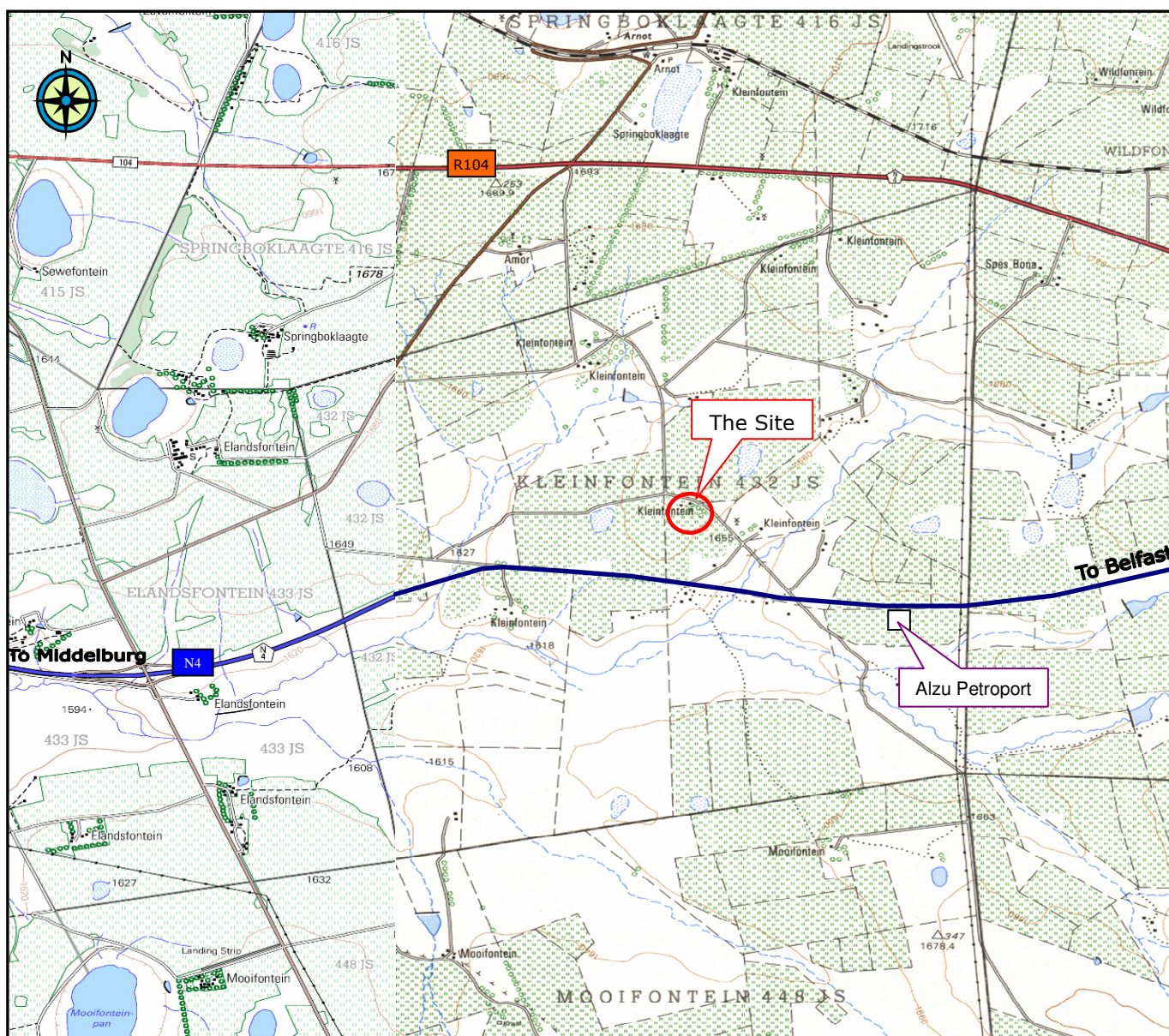


Figure 5.1: Location of site (taken from 1: 50 000 2529 DC and DD-not to scale)

5.2 Climate

5.2.1 Regional climate

The South African Weather Bureau has partitioned the country into 15 climatic regions. This division is based on:

- geographic considerations, more specifically the prominent mountain ranges (great escarpment) which constitute the main climatic divides, besides also other features such as rivers and political boundaries;
- the interior plateau - use has been made of the change from BW to BS and from BS to C climates according to the Köppen classification.
- The site falls within Climatic Region H – The Highveld.

The climate is typical of the Highveld, with warm summers and cold winters with occasional severe frosts. Rainfall typically occurs as high-intensity short duration thunderstorms. The average frost period is 111 days per annum.

The mean annual temperature is 22.5°C, with recorded extremes of -11°C and 34°C.

The site occurs in Mpumalanga and falls in the summer rainfall region, which is characterised by thunderstorm activity and relatively low average rainfall. The mean annual rainfall is 735mm compared to the mean annual potential evaporation of 1500mm. Pertinent climate data was obtained from the Middelburg (No.0515/826) and Belfast (No. 0517/0109) weather stations.

5.2.2 Mean monthly rainfall

The average number of days per month having rainfall depths in excess of 0.1mm, together with the average monthly depth of rainfall, are given in Table 5.1.

Table 5.1: Average monthly rainfall depths (mm) and days with rainfall of > 0.1mm.

Month	Average Depth	Average Days
January	132	13.8
February	103	11.2
March	88	9.5
April	42	6.5
May	19	2.9
June	7	1.5
July	9	1.7
August	8	0.9
September	22	3.7
October	63	8.3
November	124	13.0
December	118	13.1
Total	735	86.1

5.2.3 Rainfall intensities

The maximum rainfall intensities recorded at the relevant weather stations are shown in Table 5.2.

Table 5.2: Maximum rainfall intensities.

24 Hour Rainfall Depths (mm)			
Maximum recorded	1:50 Yr. Storm	1:100 Yr. Storm	1:200 Yr. Storm
117	104	118	134

5.2.4 Mean annual evaporation

The mean monthly evaporation figures recorded at the relevant weather stations are given in Table 5.3. The data in the table was obtained using an 'A' Pan.



Table 5.3: Mean monthly evaporation figures

Month	Evaporation (mm)	Rainfall (mm)	Monthly deficit (mm)
January	160	132	28
February	140	103	37
March	110	88	22
April	110	42	68
May	85	19	66
June	70	7	63
July	75	9	66
August	110	8	102
September	140	22	118
October	160	63	97
November	160	124	36
December	180	118	62
Total Average	1500	735	765

5.2.5 Mean monthly maximum and minimum temperatures

The average and actual maximum and minimum temperatures between the weather stations are given in Table 5.4.

Table 5.4: Mean monthly maximum and minimum temperatures (°C)

Month	Daily Maximum	Daily Minimum	Highest Temperature	Lowest Temperature
January	27.2	13.7	32.0	9.1
February	26.8	13.4	30.8	9.0
March	26.8	11.4	30.2	6.4
April	23.9	7.4	27.9	1.4
May	21.3	2.2	26.1	-2.9
June	18.5	-1.8	22.4	-6.0
July	18.4	-1.7	23.0	-5.8
August	21.4	0.8	26.0	-4.1
September	24.0	5.3	29.2	-1.3
October	26.0	10.1	31.2	4.4
November	26.2	11.8	31.8	5.9
December	27.1	13.2	31.2	7.8
Yearly Average	23.9	7.2	28.4	2.0

5.2.6 Prevailing wind direction

Wind pattern data obtained from the Middelburg weather station is presented in Table 5.5.

Table 5.5: Mean monthly wind speed and direction

Month	N		NE		E		SE		S		SW		W		NW	
	n	v	n	v	n	v	n	v	n	v	n	v	n	v	n	v
January	161	3.0	287	3.2	44	3.1	92	3.3	122	3.6	96	3.3	109	3.7	48	4.5
February	142	2.9	295	3.2	44	3.1	74	3.4	112	3.4	101	2.9	141	3.9	60	4.2
March	152	2.8	304	3.3	36	3.1	54	3.1	100	3.4	104	2.9	139	3.4	63	3.5
April	170	2.7	211	3.3	47	3.2	95	3.4	149	3.6	146	2.8	87	3.4	39	3.0
May	172	2.6	166	2.9	59	3.4	89	3.7	162	3.9	167	2.9	67	3.0	51	3.3
June	146	2.5	149	3.0	54	3.6	117	3.0	157	3.8	166	2.7	86	3.2	43	3.2
July	162	2.5	184	2.9	51	3.9	99	3.9	142	3.6	143	2.8	79	3.4	53	4.2
August	174	5.4	180	3.4	40	3.5	86	4.1	141	4.1	182	3.0	83	3.2	40	4.4
September	197	3.2	223	3.8	27	3.5	70	3.9	131	4.3	171	3.3	84	4.0	41	3.9
October	190	3.4	243	3.7	33	3.6	71	3.6	142	4.0	160	3.8	83	4.3	42	3.6
November	174	3.2	225	3.6	28	3.1	68	3.1	185	3.8	154	3.5	92	4.1	40	3.9
December	180	3.1	254	3.4	34	3.0	69	3.3	154	3.5	135	3.3	95	4.0	40	4.0
Average	188	2.0	227	3.3	41	3.3	82	3.8	141	3.8	146	3.1	95	3.7	47	3.8

n = average direction frequency per 1000 readings *v* = velocity (m/s)



5.2.7 The incidence of extreme weather conditions

Being located on the Highveld, the area is prone to extreme weather on a regular basis. These weather conditions include droughts, floods and strong gusty winds prior to and during thunderstorms. Frost also occurs on an average of 120 to 150 days between April and September.

5.2.8 Climate change

According to the Mpumalanga Biodiversity Sector Plan Handbook (Lotter *et. al.*, 2014), there has already been notable shifts in climate in terms of increased average temperatures in Mpumalanga. Heat waves are becoming more frequent while cold days, nights and frost are becoming less frequent.

In addition, spring events such as flowering, bird migration and egg-laying are happening earlier in the year. Altitudinal range shifts for species such as the black mamba, red toad, black-bellied starling, yellow weaver, etc. have already been recorded.

Assuming moderate to high increases in greenhouse gas concentrations (e.g. carbon dioxide), regional modelling scenarios indicate that the north eastern interior of South Africa will experience higher minimum, average and maximum temperatures over the next few decades (Lotter *et. al.*, 2014). Higher temperatures will be accompanied by increased incidents of drought, rainfall increases along the escarpment and a shift in rainfall pattern.

5.3 Land use

5.3.1 Land ownership

The Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS is registered to Statutis Trading (Pty) Ltd. A copy of the Deeds Office Property report is provided in Appendix 1.

Alzu Pig Genetics (Pty) Ltd. (i.e. the applicant) and Statutis Trading (Pty) Ltd. (i.e. the landowner) are wholly owned subsidiaries of Du Toit Zoe 8 (Pty) Ltd. A letter in this regard is provided in Appendix 1.

5.3.2 Zoning of the site

The property is zoned as 'Agricultural' and will remain as such.

5.3.3 Size of the site

The entire farm is 234.4963 ha in extent, of which approximately 6 ha will be utilized for the proposed GTC facility.

5.3.4 Servitudes

No servitudes are known to be present on site.

Eskom power lines are located in the northern portion of the site, which could be associated with a servitude. A servitude could also be registered against the gravel road extending along the western boundary of the site. No servitudes are however, indicated on the SG diagram (185/2008) in terms of the power lines or the gravel road.

5.3.5 Land use and existing infrastructure

Figure 5.2 provides an aerial view of the site indicating the existing land uses and infrastructure.



The said site comprises cultivated land (Photo 5.1 and Figure 5.2). A very small portion of the site extends into the old farmstead complex (Photo 5.2). This area is fenced and comprises various buildings, two boreholes, a windmill and Eskom power lines. Large Pine Trees extend along the fence line of the old farmstead complex. According to the applicant, nobody currently resides on site.

A gravel road provides access to the site from the western boundary (Figure 5.2).



Photo 5.1: A view of the cultivated section of the site.



