FINAL 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: October 2018 (final)

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

CLIENT	Alzu Pig Genetics (Pty) Ltd.
CONTACT DETAILS	Private Bag X251875 Middelburg 1050 013-249 8900

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DARDLEA REFERENCE NO.	1/3/1/16/1N-138
AdiE REFERENCE NO.	BA 2017/03

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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 Final 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 Final Basic Assessment Report;*
- *information provided to interested and affected parties (to date) has been included in this Final Basic Assessment Report;*
- *inputs and recommendations from the specialist reports are included in this Final Basic Assessment Report.*

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

Signature:.....

Company:.....

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

Signature:.....

Company:.....

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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.

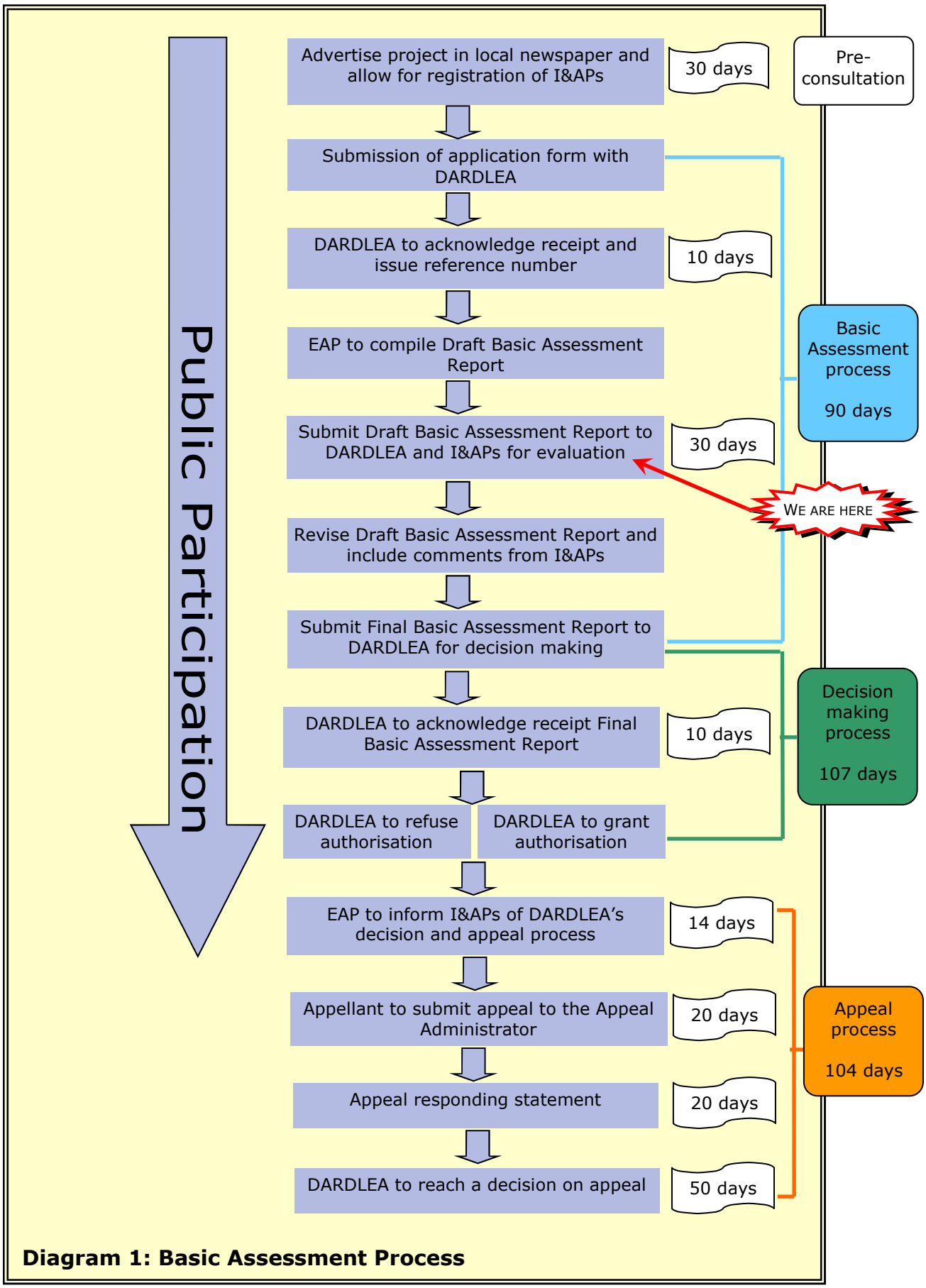

Diagram 1: Basic Assessment Process

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
Contact Person	Elizma Beukes
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
Address	P.O. Box 647 Witbank, 1035
Environmental Assessment Practitioner 1 (EAP1)	Adrienne (Adie) Erasmus *M.Sc* *Pr. Sci. Nat. (400078/96)*
Environmental Assessment Practitioner 2 (EAP2)	Riana Janse van Rensburg *M. Env. Mgt.*
Telephone number	013-697 5021
Fax number	013-697 5021
Cell number	083 271 8260
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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.)	• BEng. Civil Engineering • AutoCAD Advanced *Candidate Engineer (ECSA): 201751260* *SAICE Associate Member: 201500968*
Wetland Assessment	Ina Venter (Kyllinga Consulting)	• M.Sc (Botany) • B.Sc Hons (Botany) • B.Sc (Environmental Sciences) *SACNASP Accreditation: 400048/08*
Groundwater Assessment	C. Gouws (Geo Pollution Technologies - Gauteng (Pty) Ltd.)	• B.Sc Geology • B.Sc (Hons) Geoinformatics *SACNASP Accreditation: 117342*
Heritage Assessment	Prof Anton van Vollenhoven (Archaetnos Culture and Cultural Consultants)	• BA • BA (HONS) Archaeology • MA Archaeology • Post-Graduate Diploma in Museology • Diploma Tertiary Education • DPhil Archaeology • MA Cultural History • Management Diploma • DPhil History *ASAPA Accreditation: 166* *SASCH Accreditation: CH001*
Palaeontological Assessment	Dr Heidi Fourie (Heidi Fourie Consulting)	• B.Sc Geology and Zoology • Ph.D Palaeontology *Member: Palaeontological Society of SA.*

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, ±2km 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	25º49'07.02"S 29º46'40.25"E.
Magisterial District	Steve Tshwete Local Municipality Nkangala District Municipality
Closest Town	Middelburg - ±30km

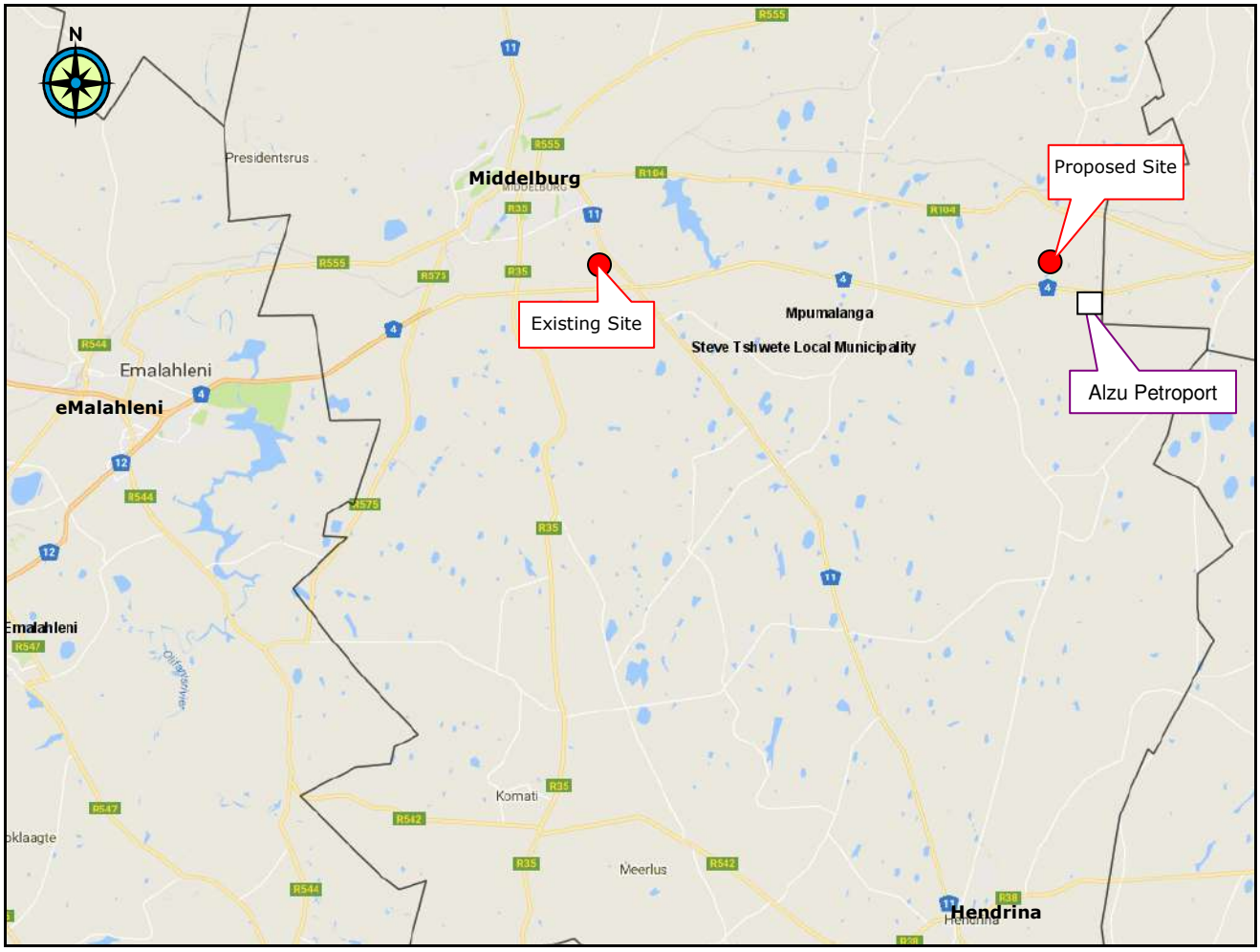


Figure 3.1: Location of existing and proposed GTC facility sites

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.

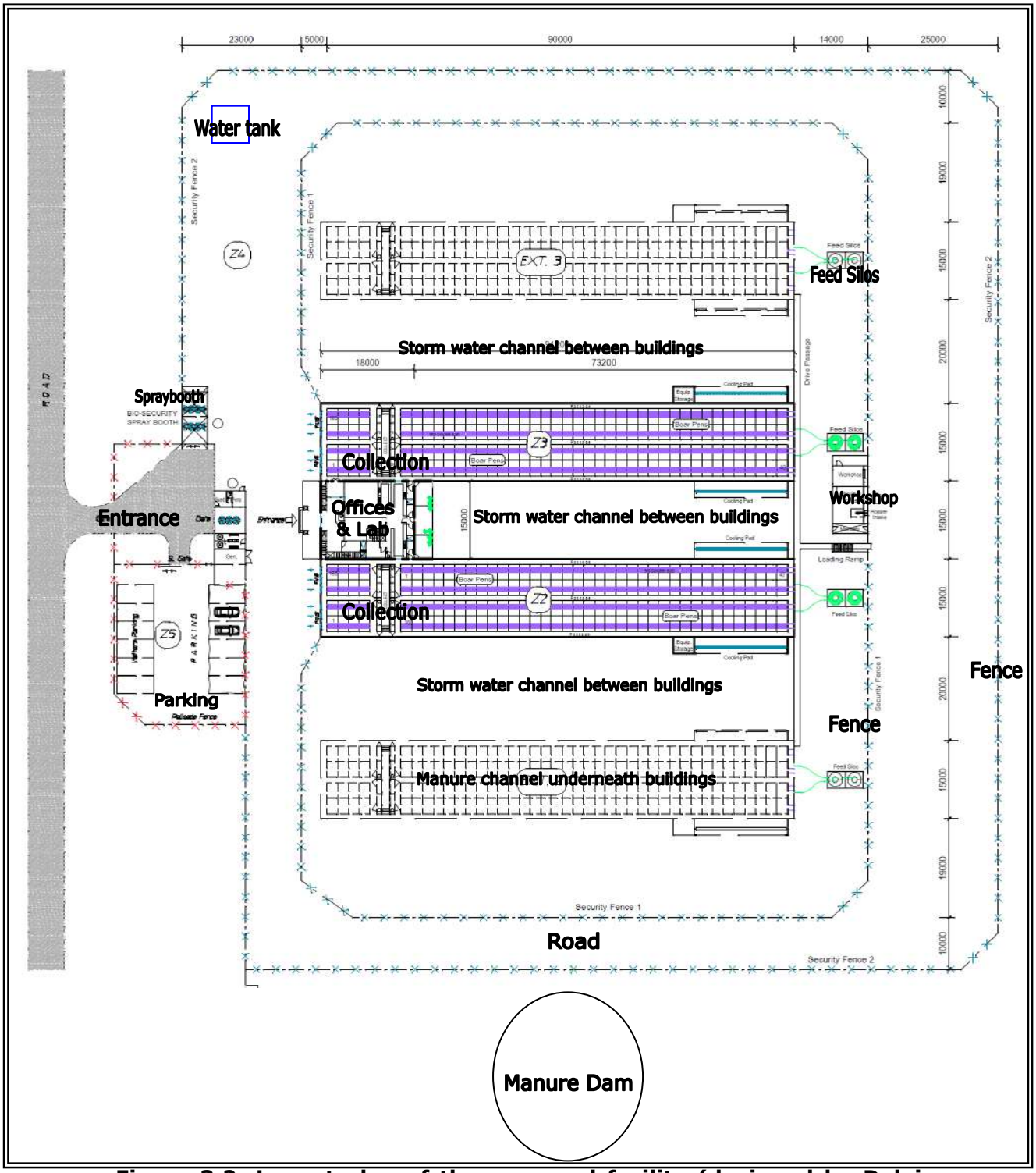


Figure 3.2: Layout plan of the proposed facility (designed by Dalein Plaasbou, 2017)

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 ±15m 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 14ºC and 21ºC. Temperatures during the summer months should not be higher than 25ºC and in the winter months, not lower than 9ºC. 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 (CO_2), methane gas (CH_4), ammonia (NH_4) and hydrogen sulphide (H_2S) (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.

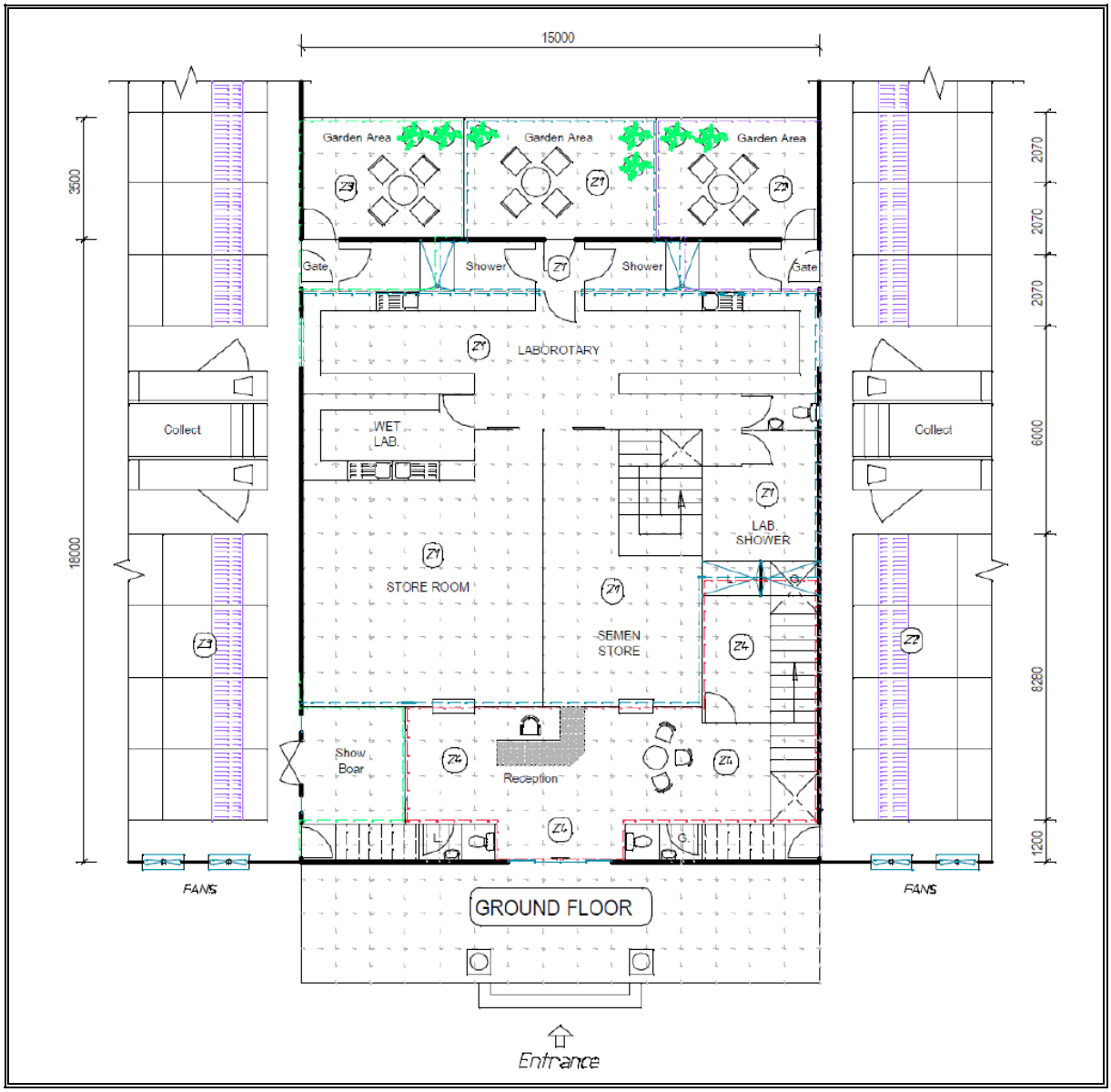


Figure 3.3a: Proposed ground floor layout for the offices and laboratory (designed by Dalein Plaasbou, 2017)

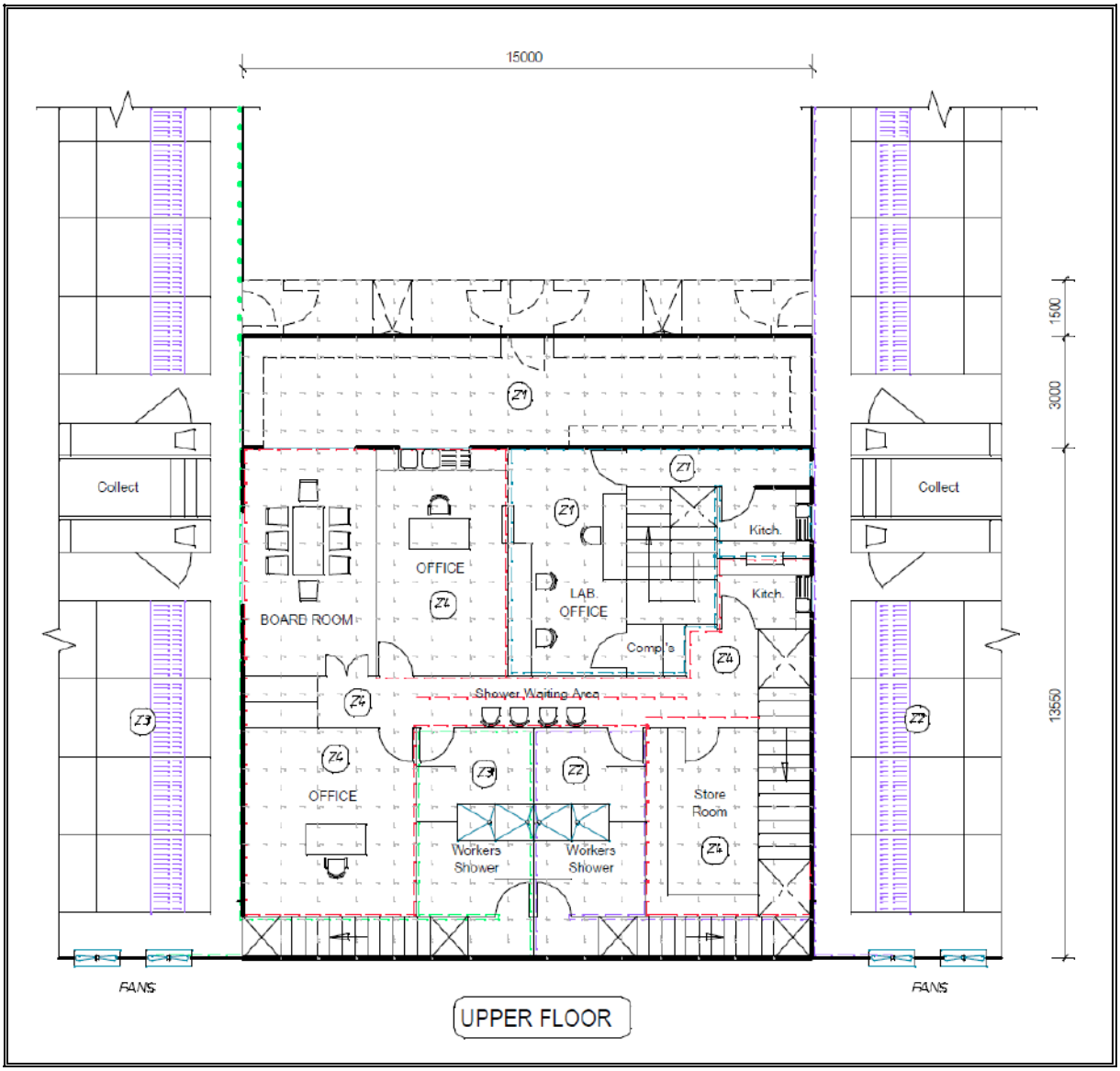


Figure 3.3b: Proposed upper floor layout for the offices and laboratory (designed by Dalein Plaasbou, 2017)

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 (20-22ºC), cold room (17ºC) and extender (34-36ºC). 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 30ºC 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 17ºC 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 m^3/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 m^3/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 m^3/annum**
TOTAL PER DAY				**16 909.75 l/day**
TOTAL PER ANNUM				**6 172.1 m^3/annum**

According to Hlasane (2018), approximately 33.82 m^3 of potable water should be stored on site to ensure a water supply for 48 hours. A storage tank of 40m^3 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 m^3/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 m^3/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 m^3 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 m^3 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 m^3 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 m^3/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.

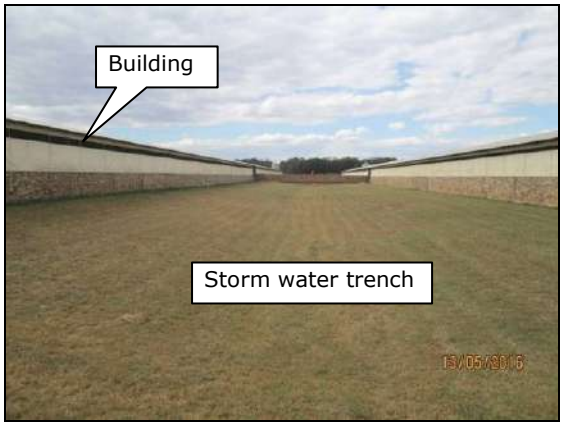


Photo 3.7: An example of a vegetated storm water trench.

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 (±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 0f 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: ▪ 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 EMPr, 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 EMPr, 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 Basic Assessment process.	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 Basic Assessment process.	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 Basic Assessment process.	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

The said property falls under the jurisdiction of the Steve Tshwete Local Municipality (MP313) and the Nkangala District Municipality.

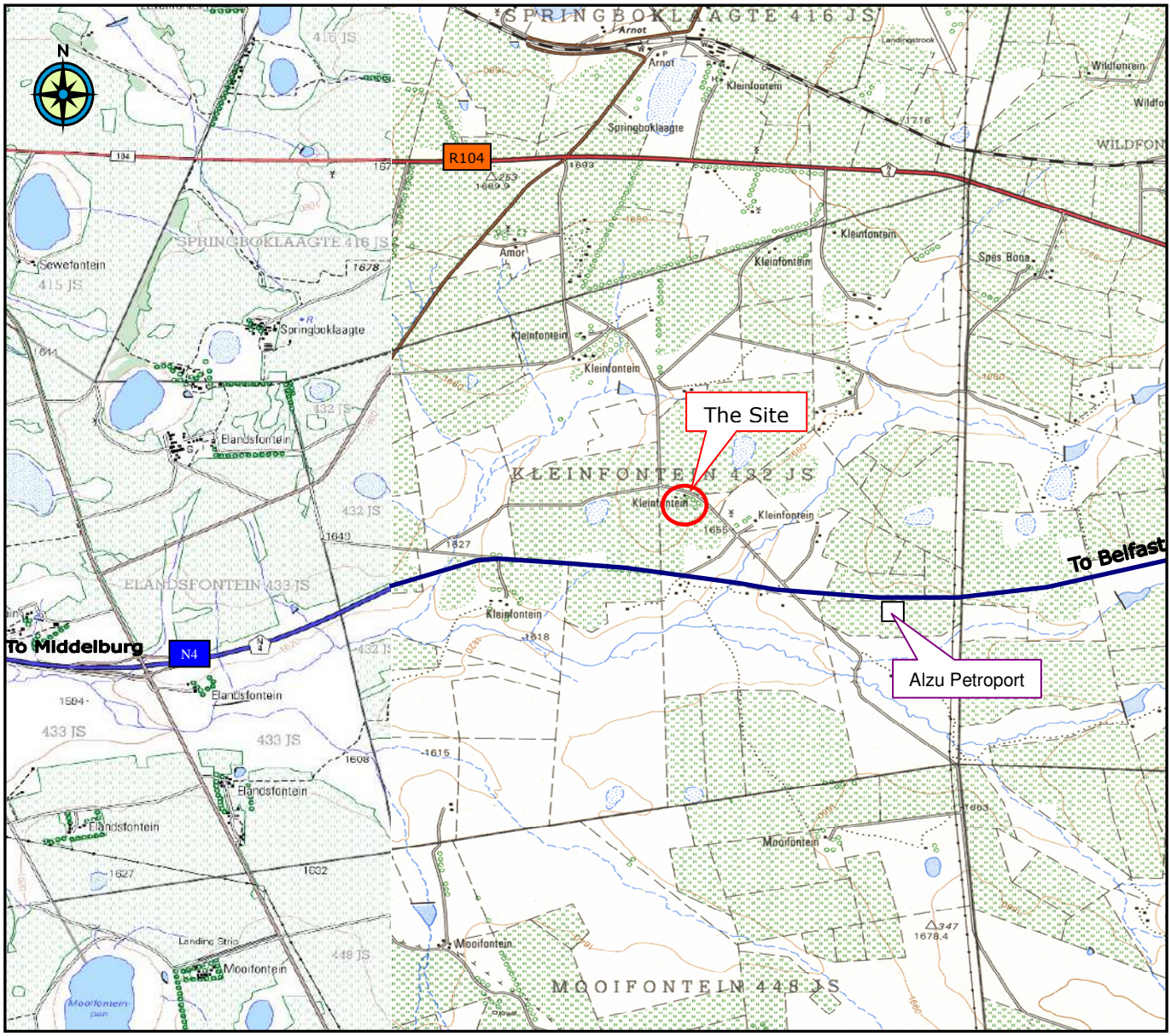


Figure 5.1: Location of site *(taken from 1: 50 000 2529 DC and DD-not to scale)*

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 (ºC)

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.

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).