Photo 5.2: A view of the northern portion of the site and the old farmstead complex.



Statutis Trading (Pty) Ltd.
(i.e. the applicant)

Cultivated land

Old farmstead

Boreholes

Eskom powerlines

Gravel road

Beestepan Boerdery (Pty) Ltd.

Cultivated land

TKL Hoffman

Wetland

Wetland

Wetland

The Site

Cultivated land

Borehole

Farmstead

Cultivated land

Gravel roads

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Image © 2018 DigitalGlobe
© 2018 AfriGIS (Pty) Ltd.

Figure 5.2: Aerial view of the site and surrounds

5.3.6 Surrounding land uses

The site is located in an agricultural area that is used for the cultivation of maize. The properties to the north, east, south and west are all used for agricultural purposes as indicated in Figure 5.3.

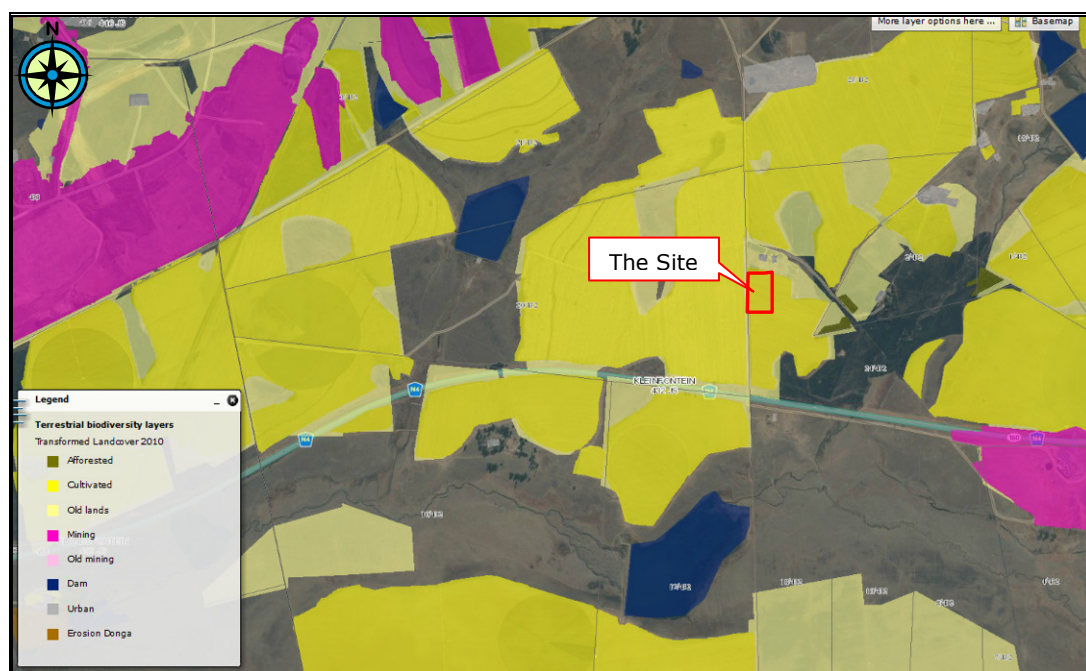


Figure 5.3: Land uses in the surrounding area (taken from MBSP, 2014)

No homesteads/farmsteads are located within a 500m radius of the site. Five farmsteads/homesteads/villages (Figure 5.4; indicated in blue) are however, located between 500m and 1.5km of the site, namely:

No (Figure 5.4)	Property	Distance
1 Homestead	Remainder of Portion 7 (Kusic Prop cc)	605m
2 Farmstead	Portion 2 (TKL Hoffman)	605m
3 Village	Portion 23 (Statutis Trading (Pty) Ltd.; Kleinfontein Village)	1 074m
4 Village	Portion 2 (TKL Hoffman)	950m
5 Homestead	Portion 15 (Statutis Trading (Pty) Ltd.)	1405m

The Alzu Petroport is located 1.7km south east of the site (Figure 5.3; indicated in pink) adjacent to the N4 national road. Alzu Petroport comprises of a filling station and various restaurants and shops. Game (e.g. buffalo, zebras, oryx, etc.) is kept in the area adjacent to the Alzu Petroport as a tourist attraction.

An opencast coal mine (Mafube Coal Mine) is located approximately 2km north west of the site (Figure 5.3; indicated in pink).

Other surrounding land uses include Eskom power lines and gravel roads (Figure 5.2).

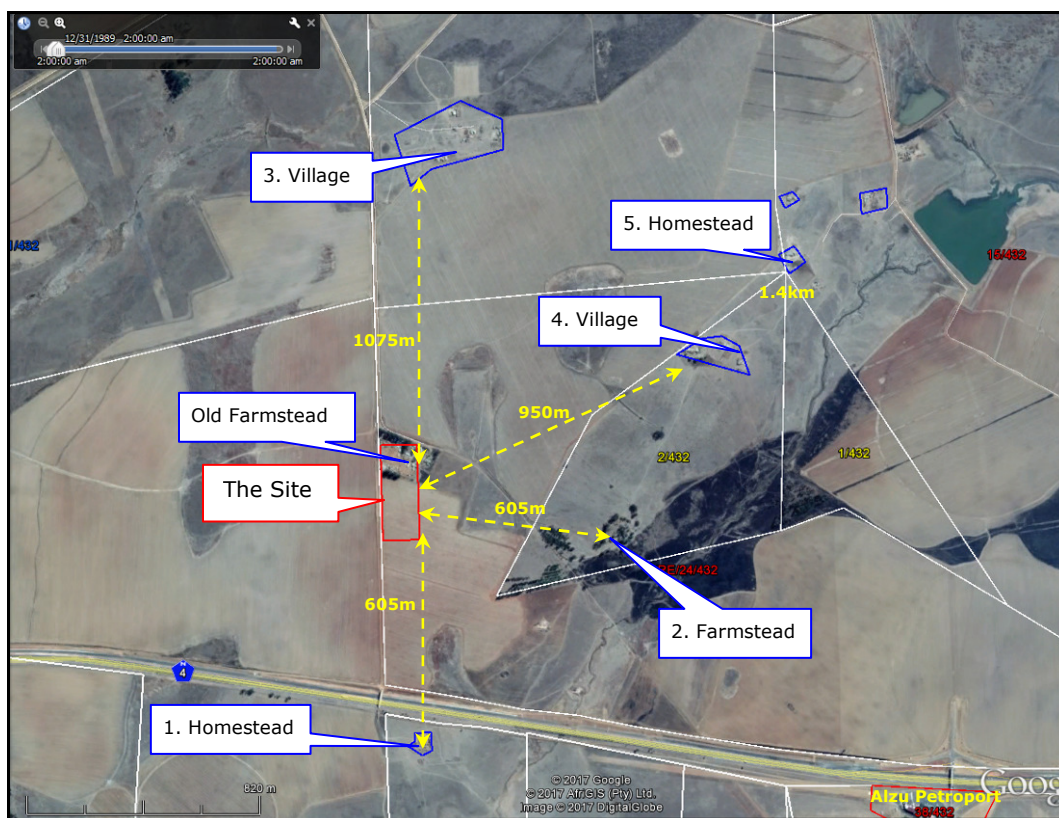


Figure 5.4: Location of homesteads/farmstead/villages in relation to the proposed site

5.4 Geology

According to the 1:250 000 Geological Series (2528 Pretoria map), the said site is underlain by sandstone, shale and conglomerates of the Vryheid Formation, Ecca Group, Karoo Supergroup (Figure 5.5; Pe - blue). The Vryheid Formation has a maximum total thickness of 500m with coal seams present within the sandstone and shale layers. The Ecca Group is underlain by the Dwyka Formation.

Volcanic rocks (rhyolites) of the Damwal Formation, Rooiberg Group, Transvaal Supergroup are present south, east and west of the site (Figure 5.5; Vdr - orange). The Rooiberg Group is a 2500-6000m thick succession of feldspathic quartzites, arkoses and shales, with interbedded volcanics and felsites.

Jurassic dolerite intrusions occur throughout the area in the form of sills and outcrops (Fourie, 2017).

The said site is not subject to undermining or dolomite related instabilities. An opencast coal mine is located approximately 2km north west of the site (Figure 5.3).

No rocky outcrops or unstable natural slopes are present on or in close proximity to the site.

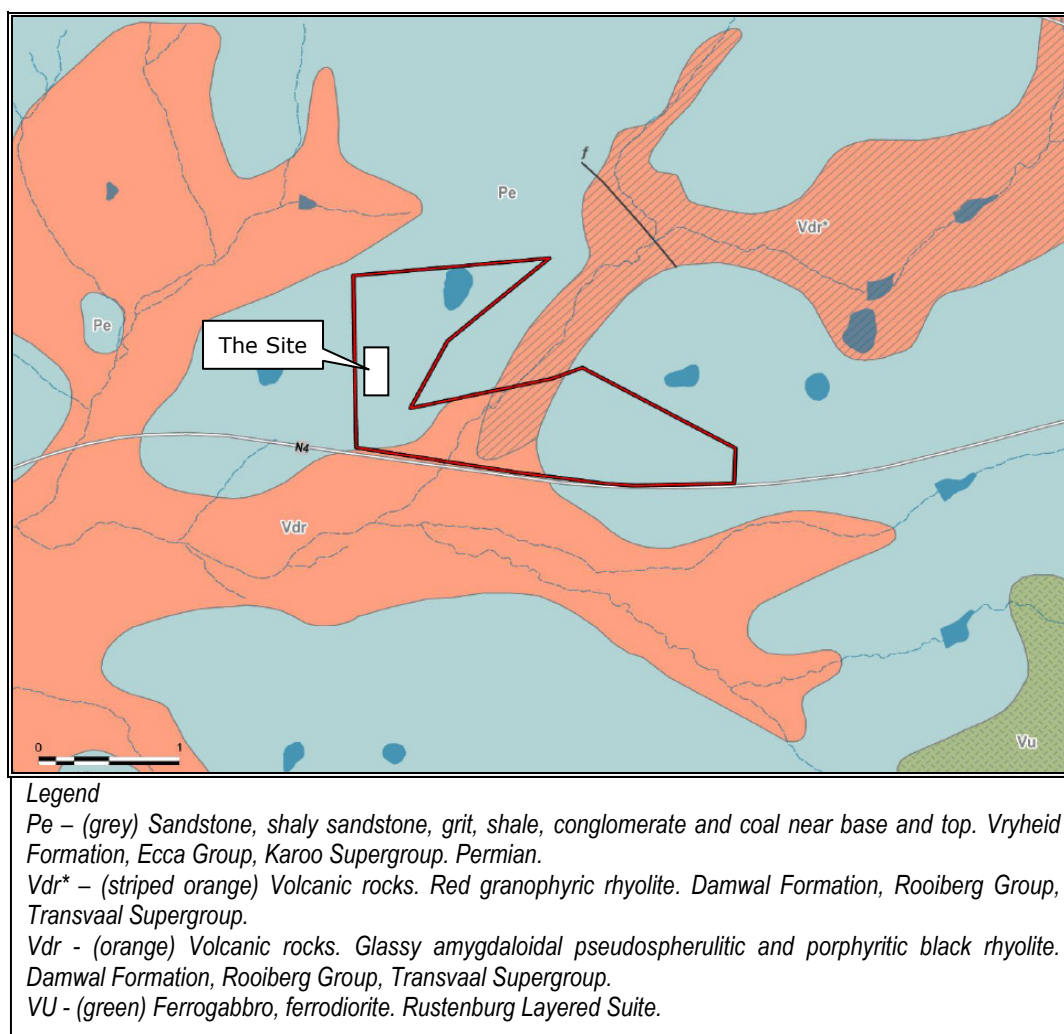


Figure 5.5: Geology of the site (taken from 2528 Pretoria 1:250 000 Geological Series and Gouws, 2018)

5.5 Topography

The said site lies at approximately 1661 meters above mean sea level (mamsl). The site is fairly flat with a gentle slope in a south easterly direction towards a small unnamed stream and wetland area. The said site has a fall of approximately 4m over a distance of 500m (Figure 5.7). The slope is more or less in the order of 2% (Gouws, 2018). Figures 5.6, 5.7 and 5.8 provide a graphic presentation of the site elevation.

According to the AGIS Comprehensive Atlas of the Department of Agriculture, Forestry and Fisheries, the terrain type is plains with open low hills or ridges as indicated in Figure 5.9.

The topography of the site and immediate surrounding area has been impacted by agricultural activities (i.e. cultivated lands), roads, power lines, farmsteads, etc.

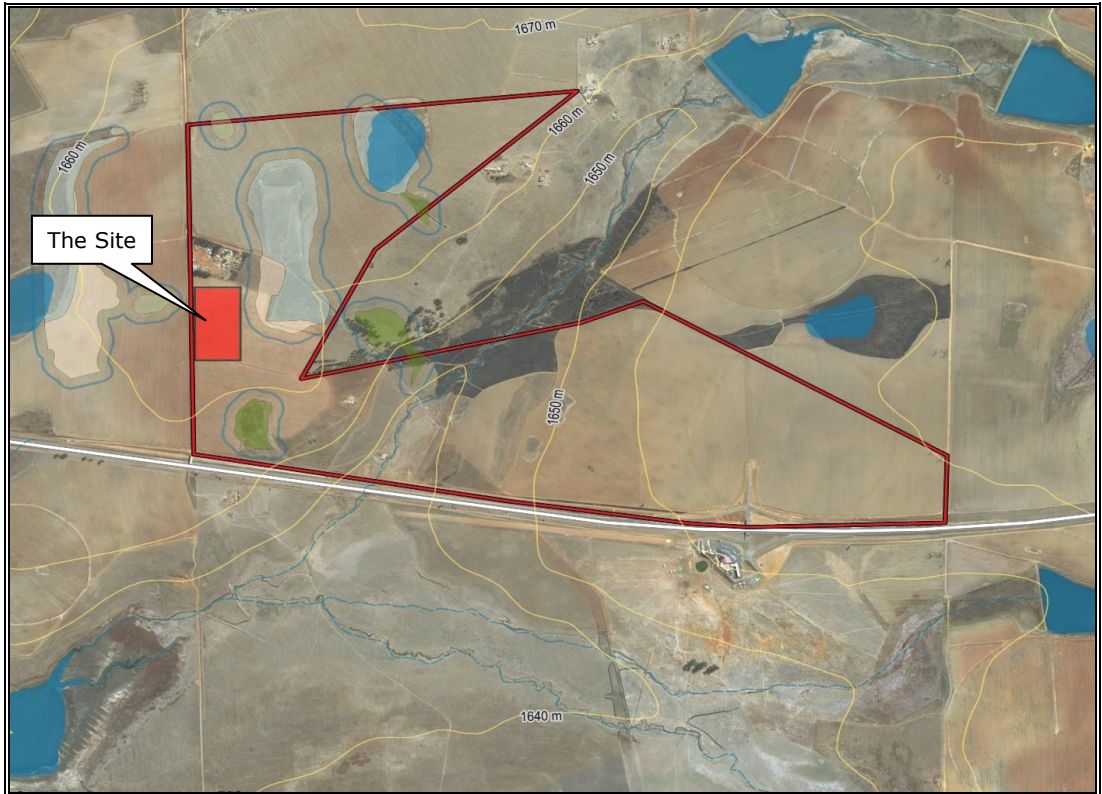


Figure 5.6: Site topography showing the 10m contours (taken from Gouws, 2018)

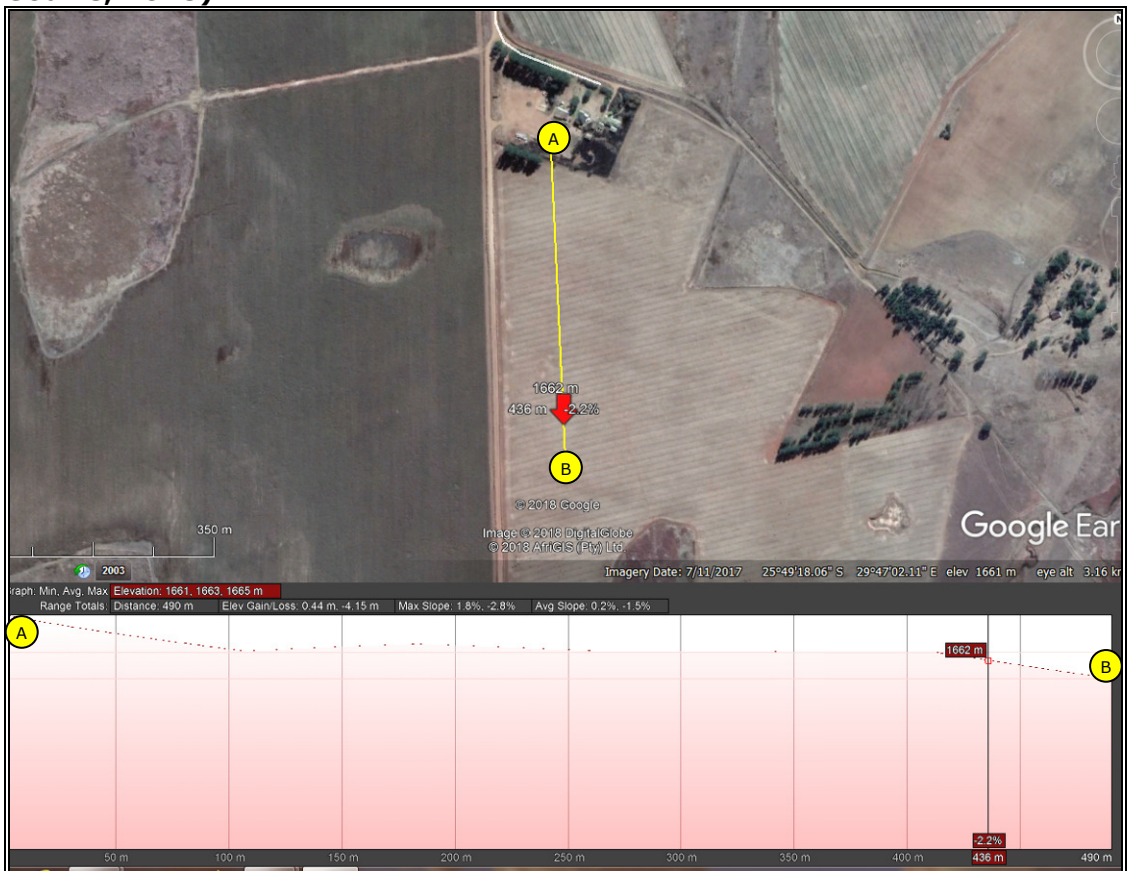


Figure 5.7: Elevation profile of site in a southerly direction (taken from Google Earth, 2016)



Figure 5.8: Elevation profile of site in a south easterly direction (taken from Google Earth, 2016)

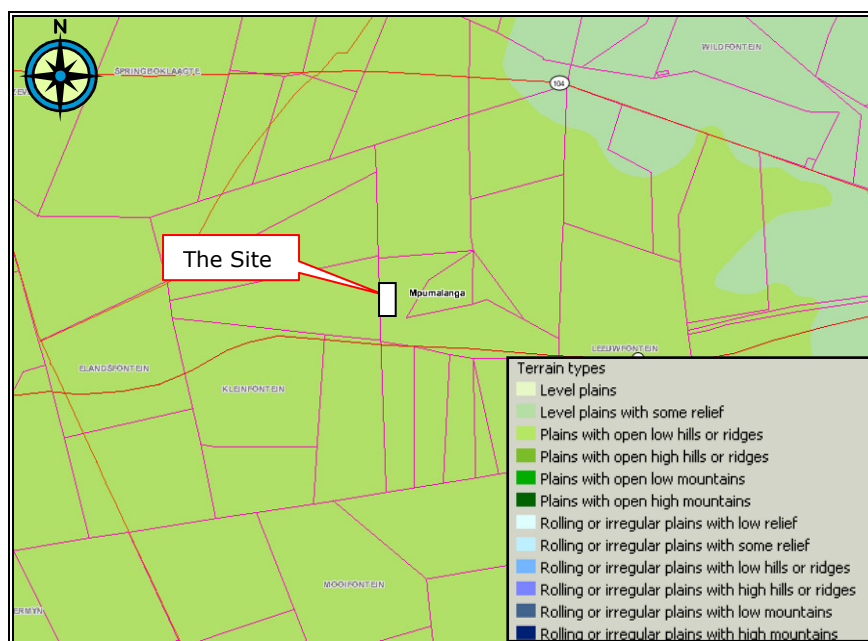


Figure 5.9: Terrain type of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

5.6 Soil

5.6.1 General

According to the Mpumalanga Biodiversity Conservation Plan (2006), the said site falls within the Ba land type (Figure 5.10), which is characterised by red,

yellow and/or greyish plinthic soils of moderate fertility. Upland duplex and marginalitic soils are rare.

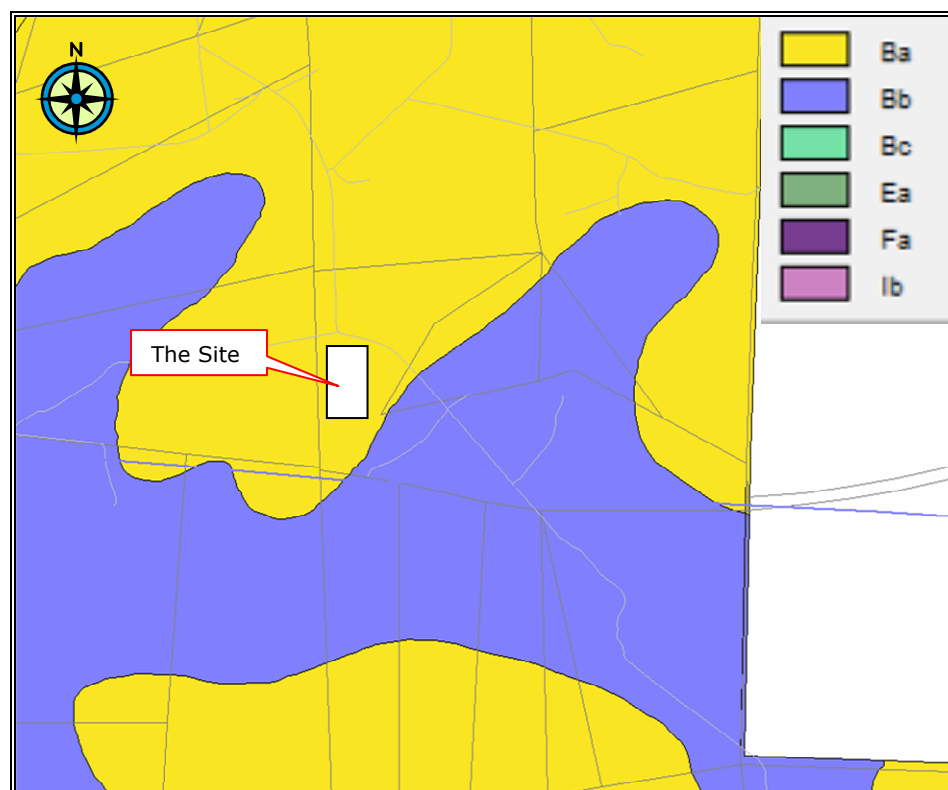


Figure 5.10: Land type of the proposed site (taken from Mpumalanga Biodiversity Conservation Plan, 2006)

According to Venter (2017), the soil on site is mostly of a red to yellow colour and could be Hutton or Avalon soil types (Photo 5.3). The majority of the site has been ploughed for the cultivation of maize (Photo 5.1). The soil in the northern portion of the site was impacted by the construction and utilization of the old farmstead complex (Photo 5.2). No soil erosion was noted.



Photo 5.3: A view of the soil present on site - cultivated lands (taken from Venter, 2017).