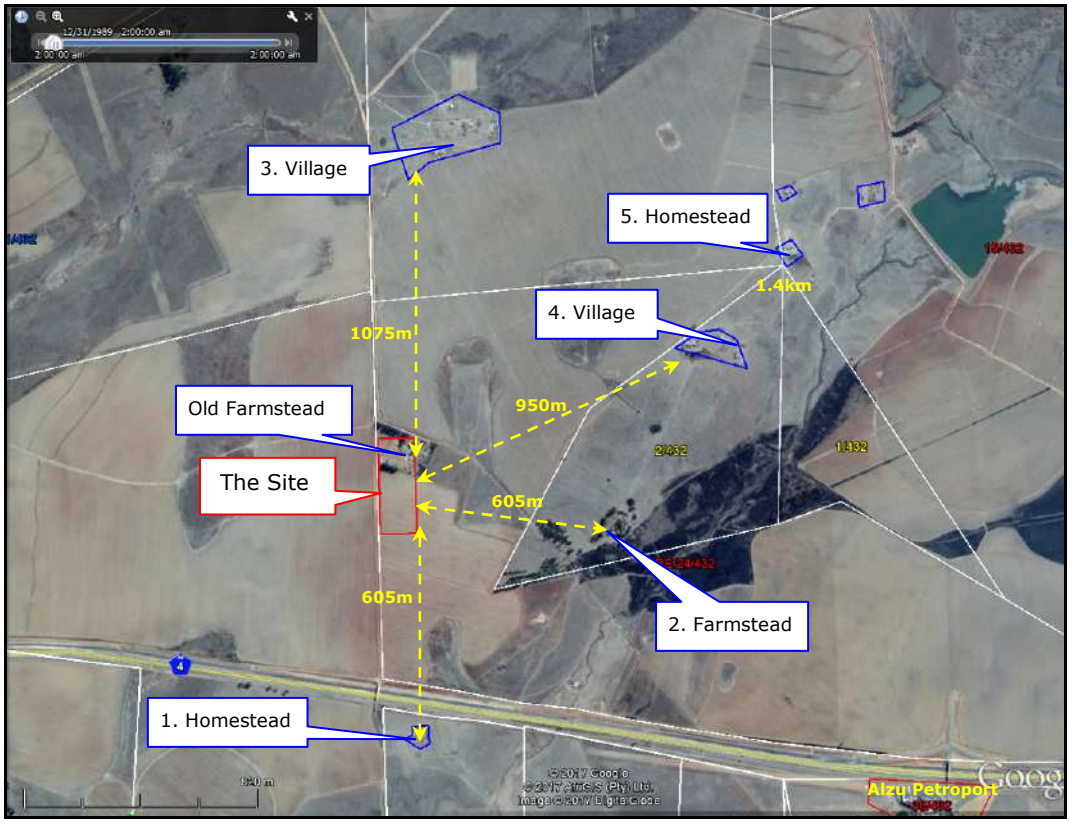


Figure 5.4: Location of homesteads/farmstead/villages in relation to the proposed site

5.4 Geology

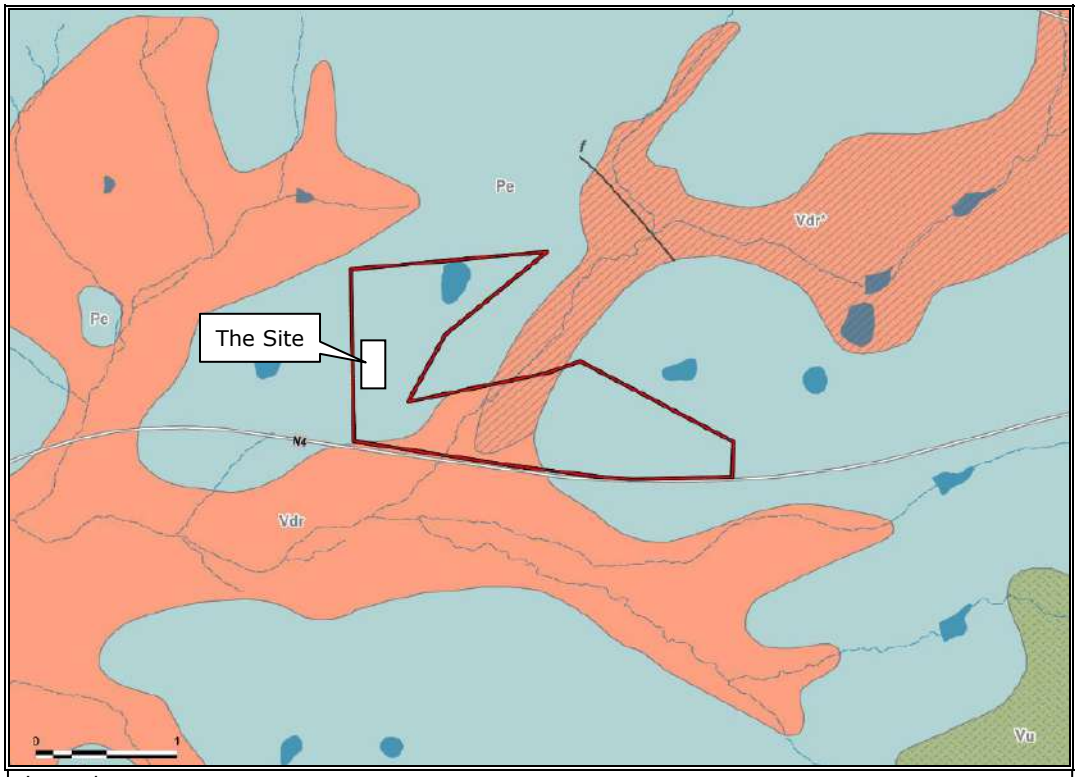
According to the 1:250 000 Geological Series (2528 Pretoria map), the said site is underlain by sandstone, shale and conglomorates of the Vryheid Formation, Ecca Group, Karoo Supergroup (Figure 5.5; Pe - blue). The Vryheid Formation has a maximum total thickness of 500m with coal seams present within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



Legend
Pe – (grey) Sandstone, shaly sandstone, grit, shale, conglomerate and coal near base and top. Vryheid Formation, Ecca Group, Karoo Supergroup. Permian.
Vdr – (striped orange) Volcanic rocks. Red granophyric rhyolite. Damwal Formation, Rooiberg Group, Transvaal Supergroup.*
Vdr - (orange) Volcanic rocks. Glassy amygdaloidal pseudospherulitic and porphyritic black rhyolite. Damwal Formation, Rooiberg Group, Transvaal Supergroup.
VU - (green) Ferrogabbro, ferrodiorite. Rustenburg Layered Suite.

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.

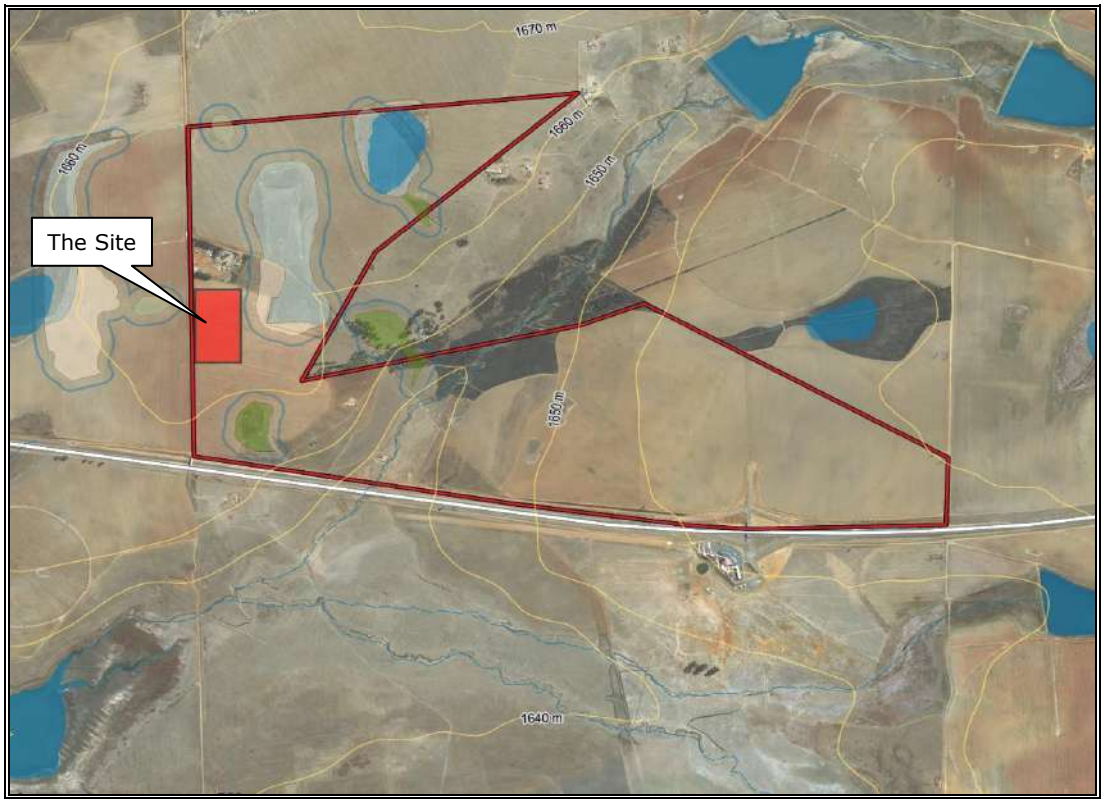


Figure 5.6: Site topography showing the 10m contours (taken from Gouws, 2018)

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 margalitic soils are rare.

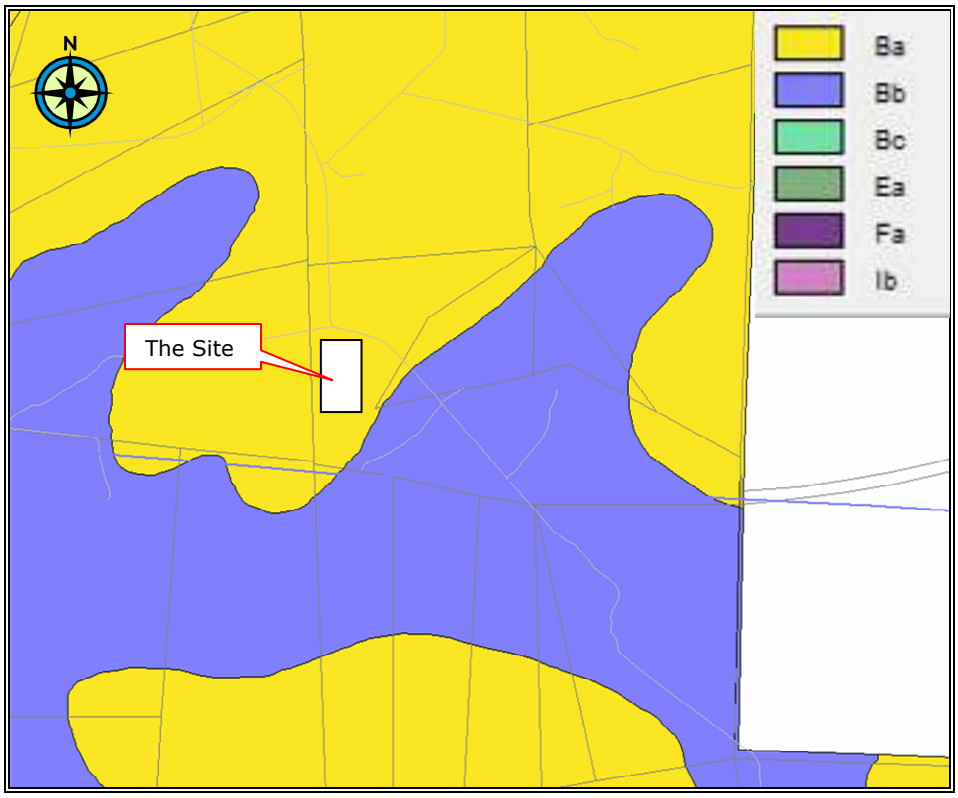


Figure 5.10: Land type of the proposed site (taken from Mpumalanga Biodiversity Conservation Plan, 2006)

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

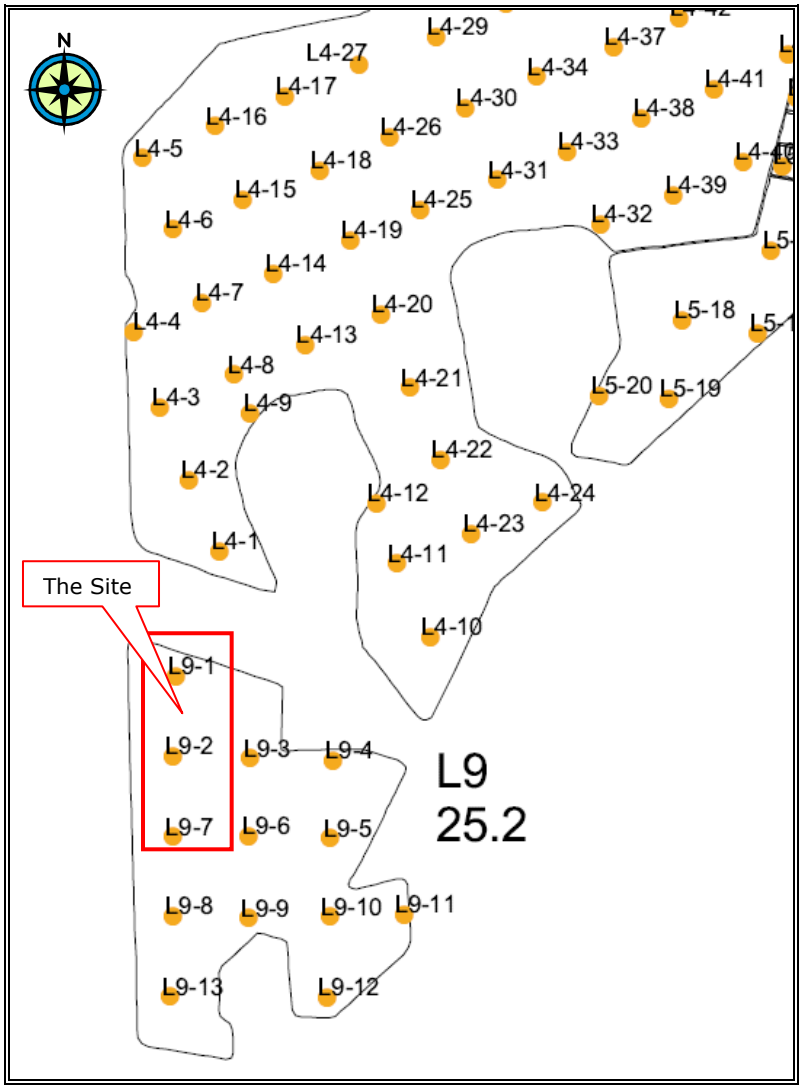


Figure 5.11: Soil sampling points (information provided by applicant)

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).

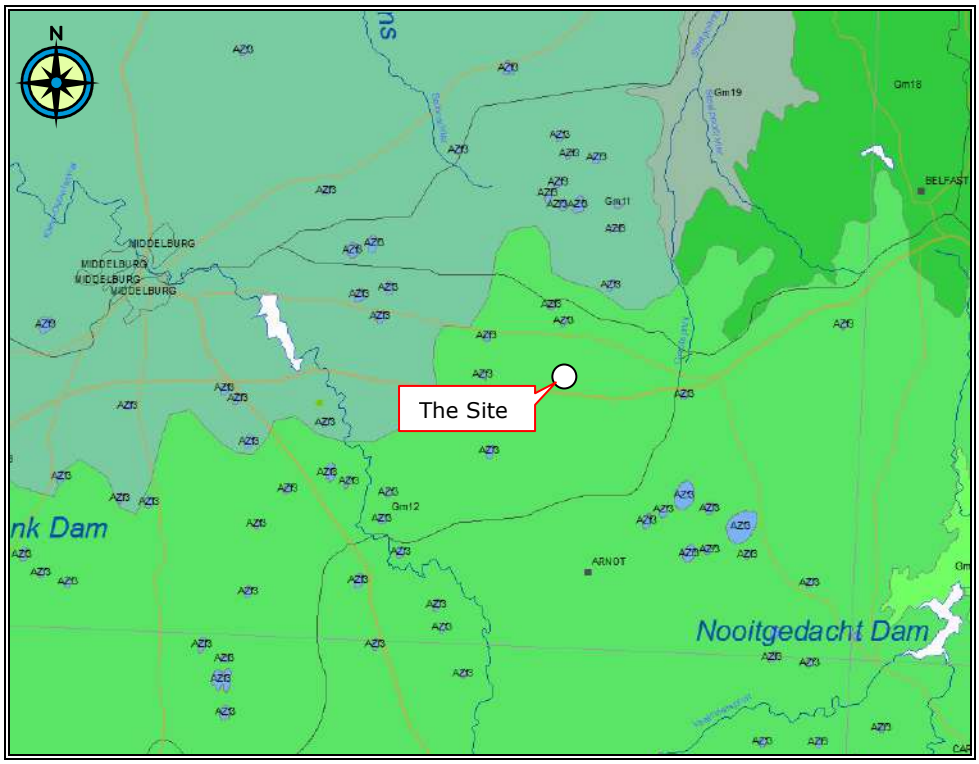


Figure 5.14: Vegetation type (taken from Mucina and Rutherford, 2006)

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.

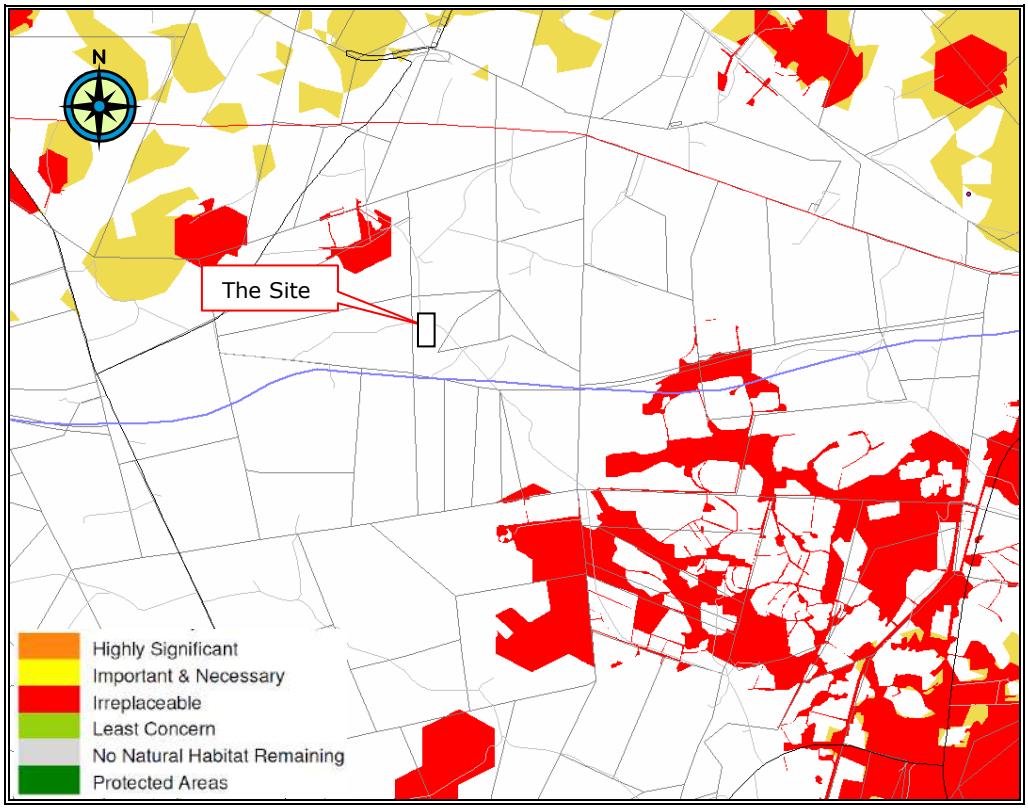


Figure 5.15a: Terrestrial biodiversity assessment of the Mpumalanga Biodiversity Conservation Plan, 2006

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 esculenthus, 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
Khadia carolinensis	Perennial, succulent	Well-drained, sandy loam soils among rocky outcrops, or at the edges of sandstone sheets, Highveld Grassland	Vulnerable
Miraglossum davyi	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
Arundo donax	Class 1b
Cirsium vulgate	Class 1b
Datura stramonium	Class 1b
Melia azedarach	Class 1b
Opuntia ficus-indica	Class 1b
Verbena bonariense	Class 1b
Verbena braziliense	Class 1b
Xanthium strumarius	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).

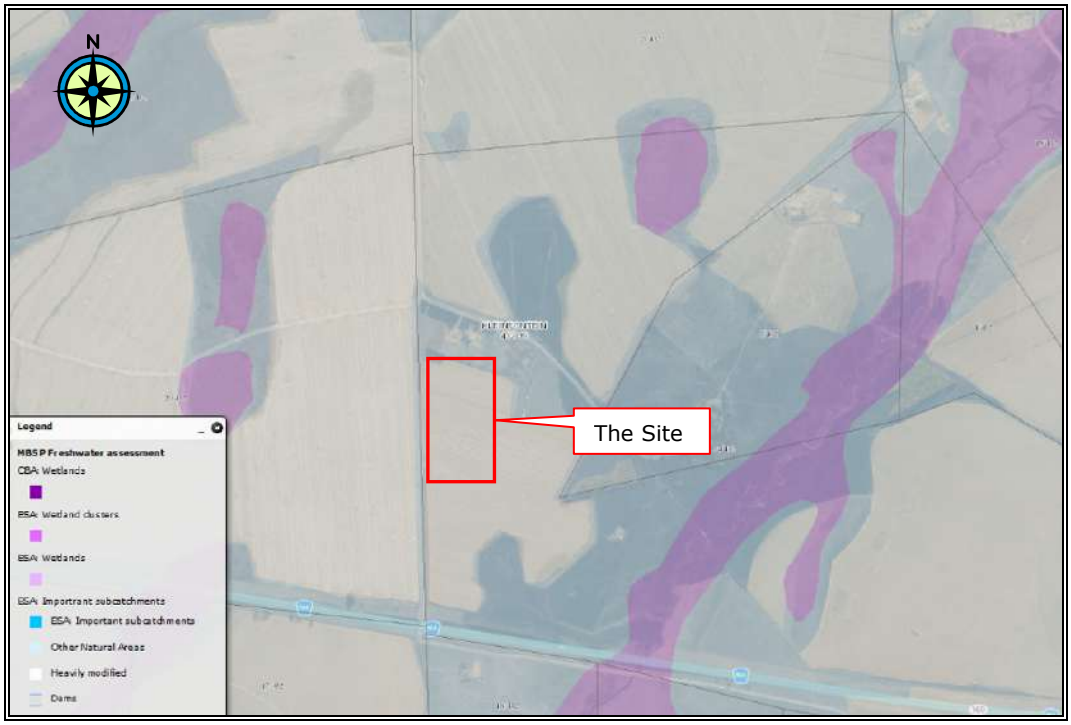


Figure 5.16: Freshwater biodiversity assessment of the Mpumalanga Biodiversity Sector Plan, 2013

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 ± 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 ±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).

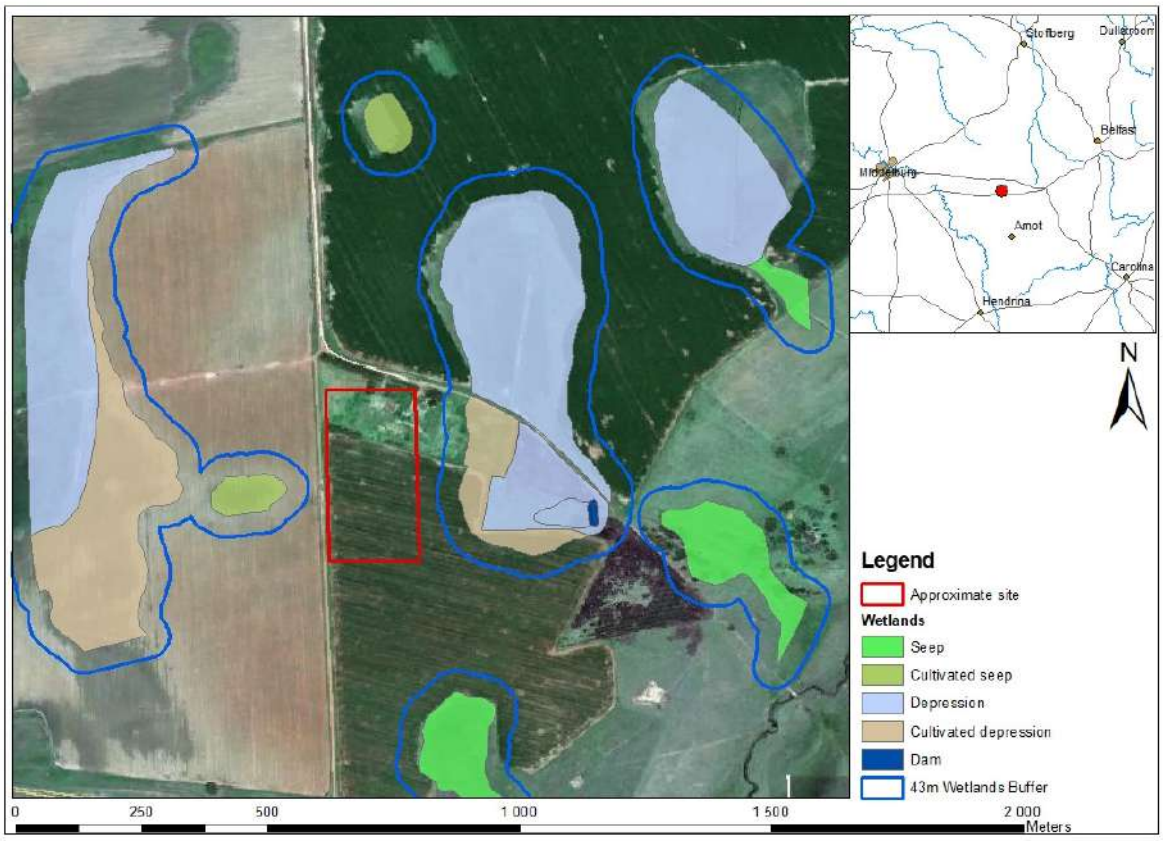


Figure 5.17: Wetland units identified (taken from Venter, 2017)

<u>Depression wetlands (Figure 5.17)</u>
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).

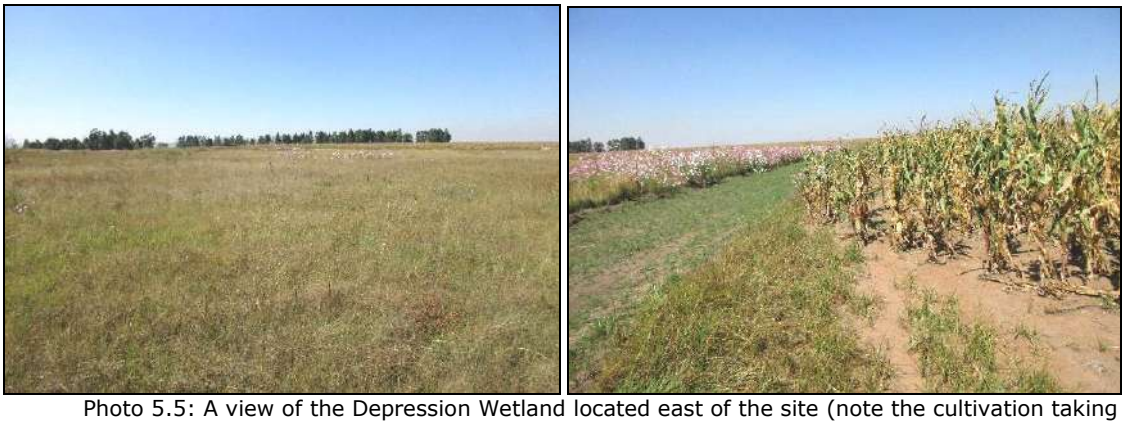


Photo 5.5: A view of the Depression Wetland located east of the site (note the cultivation taking place) (taken from Venter, 2017).

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 esculenthus, 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.

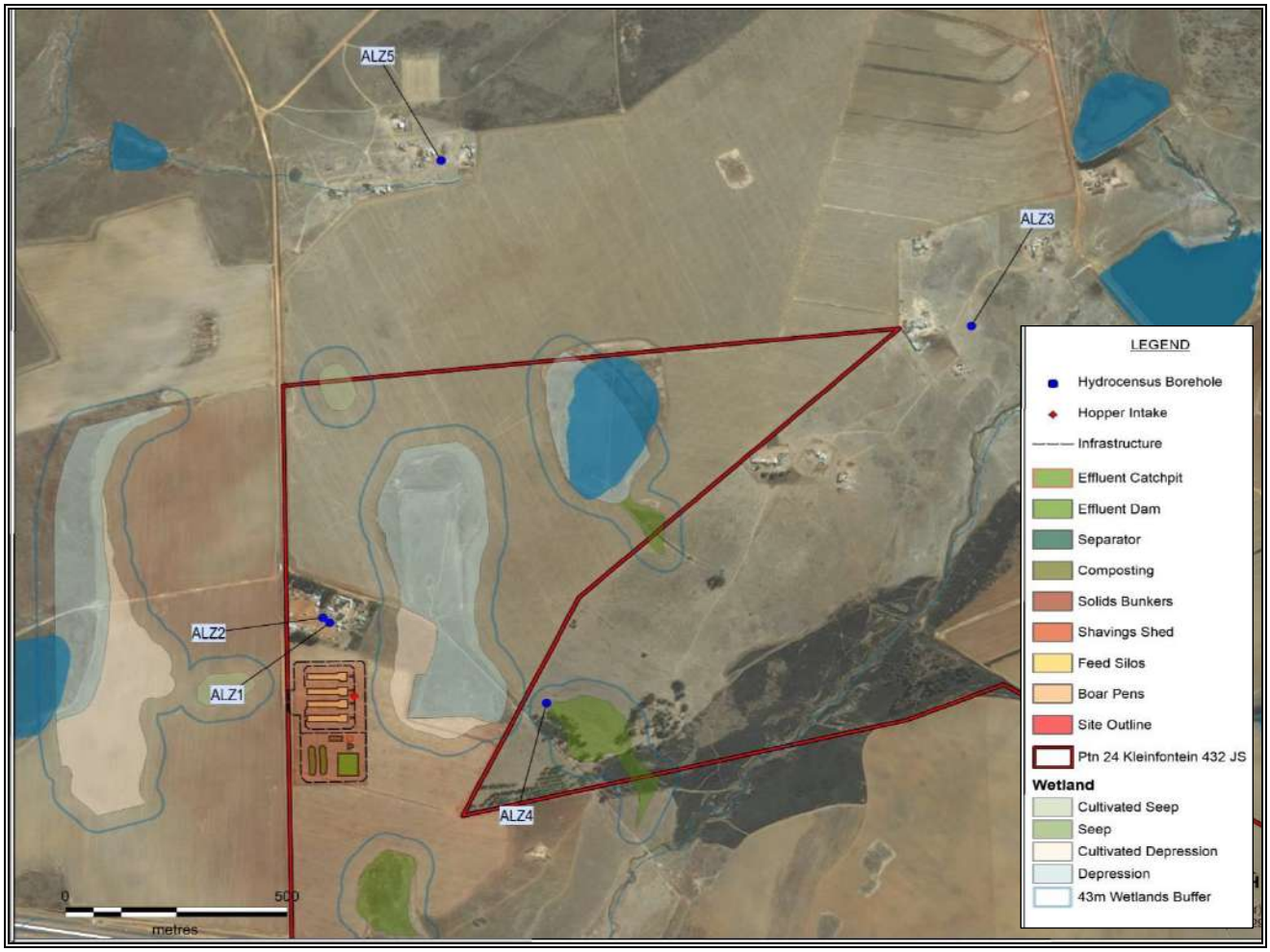


Figure 5.18: Hydrocensus points in relation to the site (taken from Gouws, 2018)

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^{0}C	EC	mS/m	≤ 170	Aesthetic	33	42.5	33.3	32.9	31.8
Total Dissolved Solids	TDS	mg/liter	≤ 1200	Aesthetic	214	276	217	214	207
pH at 25^{0}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
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 m^3/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 m^3/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 SO_2 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 SO_2 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, PM2.5, SO_2, NO, NO_2, NO_x, O_3, 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 (±2km north west of the site). According to Zunkel (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).