Wetlands were identified in areas surrounding the site. The wetland soils consist of an Orthic A horizon (with or without organic enrichment), over a yellow-brown to reddish brown layer with high chroma mottles (Photo 5.4). The depth of the layers vary, but in general the Orthic A is 0.1- 0.15m deep

with the soft plinthic layer starting at 0.5 - 0.7m. Mottling is present at any depth between 0.1m and 0.5m.

The soil in the seasonal to permanent wetness zones of these wetlands are grey in colour with signs of gleying.

According to Venter (2017), the wetland soils have been impacted upon by cultivation, artificial canals/trenches, gravel roads, dumping and the presence of a farmstead.

A detailed description of the soil samples taken on and adjacent to the site as well as photographs of the soil samples are provided in Appendix F of Appendix 3.



Photo 5.4: A view of the wetland soils present in the surrounding area (taken from Venter, 2017).

Soil sampling

Soil samples are regularly taken on the property to determine the nutrient status of the soil. This information is then utilized to determine the amount of fertilizer that needs to be added to the soil in order to reach an optimum maize yield.

Soil samples (L9-1, L9-2 and L9-7) were taken of the proposed site as indicated in Figure 5.11. Table 5.6 indicates the results of the soil analysis.

Table 5.6: Soil analysis results (information provided by applicant)

	L9-1	L9-2	L9-7
P	78	37	45
Ca	642	729	358
Mg	87	86	81
K	81	83	88
Na	6	8	5
pH	5.73	6.48	4.69
%Ca	77.24	79.23	66.26
%Mg	17.13	15.38	24.69
%K	4.98	4.63	8.28
%Na	0.65	0.77	0.77

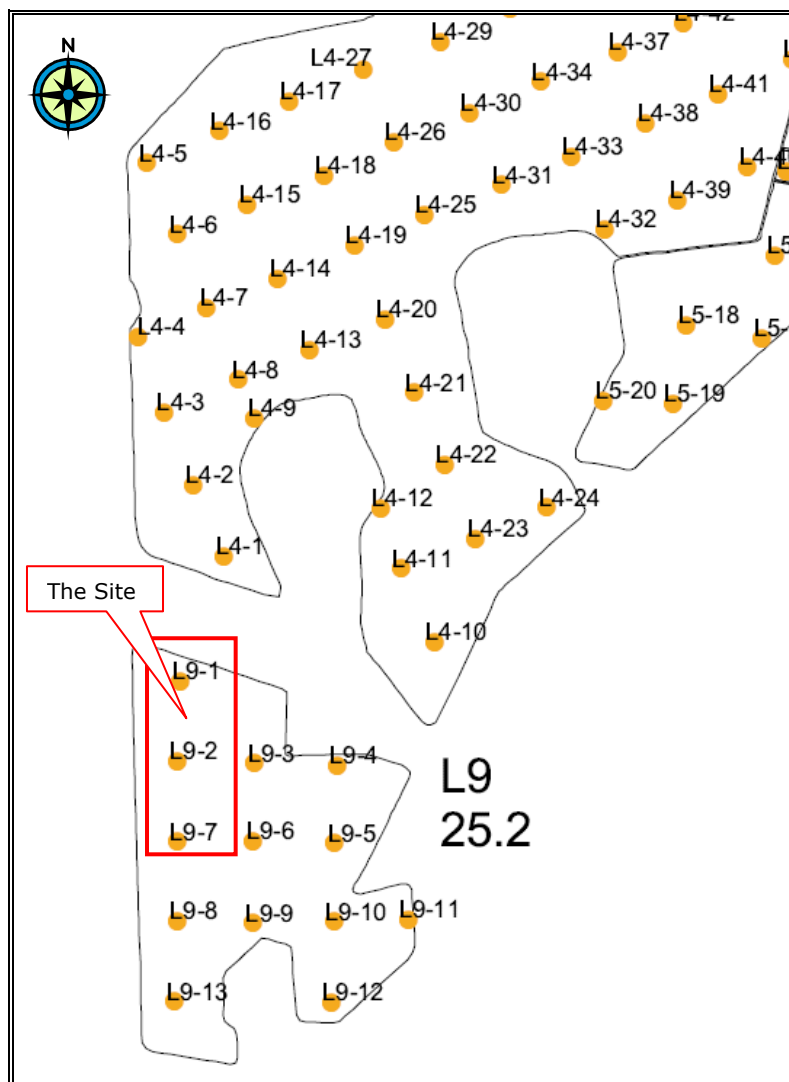


Figure 5.11: Soil sampling points (information provided by applicant)

5.6.2 Agricultural potential/land capability

The majority of the site is currently used for agricultural purposes (i.e. the cultivation of maize).

In terms of land capability, the proposed site is indicated according to the Department of Agriculture, Fisheries and Forestry (DAFF) as moderate potential arable land (Figure 5.12). Looking at grazing capacity, Figure 5.13 indicates the site as having a grazing capacity of <4 ha per live stock unit.



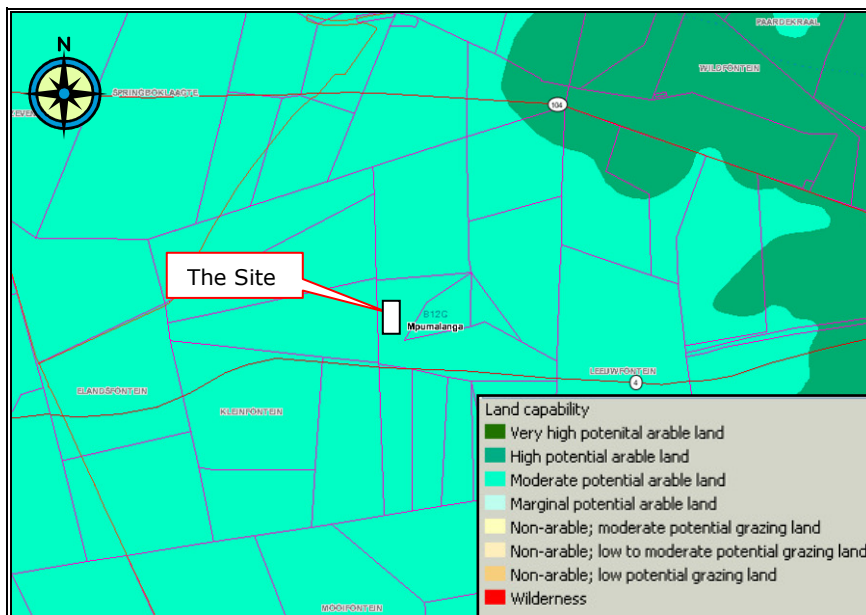


Figure 5.12: Land capability of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)



Figure 5.13: Grazing capacity of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

5.7 Natural vegetation

5.7.1 Regional vegetation and conservation status

According to 'The vegetation of South Africa, Lesotho and Swaziland', the study area falls within the Mesic Highveld Grassland bioregion, specifically the **Eastern Highveld Grassland** (veld type Gm12; Figure 5.14) (Mucina & Rutherford, 2006). The vegetation type was previously referred to by Low and Rebelo (1998) as Moist Sandy Highveld Grassland (38) and by Acocks (1953) as Bankenveld (61) and North-Eastern Sandy Highveld (57).

This grassland extends from the eastern side of Johannesburg towards Belfast and then southwards to Bethal, Ermelo and Piet Retief.

This vegetation type is characterized by short dense grassland, dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra*, *Celtis africana*, *Parinari capensis*, etc.).

Approximately 44% of the Eastern Highveld Grassland has already been transformed by cultivation, urban sprawl, mining, plantations and dams. This vegetation type has been afforded the status of **endangered** with a conservation target of 24%.

The National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists this vegetation type as **Vulnerable**.

Vulnerable (VU) ecosystems - being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems.

The stated purpose of listing 'threatened ecosystems' is primarily to reduce the rate of ecosystem degradation and species extinction.

The study area is not situated within any of the South African centres of endemism recognised by Van Wyk and Smith (2001).

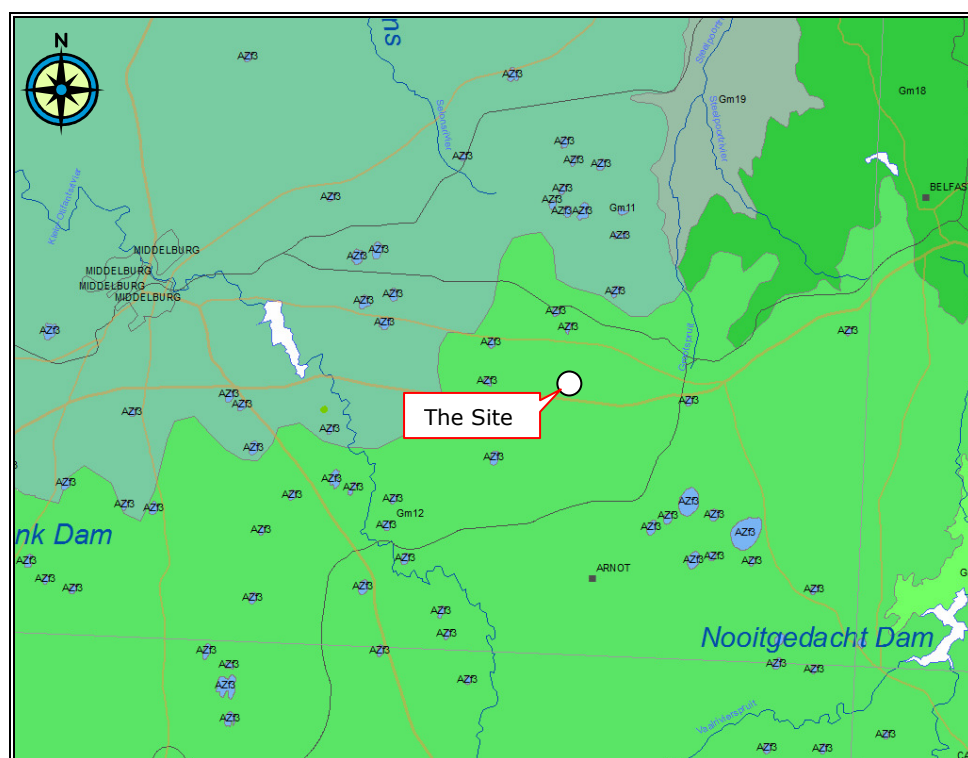


Figure 5.14: Vegetation type (taken from Mucina and Rutherford, 2006)



The said site and surrounding area are indicated as **'No Natural Habitat Remaining'** (Figure 5.15a) in terms of the terrestrial biodiversity assessment of the Mpumalanga Biodiversity Conservation Plan (2006), due to the area being cultivated.

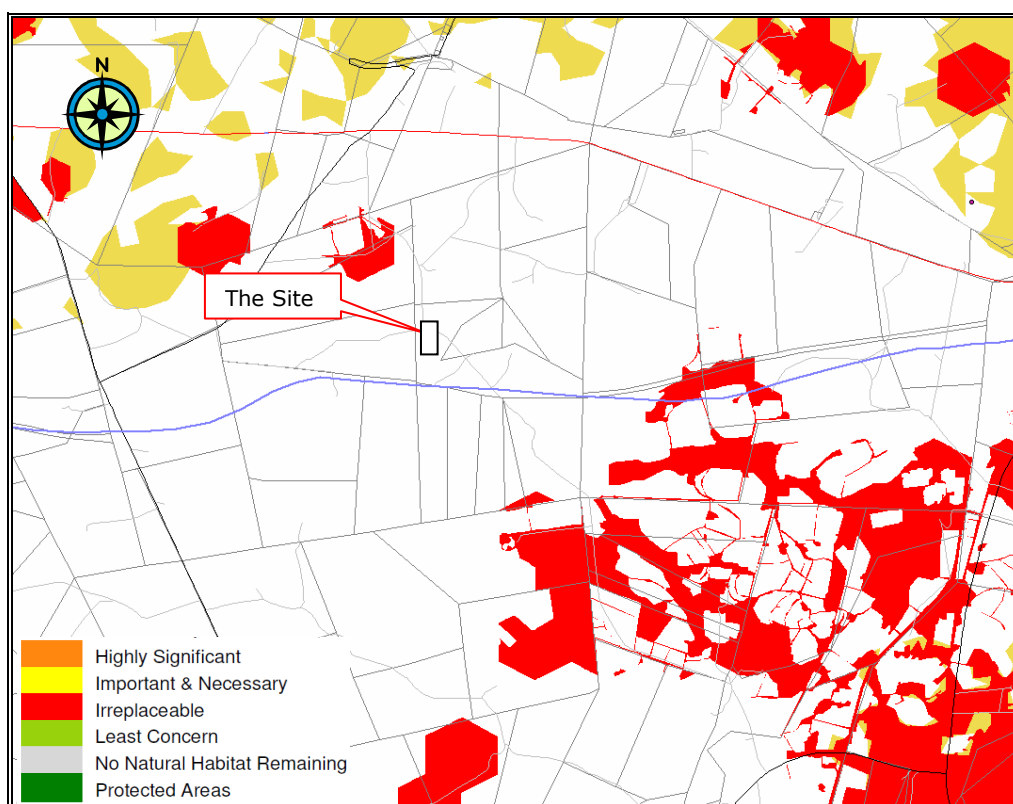


Figure 5.15a: Terrestrial biodiversity assessment of the Mpumalanga Biodiversity Conservation Plan, 2006

No listed activities in terms of Listing Notice 3 (GN R985) of the Environmental Impact Assessment Regulation, 2014 (as amended) are thus applicable.

The Mpumalanga Tourism and Parks Agency reviewed and updated the Mpumalanga Biodiversity Conservation Plan (2006) in order to align the spatial data with the bioregional plan requirements of the South African National Biodiversity Institute (SANBI) and surrounding provinces.

The Mpumalanga Biodiversity Sector Plan (MBSP, 2013) is a biodiversity planning tool that provides the most recent spatial biodiversity information to inform land-use and development planning (Lotter *et al.*, 2014). The main mapping categories used in the MBSP (in descending order of importance in terms of meeting conservation targets), are:

- Protected Areas;
- Critical Biodiversity Areas (Irreplaceable and Optimal);
- Ecological Support Areas;
- Other Natural Areas;
- Modified (Heavily Modified and Moderately Modified: old lands).

According to the Mpumalanga Biodiversity Sector Plan (MBSP, 2013), the said site is classified as **'Heavily Modified'** and **'Moderately Modified: Old**

Lands' (Figure 5.15b). **'Other Natural Areas'** are present east and south east of the site (Figure 5.15b).

No Critical Biodiversity Areas, Ecological Support Areas or Ecological Corridors are present on or near the site (Figure 5.15b).



Figure 5.15b: Terrestrial biodiversity assessment of the Mpumalanga Biodiversity Sector Plan, 2013

5.7.2 Vegetation found on site

As previously indicated, the majority of the site comprises cultivated land with no natural vegetation present (Photo 5.1).

The north eastern corner of the site extends into the old farmstead complex (Photo 5.2 and Figure 5.2). Large Pine trees (*Pinus* sp.) are present along the boundary of the farmyard (Photo 5.2). These trees were possibly planted to act as a wind break and visual barrier. The majority of the farmyard is bare, with scattered patches of disturbed grassland vegetation present adjacent to the buildings and along the fence line. Plant species noted include Kikuyu Grass, Couch Grass, Khaki Weed, Cosmos and Syringa.

5.7.3 Vegetation found in the nearby wetlands

A wetland study was commissioned to identify and delineate any wetlands on or near the site.

Venter (2017) identified depression wetlands to the east, north east and west of the site as well as small seep wetlands in the surrounding area (Figure 5.17).

According to Venter (2017), these wetlands have been disturbed and consequently contain many weeds. The disturbances are mostly due to agricultural practices taking place in and around the wetland units. Impacts

include cultivation, dumping, excavation of a small dam and excavation of a trench. The weedy component of the vegetation is mainly present along the edges of the wetlands (and where disturbances have taken place) and decreases significantly towards the centre of the wetlands.

Venter (2017) focused mostly on the depression wetland nearest the site in terms of plant species identification. According to Venter (2017), the wetland unit is dominated by typical obligate hydrophyte indigenous species, including *Kyllinga erecta*, *Cyperus denudatus* and *Calamagrostis epigeios*. *Leersia hexandra* is the dominant species in the seasonal to permanent wetness zone of the wetland.

Some of the weedy/alien plant species noted are *Amaranthus hybridus*, *Bidens bipinnata*, *Bidens pilosa*, *Cyperus esculentus*, *Hibiscus trionum* and *Paspalum dilatatum*.

A full species list, including where these species were noted, is provided in Addendum C of Appendix 3. More information with regards to the identified wetlands is provided in Section 5.9 of this report.

5.7.4 Plant Species of Conservation Concern

The term 'Species of Conservation Concern' refers to the IUCN threatened and Near Threatened categories as well as the South African Red List categories (i.e. Critically Rare, Rare and Declining).

A list of Species of Conservation Concern, which historically occurred in the area (quarter degree square 2529DD) was obtained from the PRECIS Database (South African National Biodiversity Institute) and PlantDat database (Mpumalanga Tourism & Parks Agency). The list contains only 2 species together with their conservation status categories and habitat requirements (Table 5.7).

Table 5.7: Plant Species of Conservation Concern recorded for quarter degree square: 2529DD

Latin Name	Common Name and Description	Habitat	Status
<i>Khadia carolinensis</i>	Perennial, succulent	Well-drained, sandy loam soils among rocky outcrops, or at the edges of sandstone sheets, Highveld Grassland	Vulnerable
<i>Miraglossum davyi</i>	Perennial herb, succulent	Grassland	Vulnerable

The above species were not recorded on or near the site. It is extremely unlikely that *Khadia carolinensis* or *Miraglossum davyi* will occur on the site, since the majority of the site is cultivated and no habitat for these species is present.

5.7.5 Protected plant species

In addition to the IUCN categories, the following legislation affords protected status to selected indigenous plant species:

- National Forests Act (Act 84 of 1998),
- NEMA Biodiversity Act (Act 10 of 2004, as amended in 2007), and
- Mpumalanga Nature Conservation Act (No.10 of 1998).



National Forests Act (Act 84 of 1998)

The National Forests Act lists 47 tree species that may not be removed or damaged without a license from the National Department of Agriculture.

None of the 47 tree species listed in Schedule A of this Act occurs within the study area or its immediate surroundings.

NEMA Biodiversity Act (Act 10 of 2004, as amended in 2007)

The intention of the Biodiversity Act is to protect plant species (e.g. cycads, yellow arum lily, protea, etc.) that are directly threatened in terms of their utilisation. The destruction, collection or trading of any species listed in this Act requires a permit.

As indicated in Section 5.7.3, no habitat for plant Species of Conservation Concern is present on site as the majority of the site is cultivated.

Mpumalanga Nature Conservation Act (No.10 of 1998)

A number of plant species are protected in the Mpumalanga Province under the Mpumalanga Nature Conservation Act, whether they are considered to be threatened or not. This includes, but is not limited to, the following common names: ferns, flame lilies, christmas bells, pineapple flowers, clivia, nerine, crinum, ground lily, fire lily, irises, all orchids. A permit has to be obtained prior to their removal.

No protected plant species or trees were noted on site as the majority of the site is cultivated.

5.7.6 Invader or exotic species

Declared Weeds and Invaders are subject to the Conservation of Agricultural Resources Act (Act 43 of 1983) as amended in 2001. In terms of this Act, landowners are legally responsible for the control of alien plant species on their properties.

In addition, a number of plant species are listed as alien invasive species in terms of the Alien Invasive Species (AIS) Regulations, as defined in the National Environmental Management Biodiversity Act (Act no. 10 of 2014). The AIS regulations place each declared alien invasive plant species into one of four categories and stipulates measures for the eradication of plants in each of the four categories.

Table 5.8 lists the invaders recorded by Venter (2017) on and near the site.

Table 5.8: Declared alien invasive plant species (Venter, 2017)

Latin name	Category
<i>Arundo donax</i>	Class 1b
<i>Cirsium vulgate</i>	Class 1b
<i>Datura stramonium</i>	Class 1b
<i>Melia azedarach</i>	Class 1b
<i>Opuntia ficus-indica</i>	Class 1b
<i>Verbena bonariense</i>	Class 1b
<i>Verbena braziliense</i>	Class 1b
<i>Xanthium strumarium</i>	Class 1b

*Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act (NEM: Biodiversity Act) as species which must be controlled.



5.8 Animal life

5.8.1 Regional conservation status

According to the MBSP (2013) the site is classified as '**Heavily Modified**' and '**Moderately Modified: Old Lands**' in terms of the Terrestrial Biodiversity Assessment (Figure 5.15b).

The site is also classified as '**Heavily Modified**' in terms of the Freshwater Biodiversity Assessment (Figure 5.16). A small section in the north eastern portion of the site is classified as '**Other Natural Areas**'.

'**Other Natural Areas**' (ONAs) are defined as:

Natural areas that are potentially available to changes in land-use, subject to environmental authorisation processes. Although they are not identified to support freshwater CBAs or ESAs, they still provide important ecosystem services. Freshwater ONAs are particularly important in buffers around rivers and wetlands to reduce siltation and improve water quality. Old lands were included under Freshwater ONAs because of their functional importance in supporting and maintaining freshwater CBAs.

It should be noted that the MBSP freshwater assessment includes information obtained from the National Freshwater Ecosystem Priority Areas (NFEPA) and threatened freshwater ecosystems databases (National Biodiversity Assessment 2011).



Figure 5.16: Freshwater biodiversity assessment of the Mpumalanga Biodiversity Sector Plan, 2013

No Critical Biodiversity Areas (CBA's) for aquatic species, Ecological Support Areas (ESA's) for fish, CBA Wetlands, ESA Wetlands or ESA Wetland clusters are present on or near the site (Figure 5.16). The closest ESA Wetland is

located more than 500m to the south east and 600m to the north east of the site (Figure 5.16).

5.8.2 Animal life found on site and surrounds

No animal species were noted on or near the site during the site visits. It is highly unlikely that large animal species would permanently inhabit the site since the site and surrounding area are cultivated.

Smaller species such as rodents, insects, scrub hare, birds, etc. may however, frequent the cultivated lands (especially during growing season and post-harvesting) and inhabit the area around the old farmstead complex.

The depression wetland, seep wetland and the small stream (which is located \pm 660m south east of the site; Figure 5.17) in the surrounding area would provide habitat for a number of species (e.g. duiker, mongoose, amphibians, birds, etc.).

5.8.3 Species of Conservation Concern

No Species of Conservation Concern (e.g. Giant Bullfrog, Hedgehog, Serval, etc.) were noted on site during the site visits. It is unlikely that Species of Conservation Concern will be present on site due to the site and surrounding area being cultivated as well as the fragmented nature of the remaining grassland/wetland vegetation. The possibility that Red Data species may occur in the area is however, not excluded.

5.9 Surface water

5.9.1 Catchment

The proposed site is located within the Upper Olifants Water Management Area (WMA) and more specifically the B12C quaternary catchment.

The Minister has, in terms of section 12 of the National Water Act, Act No. 36 of 1998, prescribed a system for classifying water resources by promulgating Regulation 810 (Government Gazette 33541, dated: 17 September 2010).

The Water Resource Classification System is intended to ensure the ecological sustainability of all the significant water resources taking into consideration the social and economic needs of competing interests by all who rely on the water resource.

The proposed water resource classes for the Olifants catchment were published in Notice 619 of 2015 (Government Gazette 39004, dated: 20 July 2015). In terms of this notice, the water resource class of the B12C quaternary catchment is a C (i.e. moderately modified), Ecological Importance is High and the Ecological Sensitivity is also High.