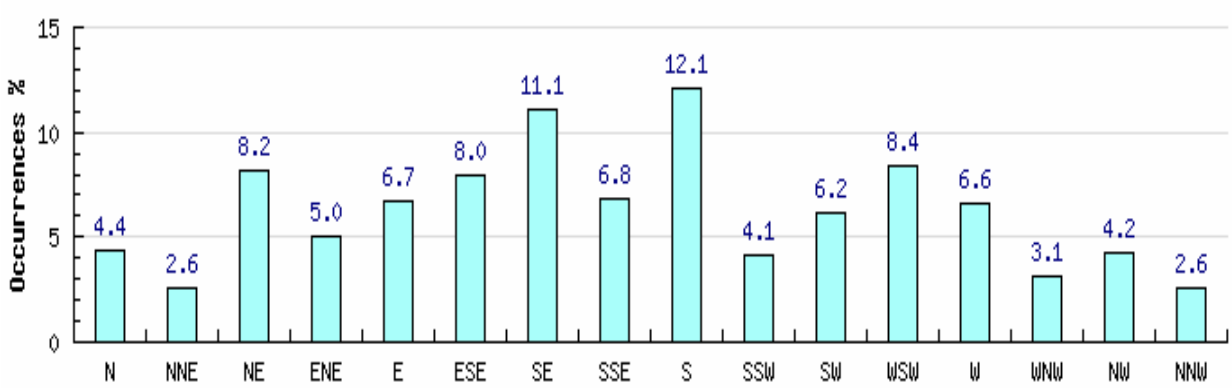


Figure 5.19a: Frequency of occurrence of wind direction at Mafube Colliery (taken from Zunckel, 2012)

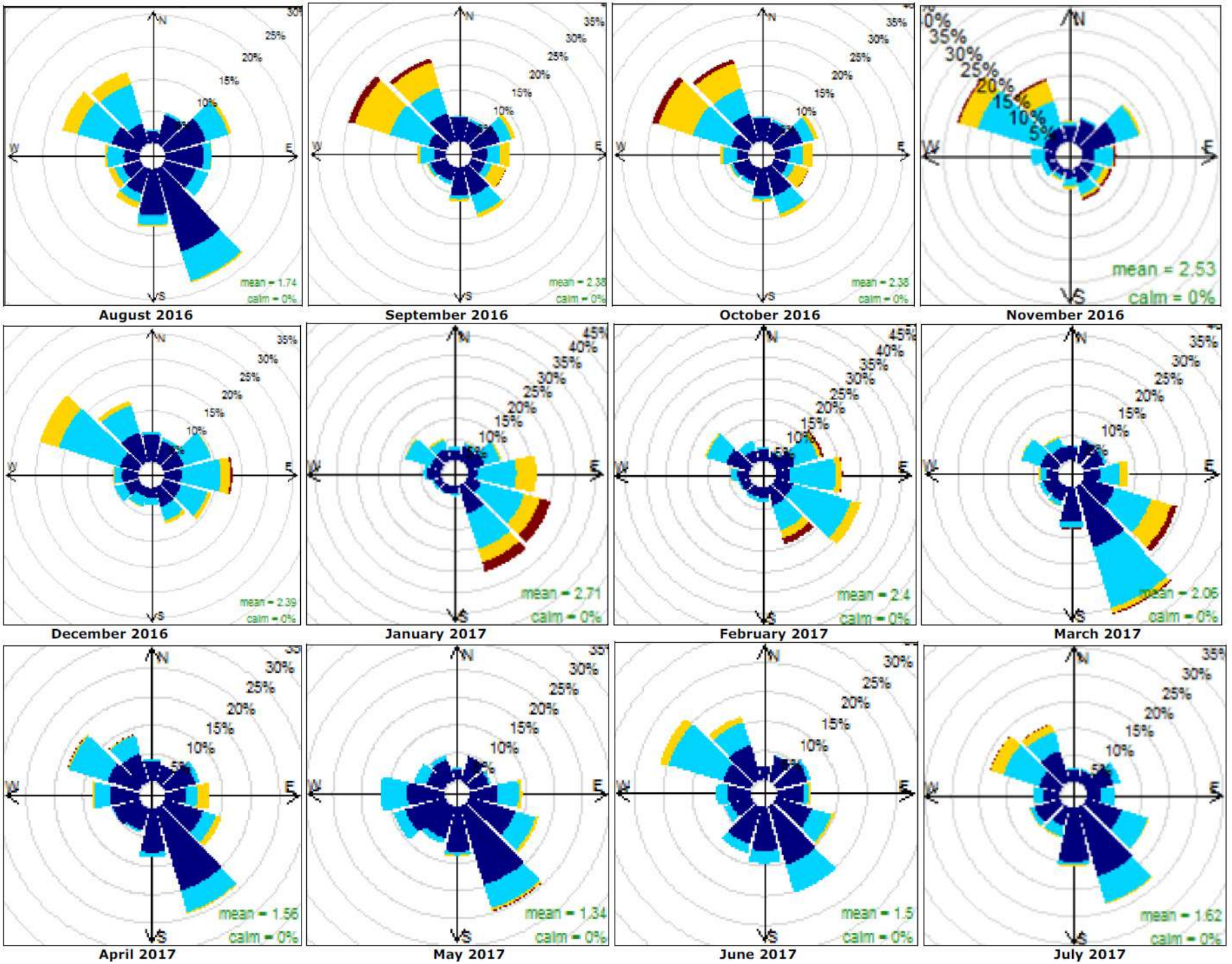


Figure 5.19b:

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 SO_2 and NO_x, accounting for approximately 99.57 % of SO_2 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 CO_2 and possibly CH_4.
- 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 000m^2.

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

Appendix 5. This report should be consulted with regards to methodology used and limitations of the study.

Van Vollenhoven (2017) indicated that the environment around Middelburg, Wonderfontein and Belfast is not known for containing Stone Age Sites. The closest recorded sites are at Carolina, Badplaas and Machadodorp. The environment is such that it does not provide natural shelter. **No Stone Age sites were noted** on or near the proposed site.

In the area around Wonderfontein, Belfast, Lydenburg, Nelspruit, Machadodorp and Badplaas, a total of 1792 Late Iron Age sites have been recorded. This type of environment was suitable to Iron Age people since it provided ample building material, water grazing and fuel. However, **no Iron Age sites were identified** on or near the proposed site.

The **Historical Age** started with the first recorded oral histories in the area. Since less time has passed, much more cultural heritage resources from this era have been left on the landscape. All cultural resources older than 60 years are potentially regarded as part of the heritage and studies are required to determine their significance.

According to Van Vollenhoven (2017), only two buildings (an old farm house and an outbuilding; Photos 5.9 to 5.11) within the old farmstead complex are older than 60 years. These buildings are located outside of the development footprint.

The farmhouse is still in good condition on the outside, but has been stripped of interior features. Further deterioration should be prevented. Van Vollenhoven (2017) recommended that these buildings (old farmstead and outbuilding) be used as part of the GTC facility (e.g. as offices), if possible.

The other buildings within the old farmstead complex are younger than 60 years and have no heritage significance.

Photo 5.9: A view of the farm house (taken from Van Vollenhoven, 2017).

Van Vollenhoven indicated that no graves were noted on site, within the old farmstead complex or in close proximity of the site.

Photo 5.10: A view of the inside of the farm house (taken from Van Vollenhoven, 2017).

Photo 5.11: A view of the outbuilding (taken from Van Vollenhoven, 2017).

Conclusion:
Van Vollenhoven (2017) concluded that the project may be exempted from a HIA since the area is completely disturbed and will probably not yield substantial heritage features. However, the developer must take note of the historical buildings (old farmstead and outbuilding) outside of the development footprint area and ensure the protection/utilization thereof.

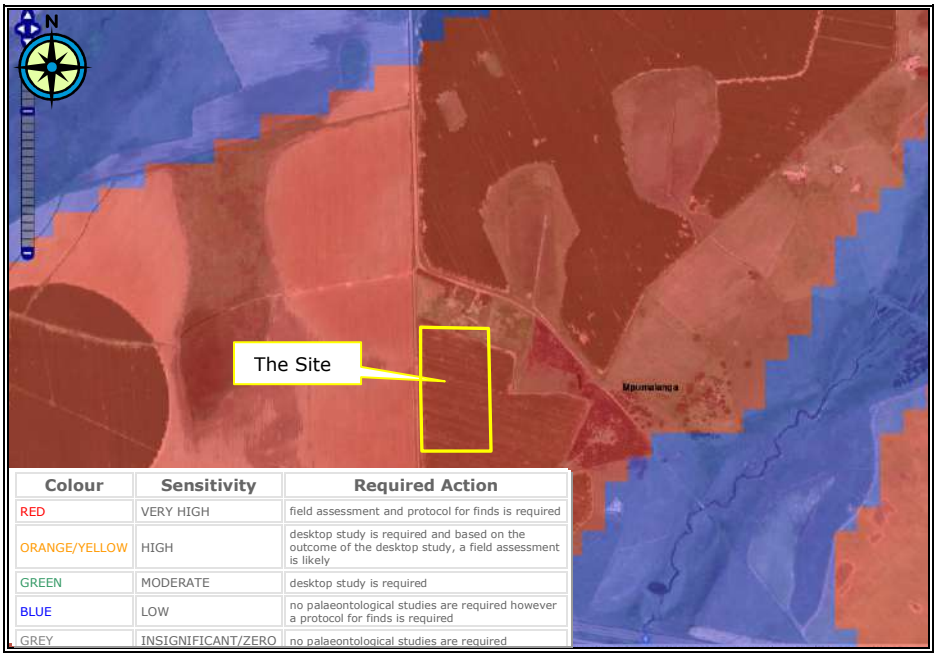
In addition, Van Vollenhoven (2017) indicated that the subterranean presence of historical sites, graves, objects or features may be uncovered during construction, in which case work must cease immediately and an archaeologist contacted.

5.13.2 Palaeontological sensitivity

According to the palaeontological map supplied by the South African Heritage Resources Agency (SAHRA, 2018), the palaeontological sensitivity of the proposed site is deemed as very high (area indicated in red; Figure 5.20). In view of this, a field assessment and protocol for finds are required as indicated in Figure 5.20.

Dr. Heidi Fourie (an accredited palaeontologist) of Heidi Fourie Consulting was appointed to conduct a Palaeontological Impact Assessment – Field Study (referred to as Fourie, 2017). A copy of the said report is provided in Appendix 6 and should be consulted with regards to the methodology used and the limitations of the study.

The aim of a Phase 1 Field Study is to ascertain if any palaeontological sensitive material is present within the proposed development site, to indicate the potential impact on the fossil heritage and state if any mitigation or conservation measures need to be implemented.



Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required

Figure 5.20: Requirement for palaeontological study (taken from SAHRA, 2018)

The palaeontological sensitivity of a site is closely related to the underlying geology, since fossils mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature.

According to the 1: 250 000 Geological Series (number 2528 Pretoria), the proposed site is underlain by shale, shaly sandstone, grit and sandstone of the Vryheid Formation, Ecca Group, Karoo Supergroup. Volcanic rocks of the Damwal Formation, Rooiberg Group, Transvaal Supergroup are present towards the north and south of the site.

The Vryheid Formation, Ecca Group is rich in plant fossils such as the *Glossopteris* flora represented by stumps, leaves, pollen and fructifications (Appendix 1 of Appendix 6). *Glossopteris* trees rapidly colonised the large deltas along the northern margin of the Karoo Sea. Dead vegetation accumulated faster than it could decay, and thick accumulations of peat formed, which were ultimately converted to coal.

Coal seams are present in the Vryheid Formation within the sandstone and shale layers. Borehole logs in the coalfields show the following layers; soil, shale and sandstone, shale and sandstone interbedded, sandstone, coal, conglomerate reworked diamictite, Dwyka Tillite, and the Pre-Karoo Basement (Fourie, 2017).

Fossils are mainly present in the grey shale which is interlayered between the coal seams (Kent, 1980; Visser, 1989). The fossils are not very rare and also occur in other parts of the Karoo stratigraphy. A locality close to Ermelo, also Vryheid Formation, has yielded *Scutum, Glossopteris* leaves,

Neoggerathiopsis leaves, the lycopod *Cyclodendron leslii,* and various seeds and scale leaves (Prevec 2011).

The proposed development (including the cultivated land south of the old farmstead) will take place on the Vryheid Formation known for its plant fossils. The palaeontological sensitivity for the **Vryheid Formation** is '**Very High**' as a result of the coal and shale layers.

The palaeontological sensitivity of the **Damwal Formation** (located north and south of the site; Figure 5.20) is **'Very Low'** with no fossils recorded.

Potential threats of the development were identified as: earth moving equipment/machinery (for example front end loaders, excavators, graders, dozers) during construction, the sealing-in or destruction of fossils by development, vehicle traffic and human disturbance.

Fourie (2017) raised no objection to the proposed development and indicated that the development may go ahead with caution. A Phase 2 Palaeontological Impact Assessment is not required since no surface fossils were found during the walk through. It is not anticipated that any surface fossils will be present in the cultivated land around the old farmstead complex.

However, special care must be taken during the construction phase (e.g. digging, drilling, blasting, excavating of foundations, removal of overburden, etc.) as a site visit may have missed a fossiliferous outcrop. A protocol for finds and management plan are provided in Appendix 2 of Appendix 6.

5.14 Sensitive landscapes

No wetlands are present on site as indicated in Section 5.9. Depression and Seep wetlands are however, located near the proposed site (Figure 5.17). According to Venter (2017), the identified wetland areas are considered to be of high sensitivity as indicated in Section 5.9. Venter (2017) recommended that no development takes place within the 43m buffer zone (Figure 5.17).

No heritage resources (e.g. graves, historic buildings, etc.) are present on site as indicated in Section 5.13. Two buildings (old farmstead and outbuilding) older than 60 years are however, present at the old farmstead complex (Photos 5.10 and 5. 11). Further deterioration of the said buildings should be prevented. Van Vollenhoven (2017) recommended that these buildings be used as part of the GTC facility (e.g. as offices), if possible.

5.15 Visual aspects

The said site is located within a rural agricultural area on property belonging to the applicant.

The site is fairly flat with a gentle slope in a south easterly direction towards an unnamed stream (Figure 5.6).

The site is highly visible from the surrounding agricultural lands, gravel access road and old farmstead complex.

The site is screened from the village located towards the north (number 3; Figure 5.4) by the large Pine trees around the old farmstead complex.

It is unlikely that the site is visible from the other residences in the area (numbers 1, 2, 4 and 5; Figure 5.4) due to the distance from the site and the undulating topography (see Figure 5.21 as an example).

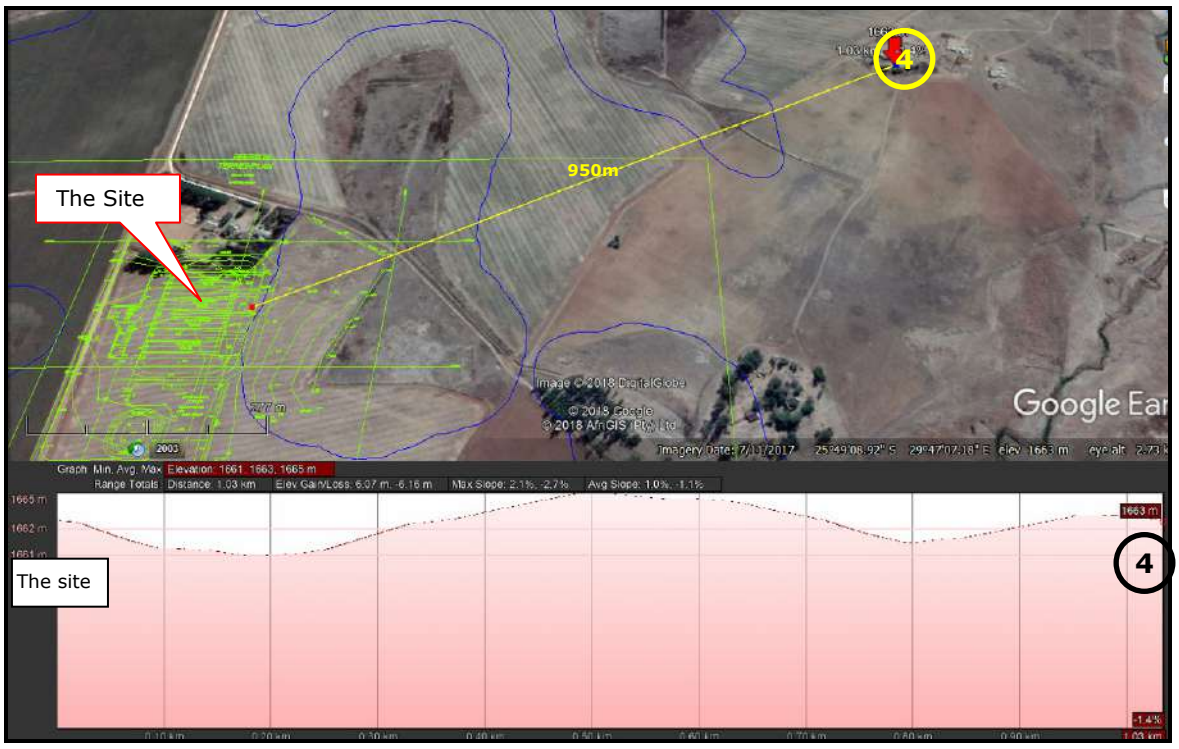


Figure 5.21: An example of the undulating topography present between the site and nearby villages/homesteads.

A steep embankment is present adjacent to the N4 national road, which screens the site from motorists.

5.16 Traffic

Two access roads to the proposed site are available. Access Road 1 (gravel road) extends from Alzu Petroport, across the N4 national road (at an existing bridge crossing) in a northerly direction towards the proposed site (Figure 5.22). Access Road 2 (gravel road) extends from the Arnot road, along the southern boundary of Mafube Coal Mine and then in a southerly direction towards the proposed site (Figure 5.22).

The gravel roads are mainly utilized by the applicant, his workers and surrounding landowners/residents. Mafube Coal Mine may also utilize Access Road 2 even though the main entrance to the mine is from the R104 provincial road. Traffic volumes in the area are thus very low.

The N4 national road is located approximately 500m south of the site and the R104 provincial road is located approximately 3.6km to the north (Figure 5.22).

Figure 5.22: Access roads to the site

5.17 Sense of place

The site is located within a rural agricultural area, approximately 30km east of Middelburg (Figure 5.1). The current sense of place is rural/agricultural.

The majority of the site and surrounding area is cultivated (Figure 5.4). Development in the area includes the N4 national road, gravel roads, Mafube Coal Mine, Alzu Petroport and scattered farmsteads/homesteads.

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 proposed site is indicated as 'Mining and Agriculture' in the Steve Tshwete Local Municipality Spatial Development Framework (2015) (Figure 5.23). The proposed development will thus be in line with the SDF (2015) as the land use will remain agriculture.

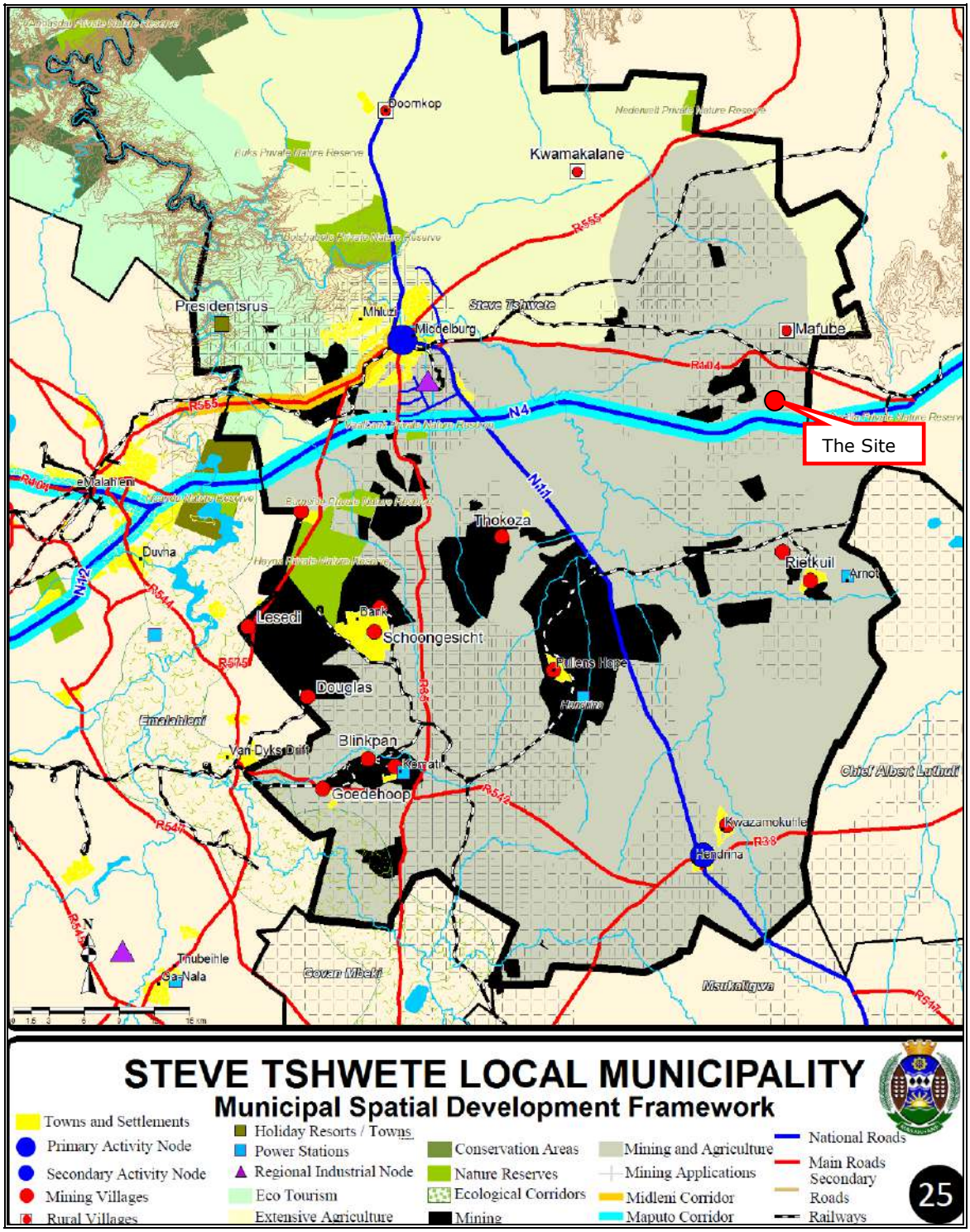


Figure 5.23: Steve Tshwete Local Municipality Spatial Development Framework (2015)

SECTION 6: DESCRIPTION OF THE PUBLIC PARTICIPATION PROCESS

The public participation process is defined in the Public Participation (PP) Guideline (2017) as *"a process by which potential interested and affected parties are given opportunity to comment on, or raise issues relevant to, the application.*"

According to the PP Guideline (2017), some characteristics of a comprehensive PP process include providing role-players with clear, accurate and understandable information about the activity, allowing them to voice their support, concerns and questions regarding the project and encouraging transparency and accountability in decision-making.

Interested and affected parties/role players also have a responsibility towards ensuring a successful public participation process and must ensure that:

a. *comments are submitted within the specified timeframes or any extension of a timeframe agreed to by the applicant or the EAP;*
b. *comments are submitted directly to the EAP; and*
c. *any direct business, financial, personal or other interest which the I&AP may have in the approval or refusal of the application is disclosed to the EAP.*

This section of the report provides an overview of the public participation process followed to date and represents the Comments and Response Report as required in terms of Section 44 of the EIA Regulations, 2014 (as amended) and the PP Guideline, 2017.

The public participation process was designed to satisfy the requirements of Chapter 6 and Appendix 1 of the EIA Regulations, 2014 (as amended) as well as the PP Guideline, 2017.

The following information is provided in this section of the report:

- Details regarding the advertising of the project (Section 6.1);
- Comment received in response to advertising and the distribution of the Background Information Document (Sections 6.2 to 6.8);
- A list of registered interested and affected parties, stakeholders and government departments (Section 6.5);
- A map indicating directly affected and adjacent landowners (Figure 6.2);
- A summary of the comments received from I&APs and a response from the EAP (Table 6.6).
- Supporting documentation e.g. copies of e-mails, notices, Background Information Document (BID), comment sheets, etc. (Appendices 7, 8 and 9).

6.1 Advertising of the project

6.1.1 Press advertising

A block advert (150mm x 95mm), according to the Environmental Impact Assessment Regulations, 2014 (as amended), was placed in the local newspaper, Middelburg Observer, on Friday, 11 August 2017. A copy of the advert is provided in Appendix 7.

The Middelburg Observer is distributed in Middelburg, Belfast, Hendrina, eMalahleni, Groblersdal and surrounding areas to more than 285 distribution points with approximately 21 500 copies sold each Friday.

6.1.2 On-site advertising

Notices according to the Environmental Impact Assessment Regulations, 2014 (as amended), were displayed at the following locations:

- On-site at the access gate to the site (A1; Figure 6.1 - Photo 6.1);
- Along the gravel road between the Alzu Petroport and the site (A3; Figure 6.1 – Photo 6.2);
- Along the gravel road between Mafube Coal Mine and the site (A3; Figure 6.1 - Photo 6.3);
- At the Alzu offices (A3).

A copy of the notice was also loaded onto the company website: http://adienvironmental.co.za.

A copy of the notice is provided in Appendix 7.

It should be noted that the A1 notice was 594 mm x 841 mm and the A3 notices 416mm x 295mm (A3) in size.

6.1.3 Informing I&APs via the internet

A copy of the following documentation was loaded onto the AdiEnvironmental cc. website (http://adienvironmental.co.za):

- Copy of the notice;
- Background Information Document (BID; Appendix 8).

This information was available on the website for the duration of the basic assessment phase.

A copy of the webpage printouts is provided in Appendix 7.

6.1.4 Feedback from the advertising process

Only two people registered as interested and affected parties in terms of the advertising process, namely:

- Mr. S. Skosana - telephonically on 24 August 2017 (see Section 6.4.2).
- Councillor J. Matshiane - email dated 30 August 2017 (see Section 6.3.6).

There was thus no need for a public meeting.

6.2 Directly affected landowner/user

Alzu Pig Genetics (Pty) Ltd/Statutis Trading (Pty) Ltd

The proposed development site is located on the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS (Figure 5.1) which is registered to Statutis Trading (Pty) Ltd.

Alzu Pig Genetics (Pty) Ltd. (i.e. the applicant) and Statutis Trading (Pty) Ltd. (i.e. the landowner) are both wholly owned subsidiaries of Du Toit Zoe 8 (Pty) Ltd. A copy of the Deeds Office Property report and a letter from the property owner giving permission for the proposed facility are provided in Appendix 1.

No outside party will thus be directly impacted by the proposed project.

Figure 6.1: Aerial view of notice placements

6.3 Identified local authorities/government departments and stakeholders

Table 6.1 provides an indication to which local authorities/government departments and stakeholders Background Information Documents (BIDs; Appendix 8) were forwarded in order to inform them of the proposed project and to obtain their issues of concern.

Table 6.1: Identified local authorities/government departments and stakeholders who received BIDs

AUTHORITY/ STAKEHOLDER	CONTACT PERSON	CORRESPONDENCE SENT	COMMENTS
Department of Agriculture, Forestry and Fisheries (DAFF)	F. Mashabela	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	Yes. See Section 6.3.1
Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) - Directorate: Land Use and Soil	J. Venter	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	Yes. See Section 6.3.2

AUTHORITY/ STAKEHOLDER	CONTACT PERSON	CORRESPONDENCE SENT	COMMENTS
Management – Ermelo			
Department of Co-operative Governance and Traditional Affairs (COGTA)	M. Loock	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Department of Mineral Resources	S. Mathavela	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Department of Rural Development and Land Reform (Commission on Restitution of Land Rights)	F. Mdushani	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	Yes. See Section 6.3.3
Department of Water and Sanitation (DWS)	N.S. Maliaga	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Distriks Landbou Unie Middelburg	J.P.J. Schmahl	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Eskom Distribution (Land & Rights)	T. Ludere	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Eskom Transmission	L. Motsisi	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Middelburg Chamber of Business and Commerce	M. Hanekom	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Mpumalanga Tourism and Parks Agency (MTPA) – Land Advisory Unit	K. Narasoo	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	Yes. See Section 6.3.4
Nkangala District Municipality	S. Links	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
South African National Roads Agency (SANRAL)	V. Bota K. Schmid	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
South African Heritage Resources Agency (SAHRA)	J. Lavin (SAHRA website)	BID loaded onto the SAHRIS portal (16 August 2017; Appendix 9)	Yes. See Section 6.3.5
Steve Tshwete Local Municipality	M. Mahamba	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Telkom	J. Smit	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None
Trans African Concessions (TRAC)	R. Nkosi C. Davis	Email (dated: 16 August 2017; Appendix 9) with BID forwarded.	None

6.3.1 Department of Agriculture, Forestry and Fisheries

A completed comment sheet (dated: 29 August 2017; Appendix 9) was received from Mr. F. Mashabela from the Department of Agriculture, Forestry and Fisheries (DAFF). Mr. Mashabela indicated the following:

> *May you kindly send me the assessment report on CD. I use to experience problems on websites when trying to open the drafts.*

Response from AdiEnvironmental
See Table 6.9.