The following Resource Quality Objectives (RQO) for the Olifants catchment applies:

- Low flows should be improved in order to maintain the river habitat for the ecosystem and ecotourism.
- Nutrient concentrations should be improved to prevent nuisance conditions for ecotourism.
- Instream habitat must be in a largely modified or better condition to support the ecosystem and for ecotourism users.



- Instream biota must be in a largely modified or better conditions and at sustainable levels.
- Low and high flows must be suitable to maintain the river habitat for ecosystem condition and ecotourism.
- Salt concentrations must be maintained at levels where they do not render the ecosystem unsustainable.
- The riparian zone must be in a moderately modified or better condition to support the ecosystem and for ecotourism.
- Riparian vegetation must be in a moderately modified or better condition .
- Low and high flows must be in a largely modified or better condition to maintain the riparian habitat and for ecotourism.

According to the MBSP Freshwater Biodiversity Assessment (2013), the proposed development site does NOT fall within an Ecological Support Area (ESA): Important subcatchment (Figure 5.16).

It should be noted that the MBSP Freshwater Biodiversity Assessment (2013) includes information obtained from the National Freshwater Ecosystem Priority Areas (NFEPA) and threatened freshwater ecosystems databases (National Biodiversity Assessment, 2011).

5.9.2 Floodline

No streams, rivers or dams are located on or adjacent to the site (Figure 5.1). The site will therefore not be affected by the 1:50 or 1:100 year floodlines.

A small unnamed stream is located \pm 600m south east of the site (Figure 5.17).

5.9.3 Surface water runoff

The site is fairly flat with a gentle slope in a south easterly direction towards an unnamed stream (Figure 5.17). Storm water drains as sheet wash across the property towards the stream and associated wetland.

5.9.4 Wetlands

The Mpumalanga Biodiversity Sector Plan (MBSP, 2013) does not indicate any important wetlands or wetland clusters on or near the site (Figure 5.16). The closest ESA Wetland is located more than 500m to the south east and 600m to the north east of the site (Figure 5.16).

A wetland assessment and delineation study was undertaken by I Venter of Kyllinga Consulting (referred to as Venter, 2017). Venter (2017) was requested to conduct a wetland assessment with regards to the proposed site as well as within a 500m radius of the proposed site. A copy of the report is provided in Appendix 3. The said report should be consulted with regards to the methodology used in this assessment and limitations of the study.

5.9.4.1 Wetlands identified on site and within a 500m radius of the site

As indicated in Figure 5.17, no wetlands were identified on site (Venter, 2017).

Depression wetlands and Seep wetlands were however, identified within a 500m radius of the site (Figure 5.17).



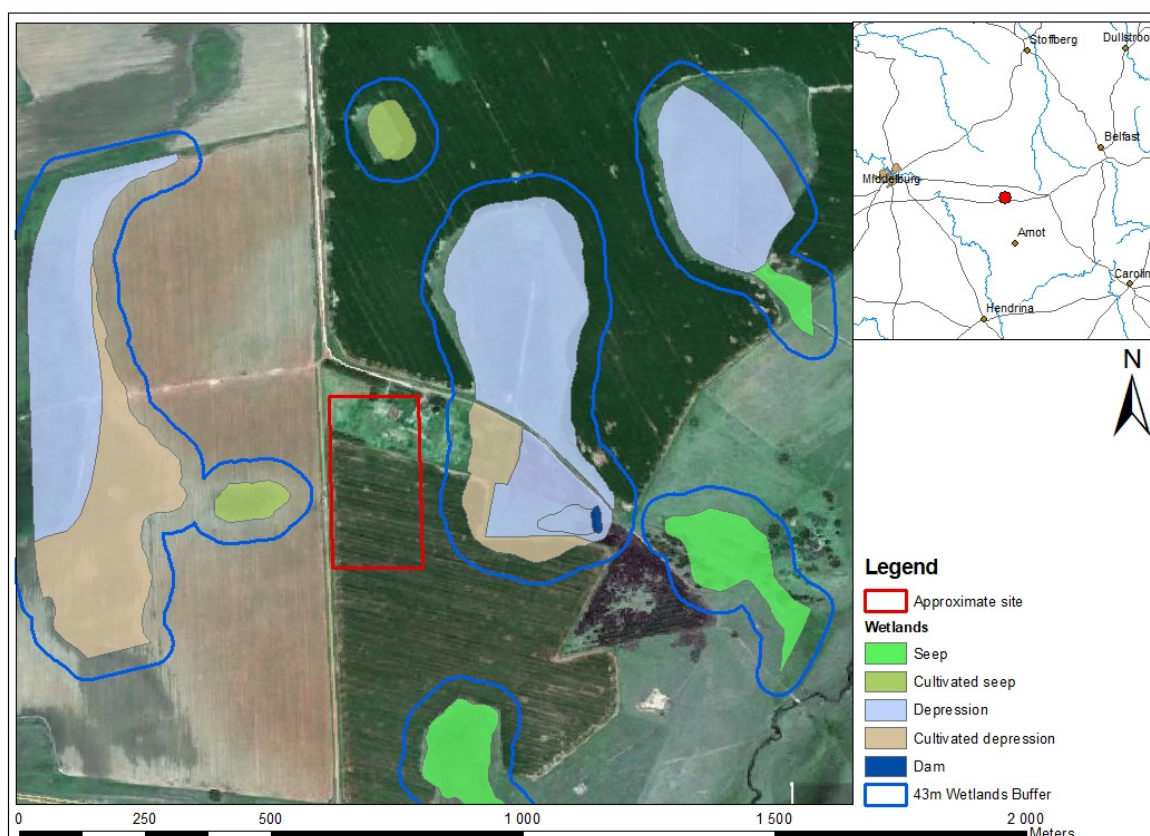


Figure 5.17: Wetland units identified (taken from Venter, 2017)

Depression wetlands (Figure 5.17)

Depression wetlands are present east, north east and west of the site (indicated in blue; Figure 5.17).

Portions of the eastern and western Depression wetlands have been cultivated (indicated in brown; Figure 5.17 and Photo 5.5). The eastern Depression wetland has also been impacted by the excavation of a trench through the wetland (possibly in an attempt to drain the wetland for cultivation purposes), the construction of a small dam, dumping and invasive plant species (Photos 5.5 and 5.6).

A trench of approximately 500m has also been excavated in the north eastern Depression wetland (Photo 5.7) in order to drain water from the wetland. However, even with the trenches, cultivation was limited to the outer perimeter of the wetlands (Venter, 2017).





Photo 5.5: A view of the Depression Wetland located east of the site (note the cultivation taking place) (taken from Venter, 2017).



Photo 5.6: A view of the dam and trench in the Depression Wetland located east of the site (taken from Venter, 2017).



Photo 5.7: A view of the Depression wetland located west of the site (taken from Venter, 2017).

Seep wetlands (Figure 5.17)

Venter (2017) identified 5 Seep wetlands within a 500m radius of the site (Figure 5.17). These wetlands are located towards the north, east, south and west. All the Seep wetlands (except the Seep wetland east of the site) have been impacted by cultivation. Impacts on the eastern Seep wetland include the excavation of a trench, gravel road, farmstead, alien vegetation, etc.

The Seep wetlands located north east and west of the site are associated with Depression wetlands (Figure 5.17). No natural connection exists between the Depression and Seep wetlands east of the site. However, an artificial trench connects these wetland units. The small Seep wetlands located north and south of the site are not connected to any other wetlands.



Photo 5.8: A view of Seep wetland east of the site (taken from Venter, 2017).

Soil associated with the Depression and Seep wetlands

According to Venter (2016), the wetland soils consist of an Orthic A horizon (with or without organic enrichment), over a yellow-brown to reddish brown layer with high chroma mottles (Photo 5.4). The depth of the layers vary, but in general the Orthic A is 0.1- 0.15m deep with the soft plinthic layer starting at 0.5 - 0.7m. Mottling is present at any depth between 0.1m and 0.5m.

The soil in the seasonal to permanent wetness zones of these wetlands is grey in colour with signs of gleying.

Vegetation found in the Depression and Seep wetlands

According to Venter (2017), the Depression and Seep wetlands found in the area contain many weeds, mostly as a result of agricultural practices. The weedy component decreases significantly towards the centre of the wetlands, away from cultivation activities.

Venter (2017) focused mostly on the Depression wetland nearest the site in terms of plant species identification. According to Venter (2017), the wetland unit is dominated by typical obligate hydrophyte indigenous species, including *Kyllinga erecta*, *Cyperus denudatus* and *Calamagrostis epigeios*. *Leersia hexandra* is the dominant species in the seasonal to permanent wetness zone of the wetland.

Some of the weedy/alien plant species noted are *Amaranthus hybridus*, *Bidens bipinnata*, *Bidens pilosa*, *Cyperus esculentus*, *Hibiscus trionum* and *Paspalum dilatatum*.

5.9.4.2 Present Ecological State and Ecological Importance and Sensitivity

Venter (2017) focused on the Depression wetland nearest the site (eastern Depression; Figure 5.17) in terms of Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS). According to Venter (2017), the PES of the Depression wetland east of the site is Class C (Moderately Modified).

Cultivation activities and excavation of a trench led to changes in the flow in the wetland, resulting in a Moderately Modified hydrology. The vegetation component is also Moderately Modified since large portions of the wetland are cultivated and patches of alien vegetation are present. The geomorphology is

still natural (Class A), with the most significant impact being slight erosion in portions of the wetland.

According to Venter (2016), the EIS of the Depression wetland east of the site is Moderate, which indicates that the wetland is important on a local to regional scale. No fauna or flora Species of Conservation Concern were observed on site, but fauna Species of Conservation Concern may occasionally occur on site.

The hydro-functional importance of the wetland is also Moderate, with the most significant potential functions being the assimilation of nitrates, phosphates and toxicants.

Table 5.9 provides a summary of the EIS values of the Depression wetland.

Table 5.9: EIS of the Depression wetland unit located east of the site (taken from Venter, 2017)

	Importance	Confidence
Ecological Importance and Sensitivity	1.8	3.6
Hydro-functional Importance	1.6	4.0
Direct Human Benefits	0.2	4.0

5.9.4.3 Buffer zone

According to Venter (2017), all the wetland areas are considered to be of high sensitivity. A buffer zone therefore needs to be implemented to mitigate the impact of the development on these sensitive features. Venter (2017) utilized the Department of Water and Sanitation buffer zone tool (Addendum G of Appendix 3) to determine the recommended buffer zone around the identified wetlands.

The site based buffer zone was determined as 23m for the construction phase and 86m for the operational phase. With mitigation measures, the operational phase buffer can be lowered to 43m (Venter, 2017).

5.10 Groundwater

A geohydrological investigation was conducted for the proposed GTC facility by C. Gouws of Geo-Pollution Technologies (hereafter referred to as Gouws, 2018). A copy of the geohydrological study is provided in Appendix 4. This report should be consulted with regards to methodology used and limitations of the study.

5.10.1 Hydrogeological setting

According to Gouws (2018), the general hydrogeology of the area comprises a weathered, shallow (10 mbgl) aquifer overlying a fractured groundwater system. The grains in the fresh rock below the weathered zone are well cemented with low permeability, thus not allowing for any significant flow of water. Groundwater therefore mainly flows along secondary structures in the rock such as fractures, cracks and joints. Unless altered by weathering or fracturing, dolerite sills and dykes are generally impermeable to water movement.



According to Gouws (2018), the aquifer system in the study area can be classified as a "Minor Aquifer System" based on the fact that the Loskop (Karoo) aquifer has a low permeability and does not produce large quantities of water. Blow yields of 0.1 - 0.5 l/s can be expected regionally.

Minor Aquifer System: These can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important for local supplies and in supplying base flow for rivers.

The aquifer vulnerability (i.e. the tendency or likelihood for contamination to reach a specified position in the groundwater system) is classified as "Medium".

Medium Vulnerable = 30 to 60%: The natural factors provide some protection to shield groundwater from contaminating activities at the land surface, however based on the contaminant toxicity mitigation measures will be required to prevent any surface contamination from reaching the groundwater table.