6.3.2 Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) - Directorate: Land Use and Soil Management – Ermelo

A completed comment sheet (dated: 26 September 2018; Appendix 9) was received from Mr. J. Venter (DARDLEA - Directorate: Land Use and Soil Management) indicating the following:

A site visit was conducted and the following issues of concern are raised:
- *The facility will be erected on disturbed land due to existing infrastructure but nevertheless the soil capability can be regarded as high. Therefore mitigation measures must be implemented for the protection of agricultural land.*
- *Mitigation measures:*
  - *Proper storm water plan must be in place ensuring compliancy with the CARA Act.*
  - *Proper waste water management thus limiting the impact of waste water on the surrounding especially the soils.*
- *Existing agriculture activities must continue despite future plans.*

Response from AdiEnvironmental
See Table 6.9.

6.3.3 Department of Rural Development and Land Reform (Commission on Restitution of Land Rights)

A letter (dated: 21 August 2017; Appendix 9) was received from FZ Ndaba of the Regional Land Claims Commission: Mpumalanga Province in which the following was indicated:

There is a land claim lodged against the mentioned farm and it is still on research stage. We have not yet determined the claimed portions. For more info on this claim please contact Mr. Sambo (team manager).
File numbers:
6627, 989, 11698, 11699, 11697, 1029, 6160

It is not within the powers of the Commission on Restitution of Land Rights to grant or withhold permission for the development or alienation in respect of land being claimed until such a claim has been gazetted, unless such development would constitute an obstruction to the achievement of the aims and objectives of the Restitution of Land Rights Act 22 of 1994. In such instances application can be made in the Land Claims Court in terms of Section 6(3) of the Restitution Act; this can be done at any stage after the claim has been lodged - even before the publishing of such a claim in terms of Section 11 of the Restitution of Land Rights Act 22 of 1994.

An e-mail (dated: 15 May 2018; Appendix 9) was subsequently forwarded to Mr. Sambo requesting the following information in order to determine whether the Remaining Extent of Portion 24 of Kleinfontein 432 JS is affected by the land claim:
- Affected portions;
- Type of claim;
- Names of claimants;
- Status of claim.

An e-mail (dated: 18 May 2018; Appendix 9) was received from Ms. F. Ndaba indicating that the Commission is not allowed to provide personal information of the claimants. However, the officers working on the various land claims were contacted by Ms. Ndaba for additional information on the affected portions. Subsequently, a letter (dated: 22 May 2018; Appendix 9) was received indicating the following:

According to our database there is a land claim lodged against the farm Kleinfontein 432 JS. So far only portions 3, 5, 15, 17, 18, 19 & 21 have been affected. File numbers - 6627, 989, 11698, 11699, 1029. The claim status is Gazette/Awaiting negotiations with the surface owner.

Response from AdiEnvironmental
See Table 6.9.

6.3.4 Mpumalanga Tourism and Parks Agency

A letter (dated: 30 August 2017; Ref: LUA17/2070; Appendix 9) was received from the Mpumalanga Tourism and Parks Agency (MTPA) indicating the following:

1. According to the Mpumalanga Biodiversity Sector Plan (MBSPl MTPA, 2014) the sensitivity of the above farm on which the proposed activity is likely to occur was assessed. This sensitivity is assessed in terms of a terrestrial and freshwater assessment. In the MBSP, sensitive areas are identified in terms of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). CBAs and ESAs are deemed to be necessary to ensure protection of biodiversity, environmental sustainability, and human well-being, and are to remain unaltered.

2. According to the terrestrial assessment, there are no biodiversity sensitive areas within the proposed farm portion.

3. In terms of the freshwater assessment (Fig. 1), there is an ESA Wetland within the proposed farm portion. 100m buffers should be implemented and adhered around the wetlands during the construction and operational activities.

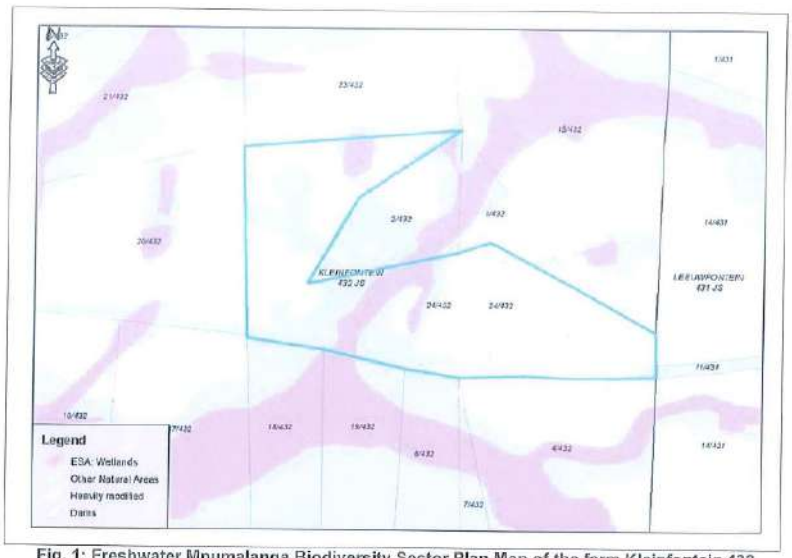


Fig. 1: Freshwater Mpumalanga Biodiversity Sector Plan Map of the farm Kleinfontein 432 JS.

4. All the negative environmental impacts that could arise as a result of this activity should be avoided, minimized, mitigated or rehabilitated to its pre-development land use or to the standards agreed to with the landowner. It is thus imperative to have photographs taken before any work commences on the land or on the existing routes.

5. The MTPA anticipates reviewing the alternatives, findings and conclusions of the relevant specialist studies to be conducted for the Basic Assessment Report.

Response from AdiEnvironmental
See Table 6.9.

6.3.5 South African Heritage Resources Agency

A letter (dated: 11 September 2017; Ref: 11519; Appendix 9) was received from the South African Heritage Resources Agency (SAHRA) indicating the following:

In terms of the National Heritage Resources Act, no 25 of 1999 (NHRA), heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are generally protected. They may not be disturbed without a permit from the relevant heritage resources authority. In contexts of development applications, the developer must ensure that no heritage resources will be impacted by the proposed development, by lodging an application to SAHRA and submitting detailed development specifications as a notification of intent to develop. If the application is made in terms of s. 38 (8) of the NHRA then it is incumbent on the developer to ensure that a Heritage Impact Assessment (HIA) is undertaken, as s. 38(2) does not apply. Such a study should follow the SAHRA impact assessment guidelines and section 38(3).

SAHRA as a commenting authority in this application requires an assessment of heritage resources including palaeontological resources to be conducted by a qualified archaeologist and palaeontologist respectively. As such SAHRA requires a Heritage desktop assessment and a desktop Palaeontological Impact Assessment for the proposed development to be conducted and submitted to SAHRA for comments. If you are unaware of any archaeologists and palaeontologists a list of them working within the Heritage Resources Management field are provided in the following websites: (see www.asapa.org.za) and (see www.palaeontologicalsocitey.co.za).

SAHRA will comment further on this proposed development once the requested reports are submitted to the case.

Response from AdiEnvironmental
See Table 6.9.

6.4 Adjacent landowners/users

In order to determine the registered owners of the various properties, a Deeds Search was conducted via the WinDeed system of the Deeds Office of South Africa. The Deeds Search Template provides information pertaining to land ownership, size and land value of each of the properties.

Contact details for the adjacent landowners/users were obtained and they were informed of the proposed development through the advertising process, telephonically and in writing. A Background Information Document (BID) was also distributed. A copy of the Background Information Document is provided in Appendix 6.

The Background Information Document included the following information:

- Project name and reference number;
- Applicant name;
- Legal requirements and list of activities to be authorised;
- Details of the EAP;
- Description of the public participation process;
- Responsibilities of I&APs;
- Date by which I&APs must register and forward comment;
- A link to the EAP website for an electronic copy of the Background Information Document and Basic Assessment Report;
- Project and property description;
- Locality map;
- Proposed layout plan.
- Short description of the process to be followed and proposed timeline;
- Comment sheet.

Comments received from the adjacent landowners/users in response to the advertising and distribution of the Background Information Document are indicated below.

Table 6.2 provides an indication to which adjacent landowner/user Background Information Documents (BIDs; Appendix 8) were forwarded in order to inform them of the proposed project and to obtain their issues of concern. Figure 6.2 indicates the location of the various landowners as well as the closest homesteads.

Table 6.2: Identified adjacent land owners/users who received BIDs

PROPERTY (FIGURE 6.2)	LANDOWNER/ CONTACT PERSON	CORRESPONDENCE	COMMENTS
KLEINFONTEIN 432 JS (Figure 6.2)			
1/432 2/432	TKL Hoffmann Contact: G. Hoffmann	Phoned - 21 August 2017. E-mail (dated: 21 August 2017; Appendix 9) with BID forwarded.	Yes. See Section 6.4.1.
2/432	C. van Wyk (renting the TKL Hoffmann property)	Phoned - 21 August 2017. E-mail (dated: 21 August 2017; Appendix 9) with BID forwarded.	Telephonically indicated-no issues. Renting property from Hoffmann.
3/432	Mafube Coal Mining (Pty) Ltd. Contact: B. Mfolo	E-mail (dated: 16 August 2017; Appendix 9) with BID forwarded.	None.
7/432 RE/8/432 RE/18/432 RE/19/432	Kusic Prop cc Contact: C. van Wyk	Phoned - 21 August 2017. E-mail (dated: 21 August 2017; Appendix 9) with BID forwarded.	None.
RE/10/432 17/432	Blyder Beleggings (Pty) Ltd. Contact: L. Cass	E-mail (dated: 16 August 2017; Appendix 9) with BID forwarded.	None.
16/432	LA Cass Contact: L. Cass	E-mail (dated: 16 August 2017; Appendix 9) with BID forwarded.	None.

PROPERTY (FIGURE 6.2)	LANDOWNER/ CONTACT PERSON	CORRESPONDENCE	COMMENTS
21/432 26/432	Beestepan Boerdery (Pty) Ltd. Contact: B. Kane-Berman	E-mail (dated: 16 August 2017; Appendix 9) with BID forwarded.	None.

6.4.1 TKL Hoffmann (Figure 6.2)

Portions 1 and 2 of Kleinfontein 432 JS (east of the site; Figure 6.2) is registered to TKL Hoffmann.

Mr. Hoffmann was telephonically contacted on 21 August 2017 with regards to the proposed project. In addition, a Background Information Document was forwarded (e-mail dated: 21 August 2017; Appendix 7).

Mr. Hoffmann indicated telephonically that they have no concerns regarding the proposed project and that they are renting the property to Mr. C. van Wyk.

Subsequently, an e-mail was received from Mr. G. Hoffmann indicating the following:

We as the Hoffmann family have no objection to the new Gene Transfer Centre to be constructed and operated by Alzu, as explained in the supporting documents. We would like to wish them success with the new venture.

Response from AdiEnvironmental

See Table 6.9.

6.5 Kleinfontein Community and Ward Councillor

6.5.1 S. Skosana

Mr. S. Skosana telephonically registered as an interested and affected party on 24 August 2017 and indicated that he represents the local community in terms of the proposed project.

According to Mr. Skosana, he resides on the farm Kleinfontein 432 JS (i.e. Portion 23; Figure 6.2) and forms part of the community who lodged a land claim against the said property. The village is located approximately 1km north of the proposed site (Figure 6.2).

Mr. Skosana raised the following issues telephonically:

- *Why has the community not been informed of the proposed project?*
- *There are people residing on site.*
- *Requested that the consultants or representatives from Alzu arrange a meeting to discuss the project and the way forward.*
- *Wants to be kept up to date with the process.*

On 11 September 2017, Mr. Skosana telephonically requested a meeting and indicated that the community would stop the project (by way of protests) if a meeting was not held.

Response from AdiEnvironmental

A meeting was held with Mr. Skosana as requested. See Section 6.5.3 and Table 6.9 for more information.

Figure 6.2: Surrounding Landowners

6.5.2 Councillor J. Matshiane (Ward 7)

The proposed site falls within Ward 7, which includes the farm Kleinfontein 432 JS as indicated in Table 6.3.

Table 6.3: Ward 7 area

Ward 7
VLAKFONTEIN 166 IS
NOOITGEDACHT 450 JS
NOOITGEDACHT 493 JS
RIETKUIL
GROOTLAAGTE 449 JS
RIETKUIL 491 JS
ARNOT EAST 984 JS
ARNOT WEST 983 JS
BRAAMSPRUIT 465 JS
BLESBOKLAAGTE 488 JS
BLESBOKFONTEIN 487 JS
KROMDRAAI 486 JS
Part of BOSMANSSPRUIT 459 JS
MAFUBE RURAL VILLAGE
KLEINFONTEIN 432 JS
SPRINGBOKLAAGTE 416 JS
MOOIFONTEIN 448 JS
ELANDSFONTEIN 433 JS
Part of MAIZELANDS 989 JS

The councillor of Ward 7 (J. Matshiane) registered as an interested and affected party and provided comment on 30 August 2017 (e-mail dated: 30 August 2017; Appendix 9).

Councillor Matshiane indicated the following:

I MMC Johan Matshiane the Ward Councillor of ward 7 there for register as the affected party on the proposed project mentioned above, on behalf of the community of Kleinfontein. I therefore request to be contacted in all the processes that is going to take place. Our concerns are the following, Households are they not going to be affected, Grazing land for the community responding in that area, Community Graves are not going to be affected, we depend on water ground are they not going to be affected, there is also a land claim in progress.

I therefore like to register the following people to be consulted or when there are engagement or meetings going to take place - Community Development Worker (CDW) Nhlanhla Dinnah Mahlangu cell 0605027693 email Dnmahlangu@mpg.gov.za,Ward Committes Florah Mabena 0766289877, MMC/CLR Johan Matshiane 0812634155/0766008803 jmatshiane@gmail.com/mmcsec@stlm.gov.za, Community Development Worker (CDW) Thembi Mnguni 0603593987/0737515154 email Tmnguni@mpg.gov.za.

Response from AdiEnvironmental

A meeting was held with Councillor Matshiane. See Section 6.5.3 and Table 6.9 for more information.

6.5.3 Meetings held with Kleinfontein Community and Ward Councillor

Meeting - 19 September 2017

An invitation to a meeting (e-mails dated: 12 and 13 September 2017; Appendix 9) was forwarded to Councillor J. Matshiane and Mr. S. Skosana. Councillor Matshiane requested (e-mail dated: 12 September 2017; Appendix 9) permission to extend the invitation to the members of the Ward Committee and Community Development. This was agreed to.

The meeting was subsequently held and attended by the following persons:

- Erasmus, A - AdiEnvironmental cc
- Janse van Rensburg, R - AdiEnvironmental cc
- Mabena, F - Ward Committee member
- Mahlangu, I - Ward Committee member
- Mahlangu, N - Community Development Worker
- Matshiane, J - Ward Councillor
- Skosana, S - Community member

The aim of the meeting was to meet with Mr. Skosana and the Ward Councillor in order to discuss and record issues of concern regarding the said project.

A copy of the minutes of the meeting and attendance register is provided in Appendix 9.

During the meeting, Mr. Skosana indicated that he resides in a village located approximately 1km north of the site (Figure 6.2) along with approximately 30 other people. Mr. Skosana raised the following issues (Table 6.4) on behalf of this community:

Table 6.4: Issues of concern raised by Mr. S. Skosana on behalf of the Kleinfontein Community during the meeting of 19 September 2017

Comment from S. Skosana
Smell/odour from piggery - this would impact on the people (including kids) living nearby.
People live in the area surrounding the proposed development site - 2 other villages are located to the east of the proposed site.
An onsite risk assessment should be done with the community to identify potential impacts.
Land claim has been lodged which is still pending. Land claim lodged by Fihliwe Geelbooi Sibanyoni on behalf of the whole community (i.e. everyone living on the farm Kleinfontein).
'Recycling' of manure - what will happen to the manure generated?
Impact of machinery on people living in surrounding area especially kids.
Impact on borehole (groundwater) - more water will be used?
Spillage from the piggery - impact on the groundwater
Will there be any further expansion of the piggery in future (i.e. outside of the 4ha site)?
Alzu does not care about people, shares not given, employment opportunities - community concerned.

Councillor Matshiane indicated that the proposed project was discussed at the ward meeting, the mayoral outreach meeting and the legislature meeting held during August 2017. He pointed out that during these meetings, the local community lodged a dispute regarding the proposed project. The issues of concern raised by the local community with regards to the proposed project are indicated in Table 6.5.

Table 6.5: Issues of concern raised by Councillor Matshiane on behalf of the Kleinfontein Community during the meeting of 19 September 2017

Comment from Councillor Matshiane
Smell/odours from piggery - impact on people living in surrounding area.
Impact on grazing land used by community - community does have a challenge in terms of grazing land for their cattle.
Graves - impact on graves as well as access to graves once the development is completed.
Road extending through site - will community still be able to use the realigned road?
Impact on boreholes (groundwater): The community faces challenges in terms of water. The increased usage of groundwater could impact on the existing boreholes used by the community. At each village there is a boreholes (sunk by the government) with a hand pump installed. information regarding the boreholes can be obtained from April Ntuli (Steve Tshwete Local Municipality). The village next to the N4 (consists of one family unit) does not have a borehole - water is transported to the village by the municipality on a regular basis.
Land claims lodged: What will happen to land claims in view of the proposed development?
Employment opportunities: will any new employment opportunities be available?
Property ownership: Does the property really belong to Alzu or is Alzu leasing the property? Where property is lease (e.g. Hoffman), community can no longer use land for grazing purposes (reduced grazing land) as the said area is fenced. No community consultation in this regard.

During the meeting, a site visit to the proposed development site was scheduled for Wednesday, 4 October 2017 at 15h00 in order to view the site and do a risk assessment as requested by Mr. Skosana.

Site visit - 4 October 2017

A site visit was arranged for 4 October 2017 as agreed upon during the meeting of 19 September 2017. The following persons were invited (e-mail dated: 2 October 2018; Appendix 9):

- Erasmus, A - AdiEnvironmental cc
- Janse van Rensburg, R - AdiEnvironmental cc
- Mabena, F - Ward Committee member
- Mahlangu, I - Ward Committee member
- Mahlangu, N - Community Development Worker
- Matshiane, J - Ward Councillor
- Skosana, S - Community member

Only Mr. Skosana and Councillor Matshiane attended the said site visit along with the EAPs.

The aim of the site visit was to view the proposed development site and do a risk assessment as requested by Mr. Skosana.

A copy of the minutes of the meeting and attendance register is provided in Appendix 9.

The meeting commenced by providing a copy of the proposed layout plan and explaining that the layout had been changed in view of the concern regarding the rerouting of the gravel road and the potential impact on the local community.

The following was established during the site visit and agreed upon by Mr. Skosana and Councillor Matshiane:

- Nobody resides on the site.
- The gravel road will not be directly impacted or rerouted.
- No graves are present on site.
- Access to the graves in the area will not be limited.
- No grazing land is present on site.
- An initiation school uses the land in the surrounding area but will not be affected in terms of access.
- The village where Mr. Skosana resides is visible from the site once harvesting has taken place.

In addition, feedback regarding issues raised during the previous meeting (Tables 6.4 and 6.5) was provided to Mr. Skosana and Councillor Matshiane. Please refer to Table 6.9 in this regard.

Mr. Skosana and Councillor Matshiane raised additional issues of concern during the site visit as indicated in Table 6.6 and Table 6.7.

Table 6.6: Issues raised by Mr. S. Skosana during the site visit on 4 October 2017

Comment from S. Skosana
The community must be convinced with regards to the project by providing them an allowance - in other words, shares in the project. Alternatively, the community must be moved/relocated by Alzu or they must be given what they want. Alzu must bring an offer to the community regarding the allowance (i.e. shares in the project).
The lack of employment opportunities would be of concern for the community.
An Initiation School utilizes the veld next to the proposed site (i.e. opposite where the existing houses are located). The initiation structures are built in this area and the adjacent gravel road is used by the initiates. The proposed project and the presence of people would thus impact on the Initiation School.
Requested that the gravel road be tarred.
From where would the community be able to obtain the project documentation once the project is operational? They want to ensure that Alzu is complying with the requirements.

Table 6.7: Issues raised by Councillor Matshiane during the site visit on 4 October 2017

Comment from Councillor Matshiane
The response with regards to employment opportunities would not be acceptable to the community.
Social development projects in terms of upliftment of the community should form part of the project. Two possible projects include: ▪ *An electrical pump for the borehole - currently there is a hand pump which is difficult for the elderly to operate;* ▪ *Assistance with education in terms of learnerships, bursaries, etc. preference should be given to those residing closest to the project.*
Could the manure generated on site be made available to the Community Works Programme of COGTA for the preparation of land for vegetable production?

During the meeting it was indicated that the Basic Assessment Report would be prepared and then made available for comment. Normally the report is made available at the nearest library (in this case Nasaret Public Library in Middelburg) but that would not be suitable for the local community. Councillor Matshiane indicated that 2 copies of the report should be provided to him.

Councillor Matshiane also indicated that the said project would once again be discussed during the next community meeting (October 2017). The minutes of the meeting would be forwarded to AdiEnvironmental cc.

AdiEnvironmental cc indicated that if necessary, a visit to the existing Rockdale Gene Transfer Centre (GTC) could be arranged to view the existing facility. Councillor Matshiane indicated that feedback in this regard would be provided.

To date, no minutes of community meetings were forwarded and no requests were made for a site visit.

Response from AdiEnvironmental
See Table 6.9.

6.6 Department of Agriculture, Rural Development, Land and Environmental Affairs

The project was registered with the Department of Agriculture, Rural Development, Land and Environmental Affairs on 24 July 2018 (see cover letter and application dated: 24 July 2018; Appendix 1). In addition, a date for a meeting and site visit was requested.

Subsequently, a letter (dated: 13 August 2018; Ref: 1/3/1/16/1N-138; Appendix 1) was received from the Department acknowledging receipt of the application form. It was indicated that AdiEnvironmental cc may proceed with the Basic Assessment process.

6.7 List of Interested and Affected Parties

From the above public participation process, the following list of Interested and Affected Parties was compiled:

Table 6.8: List of Interested and Affected Parties

INTERESTED AND AFFECTED PARTY LIST	
Organisation	**Name**
Government Departments	
Department of Agriculture, Forestry and Fisheries	F Mashabela
Department of Agriculture, Rural Development, Land and Environmental Affairs - Directorate: Land Use and Soil Management – Ermelo	J Venter
Department of Agriculture, Rural Development, Land and Environmental Affairs	The Director
Department of Co-Operative Governance and Traditional Affairs	M Loock
Department of Mineral Resources	S Mathavela
Department of Rural Development and Land Reform	F. Mdushani (now Ndaba)
Department of Water and Sanitation	NS Maliaga

INTERESTED AND AFFECTED PARTY LIST	
Other Organisations	
Distriks Landbou Unie Middelburg	JPJ Schmahl
Eskom Distribution	T Ludere
Eskom Transmission	L Motsisi
Local Municipality and Municipal Councillor	
Middelburg Chamber of Business and Commerce	M Hanekom
Mpumalanga Tourism and Parks Agency (MTPA)	K Narasoo
Nkangala District Municipality	S Links
South African Heritage Resources Agency (SAHRA)	J Lavin
South African National Roads Agency (SANRAL)	V Bota K Schmid
Steve Tshwete Local Municipality	M Mahamba
Telkom	J Smit
Trans African Concessions (TRAC)	R Nkosi, C Davis
Transvaalse Landbou Unie (TLU)	D du Plessis
Ward 9 councillor	J Matshiane

Surrounding Landowners	
Property (Figure 6.2)	**Landowner/Contact person**
Portions 1 and 2 of Kleinfontein	TKL Hoffmann Contact person: G Hoffmann
Renting Portion 2 of Kleinfontein	C van Wyk
Portion 3 of Kleinfontein	Mafube Coal Mining (Pty) Ltd. Contact person: B Mfolo
Portions 7, RE/8, RE/18 and RE/19 of Kleinfontein	Kusic Prop cc Contact person: C van Wyk
Portions RE/10 and 17 of Kleinfontein	Blyder Beleggings (Pty) Ltd. Contact person: L Cass
Portion 16 of Kleinfontein	LA Cass Contact person: L Cass
Portions 21 and 26 of Kleinfontein	Beestepan Boerdery (Pty) Ltd. Contact person: B. Kane-Berman
Village located on Portion 23 of Kleinfontein	Registered to the applicant. Village representative: S Skosana
Portions RE/4, 5, 15, 23, RE/24, 38 of Kleinfontein	Statutis Trading (Pty) Ltd. (i.e. the applicant)

6.8 Summary of issues and response

Appendix 1 (3)(h)(iii) of the EIA Regulations, 2014 (as amended) requires that a summary of the issues raised by interested and affected parties be provided in the Basic Assessment Report as well as an indication of the manner in which the issues were addressed.

Table 6.9 provides such a summary as well as the response from the EAP.

6.9 Evaluation of Draft Basic Assessment Report

As indicated in Section 11, the Draft Basic Assessment Report (BAR) will be made available to I&APs, stakeholders and government departments for a 30-day review period.

Hard copies of the document will be submitted to relevant authorities. A hard copy and electronic copy of the Draft BAR will be made available to the interested and affected parties and stakeholders consulted and/or registered as part of the process (refer to Table 6.8).

The various departments, stakeholders and I&APs will be requested to forward any comments on the report to the consultant within the 30-day period provided. These comments will be included and addressed in:

- Section 11 (Evaluation of Draft Basic Assessment Report);
- Table 11.1 (Summary of Issues of Concern and Response); and
- Appendix 12;

of the Final Basic Assessment Report.

The Final BAR (incorporating comments from I&APs) will be submitted to the Department of Agriculture, Rural Development, Land and Environmental Affairs for final decision making.

An e-mail will be forwarded to the various departments, stakeholders and interested and affected parties informing them of the comments received and the submission of the Final BAR for decision making.

Table 6.9: Summary of issues of concern and response

Issue	I&AP, Stakeholders, Authority (Section of Report)	Response
Agriculture		
The facility will be erected on disturbed land due to existing infrastructure but nevertheless the soil capability can be regarded as high. Therefore mitigation measures must be implemented for the protection of agricultural land. Mitigation measures: *- Proper storm water plan must be in place ensuring compliancy with the CARA Act.* *- Proper waste water management thus limiting the impact of waste water on the surrounding especially the soils*	DARDLEA: Directorate: Land Use and Soil Management – Ermelo (Section 6.3.2)	Noted. Mitigation measures for the protection of agricultural land have been included in the EMPr (Section 9 of this report). The mitigation measures include storm water management, waste water management, erosion control, etc.
Existing agriculture activities must continue despite future plans.	DARDLEA: Directorate: Land Use and Soil Management – Ermelo (Section 6.3.2)	Agricultural activities (maize cultivation) will continue on the remainder of the property.
Where property is leased (e.g. Hoffman), community can no longer use land for grazing purposes (reduced grazing land) as the said area is fenced. No community consultation in this regard.	Councillor Matshiane (Section 6.5.3)	As indicated in Section 5.3, the proposed GTC Facility will be located on cultivated land and on a developed area. No grazing land will thus be impacted or fenced off from the overall farm.
Impact on grazing land used by community - community does have a challenge in terms of grazing land for their cattle. Grazing land for the community residing in that area.	Councillor Matshiane (Section 6.5.1 and 6.5.3)	
Access road		
Road extending through site - will community still be able to use the realigned road?	Councillor Matshiane (Section 6.5.3)	An alternative layout plan was drafted to ensure that the gravel road would not have to be realigned. See Section 7. The community would still be able to use the said gravel road.
Requested that the gravel road be tarred.	S. Skosana (Section 6.5.3)	This option was not considered by the applicant as it would be extremely costly and is not warranted by the small amount of traffic utilizing the road.
Land claim		
There is a land claim lodged against the mentioned farm and it is still on research stage.	Department of Rural Development and Land Reform (Commission on Restitution of Land Rights) (Section 6.3.3)	AdiEnvironmental was able to confirm that claims were lodged with regards to Portions 3, 17, 18, 19 & 21 (Government Gazette search; Appendix 9). Information was also obtained regarding a claim on Portion 2. The claimants were indicated as the Sibanyoni, Msili and Thobane families (Appendix 9). No information could be obtained regarding a claim on the Remaining Extent of Portion 24. A letter was obtained from the Transvaalse Landbou Unie (TLU) (dated: 8 September 2017; Appendix 9) indicating that according to their records, no land claims have been lodged against the said property. The said site is therefore currently not affected by a land claim. According to the Commission on Restitution of Land Rights, no land claims have been lodged on the said site (i.e. Portion 24 of Kleinfontein 432 JS). See Section 6.3.3 for more details. Details regarding the 'land claim' was requested from Councillor Matshiane and S. Skosana. However, no documentation was forthcoming. The proposed development will thus not impact on any land claims.
According to our database there is a land claim lodged against the farm Kleinfontein 432 JS. So far only portions 3, 5, 15, 17, 18, 19 & 21 have been affected. File numbers - 6627, 989, 11698, 11699, 1029. The claim status is Gazette/Awaiting negotiations with the surface owner	Department of Rural Development and Land Reform (Commission on Restitution of Land Rights) (Section 6.3.3)	
Land claims lodged: What will happen to land claims in view of the proposed development?	Councillor Matshiane (Section 6.5.3)	
Land claim has been lodged which is still pending. Land claim lodged by Fihliwe Geelbooi Sibanyoni on behalf of the whole community (i.e. everyone living on the farm Kleinfontein).	S. Skosana (Section 6.5.3)	
Biodiversity		
1. According to the Mpumalanga Biodiversity Sector Plan (MBSPl MTPA, 2014) the sensitivity of th *e above farm on which the proposed activity is likely to occur was assessed. This sensitivity is assessed in terms of a terrestrial and freshwater assessment. In the MBSP, sensitive areas are identified in terms of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). CBAs and ESAs are deemed to be necessary to ensure protection of biodiversity, environmental sustainability, and human well-being, and are to remain unaltered.* *2. According to the terrestrial assessment, there are no biodiversity sensitive areas within the proposed farm portion.* *3. In terms of the freshwater assessment (Fig. 1), there is an ESA Wetland within the proposed farm portion. 100m buffers should be implemented and adhered around the wetlands during the construction and operational activities.*	Mpumalanga Tourism and Parks Agency (Section 6.3.4)	1. Noted. 2. Noted and agreed. See Section 5.7 for further details. 3. The ESA Wetland is located more than 500m south east of the site. See Section 5.9 for more information regarding the wetlands identified.
4. All the negative environmental impacts that could arise as a result of this activity should be avoided, minimized, mitigated or rehabilitated to its pre-development land use or to the standards agreed to with the landowner. It is thus imperative to have photographs taken before any work commences on the land or on the existing routes.	Mpumalanga Tourism and Parks Agency (Section 6.3.4)	4. Mitigation measures are provided in Section 9 of this report. Photographs of the proposed site were taken prior to construction and are included in this report.
5. The MTPA anticipates reviewing the alternatives, findings and conclusions of the relevant specialist studies to be conducted for the Basic Assessment Report.	Mpumalanga Tourism and Parks Agency (Section 6.3.4)	5. A copy of the Draft Basic Assessment Report (including specialist studies) will be forwarded to the MTPA as requested.
Cultural and Heritage Resources		
SAHRA as a commenting authority in this application requires an assessment of heritage resources including palaeontological resources to be conducted by a qualified archaeologist and palaeontologist respectively. As such SAHRA requires a Heritage desktop assessment and a desktop Palaeontological Impact Assessment for the proposed development to be conducted and submitted to SAHRA for comments. SAHRA will comment further on this proposed development once the requested reports are submitted to the case.	South African Heritage Resources Agency (Section 6.3.5)	A Palaeontological Impact Assessment and desktop Heritage Impact Assessment were conducted as requested by SAHRA. More information is provided in Section 5.13 and Appendix 6. A letter requesting exemption from conducting a full Heritage Impact Assessment was also compiled by the specialist. See Section 5.13 and Appendix 5 for more information. Both the PIA and the exemption request letter were loaded onto the SAHRA website (SAHRIS) (Appendix 9) for review and final comment. To date, no further comment has been received.
An Initiation School utilizes the veld next to the proposed site (i.e. opposite where the existing houses are located). The initiation	S. Skosana (Section 6.5.3)	The said property belongs to a private landowner and does not form part of the municipal

Table 6.9: Summary of issues of concern and response

Issue	I&AP, Stakeholders, Authority (Section of Report)	Response
structures are built in this area and the adjacent gravel road is used by the initiates. The proposed project and the presence of people would thus impact on the Initiation School.		commonage. Permission to utilise the said area for any activities must be obtained from the said landowner.
Graves - impact on graves as well as access to graves once the development is completed.	Councillor Matshiane (Section 6.5.3)	No graves are located on site. See Section 5.13 and Appendix 5. During the meeting on 19 September 2018, Mr. Skosana pointed out that the graves are located far from the site and will not be impacted. Access to the graves in the surrounding area would also not be limited in terms of the proposed development.
Socio-economic		
Why has the community not been informed of the proposed project?	S. Skosana (Section 6.5.1)	AdiEnvironmental informed Mr. Skosana (telephonically on 24 August and 11 September 2017) that the Basic Assessment process (and hence the public participation process) had just commenced and assured him that a meeting would be arranged. The proposed project and process to be followed was telephonically explained to Mr. Skosana in detail. A Background Information Document was also forwarded (e-mail dated: 24 August 2017; Appendix 9) to Mr. Skosana for review and comment.
Requested that the consultants or representatives from Alzu arrange a meeting to discuss the project and the way forward.	S. Skosana (Section 6.5.1)	As requested, a meeting was held on 19 September 2017 - see Section 6.5.3 for further details.
Households are they not going to be affected.	Councillor Matshiane (Section 6.5.1)	No households will be affected by the proposed development.
There are people residing on site.	S. Skosana (Section 6.5.1)	A site visit was conducted on 3 October 2017. The site visit was attended by Mr. Skosana and Councillor Matshiane. During the site visit, it was established that nobody resides on site.
People live in the area surrounding the proposed development site - 2 other villages are located to the east of the proposed site.	S. Skosana (Section 6.5.3)	Noted. The said villages were identified (Figure 5.4) and the potential impact thereon indicated in Section 8 of this report.
Impact of machinery on people living in surrounding area especially kids.	S. Skosana (Section 6.5.3)	According to the applicant, the gravel road extending over the N4 national road to Alzu Petroport will be used during the construction and operational phases (see Section 5.16). The gravel road extending past the village will not be used. The applicant also indicated that only one truck per week would visit the site to deliver feed to the facility.
Alzu does not care about people, shares not given, employment opportunities - community concerned.	S. Skosana (Section 6.5.3)	Noted. Alzu were informed of concerns raised by community.
Social development projects in terms of upliftment of the community should form part of the project. Two possible projects include: ▪ *An electrical pump for the borehole - currently there is a hand pump which is difficult for the elderly to operate;* ▪ *Assistance with education in terms of learnerships, bursaries, etc. preference should be given to those residing closest to the project.*	Councillor Matshiane (Section 6.5.3)	Social development projects are usually a requirement in terms of the Mining Charter (i.e. applicable to mining operations). According to the applicant, written proposals in this regard must be forwarded to the applicant for perusal.
The community must be convinced with regards to the project by providing them an allowance - in other words, shares in the project. Alternatively, the community must be moved/relocated by Alzu or they must be given what they want. Alzu must bring an offer to the community regarding the allowance.	S. Skosana (Section 6.5.3)	No homesteads/villages are located on site. In addition, no homesteads/farmsteads/villages are located within a 500m radius of the site (Figure 5.4). The closest homestead is located 605m to the south of the site opposite the N4 national road. No community members will thus be directly impacted by the proposed development. Therefore, no community members need to be relocated.
Employment opportunities: will any new employment opportunities be available?	Councillor Matshiane (Section 6.5.3)	During the construction phase, 40 employment opportunities will be created. During the operational phase, the 13 employees at the existing GTC facility will remain employed. An additional 13 employment opportunities might become available in the future as the facility grows. Employment opportunities would depend on the level of expertise/skill required and can thus not be promised to the Kleinfontein community.
The lack of employment opportunities would be of concern for the community.	S. Skosana (Section 6.5.3)	
The response with regards to employment opportunities would not be acceptable to the community.	Councillor Matshiane (Section 6.5.3)	
Groundwater		
Impact on boreholes (groundwater): The community faces challenges in terms of water. The increased usage of groundwater could impact on the existing boreholes used by the community. At each village there is a boreholes (sunk by the government) with a hand pump installed. information regarding the boreholes can be obtained from April Ntuli (Steve Tshwete Local Municipality). The village next to the N4 (consists of one family unit) does not have a borehole - water is transported to the village by the municipality on a regular basis.	Councillor Matshiane (Section 6.5.3)	A groundwater study was conducted to determine the potential impact on surrounding boreholes as a result of increased abstraction at the proposed site. A copy of the groundwater study is provided in Appendix 4 and a summary of the results in Section 5.10. According to Gouws (2018) the surrounding boreholes (especially the borehole located at Mr. Skosana's village) will not be impacted by the proposed GTC facility. See Section 5.10 for more information in this regard.
We depend on water ground are they not going to be affected?	Councillor Matshiane (Section 6.5.3)	
Impact on borehole (groundwater) - more water will be used?	S. Skosana (Section 6.5.3)	
Spillage from the piggery - impact on the groundwater	S. Skosana (Section 6.5.3)	The manure will be contained in a closed system and stored in a manure pit as indicated in Section 7. Sufficient storage capacity will be provided. No spillages are therefore anticipated. Management measures for the storage and handling of manure are indicated in Section 9 (EMPr).
Manure		
'Recycling' of manure - what will happen to the manure generated?	S. Skosana (Section 6.5.3)	The manure will collected in a manure pit and spread onto cultivated lands. See Sections 3 and 7 for more details in this regard.
Could the manure generated on site be made available to the Community Works Programme of COGTA for the preparation of land for vegetable production.	Councillor Matshiane (Section 6.5.3)	The applicant indicated that written proposals in this regard must be forwarded to the applicant for perusal.
Air quality		
Smell/odours from piggery - impact on people living in surrounding area.	Councillor Matshiane (Section 6.5.3)	The GTC facility and the manure pit would be located approximately 1.7km south of the village where S. Skosana resides (Village 3; Figure 5.4) and 605m north of the village

Table 6.9: Summary of issues of concern and response

Issue	I&AP, Stakeholders, Authority (Section of Report)	Response
Smell/odour from piggery - this would impact on the people (including kids) living nearby.	S. Skosana (Section 6.5.3)	located south of the N4 national road (Homestead 1; Figure 5.4). The impact in terms of odours is thus expected to be low. See Section 8 of the impact assessment for the impact rating.
Future expansion of development		
Will there be any further expansion of the piggery in future (i.e. outside of the 4 ha site)?	S. Skosana (Section 6.5.3)	No further expansion outside the site boundary (i.e. 6 ha area) is proposed. The proposed facility will however, be constructed in two phases over a period of time.
Risk Assessment		
An onsite risk assessment should be done with the community to identify potential impacts.	S. Skosana (Section 6.5.3)	An onsite risk assessment was done with Mr. Skosana on 4 October 2017 (Appendix 9)
General		
May you kindly send me the assessment report on CD. I use to experience problems on websites when trying to open the drafts	Department of Agriculture, Forestry and Fisheries (Section 6.3.1)	An electronic copy of the Draft Basic Assessment Report will be couriered to Mr. Mashabela as requested (Section 11).
We as the Hoffmann family have no objection to the new Gene Transfer Centre to be constructed and operated by Alzu, as explained in the supporting documents. We would like to wish them success with the new venture	TKL Hoffmann (Section 6.4.1)	Noted.
I MMC Johan Matshiane the Ward Councillor of ward 7 there for register as the affected party on the proposed project mentioned above, on behalf of the community of Kleinfontein. I therefore request to be contacted in all the processes that is going to take place. Our concerns are the following, Households are they not going to be affected, Grazing land for the community responding in that area, Community Graves are not going to be affected, we depend on water ground are they not going to be affected, there is also a land claim in progress. *I therefore like to register the following people to be consulted or when there are engagement or meetings going to take place - Community Development Worker (CDW) Nhlanhla Dinnah Mahlangu cell 0605027693 email Dnmahlangu@mpg.gov.za,Ward Committes Florah Mabena 0766289877, MMC/CLR Johan Matshiane 0812634155/0766008803 jmatshiane@gmail.com/mmcsec@stlm.gov.za, Community Development Worker (CDW) Thembi Mnguni 0603593987/0737515154 email Tmnguni@mpg.gov.za.*	Councillor J. Matshiane (Section 6.5.2)	AdiEnvironmental indicated the following in their response (email dated: 30 August 2017; Appendix 9) to Councillor Matshiane: *"Thank you for registering as an interested and affected party in terms of the Alzu GTC project and for providing comment. The issues raised will be addressed as part of the Basic Assessment Process.* *Please find attached a Background Information Document providing more information about the project and the process to be followed.* *It would be highly appreciated if you could forward details regarding the Land Claim e.g. who the claimants are, what portions of the farm are being claimed, status of claim, etc. This information will assist us in addressing your concerns."*
Property ownership: Does the property really belong to Alzu or is Alzu leasing the property?	Councillor Matshiane (Section 6.5.3)	The property is registered to Statutis Trading (Pty) Ltd. 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. In other words, the property does belong to Alzu.
From where would the community be able to obtain the project documentation once the project is operational? They want to ensure that Alzu is complying with the requirements.	S. Skosana (Section 6.5.3)	Copies of the Draft Basic Assessment Report and the Environmental Authorisation will be made available to all registered I&APs. A copy of the documentation will also be downloadable from the AdiEnvironmental website for a certain time period. The relevant documentation (i.e. copy of Basic Assessment Report, Environmental Authorisation, etc.) would be kept at the site office. See Section 11 for further details.
Wants to be kept up to date with the process.	S. Skosana (Section 6.5.1)	Mr. Skosana was registered as an I&AP and will be informed of the availability of the Draft BA Report for comment.

SECTION 7. DESCRIPTION OF ALTERNATIVES

According to Appendix 1 of the EIA Regulations, 2014 (as amended), one of the objectives of the basic assessment process is to identify the alternatives considered for the proposed development and to rank these alternatives in terms of the potential impacts identified in order to identify the preferred alternatives.

The EIA Regulations (2014; as amended) defines alternatives as:
"different means of meeting the general purpose and requirements of the activity, which may include alternatives to the -

a. *property on which or location where the activity is proposed to be undertaken;*
b. *type of activity to be undertaken;*
c. *design or layout of the activity;*
d. *technology to be used in the activity; or*
e. *operational aspects of the activity;*

and includes the option of not implementing the activity."

In addition to the above-mentioned, Section 24O(1)(b)(iv) of NEMA requires that the competent authority must take into account *"where appropriate, any feasible and reasonable alternatives to the activity which is the subject of the application and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment."*

This section therefore provides a detailed description of the various alternatives investigated and process followed to decide on the preferred alternatives to be implemented.

The following alternatives were investigated:

- 7.1: Alternative sites;
- 7.2: Alternative layout plans;
- 7.3: Alternatives in terms of manure handling;
- 7.4: Alternative service provision (water, electricity, waste and storm water);
- 7.6: No-go option.

7.1 Alternative sites

Five (5) alternatives in terms of the location of the proposed GTC facility were investigated, namely:

- 7.1.1: Expansion of the existing GTC facility located on the farm Rockdale;
- 7.1.2: Site 1 - located on the farm Kleinfontein, at the old farmstead complex;
- 7.1.3: Site 2 - located on the farm Kleinfontein, south east of the old farmstead complex;
- 7.1.4: Site 3 - located on the farm Kleinfontein, west of the old farmstead complex;
- 7.1.5: Site 4 - located on the farm Kleinfontein, south of the old farmstead complex.

Figure 7.1 indicates the location of Alternative Sites 1 - 4, whilst the location of the existing site is indicated in Figure 3.1.

Figure 7.1: Aerial view indicating the location of alternatives sites

Table 7.1 provides a summary of the advantages and disadvantages of the various alternative sites investigated, as well as an indication of the preferred alternative.

Table 7.1: Matrix for determining the preferred site

Alternative	Advantages	Disadvantages	Ranking	Option selected
Alternative Sites				
7.1.1: Existing Site - located on the farm Rockdale (Figure 3.1)		x **Landowner intends to develop a residential area and requested that the GTC facility be relocated**.	0 Fatal flaw	No
7.1.2: Site 1 - located at the old farmstead complex (Figure 7.1)	√ The property belongs to the applicant; √ The site is easily accessible; √ The existing buildings at the old farmstead complex can be utilized; √ Only a very small portion of cultivated land would be impacted; √ Easy connection to Eskom power lines; √ Existing boreholes can be used.	x **The site is located within a Depression wetland and associated 43m buffer zone.** x The site would impact on a gravel road utilized to access the adjacent property belonging to Mr. Hoffman. x The site slopes in both a southerly and northerly direction, which is not suitable in terms of effluent management since two manure dams/pits would have to be provided. x Buildings older than 60 years were identified at the old farmstead complex. Permission would have to be obtained from the South African Heritage Resources Agency to demolish or renovate these buildings.	0 Fatal flaw	No
7.1.3: Site 2 - located south east of the old farmstead complex (Figure 7.1)	√ The property belongs to the applicant; √ The site is easily accessible; √ No cultivated land (moderate arable land) would be lost; √ This portion of the property is not utilized by the applicant; √ No buildings or infrastructure would be impacted.	x **Located within a Depression wetland and associated 43m buffer zone.**	0 Fatal flaw	No
7.1.4: Site 3 - located west of the old farmstead complex (Figure 7.1)	√ The site is easily accessible; √ The existing buildings at the old farmstead complex can be utilized; √ Easy connection to Eskom power lines; √ Existing boreholes can be used; √ Located outside the identified wetland areas and associated 43m buffer zones (Figure 7.1); √ The site has already been impacted by development and agriculture; √ The site is north facing, which is ideal in terms of the placement of the buildings.	x **The site extends onto the adjacent property (Portion 26 of Kleinfontein 432 JS), that belongs to Beestepan Boerdery (Pty) Ltd. (Figure 6.2).**	0 Fatal flaw	No

Alternative	Advantages	Disadvantages	Ranking	Option selected
7.1.5: Site 4 - located south of the old farmstead complex (Figure 7.1)	√ *The property belongs to the applicant;* √ *The site is easily accessible;* √ *Located outside the identified wetland areas and associated 43m buffer zones (Figure 7.1);* √ *The site is located away from the buildings identified as older than 60 years of age;* √ *Easy connection to Eskom power lines;* √ *Existing boreholes can be used;* √ *The site will not impact on any access roads leading to surrounding properties, homesteads or villages;* √ *The topography of the site is suitable for development since it is relatively flat, which will minimize the need for earthworks;* √ *The site is not located near a river or stream and therefore not affected by the 1:100 year floodline. There is thus no flood risk and the potential for surface water pollution is low;* √ *The closest homesteads are located 605m south and east of the site (Figure 5.4).*	x *Loss of approximately 6 ha of cultivated land;* x *Eskom power lines are present in the northern* portion *of the site and will have to be relocated.*	*1 Preferred*	***Yes***

Legend: 0 = Fatal Flaw; 1 = Preferred Option; 2 = Second Option; 3 = Third Option

7.2 Alternative layout plans

Six (6) alternative layouts for the proposed GTC facility were investigated, namely:

- 7.2.1: Layout 1 - Site 3 (Figure 7.1) located west of the old farmstead complex;
- 7.2.2: Layout 2 - Site 4 (preferred site) with manure dam and separator;
- 7.2.3: Layout 3 - Site 4 (preferred site) with manure dam located south of facility;
- 7.2.4: Layout 4 - Site 4 (preferred site) with manure dam located south east of facility;
- 7.2.5: Layout 5 - Site 4 (preferred site) with manure dam located near the N4.
- 7.2.6: Layout 6 - Site 4 (preferred site) with manure pit located on the south eastern corner of the site.

7.2.1 Layout 1 - Site 3 located west of the old farmstead complex (Figure 7.2)

A layout plan was designed for Site 3 located west of the old farmstead complex (Figure 7.1). Figure 7.2 provides an indication of the layout plan.

Layout 1 comprised of the following:

- Footprint of 245m x 95m (excluding the parking area);
- 2 buildings (195m x 15m), comprising of 200 boar pens each;
- Laboratory, office facilities, workshop, laundry room,
- Parking area;
- Feed silos;
- Shavings shed;
- Effluent catch pit in the south western corner of the site.

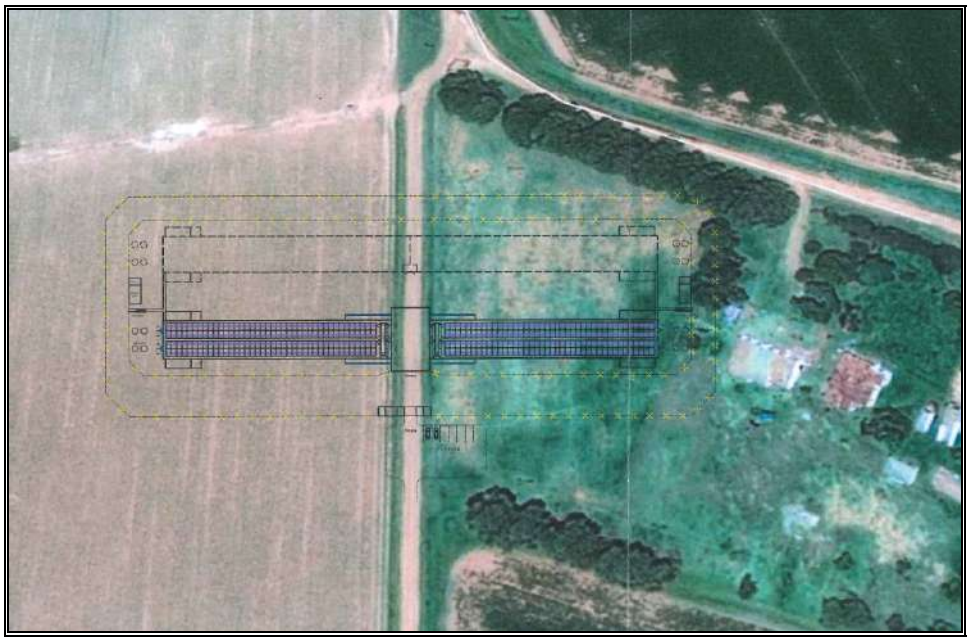


Figure 7.2: Layout 1 (designed by Dalein Plaasbou, 2017)

7.2.2 Layout 2 - Site 4 (preferred site) with manure dam and separator (Figure 7.3)

As indicated in Section 7.2.1, Layout 2 was discarded since the layout plan extended onto the adjacent property, which does not belong to the applicant. Therefore, a new layout plan had to be drafted for Site 4 taking into account the north-south orientation of the site and the location of the access road.

Layout 2 comprised of the following as indicated in Figure 7.3:

- Footprint of 157m x 173m (excluding the entrance and manure dam);
- 4 buildings (91.2m x 15m), comprising of 100 boar pens each;
- Laboratory, office facilities, workshop, laundry room,
- Parking area;
- Shavings shed;
- Feed silos.

In addition, provision was made for an effluent catchpit, separator, effluent dam, solids bunkers and a composting site south of the proposed facility.

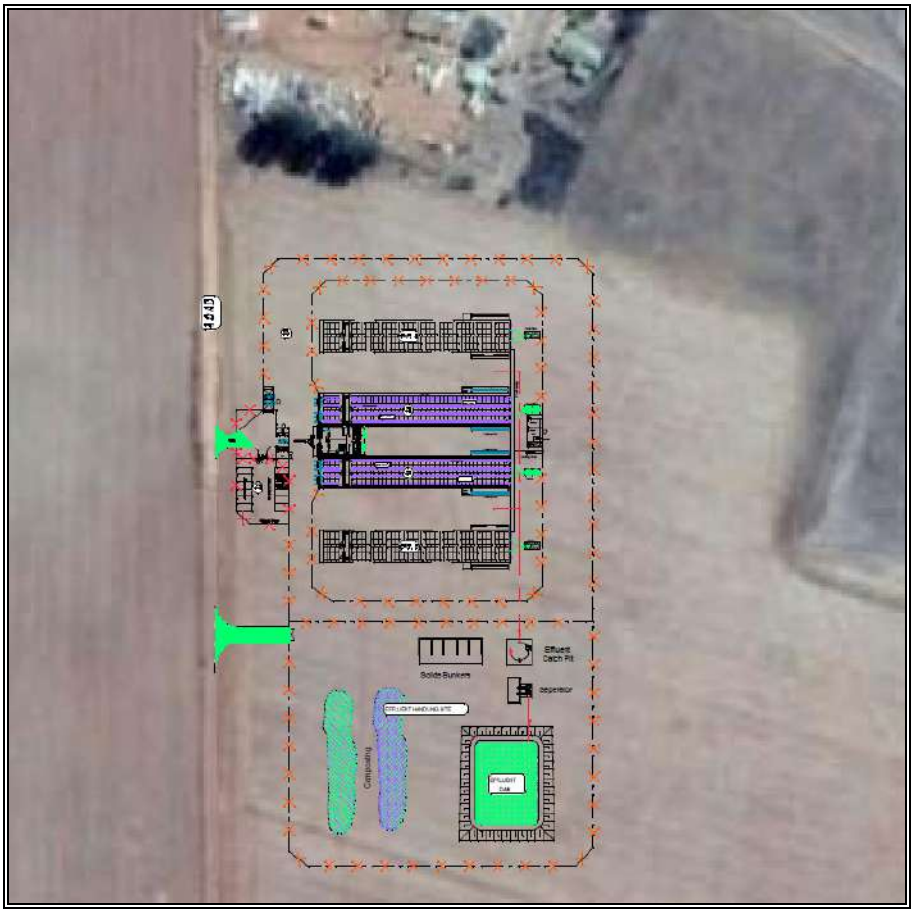


Figure 7.3: Layout 2 (designed by Dalein Plaasbou, 2017)

7.2.3 Layout 3 - Site 4 (preferred site) with manure dam located south of facility (Figure 7.4)

Layout 3 comprised of the following as indicated in Figure 7.4:

- Footprint of 145m x 135m (excluding the manure dam, entrance and fence);
- 4 buildings (100m x 19m), comprising of 100 boar pens each;
- Laboratory, office facilities, workshop, laundry room,
- Parking area; and

- Feed silos.

This layout plan included a manure dam south of the facility as well as details regarding the flow of manure from the facility to the manure dam. Provision was made for storm water channels (16m wide) between each platform (Figure 7.4).

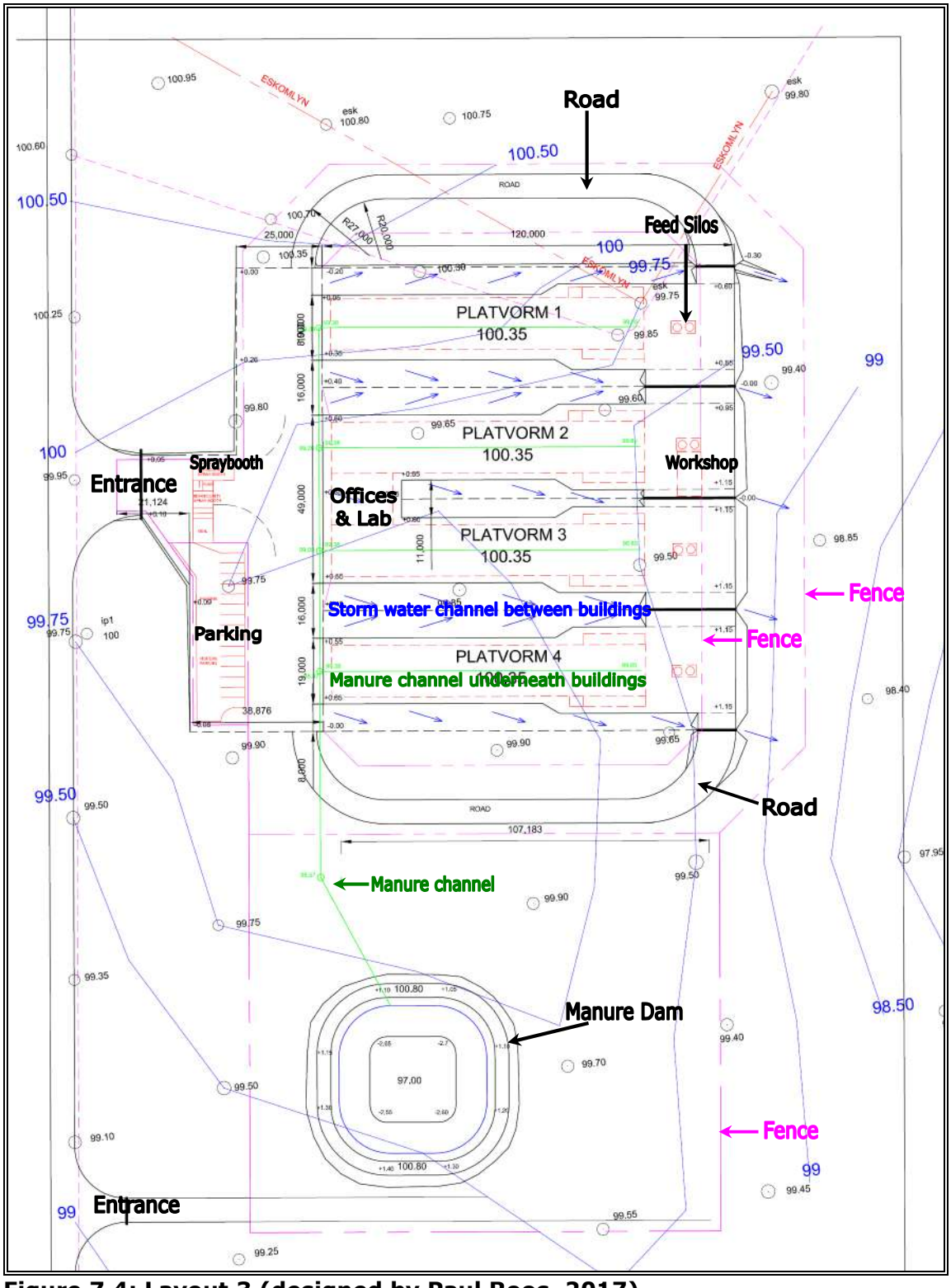


Figure 7.4: Layout 3 (designed by Paul Roos, 2017)

7.2.4 Layout 4 - Site 4 (preferred site) with manure dam located south east of facility (Figure 7.5)

Layout 3 was discarded since the manure dam was not located in the correct position to allow for gravitational flow of manure from the boar pens to the manure dam. Layout 4 (Figure 7.5) was subsequently adapted by Hlasane (2018).

In order to ensure that the manure would be able to gravitate to the manure dam, the manure dam had to be relocated to a position a few hundred meters south east of the site (Figure 7.5).