The aquifer protection level was also estimated as "Medium", meaning that measures must be taken to limit the risks to the underlying aquifer, downstream groundwater users and nearby wetlands.

5.10.2 Hydrocensus

A hydrocensus was conducted in order to identify groundwater users in the area and to collect groundwater related data. The development is classified as a small-scale abstraction (Category A) development, which requires a borehole census within a 1km radius of the property. Gouws (2018) identified five (5) boreholes within the 1km radius of which four (4) are used for domestic purposes. The borehole positions are indicated in Figure 5.18 and the hydrocensus information is provided in Table 5.10.

Table 5.10: Summarized hydrocensus information (taken from Gouws, 2018)

ID	Co-ordinates	Distance and direction from site centre	Casing height	Static water level (mbgl)	Use
ALZ1	-25.82251 29.77531	On-site at the old farmstead	0.025	3.58	Domestic
ALZ2	-25.8224 29.77515	On-site at the old farmstead	0.035	3.84	Domestic
ALZ3	-25.81597 29.78976	±1.5km north east of the site near a homestead.	0.000	BH closed	Domestic
ALZ4	-25.82427 29.78019	± 380m east of the site near a farmstead	0.000	BH closed	Unknown
ALZ5	-25.81233 29.77782	±1.2km north of the site at a village	0.045	BH closed	Domestic; Livestock

All the boreholes are located on property belonging to the applicant, except ALZ4 which is located on the adjacent Hoffman property (Figure 5.18).



As indicated in Table 5.10, the static water level could only be measured at the two boreholes (ALZ1 and ALZ2; Figure 5.18) located on site. The groundwater level varied between a minimum of 3.58 mbgl to a maximum of 3.84 mbgl. Currently, boreholes ALZ1 and ALZ2 are not used for domestic purposes since nobody resides in the old farmstead. The boreholes are however, functional and fitted with a windmill and submersible pump.

Borehole ALZ3 (located north east of the site; Figure 5.18) is utilized by 11 households (± 60 people) for domestic purposes only. The water is pumped by a windmill and stored in a 20kl storage tank.

The current water use of borehole ALZ4 (Figure 5.18) is unknown. The water is pumped by a windmill to a small 2.5kl storage tank.

Borehole ALZ5 (Figure 5.18) is located within a village and used for domestic and livestock purposes. Between 30 and 40 people reside at the village. The borehole is fitted with a hand pump and no storage tanks are present.

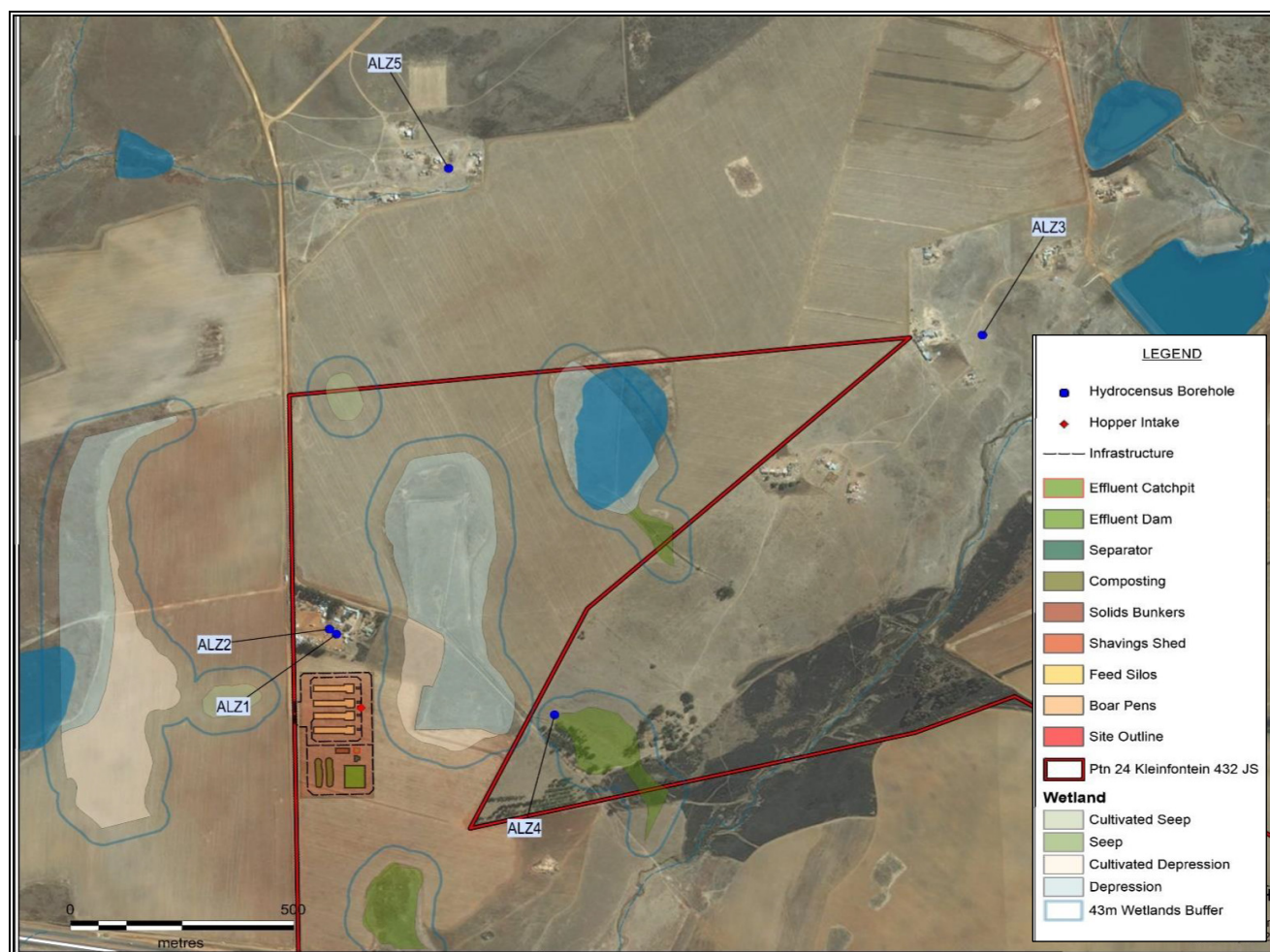


Figure 5.18: Hydrocensus points in relation to the site (taken from Gouws, 2018)

5.10.3 Groundwater flow and levels

According to Gouws (2018), the surface topography (slope and direction of fall of an area) usually gives a good indication of the hydraulic gradient of the unconfined aquifer.

As indicated in Section 5.5, the site is fairly flat with a gentle slope of approximately 2% in a south easterly direction. The groundwater flow direction is thus inferred to be in a south easterly direction towards the unnamed stream located approximately 600m from the site (Figure 5.18).

5.10.4 Groundwater quality

Gouws (2018) collected a groundwater sample from each of the 5 boreholes (ALZ1 - ALZ5; Table 5.10 and Figure 5.18) in order to determine the water quality of the area. The water quality results were compared to the domestic standards as defined by SANS241: 2015 and are presented in Table 5.11.

According to Gouws (2018), the groundwater type can be described as freshly recharged, unpolluted bicarbonate type water.

As indicated in Table 5.11, only Mn concentrations at ALZ1 exceed the SANS standard aesthetic limit.



Table 5.11: Water quality results (taken from Gouws, 2018)

Parameter	Unit	SANS 241: 2015 Recommended Limits	Risk	Results					
				ALZ1/20/02/2018	ALZ2/20/02/2018	ALZ3/20/02/2018	ALZ4/20/02/2018	ALZ5/20/02/2018	
Physical & Aesthetic Determinants									
Electrical conductivity at 25°C	EC	mS/m	≤ 170	Aesthetic	33	42.5	33.3	32.9	31.8
Total Dissolved Solids	TD S	mg/liter	≤ 1200	Aesthetic	214	276	217	214	207
pH at 25°C		pH units	≥ 5 to ≤9.7	Aesthetic	6.46	7	7.72	7	7.16
Chemical Determinants - Macro Determinants									
Nitrate as N	NO ₃	mg/liter	≤ 11	Acute Health	3.68	10.5	1.67	3.51	1.69
Nitrite as N	NO ₂	mg/liter	≤ 9	Acute Health	0.015	0.031	0.002	0.003	0.002
Sulphate	SO ₄	mg/liter	Acute Health ≤500; Aesthetic ≤250	Acute Health/Aesthetic	20.4	17.3	2.19	10.6	1.62
Fluoride	F	µg/liter	≤1500	Chronic Health	0.049	0.042	0.319	0.173	0.262
Ammonia as N	NH ₃	mg/liter	≤ 1.5	Aesthetic	0.063	0.001	0.001	0.001	0.001
Chloride	Cl	mg/liter	≤ 300	Aesthetic	38.8	48.8	10.9	49.8	25.6
Sodium	Na	mg/liter	≤ 200	Aesthetic	22.7	21.9	25.2	23.7	32.7
Zinc	Zn	µg/liter	≤5000	Aesthetic	0.12	0.05	0.05	0.46	0.78
Chemical Determinants - Micro Determinants									
Arsenic	As	µg/liter	≤ 10	Chronic Health	0.1	0.1	0.1	0.1	0.1
Barium	Ba	µg/liter	≤ 700	Chronic Health	0.17	0.2	0.09	0.05	0.05
Boron	B	µg/liter	≤ 2400	Chronic Health	0.05	0.05	0.05	0.05	0.05
Cadmium	Cd	µg/liter	≤ 3	Chronic Health	0.05	0.05	0.05	0.05	0.05
Total Chromium	Cr	µg/liter	≤ 50	Chronic Health	0.05	0.05	0.05	0.05	0.05
Copper	Cu	µg/liter	≤ 2000	Chronic Health	0.05	0.05	0.05	0.05	0.05
Free CN	CN	mg/liter	≤ 0.2	Chronic Health	0.05	0.05	0.05	0.05	0.05
Total Iron	Fe	mg/liter	Acute Health ≤ 2.0; Aesthetic ≤0.3	Acute/Aesthetic	0	0	0	0	0
Lead	Pb	µg/liter	≤ 10	Chronic Health	0.05	0.05	0.05	0.05	0.05
Total manganese	Mn	mg/liter	Acute Health ≤0.4; Aesthetic ≤0.1	Acute/Aesthetic	0.31	0.05	0.05	0.05	0.05
Nickel	Ni	µg/liter	≤ 70	Chronic Health	0.05	0.05	0.05	0.05	0.05
Selenium	Se	µg/liter	≤ 40	Chronic Health	0.05	0.05	0.05	0.05	0.05
Uranium	U	µg/liter	≤ 30	Chronic Health	0.05	0.05	0.05	0.05	0.05
Aluminium	Al	µg/liter	≤ 300	Operational	0.05	0.05	0.05	0.05	0.05

5.10.5 Available groundwater

A standard pump test was conducted on the proposed water supply borehole ALZ1 (Figure 5.18) to estimate the sustainable borehole yield.

The sustainable yield is defined as the rate at which the borehole can be operated for long durations without reaching a specified drawdown level, or a yield that will not adversely affect people or the environment now and in the future.

As indicated in Table 5.12, borehole ALZ1 can be pumped at a sustainable rate of 8.6 m³/d for no more than 8 hours at a time. The borehole should thus be pumped for 8 hours and left to recover for 16 hours in a 24 hour cycle. The maximum pumping should not exceed 0.5 l/s or 43 m³/day.

Table 5.12: Pump test results for ALZ1

Total drawdown	22m
Transmissivity value	0.3 m ² /d
Sustainable pump rate	0.1 l/s or 8.6 m ³ /d for 8 hours

ALZ2 (Figure 5.18) could not be pump tested since the borehole is blocked at 14m. Gouws (2018) estimated the sustainable rate to be less than 0.1 l/s and recommended that this borehole not be considered for long term supply.