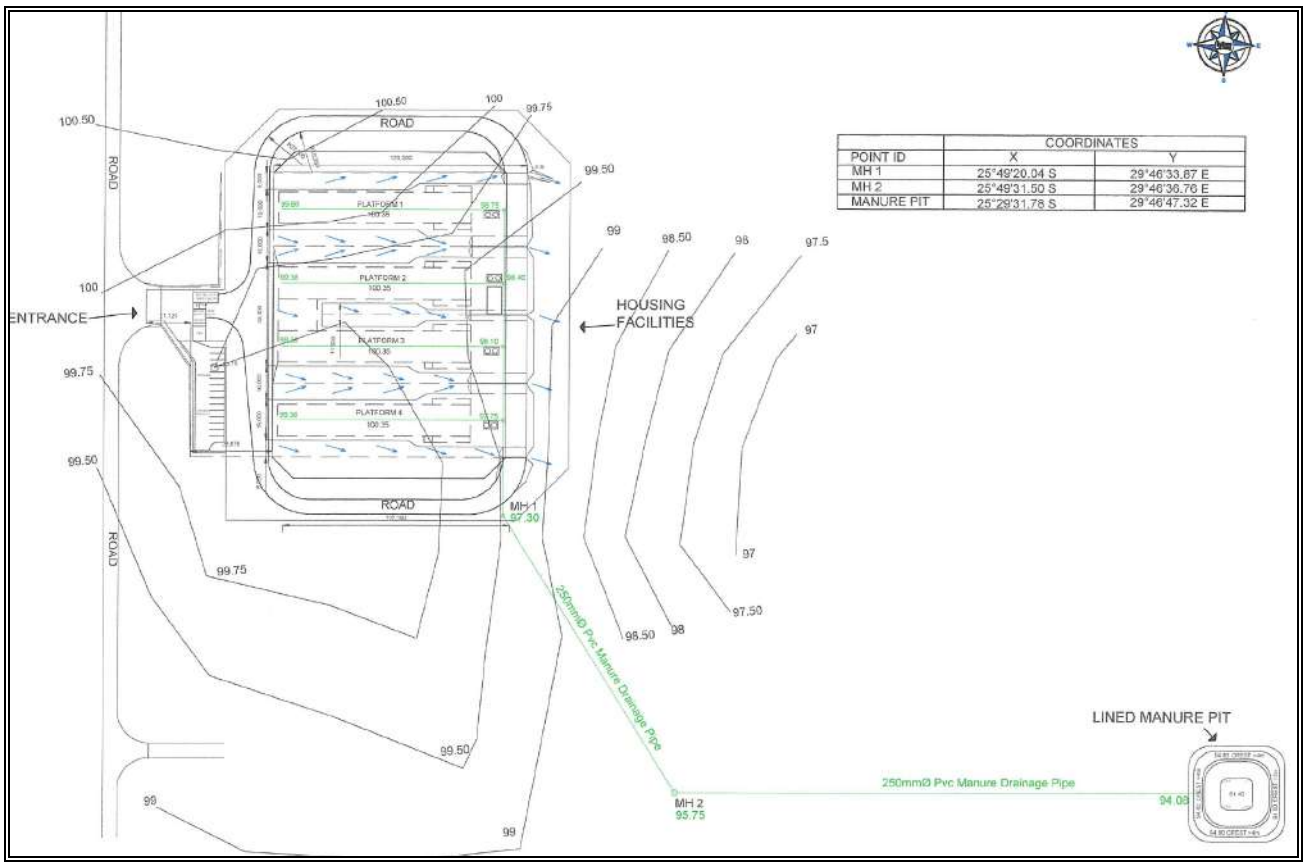


Figure 7.5: Layout 4 (taken from Hlasane, 2018)

7.2.5 Layout 5 - Site 4 (preferred site) with manure dam located near the N4 (Figure 7.6b)

Layout 5 (Figure 7.6b) is similar to Layout 4 (Figure 7.5), except for the location of the manure dam. The manure dam was relocated from south east of the facility to approximately 400m south of the facility (near the N4 national road) as indicated in Figures 7.6a and 7.6b.

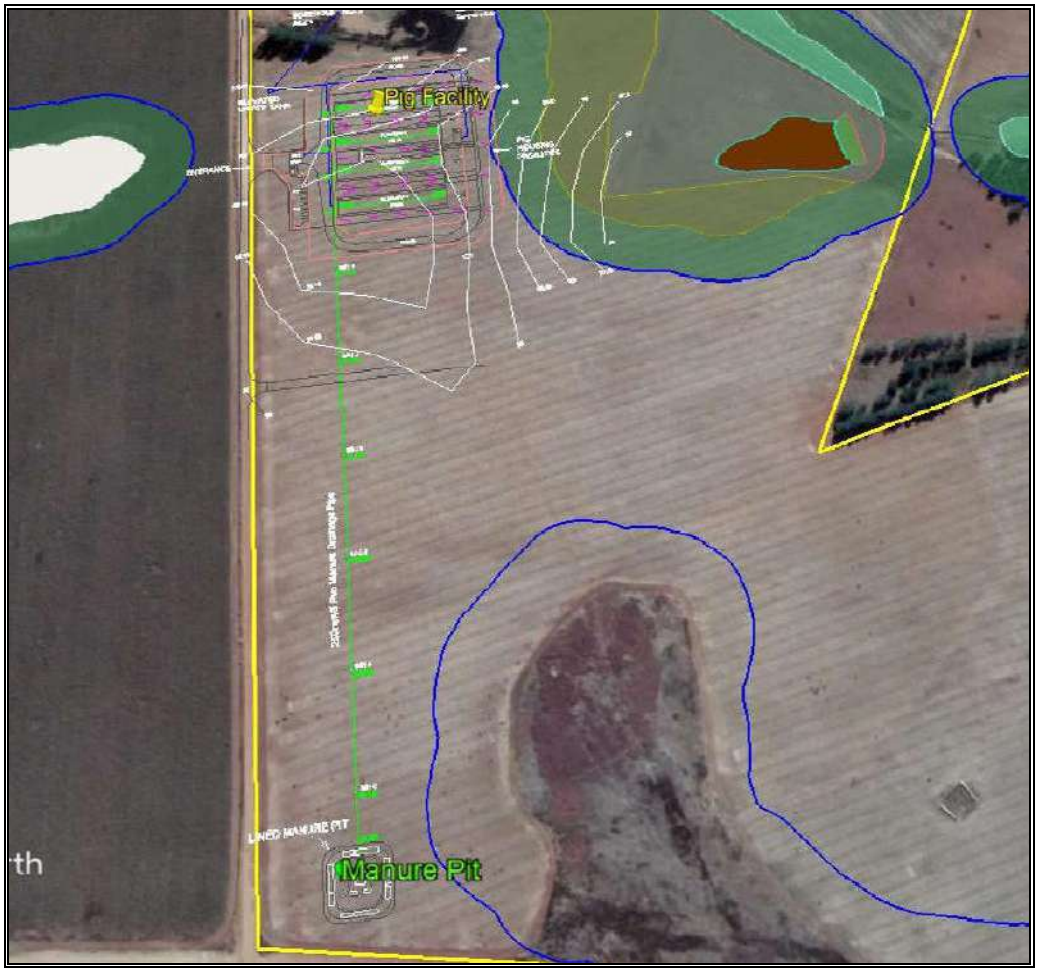


Figure 7.6a: Alternative layout 5 in relation to the property boundaries and wetland buffer zones (taken from Hlasane, 2018)

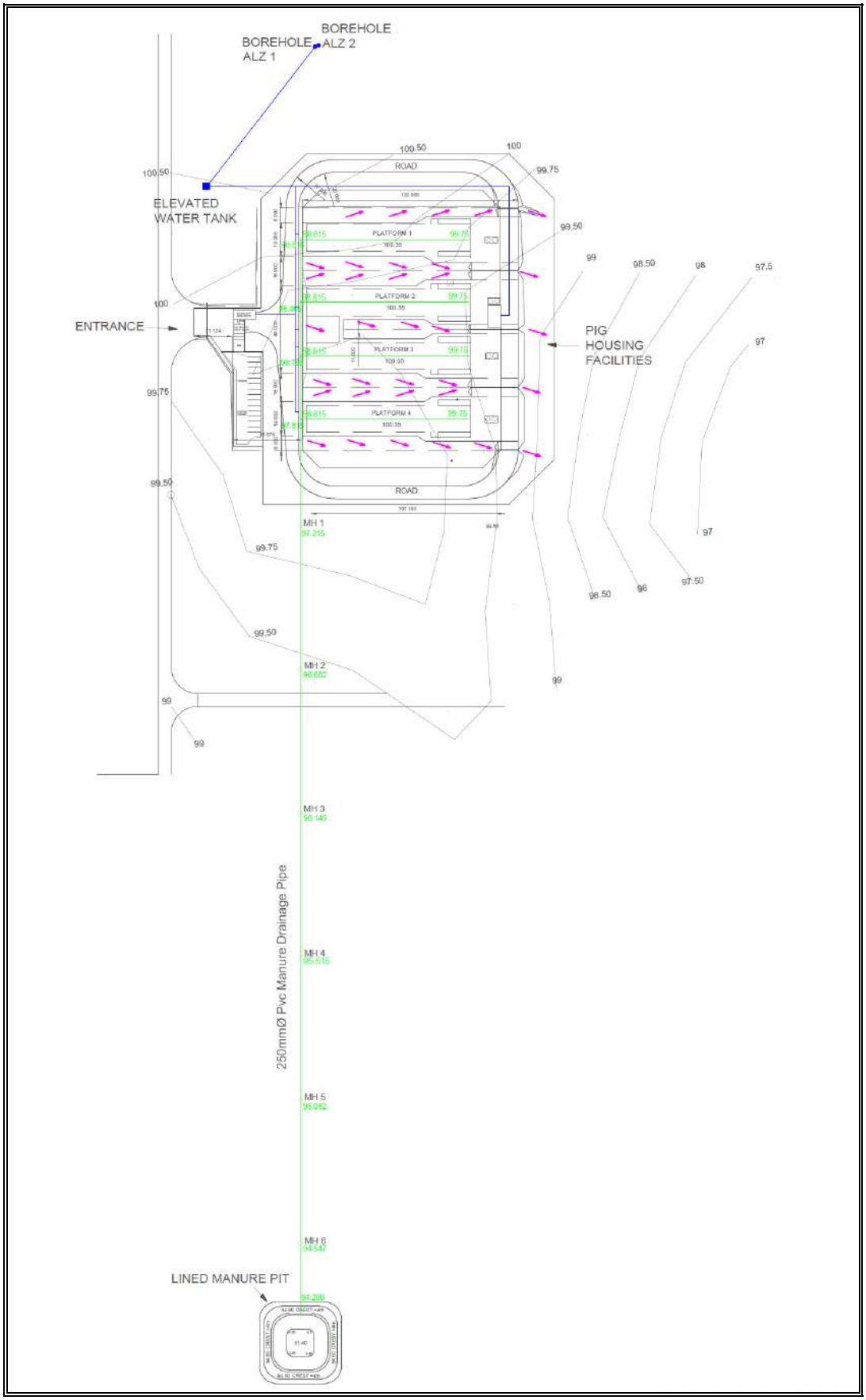


Figure 7.6b: Alternative Layout 5 (taken from Hlasane, 2018)

7.2.6 Layout 6 - for Site 4 (preferred site) with manure pit located on the south western corner of the site (Figure 7.7)

Layout 5 was discarded since an additional 8 ha of cultivated land would be lost in order to ensure that the manure can gravitate to the manure dam.

The applicant subsequently discarded the entire concept of a manure dam and opted for the construction of a concrete manure pit located beneath ground level (i.e. not built up like the manure dam). Section 7.3 provides more information with regards to the design of the manure pit.

Layout 6 comprises of the following as indicated in Figure 7.7:

- Footprint of 145m x 135m (excluding the manure pit, entrance and fence);
- 4 platforms (100m x 19m) 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 of 16m between each building with a total of 5 channels; pink lines on Figure 7.7);
- Feeder system (i.e. feeders, feed silo's, etc.);
- Water system (i.e. boreholes, water tank and pipes, nozzles; blue line on Figure 7.7)
- Heating/ventilation system (i.e. diesel burners, fans, curtains, etc.);
- Waste management system (i.e. manure drainage system to manure pit; brown lines on Figure 7.7);
- Laboratory, office, ablutions and laundry;
- Workshop;
- Semen collection area;
- Biosecurity spray booth;
- Staff and visitors parking area;
- Access road;
- Double fencing.

Figure 7.8 provides a cross-section of the buildings indicating the walkways, boar pens, slotted floors, manure compartments and manure discharge pipe.

It should be noted that small changes to the layout plan in terms of the size of the buildings, rotation, location of entrance/parking area, etc. are possible depending on the final building plans.

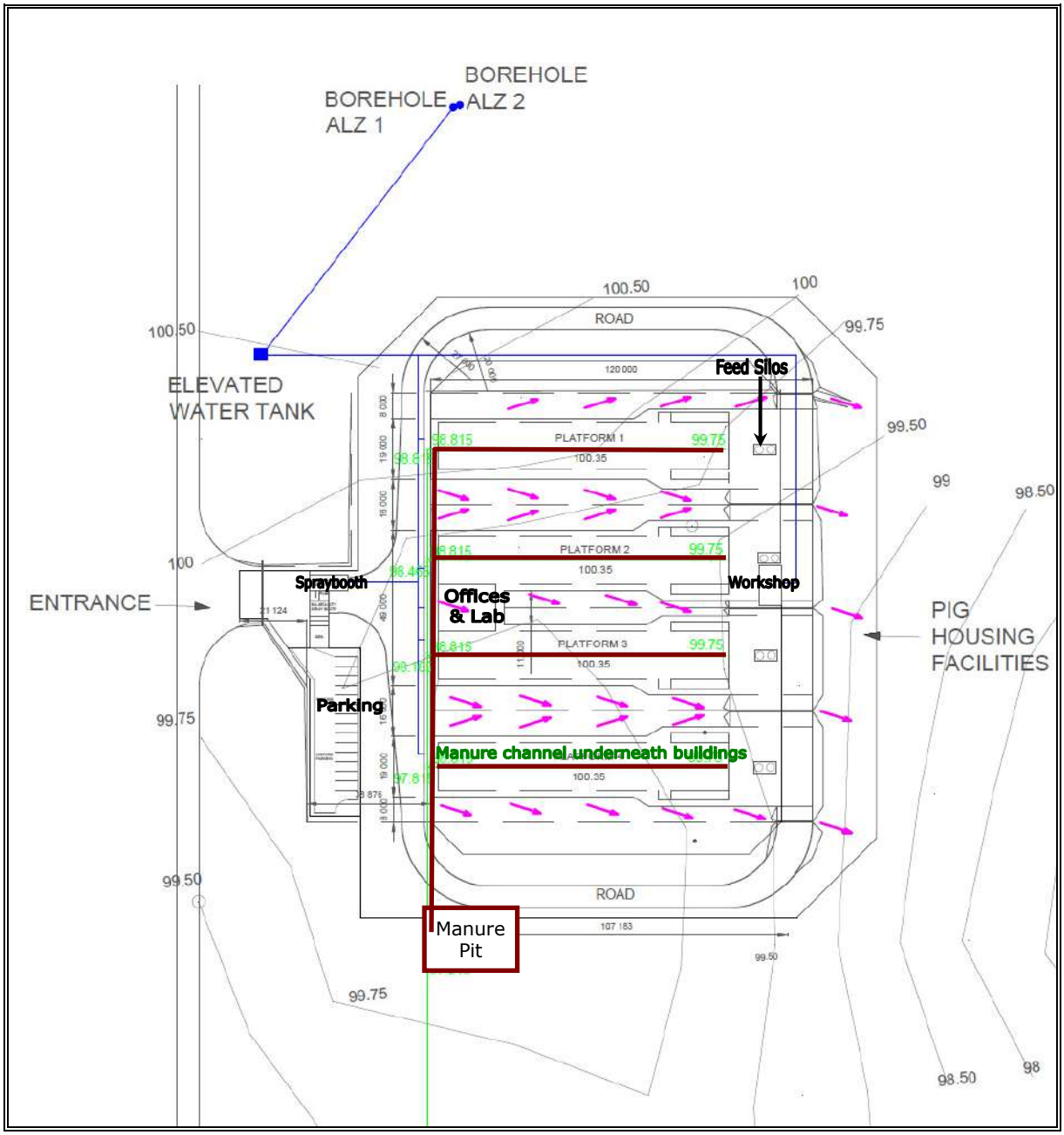


Figure 7.7: Layout 6 (adapted from Hlasane, 2018 and Paul Roos, 2017)

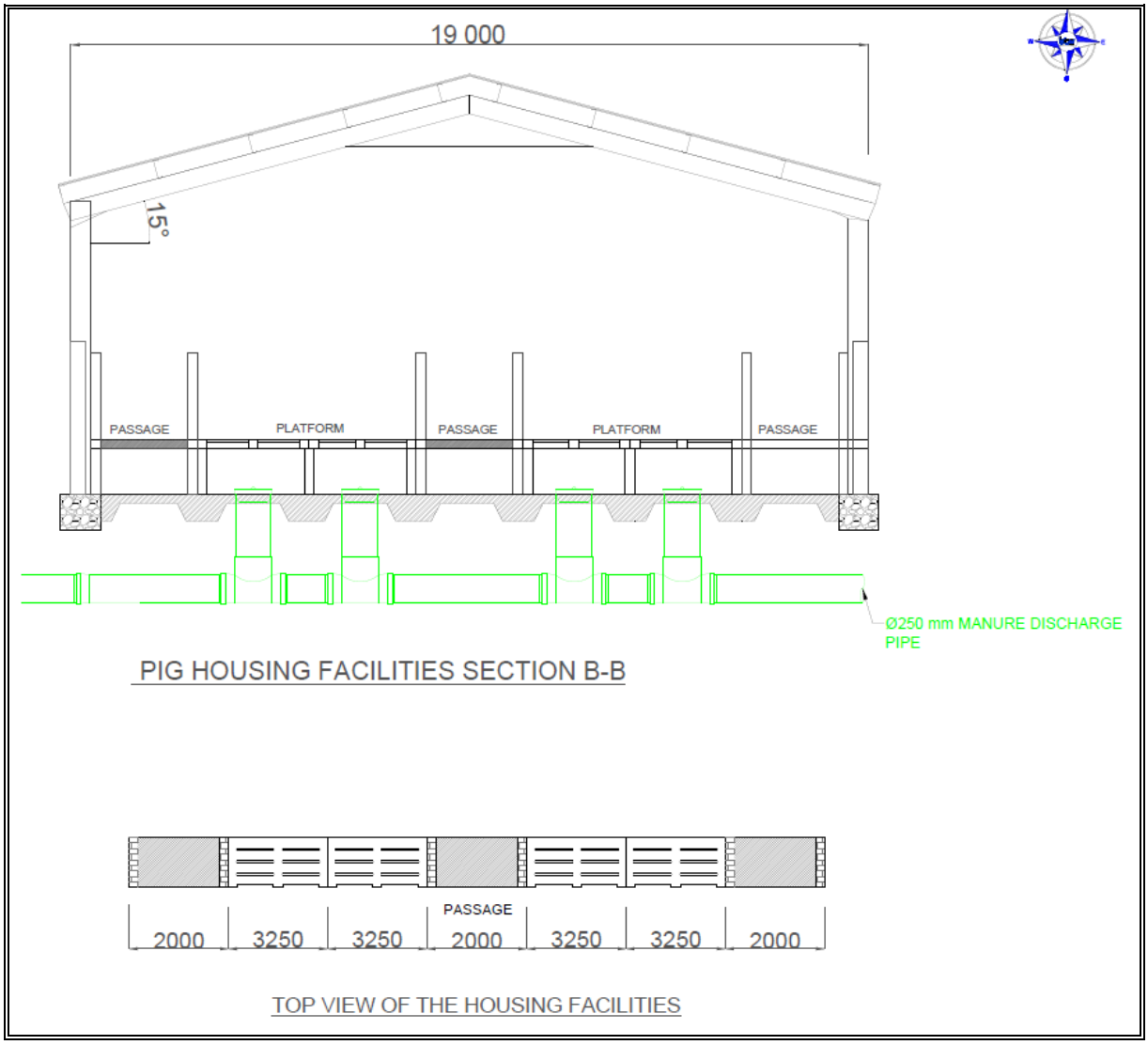


Figure 7.8: Cross section of the buildings (taken from Hlasane, 2018)

Table 7.2 provides a summary of the advantages and disadvantages of the various alternative layout plans investigated as well as an indication of the preferred alternative.

Table 7.2: Matrix for determining the preferred layout

Alternative	Advantages	Disadvantages	Ranking	Option selected
Alternative layout plans				
7.2.1: Layout 1 - Site 3 located west of the old farmstead complex (Figure 7.2)	√ The site is north facing, which is ideal in terms of the placement of the buildings.	x **The layout plan extends onto the adjacent property (Portion 26 of Kleinfontein 432 Js) that belongs to Beestepan Boerdery (Pty) Ltd. (Figure 6.2);** x Residents in the area raised concerns regarding access to their properties since the site extends across a gravel access road (see Section 6.5); x The gravel road would have to be realigned.	0 Fatal flaw	No
7.2.2: Layout 2 - Site 4 (preferred site) with manure dam and separator (Figure 7.3)	√ The layout plan does not extend onto the adjacent property; √ No infrastructure will be impacted.	x The installation of a separator (Figure 7.3) and the composting of the manure would be costly; x The provision of an effluent catchpit, separator, composting area and solids bunker is therefore not required (Figure 7.3); x The shavings shed is no longer required since bedding would not be provided to the boars; x No storm water management measures are indicated on the layout plan.	3rd Option	No
7.2.3: Layout 3 - Site 4 (preferred site) with manure dam located south of facility (Figure 7.4)	√ Manure dam included (instead of a catchpit, separator and composting area) as requested by the applicant; √ Storm water management measures (blue arrows) indicated on plan; √ Shavings shed removed since it is no longer required.	x **The slope of the site is insufficient for gravitational flow of manure from the boar pens to the manure dam;** x The manure dam needs to be repositioned;	0 Fatal flaw	No
7.2.4: Layout 4 - Site 4 (preferred site) with manure dam located south east of facility (Figure 7.5)	√ The manure dam is not located on the adjacent property; √ Manure can gravitate from the boar pens to the manure dam; √ The manure dam is not located within a wetland or associated 43m buffer zone; √ The positions of the boreholes and proposed location of the elevated water tank are indicated.	x **The manure dam would be located on the adjacent property belonging to Mr. Hoffman;** x The manure dam would be located close to the Seep wetland and associated 43m buffer zone (Figure 7.5) as well as an unnamed stream present south east of the site.	0 Fatal flaw	No
7.2.5: Layout 5 - Site 4 (preferred site) with	√ The manure dam is located on property belonging to the applicant;	x The manure dam and pipeline would extend across cultivated land, which would lead to the loss of an	2nd Option	No

Alternative	Advantages	Disadvantages	Ranking	Option selected
manure dam located near the N4 (Figure 7.6b)	√ Gravitational flow of manure from the boar pens to the manure dam; √ The manure dam is not located within a wetland or associated 43m buffer zone (Figure 7.6a).	additional 8 ha of agricultural land; x The manure dam would be located very close (72m) to the N4 national road, which could be an issue in terms of odours; x The manure dam would be located close (220m) to Homestead 1 (Figure 5.4), which could be an issue in terms of odours.		
7.2.6: Layout 6 - Site 4 (preferred site) with manure pit located on the south western corner of the site (Figure 7.7)	√ *Gravitation of the manure from the boar pens would no longer pose a problem;* √ *The manure pit would be located close to the facility ensuring that the development footprint is kept to a minimum.*	x *None*	*1 Preferred*	***Yes***

Legend: 0 = Fatal Flaw; 1 = Preferred Option; 2 = Second Option; 3 = Third Option

7.3 Alternatives in terms of manure handling

The following alternatives in terms of manure handling were investigated:

7.3.1: In-house effluent collection - Alternatives 1A and 1B;
7.3.2: Temporary outside storage of manure - Alternatives 2A to 2D;
7.3.3: Utilization of manure - Alternatives 3A to 3C.

7.3.1 In-house effluent collection

The following effluent collection systems can be implemented (Tucker *et. al*., 2010) at piggeries in general:

- Flushing systems/flush channels - underfloor channels that are flushed on a regular basis. (This system is in place at the existing GTC facility).
- Pull-plug system - effluent is stored in underfloor pits, which are drained every 2 weeks using gravity release pipes in the centre of the pits.
- Static pits/deep channel storage systems - underfloor pits that store effluent for up to several weeks before it is released via a sluice gate.
- Open flush gutters/channels - effluent is collected in open gutters/v-drains running beside the pens.
- Dry scraping systems - manure and wastewater from underfloor effluent channels are dragged by means of blades attached to cables.
- Effluent sump - effluent is stored in sumps before being directed to ponds or used for irrigation. The effluent is agitated by means of mechanical stirrers or high velocity pumps to enable pumping of the resulting slurry.

Each of the above-mentioned effluent collection systems has a number of advantages and disadvantages.

For example, the static pits/deep channel storage systems are not recommended due to the build-up of toxic gases and gases with an unpleasant odour. The open flush gutters/channels are most commonly used, but require large amounts of water. Another potential problem is the spreading of disease since the open channel system allows animals to have direct contact with the flushing water.

Flushing water is not added to the manure in dry scraping systems, which means that the amount of effluent that needs to be treated is greatly reduced. However, the effluent has a very high concentration of solids, that results in high ammonia concentrations within the piggery.

For this project, the applicant focused on only two types of effluent collection systems namely:

- Alternative 1A: Concrete floor with bedding and flush channels (implemented at the existing GTC facility).
- Alternative 1B: Slotted floors with deep pit storage system.

<u>Alternative 1A: Concrete floor with bedding and flush channels (Photo 7.1)</u>

The in-house effluent collection system at the existing GTC facility comprises flush channels, which are underfloor channels that are flushed on a regular basis.

The boar pens are constructed with solid concrete floors and a slotted floor in the front of the pen (Photo 7.1). A channel is located underneath the slotted floor.

The concrete floors are covered with bedding (wood shavings), which is scraped along with the manure and urine into the underfloor channel on a daily basis. The underfloor channels are not closed with valves or sluice gates, meaning that the channel can drain freely to the manure pit.

Photo 7.1: Photographic view of the concrete floor and flush channel system at the existing GTC facility.

Twice a week, the channels are flushed with water, which clears away any solids that may be present. The pens are washed with a pressure washer every 3rd month and disinfected. The washwater flows into the channel and drains to the manure pit.

Alternative 1B: Slotted floors with deep pit storage system (Photo 7.2)

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 (510mm deep) located beneath the floor. Photo 7.2 provides an example of the slotted floors and manure compartment.

Photo 7.2: Example of the slotted floor system (obtained from www.stockyardindustries.com).

All 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 (250mm diameter) to a central manure dam/pit.

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.

Table 7.3 provides a summary of the advantages and disadvantages of the various in-house effluent collection systems investigated as well as an indication of the preferred alternative.

Table 7.3: Matrix for determining the preferred alternative in terms of effluent collection

Alternative	Advantages	Disadvantages	Ranking	Option selected
In-house effluent collection				
Alternative 1A - Concrete floor with bedding and flush channels (Photo 7.1)	√ Comfort provided to the animals in terms of bedding and a solid floor; √ There is no risk of a slotted floor breaking and the boar getting injured/drowning in the underfloor manure compartment.	x Labour intensive since the pens need to be scraped every day and new bedding added; x Costly since the bedding needs to be replaced on a daily basis; x Water intensive since the channel needs to be flushed once a week requiring large amounts of water; x This system is prone to blockages due to the high volumes of solids in the channel.	2nd Option	No
Alternative 1B - Slotted floors with deep pit storage system (Photo 7.2)	√ *Low management and labour requirement;* √ *Low operating costs;* √ *No electricity requirements, thereby reducing the carbon footprint of the facility and reducing stress on the national electricity network;* √ *High retention of fertilizer nutrients in the waste that will be spread onto lands;* √ *The boars are clean and live in a clean environment.*	x *There is a risk that the slotted floors (specifically the plastic variety) could break, resulting in injury to the boar;* x *Blockages could occur leading to a rise in the manure level;* x *The fact that the manure is left underneath the pen to ferment does result in the production of gases with an unpleasant odour, hence the need for a proper ventilation system.*	*1 Preferred*	***Yes***

Legend: 0 = Fatal Flaw; 1 = Preferred Option; 2 = Second Option; 3 = Third Option

7.3.2 Temporary outside storage of manure

Four options for the storage of manure were investigated namely:

- Alternative 2A: Storage of manure in shallow evaporation manure pits;
- Alternative 2B: Storage of manure in an effluent dam with separator and composting component;
- Alternative 2C: Storage of manure in a manure dam without a separator;
- Alternative 2D: Storage of manure in a concrete manure pit.

Alternative 2A: Storage of manure in shallow evaporation manure pits

Manure from the existing GTC facility is channelled to two (2) shallow evaporation manure pits located near the main building (Photo 7.3).

Manure is firstly channelled to one manure pit until it is full, whereafter the manure is diverted to the second manure pit. The full manure pit is then left to dry. By the time the second manure pit reaches maximum capacity, the first manure pit is dry enough for the manure to be lifted out by a bobcat or back-actor (Photo 7.4). The dry manure is then stored on a concrete slab until it can be transported to one of the Alzu farms and spread on cultivated land as fertilizer.

Photo 7.3: A view of the two evaporation manure pits at the existing GTC facility.

Photo 7.4: A view of the back-actor loading dry manure from the stockpile onto a truck.

Alternative 2B: Storage of manure in an effluent dam with separator and composting component

Alternative 2B proposed separating the dry matter from the liquid. The manure would be channelled from the pens to an effluent catch pit (Figure 7.9). From there, the manure would be fed through a separator (usually a screen or screw-press) (Photo 7.5) to separate the liquids and solids.

The liquid fraction would be diverted to an effluent dam (Figure 7.9) where it would be left to ferment before being irrigated onto agricultural land. The solid fraction would fall into a bunker (Figure 7.9), whereafter it would be moved to cement slabs and composted for 2 – 12 weeks before being applied to agricultural land or sold as fertilizer.

Figure 7.9 provides an indication of the proposed effluent handling site layout as designed by Dalein Plaasbou (2017).

Photo 7.5: An example of a screw-press separator (obtained from Big Dutchman and www.sajWare.com).

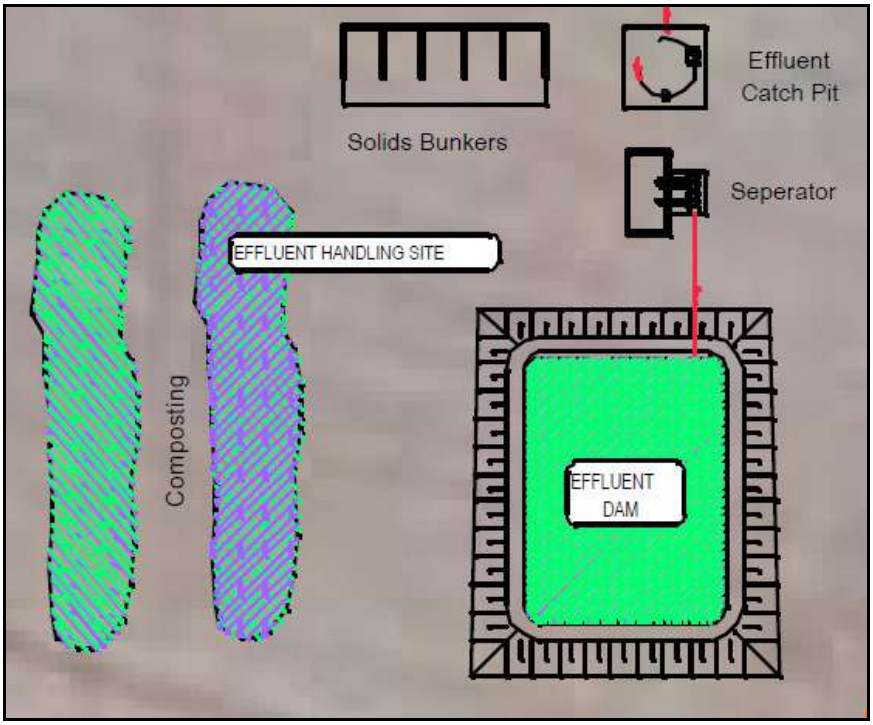


Figure 7.9: Alternative 2B - effluent handling site layout (designed by Dalein Plaasbou, 2017)

<u>Alternative 2C: Storage of manure in a manure dam without a separator</u>

Alternative 2C involved the construction of a manure dam to temporarily store manure at the proposed GTC facility.

The manure dam would be constructed aboveground (not dug out) down slope of the GTC facility (Figure 7.6b). During construction, soil would be placed in 150 mm layers and compacted to 93% MOD AASHTO to ensure that the dam wall is of sufficient strength. In order to prevent seepage into the soil and groundwater, the manure pit would be lined with a Gundle plastic membrane/liner. Manure would then gravitate via a pipeline (Photo 7.6) towards the manure dam, where it would be allowed to ferment before it is spread on cultivated land by means of a tractor and tanker.

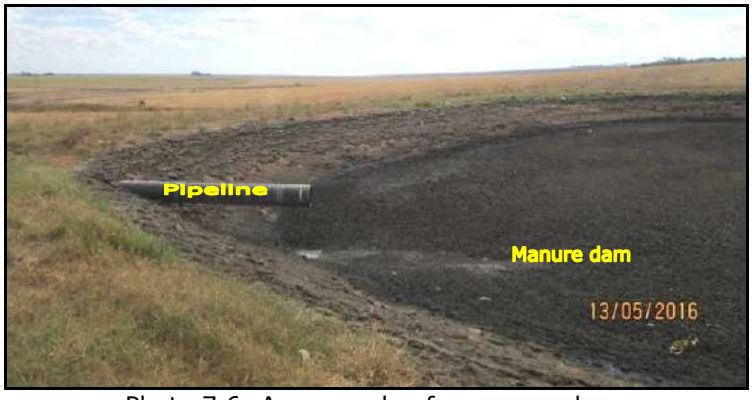


Photo 7.6: An example of a manure dam.

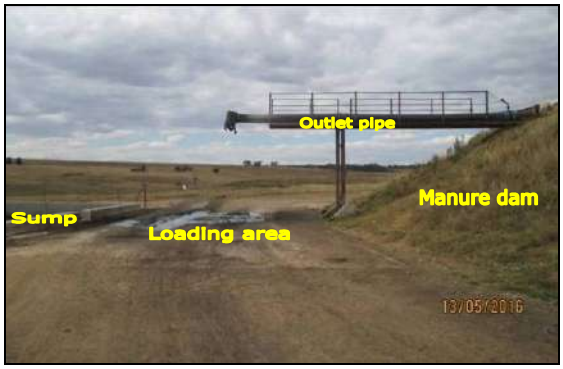


Photo 7.7: An example of the manure loading area and sump.

Two designs were drafted for the proposed manure dam as indicated in Figure 7.10 and Figure 7.11.

The design parameters of the manure dam (Figure 7.10) drafted by Paul Roos (2017) is as follows:

- 3:1 slope
- 4m crest
- Footprint 3329m^2 (60m x 60m)
- Volume 3222m^3
- Depth 3m
- Freeboard 1m

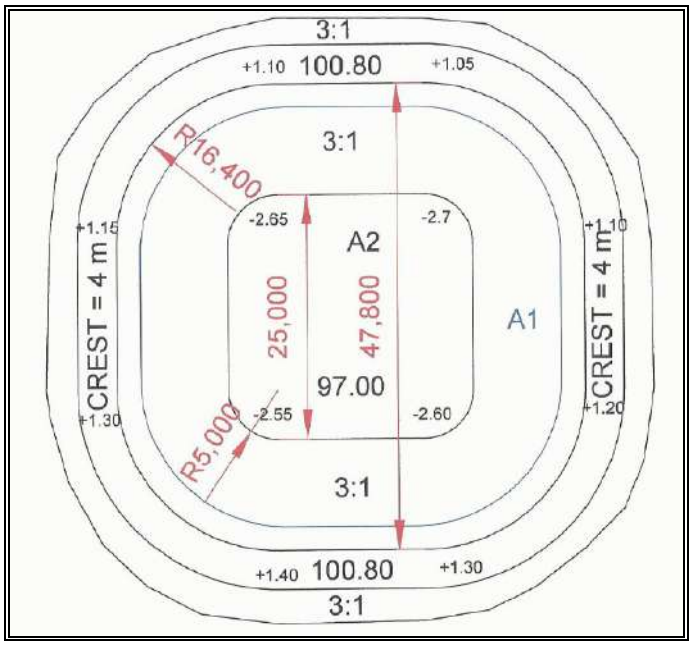


Figure 7.10: Manure dam design (designed by Paul Roos, 2017)

Hlasane (2018) indicated that the manure dam would be too big for the estimated amount of manure to be produced at the GTC facility. A new design (Figure 7.11) was therefore drafted by Hlasane (2018) with the following design parameters:

- 3:1 slope
- 4m crest
- Footprint ±1600m^2 (40m x 40m)
- Volume 1400m^3
- Freeboard 0.8m

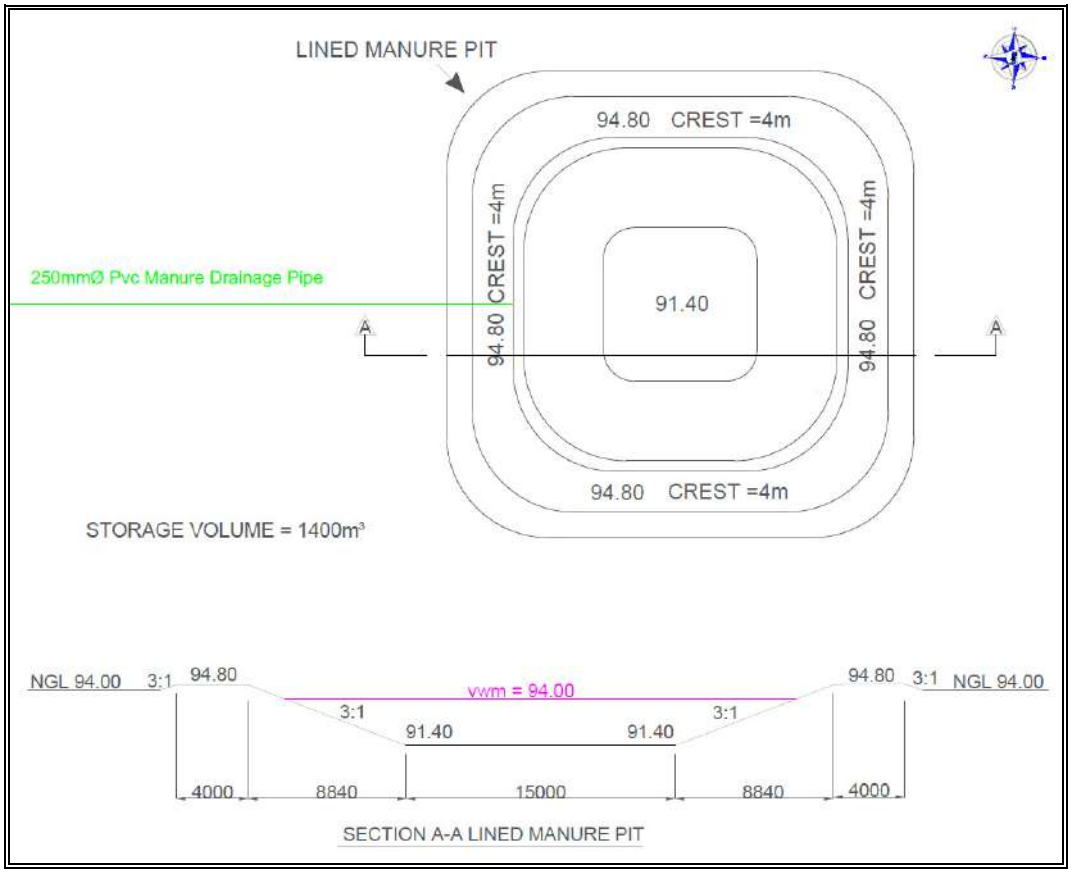


Figure 7.11: Manure dam design (taken from Hlasane, 2018)

Alternative 2D: Storage of manure in a concrete manure pit

Alternative 2D involves the construction of a concrete manure pit. Two different manure pits were investigated namely:

- Alternative 2D1 - A covered concrete manure pit;
- Alternative 2D2 - An open concrete manure pit.

Alternative 2D1 - Covered concrete manure pit:

Alternative 2D1 involves a concrete manure pit (6m x 6m x 6m) with a storage capacity of 200m^3 and surface area of 36m^2, which would allow for ±2 weeks' storage. The manure pit would be covered with a concrete lid and would have manholes through which the manure could be pumped out (Photo 7.8).

Photo 7.8: An example of a concrete sump with lid (provided by Big Dutchman, 2017)

Alternative 2D2 - Open concrete manure pit:

Alternative 2D2 involves the construction of an open concrete manure pit of 8m long x 3m wide x 4.5m deep with a capacity of ±86m^3 and surface area of 24m^2. A conceptual design of the manure pit is provided in Figure 7.12.

The manure pit will be excavated on the south western corner of the site as indicated in Figure 7.7. Manure will be collected from the boar pens by means of a 250 mm pipeline and piped to a small manhole (1m x 1m x 1m) located outside the buildings. From here, the manure will be piped to the manure pit via a 315mm discharge pipe (Figure 7.12).

The manure pit will be constructed with concrete walls, reinforced steel and a large concrete footing to resist wall pressure (Figure 7.12).

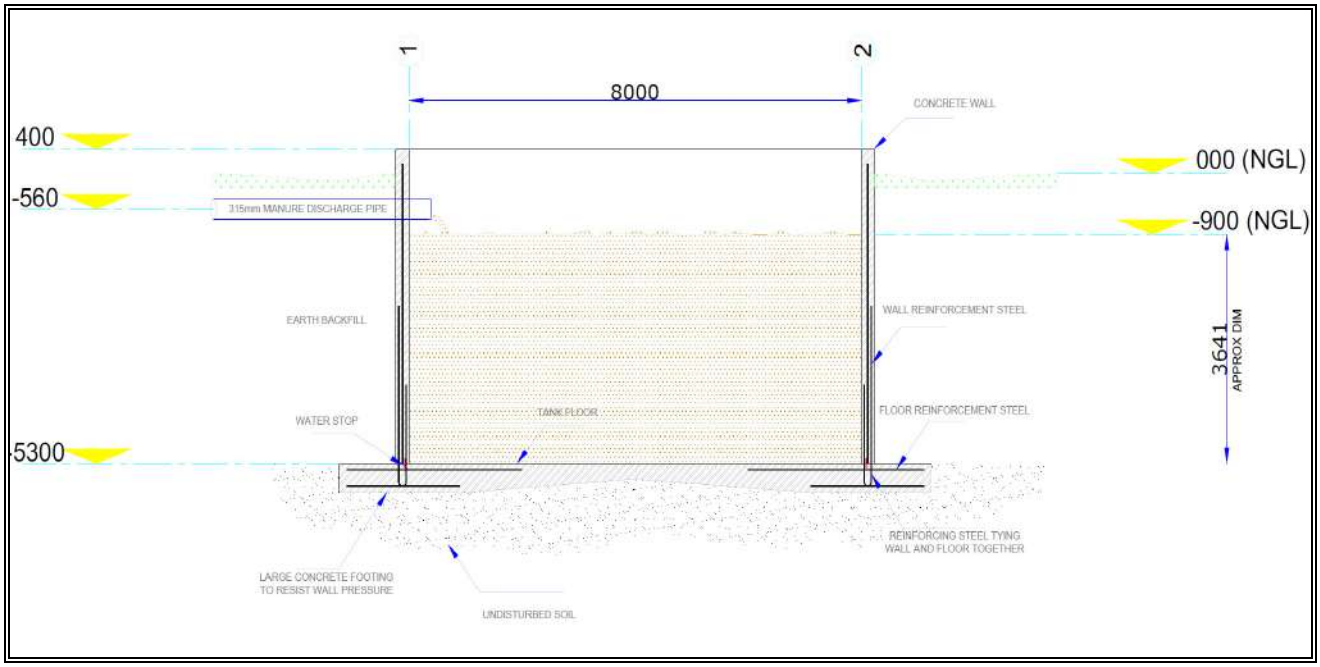


Figure 7.12: Manure pit design (designed by NewQuip Agri Supplies)

Based on the capacity of the manure pit, it will have to be emptied once a week if 400 boars are kept at the facility and once every two weeks if only 200 boars are kept at the facility. The manure pit will be drained with a suction pipe and spread onto cultivated lands with a tractor and tanker (Photo 7.9). Before the manure is sucked out of the manure pit, it will be mixed by means of blades or air released from the suction pipe.

Photo 7.9: An example of the tractor and tanker to be used for the spreading of manure

Subsequently, the applicant indicated that the manure pit will be covered with corrugated iron for safety purposes and to reduce the smell and visual impact.

Table 7.4 provides a summary of the advantages and disadvantages of the various alternatives investigated in terms of the outside storage of manure as well as an indication of the preferred alternative.

Table 7.4: Matrix for determining the preferred alternative in terms of the outside storage of manure

Alternative	Advantages	Disadvantages	Ranking	Option selected
Temporary outside storage of manure				
Alternative 2A - Storage of manure in shallow evaporation manure pits (Photo 7.3)	√ Cost effective, since minimum handling of manure is required.	x The two shallow evaporation pits would not be able to accommodate the quantity of manure produced at the proposed GTC facility; x A larger surface area would therefore be required, leading to an increased development footprint and loss of cultivated land; x More odours due to the larger surface area.	4th Option	No
Alternative 2B - Storage of manure in an effluent dam with separator and composting component (Figure 7.9)	√ The volume of wastewater to be applied to agricultural/cultivated lands is reduced thereby also reducing the risk of runoff to surface water environments and eutrophication of nearby streams/dams; √ Stackable solids are produced that can be sold as fertilizer; √ The conversion of Nitrogen to Ammonium facilitates nutrient uptake by plants; √ Correct pH and moisture percentage (%) results in reduced pathogen counts; √ The quality of the solid fraction could be improved; √ Odours would be reduced by reducing organic matter and suspended solids in the liquid fraction; √ Odours would be reduced during the spreading of the manure since the liquid fraction would enter the soil more efficiently; √ Odours and vector attraction (flies, rodents, etc.) would be reduced by subjecting the solid fraction to an aerobic process and reducing the moisture content of the manure.	x The small amount of manure produced at the GTC facility does not warrant the installation of a separator; x The installation of a separator would be very costly; x New equipment would have to be purchased e.g. front-end loaders, irrigation equipment, etc; x The separator phase would require the installation of sumps, pumps, etc. since the manure would have to be pumped through the separator (gravitation would be inadequate); x The electricity usage at the GTC facility would be higher with the separator; x The operational costs of the GTC facility would be higher due to the use of heavy vehicles to constantly move and turn the compost; x The site footprint would increase with the separator phase as a result of cement slabs, pumps, access roads, screen/press, etc.; x Storm water management around the composting facility could be problematic.	3rd Option	No
Alternative 2C - Storage of manure in a manure dam without a separator (Figure 7.11)	√ Soil for the construction of the dam would be sourced from cut-and-fill during construction of the platforms; √ Minimum excavation required since the dam would be constructed above ground;	x The dam wall could break if not constructed properly, resulting in the spillage of manure and soil, groundwater and surface water pollution; x The outlet pipe could get blocked, resulting in the tractors and tankers not being able to drain manure	2nd Option	No

Alternative	Advantages	Disadvantages	Ranking	Option selected
	√ The dam would be lined, minimizing the risk of soil and water pollution. √ The tractor and tanker can park underneath the outlet pipe (Photo 7.7); √ A sump would be provided adjacent to the loading area (Photo 7.7) to capture any manure that may spill during the loading process.	from the dam. This could lead to the dam overflowing; x Spillage could take place at the loading area; x Solids could accumulate at the bottom of the dam resulting in a decrease in capacity; x If no freeboard is available, the dam could overflow resulting in the spillage of manure; x The liner could tear or perish over time, possibly resulting in soil and groundwater pollution.		
Alternative 2D1 - Storage of manure in a closed concrete manure pit (Photo 7.8)	√ The manure pit can be placed directly adjacent to the buildings thereby reducing the footprint of the development (Figure 7.7); √ The manure pit would be located below ground level and covered with a concrete lid thereby addressing safety and aesthetic concerns; √ Odours would be minimal due to the manure pit being enclosed; √ The solid and liquid fractions would be mixed before the manure is abstracted, thereby preventing solids/sludge from building up and reducing the capacity of the pit.	x Excavation to a depth of ±6m would be required; x The manure pit was overdesigned to more than double the capacity required; x **Too expensive due to the size of the pit and the concrete cover.**	*0 Fatal flaw*	***No***
Alternative 2D2 - Storage of manure in an open concrete manure pit (Figure 7.12)	√ The manure pit can be placed directly adjacent to the buildings thereby reducing the footprint of the development (Figure 7.7); √ The manure pit would be located below ground level and covered with corrugated iron thereby addressing safety and aesthetic concerns; √ Odours would be minimal due to the manure pit being enclosed; √ The solid and liquid fractions would be mixed before the manure is abstracted, thereby preventing solids/sludge from building up and reducing the capacity of the pit.		*1 Preferred*	***Yes***

Legend: 0 = Fatal Flaw; 1 = Preferred Option; 2 = Second Option; 3 = Third Option; 4 = Fourth Option

7.3.3 Utilization of manure

The effluent (mixture of manure, urine, clean and dirty water) produced at a piggery needs to be treated and disposed of in an environmentally friendly manner. There are various ways to dispose of the manure, e.g.:

- composted and sold (i.e. Screw-Press Separator);
- used as an energy source for power generation/heating (i.e. biogas);
- spreading on agricultural land as fertilizer.

The applicant investigated three alternatives in terms of the disposal/utilization of manure, namely:

- Alternative 3A: Composting;
- Alternative 3B: Biogas production;
- Alternative 3C: Spreading of manure on agricultural land as fertilizer.

Alternative 3A: Composting

Alternative 3A would entail utilizing a separator (Photo 7.5) to separate the liquids and solids. The liquid fraction would be diverted to an effluent dam (Figure 7.9) and the solid fraction would be composted for 2 – 12 weeks on cement slabs before being applied to agricultural land or sold as fertilizer.

Alternative 3B: Biogas production

One alternative investigated by the applicant is utilizing the manure as an energy source (producing biogas) for power generation/heating within the piggery.

Biogas is a by-product of the decomposition of organic solids by anaerobic bacteria. The manure is placed in a tank, where it is heated and agitated. Since no oxygen is present, anaerobic bacteria consume the organic matter and produces biogas. The biogas is then converted to electricity. A complete biogas facility would comprise of the following components:

- A settling facility, where solids concentration is increased;
- A digester, where the manure is digested and biogas produced;
- A biogas collection system, where the biogas is burned and heat generated to warm the digester. Excess biogas is flared;
- A gas fired generator to produce electricity from the biogas (instead of flaring).
- A manure pit, where the remaining digestate is stored.

Alternative 3C - Spreading of manure on agricultural land as fertilizer

The manure from the proposed facility will be stored temporarily in a manure pit (Alternative 2D; Section 7.3.2) and spread over cultivated land as fertilizer. The applicant plans to spread the manure on the property on which the facility is to be located (i.e. the farm Kleinfontein 432 JS).

No manure will be spread within the delineated wetland areas and associated 43m buffer zones (Figure 5.17). In addition, no manure will be spread near the unnamed stream or near the boreholes located on site.

The manure will be worked/tilled into the soil as quickly as possible to combat any odours. The soil will be tested every year to determine the condition of the soil.

Table 7.5 provides a summary of the advantages and disadvantages investigated in terms of the utilization of manure as well as an indication of the preferred alternative.

Table 7.5: Matrix for determining the preferred alternative in terms of the utilization of manure

Alternative	Advantages	Disadvantages	Ranking	Option selected
Utilization of manure				
Alternative 3A - Composting	√ The volume of wastewater to be applied to agricultural/cultivated lands is reduced thereby also reducing the risk of runoff to surface water environments and eutrophication of water bodies; √ Stackable solids are produced that can be sold as fertilizer; √ The conversion of Nitrogen to Ammonium facilitates nutrient uptake by plants; √ Correct pH and moisture percentage (%) results in reduced pathogen counts; √ The quality of the solid fraction could be improved; √ Odours would be reduced by reducing organic matter and suspended solids in the liquid fraction; √ Odours and vector attraction (flies, rodents, etc.) would be reduced by subjecting the solid fraction to an aerobic process and reducing the moisture content of the manure.	x The small amount of manure produced at the GTC facility does not warrant the installation of a separator; x The installation of a separator phase would be very costly; x New equipment would have to be purchased e.g. front-end loaders, irrigation equipment, etc; x The separator phase would require the installation of sumps, pumps, etc. since the manure would have to be pumped through the separator (gravitation would be inadequate); x High volumes of electricity would be used; x The site footprint would increase (i.e. cement slabs, pumps, access roads, screen/press, etc.), encroaching into more cultivated land; x Storm water management at new areas would become an issue; x The carbon footprint of the operation would increase due to the increased use of electricity and emissions from heavy vehicles operating on site.	2nd Option	No
Alternative 3B - Biogas production	○ Generating electricity (thereby placing less stress on the grid), ○ The facility could be used to flare methane, thereby reducing odour issues and improving air quality. ○ The combustion of methane produces carbon dioxide and water, which would reduce the release of greenhouses gasses, as methane is 20 times the greenhouse equivalent of carbon dioxide. ○ More capacity would be available in the manure pit to ensure contingency storage during times of heavy rain fall.	▪ Digesters are very expensive (> R15 million) and technically demanding; ▪ The potential exists that methane gas could be released resulting in an explosion; ▪ The biogas plant may not produce sufficient amounts of electricity due to the small volumes of manure produced at the GTC facility; ▪ **The boar feed does not contain enough fibre to produce adequate amounts of biogas;** ▪ The manure would have to be mixed with cow dung in order for the facility to be successful; ▪ Sufficient quantities of cow dung are not available in close vicinity of the proposed facility, which would result in high transport costs; ▪ A biogas to electricity plant would also require	0 Fatal flaw	No

Alternative	Advantages	Disadvantages	Ranking	Option selected
		additional water, which may not be available on site; ▪ An EIA would have to be conducted for the activity and an emissions licence would have to be obtained in terms of the NEM: Air Quality Act (Act 39 of 2004).		
Alternative 3C - Spreading of manure on agricultural land as fertilizer	√ *Cultivated land is located adjacent to the site and in the surrounding area where the manure could be spread;* √ *Diesel costs would be kept low since the tractor would not have to travel far;* √ *Less (or even no) fertilizer would have to be purchased for the cultivated lands resulting in cost savings;* √ *Supply of major plant nutrients (calcium, magnesium, potassium, phosphorus, nitrogen);* √ *Supply of some essential micronutrients (zinc, copper, molybdenum and manganese) and;* √ *Improvement in soil physical properties, i.e. better soil structure, increased water retention capacity and improved soil water transmission.*	x *The soils do not have an unlimited capacity for receiving effluent because of the salt, nutrients and trace elements content. Mitigation measures would therefore have to be implemented to prevent nutrient overloading of the soil and potential contamination of ground and surface water.* x *A specialized tractor and tanker would have to be purchased by the applicant, which would be costly.*	*1 Preferred*	***Yes***

Legend: 0 = Fatal Flaw; 1 = Preferred Option; 2 = Second Option; 3 = Third Option

7.4 Alternative service provision

Alternatives were investigated in terms of:

- 7.4.1: Water provision;
- 7.4.2: Electricity;
- 7.4.3: Sewage disposal;
- 7.4.4: Access road;
- 7.4.5: Storm water management.

7.4.1 Water provision

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).

The following alternatives in terms of water provision were investigated:

- Alternative 1 - water from Steve Tshwete Local Municipality;
- Alternative 2 - surface water;
- Alternative 3 - groundwater.

Alternative 1 - water from Steve Tshwete Local Municipality

The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. The GTC facility can therefore not connect to the municipal bulk water supply system.

Alternative 2 - surface water

No streams, rivers or dams are located on or adjacent to the site (Figure 5.1). A small unnamed, non-perennial stream is located ±600m south east of the site (Figure 5.17), which would not be able to provide a sustainable water supply.

Alternative 3 - groundwater

Alternative 3 entails the abstraction of groundwater from new or existing boreholes near the site.

Groundwater will be abstracted from the existing (and new) boreholes located on the property. A storage tank of 40m^3 will be provided in the north western corner of the site for the storage of potable water. Mitigation measures will be implemented to ensure that the groundwater is not over abstracted.

According to Hlasane (2018), 6 172.1 m^3/annum or **16 909.75 liters per day** of groundwater will be required for the proposed GTC facility (based on 400 boars) as indicated in Table 3.2.

7.4.2 Electricity

Alternative 1 - electricity from the Steve Tshwete Local Municipality

The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. The GTC facility can therefore not connect to the electrical network of the municipality.

Alternative 2 - obtaining electricity from Eskom
Electricity will be obtained from Eskom (see Section 3.3.2).

The GTC facility will connect to an existing transformer and power line located on the northern boundary of the site (Figure 5.3). In case of a power outage, a generator will be utilized.

7.4.3 Sewage disposal

According to Hlasane (2018), 607.29 m^3/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.

Alternative 1 - connecting to the Steve Tshwete Local Municipality sewer system
The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. The GTC facility can therefore not connect to the municipal sewer network.

Alternative 2 - sewage treatment/package plant
The volume of sewage/grey water produced at the facility does not justify the installation of a sewage treatment plant or package plant.

Alternative 3 - septic tank with French drain
Septic tanks with French drains are no longer accepted by the Department of Water and Sanitation due to the potential pollution risks. This option was thus not considered.

Alternative 4 - conservancy tank
The wastewater from the ablution facilities, laundry and laboratory will be disposed by means of conservancy tank. Hlasane (2018) recommended that a conservancy tank of 10 m^3 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 m^3 reserve for unforeseen circumstances.

7.4.4 Access road

Access Road 1 - connecting to the Alzu Petroport entrance road (Figure 5.22)
Access Road 1 (gravel road) extends from the Arnot road, along the southern boundary of Mafube Coal Mine and then in a southerly direction towards the proposed site (Figure 5.22).

Access Road 2 - connecting to the Arnot road (Figure 5.22)
Access Road 2 (gravel road) extends from Alzu Petroport, across the N4 national road (at an existing bridge crossing) in a northerly direction towards the proposed site (Figure 5.22).

7.4.5 Storm water management

Storm water will have to be managed on site to ensure that the clean storm water system and the wastewater system are kept separate with no risk of contamination.

Alternative 1- connecting to an existing storm water system
The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. The GTC facility can therefore not connect to the municipal storm water system.

Alternative 2 - new storm water system

A new storm water system will be established for the said site as indicated in Section 3.2.5. Figure 7.7 provides an indication of the storm water management plan.

Large, grassed storm water trenches will be provided between each platform to capture runoff from the roofs of the buildings and the surrounding terrain. 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.