5.10.6 Risk assessment

Gouws (2018) conducted a risk assessment to determine the potential contamination impacts on the groundwater, since a manure dam/pit would form part of the development and manure would be spread on surrounding agricultural lands. The results of the risk assessment are indicated in Section 8 (Impact Assessment) of this report.

5.11 Air quality

The proposed site is located in the Steve Tshwete Municipal area hot spot, which extends across the Steve Tshwete Local Municipality from its border with eMalahleni to Arnot in the east. This is an area where measured or modelled concentrations exceed, or are predicted to exceed, ambient air quality standards as identified in the Air Quality Management Plan for the Highveld Priority Area (HPA; Republic of South Africa, 2011). This Priority Area was declared in terms of Section 18(1) of the National Environmental Management: Air Quality Act 2004 (Act 39 of 2004) due to poor air quality and associated health risks.

Three main nodes of non-compliance with ambient standards occur within this hotspot. In the Middelburg node, both modelled 24-hour SO₂ and PM₁₀ standards are frequently exceeded. Ambient monitoring at Middelburg, a site influenced by industrial sources, confirms the PM₁₀ exceedances. This hot spot is mostly attributed to emissions from the metallurgical industries and residential fuel burning. The contribution of industries in the area dominates the source contributions for all pollutants considered. In terms of PM₁₀, residential fuel burning does contribute a sizeable percentage to ambient concentrations.



Few exceedances of the SO₂ standard occur in the Arnot node. The said site is located nearest the Arnot node.

Ambient air quality monitoring stations

Five ambient air quality monitoring stations are operated and maintained in the Highveld Priority Area (HPA) by the South African Weather Service (SAWS). These stations are located in eMalahleni (Witbank), Middelburg, Ermelo, Secunda and Hendrina and were installed in 2008. The SAWS manages the network which includes routine maintenance, calibration, data management and reporting.

At each of the said stations the following is measured: PM₁₀, PM_{2.5}, SO₂, NO, NO₂, NO_x, O₃, CO, benzene, toluene, ethylbenzene and xylene. In addition, the following meteorological data is also measured: wind speed, wind direction, ambient temperature, relative humidity, rainfall, solar radiation, barometric pressure.

▪ Middelburg Station

The Middelburg Station is located nearest the proposed site (i.e. ±30km towards the west in the residential area of Aerorand). This site was selected to measure the impact of emissions from mining and industry especially the large industrial sources such as Columbus Stainless and Middelburg Ferrochrome.

Monitoring Station	Co-ordinates	Monitoring Period	Pollutant Sources
Middelburg	S-25.79070; E29.462801	August 2008 - present	Large industrial sources (Columbus Stainless and Middelburg Ferrochrome, industries to the south and mine dumps to the north west, no local impact from domestic fuel burning.

▪ Wind roses

Wind roses summarise the occurrence of winds at a location, representing their strength, direction and frequency. Figure 5.19 provides the wind roses from August 2016 to July 2017 for the Middelburg Station while Table 5.13 summarises the dominant winds and wind speed for each month.

Table 5.13: Dominant wind and wind speed for Middelburg from August 2016 to July 2017 (@ Middelburg Station)

MONTH	DOMINANT WIND	FREQUENCY OF OCCURRENCE (%)	WIND SPEED (maximum) (m/s)
August 2016	SE	17%	6
September 2016	NW	20%	10.99
October 2016	NW	20%	10.99
November 2016	NW	24%	10.05
December 2016	NW	20%	6
January 2017	SE	20%	8.75
February 2017	SE	22%	6
March 2017	SE	27%	6.82
April 2017	SE	18%	4
May 2017	SE	20%	7.97



MONTH	DOMINANT WIND	FREQUENCY OF OCCURRENCE (%)	WIND SPEED (maximum) (m/s)
June 2017	NW & SE	16% & 15%	6 & 4
July 2017	SE	18%	4

As is evident from Table 5.14 and Figure 5.19b, winds in the area are relatively stable with the dominant wind directions being north westerly and south easterly winds.

This corresponds with the dominant wind directions measured at Mafube Colliery (± 2 km north west of the site). According to Zunckel (2012), approximately 45% of winds occur in the sector east to south and 20% in the southwest to west sector (Figure 5.19a). Approximately 14% of the winds come from the north westerly sector. The winds are light with 9% of all wind recorded as being less than 5 m/s (Zunckel, 2012).

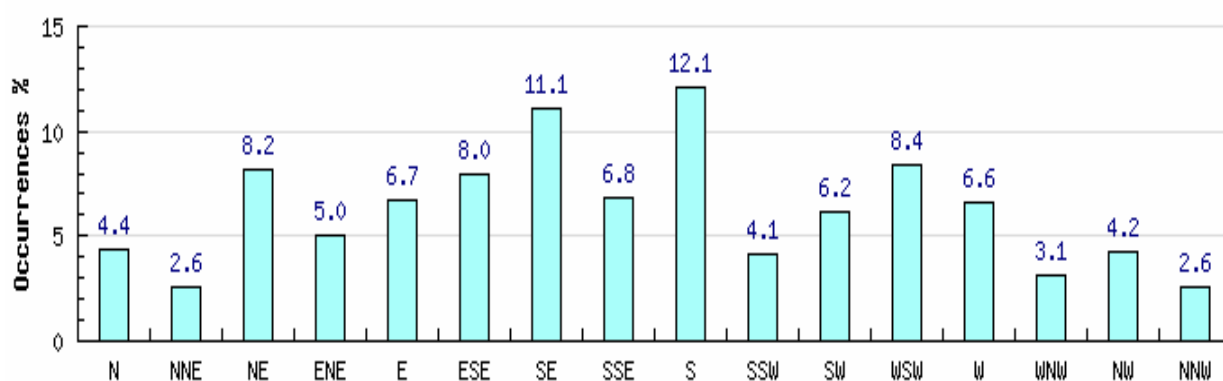
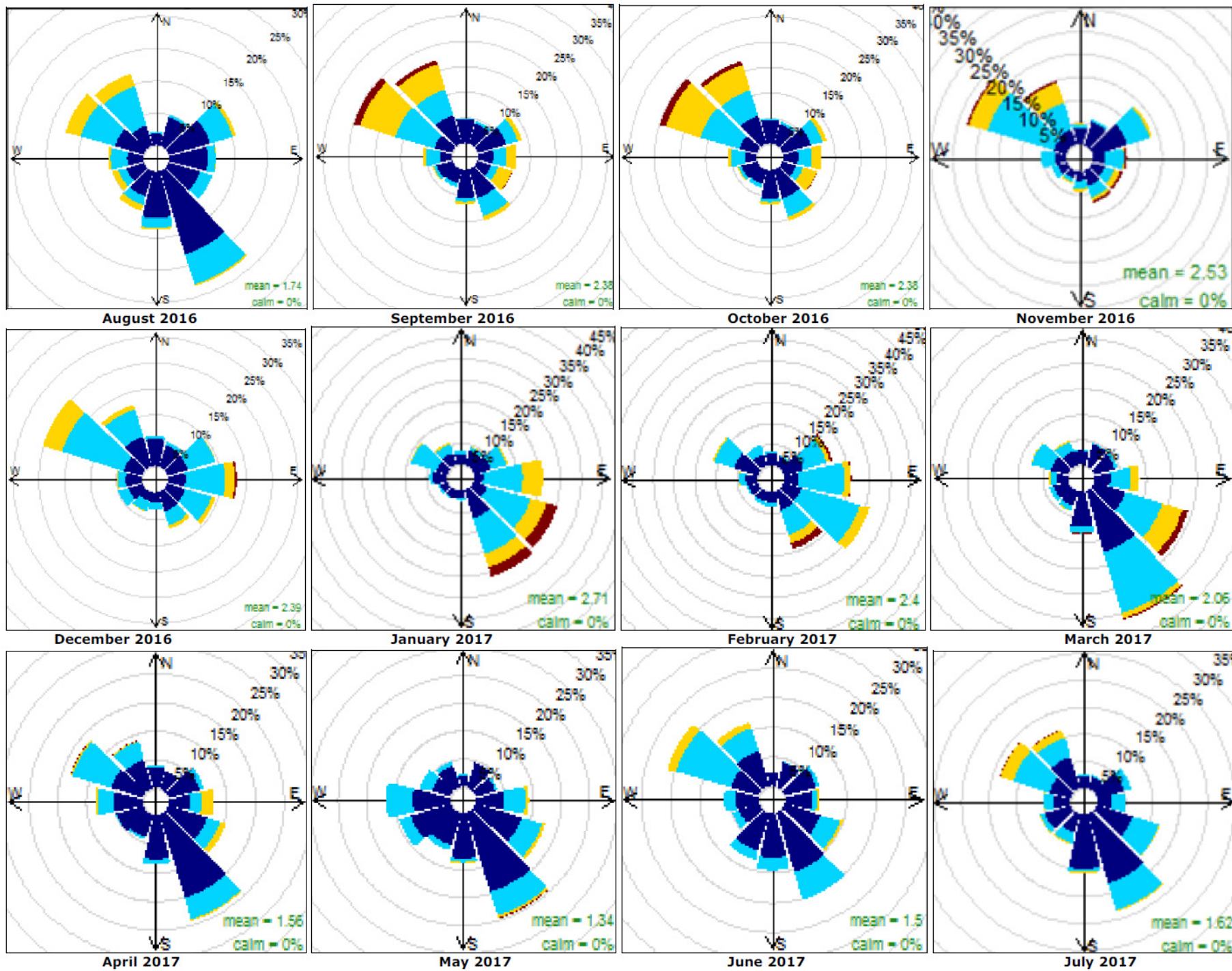


Figure 5.19a: Frequency of occurrence of wind direction at Mafube Colliery (taken from Zunckel, 2012)





telburg

Figure 5.19b:

Windroses
(South African Weather Service, 2016-1017)

▪ **Ambient air quality**

According to the HPA: Air Quality Management Plan (2011), industrial sources are by far the largest contributor of SO₂ and NO_x, accounting for approximately 99.57 % of SO₂ and 95.97% of NO_x emissions. Mining is the largest contributor of PM10 emissions.

Although the site is located approximately 30km from the industrial sources in Middelburg, other sources that could impact on the ambient air quality are located in the vicinity. Mafube Coal Mine (including open cast areas, discard dump, haul roads, a briquetting plant, etc.) is located ±2km north west of the site and Arnot Power Station is located ±12km south of the site. The ambient air quality of the site would also be impacted by agricultural practices.

Activities in the surrounding area that could potentially impact on the air quality of the site include the following:

- Agricultural activities, namely ploughing, planting and harvesting;
- Dust from traffic utilizing the surrounding gravel roads;
- Dust from mining activities (i.e. haul roads, blasting, open cast areas, crushing and screening, material handling, stockpiles and discard dump) (2km north west of the site);
- Emissions from the briquetting plant (2km north west of the site);
- Greenhouse gases (GHGs) emitted from opencast coal mines including CO₂ and possibly CH₄.
- Emissions from vehicles utilizing the nearby N4 national road (±500m south of the site);
- Smoke from cooking fires at the surrounding farm villages;
- Smoke emitted from veld fires.

5.12 Noise

In general, the ambient noise level of the site is relatively low since the site is located in a rural agricultural area.

The major contributing factor to the ambient noise level of the site would be as a result of agricultural activities and vehicles travelling on the farm roads.

Blasting at the nearby Mafube Coal Mine would also contribute to the ambient noise level during blasts. These noise generating activities do however, not occur on a continuous basis.

Traffic on the N4 national road could also impact on the ambient noise levels on site depending on the time of day, wind direction and traffic volumes.

5.13 Sites of archaeological and cultural interest

5.13.1 Cultural Heritage sensitivity

A Heritage Impact Assessment (HIA) is required in terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999) for any development or other activity that will change the character of a site and exceeds 5 000m².

A Phase I Heritage Impact Assessment (HIA) was undertaken by Dr. A. van Vollenhoven of Archaetnos Culture and Cultural Resource Consultants (referred to as Van Vollenhoven, 2017). A copy of the report is provided in