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 and roads.

Table 7.4 provides a summary of the advantages and disadvantages of the various alternatives investigated in terms of service provision, as well as an indication of the preferred alternatives.

Table 7.6: Matrix for determining the preferred alternative in terms of service provision

Alternative	Advantages	Disadvantages	Ranking	Option selected
Alternative service provision				
7.4.1 Water provision				
Alternative 1 - water from Steve Tshwete Local Municipality		x **The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. The GTC facility can therefore not connect to the municipal bulk water supply system.**	0 Fatal flaw	No
Alternative 2 - surface water		x **A sustainable volume of water may not be available from the non-perennial stream;** x A pipeline would have to be installed across a Seep wetland over a distance of approximately 600m to abstract water from the stream; x The surface water could be polluted as a result of activities taking place upstream of the site; x A pump would have to be installed in the stream, which would be risky in terms of theft.	0 Fatal flaw	No
Alternative 3 - groundwater	√ Two boreholes are present on the property, which can deliver a total of 8600l/day pumped at a sustainable rate of 0.1 l/s (Gouws, 2018). √ Adequate water is available from the existing two boreholes for 200 boars. √ The groundwater quality was tested by Gouws (2018) and can be described as freshly recharged, unpolluted bicarbonate water.	x Adequate water (16 909 l/day) is not available from the existing two boreholes for 400 boars. x An additional borehole will have to be drilled to provide a sustainable water supply for 400 boars.	*1* *Preferred*	***Yes***
7.4.2 Electricity				
Alternative 1 - electricity from the Steve Tshwete Local Municipality		x **The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. The GTC facility can therefore not connect to the electrical network of the municipality.**	0 Fatal flaw	No
Alternative 2 - obtaining electricity from Eskom	√ *The GTC facility will connect to an existing transformer and power line located on the northern boundary of the site.*		*1* *Preferred*	***Yes***
7.4.3 Sewage disposal				
Alternative 1 - connecting to the Steve	√	x **The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete**	0 Fatal flaw	No

Alternative	Advantages	Disadvantages	Ranking	Option selected
Tshwete Local Municipality sewer system		**Local Municipality. The GTC facility can therefore not connect to the municipal sewer network.**		
Alternative 2 - sewage package plant		x The volume of sewage/grey water produced at the facility does not justify the installation of a sewage treatment plant or package plant.	*2nd Option*	No
Alternative 3 - septic tank and French drain		x **Septic tanks with French drains are no longer accepted by the Department of Water and Sanitation due to the potential pollution risks.**	0 Fatal flaw	No
Alternative 4 - conservancy tank	√ *The wastewater from the ablution facilities, laundry and laboratory will be disposed by means of a conservancy tank.* √ *The conservancy tank (10m^3) will have sufficient capacity.* √ *The conservancy tank will be emptied by a contractor on a regular basis reducing the risk of pollution.*		*1 Preferred*	***Yes***
7.4.4 Access road				
Access Road 1 - connecting to the Alzu Petroport entrance road	√ *An existing gravel road will be utilized.* √ *No traffic from the GTC facility will drive past Village 3 (Figure 5.4).*		*1 Preferred*	***Yes***
Access Road 2 - connecting to the Arnot road	√ An existing gravel road will be utilized.	x Traffic from the GTC facility will drive past Village 3 (Figure 5.4). The representative of the village (Mr. S. Skosana) raised issues in this regard.	2nd Option	No
7.4.5 Storm water management				
Alternative 1 - connecting to an existing storm water system		x **The said site is located within a rural agricultural area that is not serviced by the Steve Tshwete Local Municipality. The GTC facility can therefore not connect to the municipal storm water system.**	0 Fatal flaw	No
Alternative 2 - new storm water system	√ *A storm water management plan was drafted for the proposed GTC facility (Figure 7.7) and will be implemented ensuring the separation of clean storm water and wastewater.*		*1 Preferred*	***Yes***

Legend: 0 = Fatal Flaw; 1 = Preferred Option; 2 = Second Option; 3 = Third Option

7.5 The 'No Project Option'

The 'no project option' is the alternative of not going ahead with the proposed development. The 'no project option' is only considered if it is found that the development will have significant negative impacts on the environment, which cannot be mitigated or managed.

If the 'no project option' in terms of the proposed project was exercised, it would mean that:

- The applicant would have to investigate alternative sites for the proposed GTC facility;
- A new Basic Assessment process would have to be followed;
- New layout plans would have to be drafted;
- Alternatively, the applicant would have to close the business since the existing site would no longer be available. This would impact on the pork industry in terms of the availability of sperm and breeding of high quality pigs;
- Job opportunities created by the project applicant (construction phase: 40 employees; operational phase: 30 employees) would be lost.

7.6 Concluding statement on alternatives

In summary, the following alternatives are deemed feasible and will be assessed in Section 8 of this document:

Section	Alternative	Description
7.1.5	Site 4	Site 4 is located on the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, south of the old farmstead complex as indicated in Figure 7.1. The said property belongs to the applicant (see Section 5.3.1).
7.2.6	Layout 6	Drafted for Site 4 (preferred site) with manure pit located on the south eastern corner of the site (Figure 7.7).
7.3.1	In-house effluent collection Alternative 1B	Slotted floors with deep pit storage system (Photo 7.2).
7.3.2	Temporary outside storage of manure - Alternative 2D	Storage of manure in a concrete manure pit (Figure 7.12).
7.3.3	Utilization of manure Alternative 3C	Spreading of manure on agricultural/cultivated land as fertilizer.
7.4.1	Water provision Alternative 3	Groundwater will be abstracted from boreholes.
7.4.2	Electricity - Alternative 2	Electricity will be obtained from Eskom.
7.4.3	Sewage disposal - Alternative 4	Sewage will be disposed of by means of a conservancy tank.
7.4.4	Access Road 1	Existing gravel road that extends from Alzu Petroport, across the N4 national road (at an existing bridge crossing) in a northerly direction towards the proposed site (Figure 5.22).
7.4.5	Storm water management - Alternative 2	A new storm water system will be installed comprising of grassed trenches and culverts (Figure 7.7).

Mitigation and management measures to reduce any potential negative impacts relating to any of these alternatives are provided in Section 9 of this report.

SECTION 8: ENVIRONMENTAL IMPACT DESCRIPTION AND EVALUATION

8.1 Introduction

As required in terms of Appendix 1 of the EIA Regulations (2014), this section of the report describes the impacts and risks identified (physical and social) as a result of the proposed project, including:

- an indication of the preferred alternatives;
- the methodology used in determining and ranking the potential impacts;
- the nature, significance, consequence, extent, duration and probability of the impacts during all phases of the development;
- the degree to which these impacts can be avoided, managed, mitigated, reversed or may cause irreplaceable damage;
- positive impacts;
- cumulative impacts;
- mitigation measures to be implemented.

The impacts presented in this section were identified through the status quo of the environment, specialist input, experience of the EAPs and comment from I&APs.

8.2 Description of the preferred alternatives

Section 7 provides a detailed description of all alternatives investigated with regards to this project. As indicated in Section 7.6, the following alternatives are deemed feasible and will be assessed in Section 8.5:

Aspect	Alternative
Site	Site 4 - located on the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, south of the old farmstead (Figure 8.1).
Layout	Layout 6 - Drafted for Site 4 (preferred site) with manure pit located on the south eastern corner of the site (Figure 8.2).
Manure handling	• Alternative 1B - Slotted floors with deep pit storage system. • Alternative 2D - Storage of manure in a concrete manure pit closed with a corrugated iron lid. • Alternative 3C - Spreading of manure on agricultural/cultivated land as fertilizer.
Service provision	• Water provision - Groundwater will be abstracted from boreholes. • Electricity - Electricity will be obtained from Eskom. • Sewage disposal - Sewage will be disposed of by means of a conservancy tank. • Storm water management - A new storm water system will be installed comprising of grassed trenches and culverts. • Access road - The site will be accessed from an existing gravel road that extends from Alzu Petroport, across the N4 national road in a northerly direction towards the proposed site.
Access road	• Access Road 1 - Existing gravel road that extends from Alzu Petroport, across the N4 national road (at an existing bridge crossing) in a northerly direction towards the proposed site (Figure 5.22).

Figure 8.1: Aerial view of the preferred site - Site 4

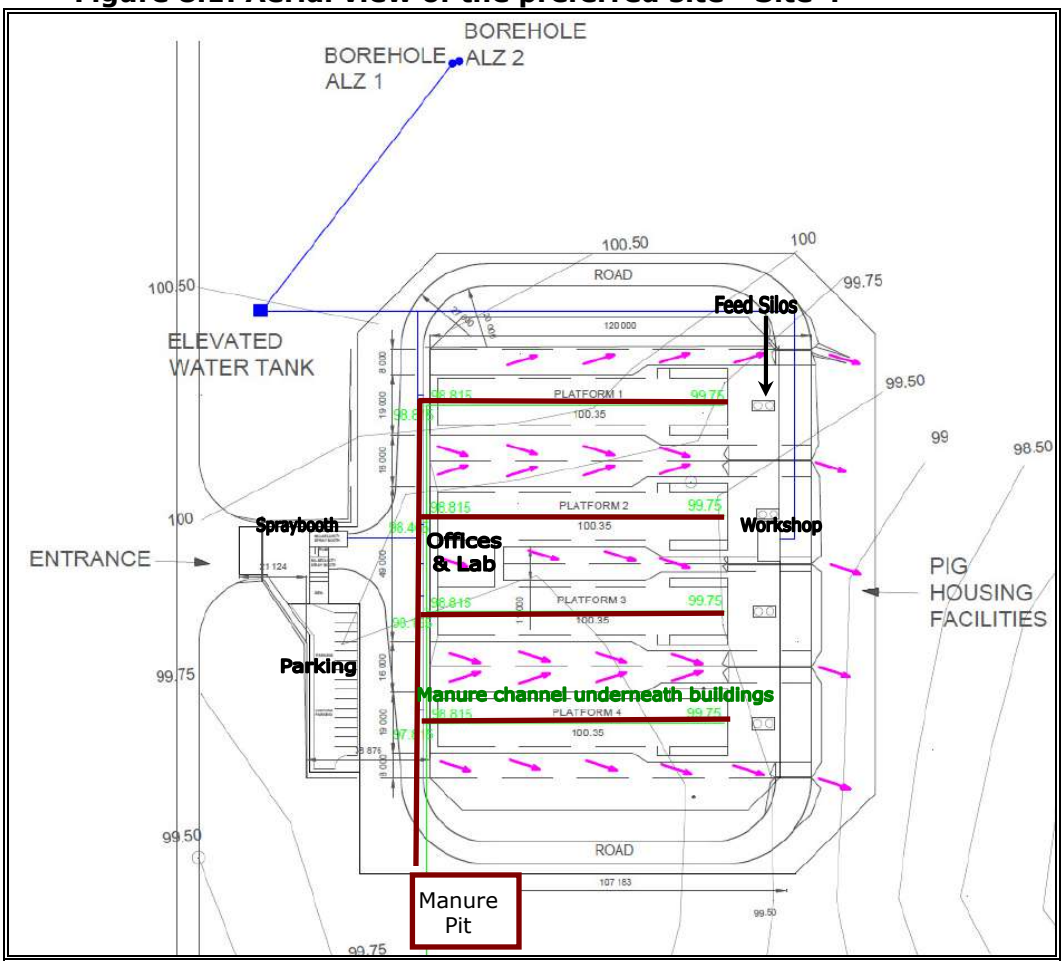


Figure 8.2: Preferred layout - Layout 6 (adapted from Hlasane, 2018 and Paul Roos, 2017)

8.3 Development phases

The impact of the development has to be assessed in terms of the following development phases:

- **Planning and design phase**
- **Construction phase**
- **Operational phase**
- **Decommissioning phase**

8.3.1 Planning and design phase

The planning and design phase involved mostly office work and site surveys with regards to the design of the layout plan, the Basic Assessment Report and the specialist studies. It also involves obtaining the necessary authorisations for the said development.

No actual construction took place on site. Thus, no impacts are associated with the planning and design phase.

8.3.2 Construction phase

The construction of the GTC facility (platforms, buildings and associated infrastructure) (Figure 8.2) would involve the following:

- clearing of vegetation (if any) and levelling of the site (±2 ha area);
- excavation/earthworks for the required foundations/platforms, and service trenches;
- installation of the services (i.e. water supply, electrical connections, conservancy tank, access road and storm water trenches);
- laying of the required foundations;
- building of the outer structures;
- installation of the required internal fittings;
- fencing of the site;
- revegetation of the surrounding area impacted by the construction activities.

The construction of the **manure pit** (Figure 8.2) would involve the following:

- excavation of the manure pit (±100m^2);
- installation of the reinforced steel, concrete walls and piping;
- backfilling of soil;
- revegetation of the surrounding area impacted by the construction activities.

Section 8.5 provides details with regards to potential impacts identified during the construction phase.

8.3.3 Operational phase

The operational phase would involve the following:

- The utilization of the GTC facility;
- The utilization of the manure pit;
- The spreading of manure on cultivated land.

Section 8.5 provides details with regards to potential impacts identified during the operational phase.

8.3.4 Decommissioning phase

If required, this phase would involve the decommissioning of the facilities constructed as part of this project (see Section 8.3.2).

The decommissioning phase will not be discussed in detail. It is recommended that at the time of decommissioning, a specific Environmental Management Programme (EMPr) be compiled which specifically addresses this phase. This EMPr would have to address issues such as the removal of building rubble and the rehabilitation of the site. Soil conservation measures would also have to be implemented.

Section 8.5 indicates some of the potential impacts identified during the decommissioning phase.

8.4 Approach and methodology

This section presents the proposed approach to assessing the potential impacts, with the aim of determining the significance of these impacts. The impact will be determined for each aspect of the environment with and without the implementation of mitigation measures. This allows for a prediction of how the impact can be managed or mitigated.

The evaluation of impacts is conducted in terms of the following criteria:

- **Nature of impact (i.e. description of the impact)**

- **Extent (i.e. spatial scope or geographical extent of the impact to the receiving environment)**

Site	Effect limited to the site and its immediate surroundings
Local	Effect limited to within 3-5 km of the site
Regional	Effect will have an impact on a regional scale

- **Duration (i.e. length of permanence of the impact. In other words, how long will the impact last)**

Short	Effect lasts for a period 0 to 5 years
Medium	Effect continues for a period between 5 and 10 years
Long	Effect will cease after the operational life of the activity either because of natural process or by human intervention
Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient

- **Probability (i.e. likelihood that the impact will occur)**

Improbable	Less than 33% chance of occurrence
Probable	Between 33 and 66% chance of occurrence
Highly probable	Greater than 66% chance of occurrence
Definite	Will occur regardless of any prevention measures

- **Significance/intensity of impact (i.e. degree of alteration to the affected receiving environment)**

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

- **Status (i.e. whether the impact will have a positive (beneficial) or negative (detrimental) effect on the receiving environment)**

Positive	Impact will be beneficial to the environment
Negative	Impact will not be beneficial to the environment
Neutral	Positive and negative impact

- **Reversibility (i.e. whether the impact can be reversed or not)**

Reversible	Impact is reversible without incurring significant time and cost
Reversible (costly)	Impact is reversible only by incurring significant time and cost.
Irreversible	Impact is irreversible

8.5 Description of potential impacts

The following section provides an indication of the environmental features that will be impacted (directly and indirectly) during the construction, operational and decommissioning phases of the proposed project.

It must be noted that many of the potential negative consequences can be mitigated successfully. It is however, necessary to make a thorough assessment of all possible impacts in order to ensure that environmental considerations are taken into account, in a balanced way, as far as possible, supporting the aim of creating a healthy and pleasant environment.

Please note: Only the most important mitigation measures associated with identified impacts are indicated in this section. The Environmental Management Programme Report (EMPr) (included in this report as Section 9) provides a comprehensive description of the various mitigation and management measures proposed to ensure minimal impact on the environment.

8.5.1 Topography

Section 5.5 provides an indication of the geology of the proposed site. The said site lies at approximately 1661 meters above mean sea level (mamsl) and is fairly flat. The slope is in the order of 2% (gently slope) towards a small unnamed stream and wetland area (Figure 5.7).

Construction phase

In general, the construction activities (i.e. sloping of the site, excavations, construction of buildings/platforms/manure pit and associated infrastructure) would directly impact on the topography and would result in changed runoff patterns and an increased risk of soil erosion if mitigation measures are not

implemented. This could indirectly impact on the Seep and Depression wetlands located near the site (Figure 5.17) as well as the adjacent cultivated land.

Operational phase
Direct impact on topography will continue in terms of the presence of the platforms, buildings and associated infrastructure (including manure pit), which in turn could impact upon the surface water runoff and the nearby Depression and Seep wetlands (Figure 5.17) if mitigation measure are not implemented.

Decommissioning phase
During decommissioning, the platforms, buildings and associated infrastructure (including manure pit) will be demolished and removed from site. The site will be top soiled and shaped to conform to the original slope of the area, which will have a positive impact on the topography and runoff from the site.

IMPACT ON TOPOGRAPHY					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE					
Site	Long	Highly probable	Medium Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Short	Highly probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *Earthworks should be kept to a minimum during the construction phase and limited to the footprint of the site.*
- *A storm water management plan must be drafted and implemented during all phases of the development.*

8.5.2 Geology

Section 5.4 provides an indication of the geology of the proposed site. As indicated in Section 5.4, the proposed site is underlain by sandstone, shale and conglomerates of the Vryheid Formation, Ecca Group, Karoo Supergroup.

Construction phase
In general, the construction activities could impact on the sandstones of the Vryheid Formation depending on depth of the excavations/earthworks required for the buildings and associated infrastructure (including manure pit). The impact is expected to be minimal due to the small footprint of the development and the fact that the platforms will be built up. The impact on the underlying geology cannot be mitigated.

Operational phase
No further impact expected since no further excavation would take place.

Decommissioning phase
No further impact expected since no further excavation would take place.

IMPACT ON GEOLOGY					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Permanent	Probable	Low Negative	Low Negative	Irreversible
OPERATIONAL PHASE					
None					
DECOMMISSIONING PHASE					
None					

8.5.3 Soil and arable land

Section 5.6 provides an indication of the soil associated with the proposed site. The soil on site is mostly of a red to yellow colour and could be Hutton or Avalon soil types. The majority of the site has been ploughed for the cultivation of maize. The proposed site is indicated as moderate potential arable land according to the Department of Agriculture, Fisheries and Forestry.

A) Disturbance of soil profiles

Construction phase

The soil of the site has already been impacted upon by agricultural activities and the old farmstead complex. During construction, the soil will be directly impacted in terms of soil structure, nutritional and chemical values when the topsoil is removed, the site is sloped and the platforms/buildings and associated infrastructure (including manure pit) are constructed. The soil will also be impacted in terms of stockpiling of topsoil, subsoil, overburden and rocks.

Operational phase

Direct impact on soil i.t.o. soil structure, nutritional and chemical values and soil compaction will continue due to the presence of the platforms/buildings and associated infrastructure (including manure pit).

Decommissioning phase

The decommissioning activities will have an initial negative impact on the soil in terms of disturbance (physical and biological properties). The removal of any polluted soil and proper rehabilitation of the site after decommissioning will however, have a positive impact on the soil.

DISTURBANCE OF SOIL PROFILES					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Definite	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE					
Site	Long	Definite	Low Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Long	Probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *Earthworks should be kept to a minimum during the construction phase and limited to the footprint of the site.*
- *Before construction, topsoil must be removed and stockpiled in a demarcated area for rehabilitation of the area surrounding the buildings.*

B) Increase in erosion

Construction phase
The sloping of the site and construction of platforms/buildings and associated infrastructure (including manure pit) would result in changed runoff patterns and an increased risk of soil erosion if mitigation measures are not implemented. This could indirectly impact on the Seep and Depression wetlands located near the site (Figure 5.17) as well as the adjacent cultivated land in terms of loss of topsoil and sedimentation.

Operational phase
The presence of the platforms, buildings and impermeable surfaces would impact on the surface water runoff patterns (volume, intensity, infiltration) on site, which could lead to an increased risk of soil erosion. This could impact on the nearby Depression and Seep wetlands (Figure 5.17) in terms of sedimentation. It could also impact on the adjacent cultivated land in terms of loss of topsoil.

Decommissioning phase
The decommissioning activities could initially result in soil erosion when the buildings/platforms and storm water management measures are demolished. However, proper rehabilitation and vegetation of the site after decommissioning will have a positive impact in terms of reduced soil erosion risk.

INCREASE IN EROSION					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE					
Site	Long	Highly probable	Medium Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Long	Highly probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *A storm water management plan must be drafted and implemented during all phases of the development.*
- *Monitor for erosion and intervene and/or rehabilitate where necessary.*

C) Risk of soil pollution

Construction phase
Soil pollution may occur if the construction vehicles are not maintained/repaired resulting in oil leaks and fuel spills, waste management measures are not implemented and proper ablution and sanitation facilities are not provided for the site workers to use on site.

Operational phase
Soil pollution could occur if the waste management measures as indicated in Section 3 are not implemented and if the conservancy tank is not emptied on a regular basis (resulting in sewage overflows).

In addition, soil pollution could take place at the manure pit if:

- it is not constructed properly or maintained resulting in manure seeping into the soil;
- it does not have sufficient storage capacity and overflows;
- it is not emptied on a regular basis and overflows;
- mitigation measures are not implemented to contain leaks/spills.

The spreading of manure on surrounding cultivated lands could have a positive impact on the soil in terms of: increased nutrients needed by plants, increased water infiltration rates by improving soil structure and increased organic matter content. However, if too much manure is applied, it could have a negative impact in terms of increased mineral and metal content of soils (salinization) as well as nitrogen and phosphate levels in excess of crop requirements. Soil pollution could also take place if there are chemicals, detrimental bacteria and pathogens in the manure and the manure is not tilled into the soil as quickly as possible.

Decommissioning phase

The removal of any polluted soil and proper rehabilitation of the site after decommissioning will have a positive impact on the soil.

RISK OF SOIL POLLUTION					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, building and associated infrastructure					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Manure pit					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Spreading of manure					
Local	Long	Highly probable	Medium Negative	Medium Positive	Reversible
DECOMMISSIONING PHASE					
Site	Long	Probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *The waste management measures as indicated in Sections 3 and 9 to be implemented during all phases of the development.*
- *Conservancy tank to be emptied every 4 days as recommended by Hlasane (2018).*
- *Manure pit to be emptied on a regular basis to ensure that it does not overflow.*
- *A soil nutrient management plan/effluent spreading plan should be compiled and implemented.*

D) Loss of arable land

Construction phase

The construction activities would impact on ±6 ha of moderate potential arable land. Currently, maize is planted.

Operational phase

The said area (±6ha) will no longer be available for cultivation (maize) due to the presence of the GTC facility.

However, the spreading of manure on surrounding cultivated lands could have a positive impact on the soil in terms of: increased nutrients needed by plants, increased water infiltration rates by improving soil structure and increased organic matter content. This could result in better crop yields thus having a positive impact on arable land.

Decommissioning phase

The removal of any polluted soil and proper rehabilitation of the site after decommissioning will have a positive impact on the soil and allow agricultural activities to once again take place on site.

LOSS OF ARABLE LAND					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Definite	Low Negative	Low Negative	Reversible (costly)
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure (including manure pit)					
Site	Long	Definite	Low Negative	Low Negative	Reversible (costly)
OPERATIONAL PHASE - Spreading of manure					
Local	Long	Highly probable	Low Positive	Medium Positive	N/A
DECOMMISSIONING PHASE					
Site	Long	Highly probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *Earthworks should be kept to a minimum during the construction phase and limited to the footprint of the site.*
- *The operational activities should be confined to the development footprint as per Layout 6.*

8.5.4 Land use and sense of place

The site is located within a rural agricultural area, approximately 30km east of Middelburg. The current sense of place is rural/agricultural. The majority of the site and surrounding area is cultivated. Development in the area includes the N4 national road, gravel roads, Mafube Coal Mine, Alzu Petroport and scattered farmsteads/homesteads. No homesteads/farmsteads are located within a 500m radius of the site (Figure 5.4).

Construction phase

The construction activities will impact on the current land use since buildings will be constructed on cultivated land. The construction phase will also have a short term impact on the sense of place in terms of increased noise levels in the rural area. However, no homesteads/farmsteads are located within a 500m radius of the site (Figure 5.4).

Operational phase

It would no longer be possible to cultivate the ±6ha site due to the presence of platforms, buildings and associated infrastructure (including manure pit) on site, thereby impacting on the land use. However, the operational activities at the proposed GTC facility are related to agriculture and should thus not impact on the overall sense of place.

The spreading of manure as fertilizer would be positive since it could improve the soil quality resulting in improved yields thus enhancing the existing land use (maize cultivation).

Decommissioning phase
The decommissioning of the buildings, platforms and associated infrastructure (including the manure pit) and rehabilitation of the site would allow for a different land use on site. The impact will depend on the land use in the area at the said time.

IMPACT ON LAND USE AND SENSE OF PLACE					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Definite	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure					
Site	Long	Definite	Low Neutral	Low Neutral	N/A
OPERATIONAL PHASE - Spreading of manure					
Local	Long	Probable	Low Positive	Low Positive	N/A
DECOMMISSIONING PHASE					
Site	Long	Highly probable	Low Neutral	Low Neutral	N/A

8.5.5 Natural vegetation and animal life

As indicated in Section 5.7, the majority of the site comprises cultivated land with no natural vegetation present. The north eastern corner of the site extends into the old farmstead complex, which is mostly bare of vegetation. Large Pine trees (*Pinus* sp.) are however, present along the fence line as well as weeds and kikuyu grass.

According to the Mpumalanga Biodiversity Sector Plan (MBSP, 2013), the site and surrounding area are classified as Heavily Modified and Moderately Modified (Old Lands).

A) Destruction of natural vegetation

Construction phase
The construction activities would not impact on any areas of biodiversity importance since the site is mainly cultivatec. A few of the large Pine trees at the old farmstead complex will have to be removed along with small patches of disturbed vegetation, comprising mostly of kikuyu grass and weeds. Since the majority of plant species are exotic and/or alien invaders, the removal of these plant species during construction will have a positive impact. No negative impact on natural grassland vegetation is expected.

Operational phase
The operational activities (i.e. operation of the GTC facility and the spreading of manure on cultivated land) would not lead to the destruction of any natural vegetation. However, alien plants could spread to the surrounding vegetation and nearby Depression and Seep wetlands should it be planted at the facility for landscaping purposes. Natural grass (*Eragrostis curvula* - Weeping Love Grass) will however, be planted between the buildings.

Decommissioning phase
The vegetation that re-established within the facility during the operational phase would be impacted upon by decommissioning. However, the rehabilitation of the site after decommissioning would be positive, unless the area is not rehabilitated properly and alien species are introduced.

DESTRUCTION OF NATURAL VEGETATION					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Definite	Low Positive	Low Positive	N/A
OPERATIONAL PHASE					
Site	Long	Highly probable	Low Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Long	Highly probable	Low Neutral	Low Neutral	N/A

Proposed mitigation:

- *Construction and operational activities should be limited to the footprint of the site.*
- *Disturbed areas should be properly rehabilitated.*
- *No alien/exotic plants to be used for landscaping purposes.*

B) Impact on animal life

Construction phase

It is not anticipated that the development will have a significant impact on animal life since most of the site is cultivated and no animal species were noted on site during the site visits. Smaller species such as birds, reptiles, mongoose, etc. may however, frequent the site and forage in the area (especially in the nearby wetlands where natural habitat is still available). The construction activities could impact on these species and cause them to move to another area.

Operational phase

No further direct impact on animal life is expected since the area will be fenced and all operational activities (except the spreading of manure) will take place within the fenced area. The spreading of manure on cultivated land is not expected to have any impact on animal life.

Decommissioning phase

During decommissioning, building rubble and any polluted soil will be removed from the site and disposed of accordingly. The said area will then be rehabilitated in order to establish a vegetation cover and prevent soil erosion. This could result in the creation of habitat for animal life within the rehabilitated area.

IMPACT ON ANIMAL LIFE					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Probable	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE					
None	None	None	None	None	N/A
DECOMMISSIONING PHASE					
Site	Long	Probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *Construction and operational activities should be limited to the footprint of the site.*
- *Should any animals be found during the construction phase, a specialist should be contacted to ensure the safe removal of the specimen(s).*

C) Impact on boar health

Construction phase
None since no boars will be present on site during the construction phase.

Operational phase
The boars could be impacted upon in terms of health and welfare should the GTC facility not be well constructed and managed in terms of size and quality of accommodation, treatment of animals, cleanliness, quality of feed, semen collection, etc. It is however, unlikely that the GTC facility will not be well managed since this would impact on the Alzu Pig Genetics (Pty) Ltd. business and the quality of product produced. The existing GTC facility is currently well managed with various SOP's in place.

Decommissioning phase
No impact since the boars will no longer be on site during the decommissioning phase.

IMPACT ON BOAR HEALTH					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
None	None	None	None	None	N/A
OPERATIONAL PHASE					
Site	Long	Improbable	Medium Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
None	None	None	None	None	N/A

Proposed mitigation:

- *Alzu Pig Genetics (Pty) Ltd. must continue participating in the Pork 360 quality assurance system.*
- *The existing Standard Operating Procedures (SOP's) must be updated and adhered to.*
- *Stringent bio-security measures and meticulous cleaning must be implemented in order to control diseases and enhance animal welfare.*

8.5.6 Surface water and wetlands

No streams, rivers or dams are located on or adjacent to the site. A small unnamed stream is located ±600m south east of the site. Depression and Seep wetlands were identified within a 500m radius of the site (Figure 5.17), but not on the site.

A) Direct impact on surface water environment

Construction, Operational and Decommissioning phases
The development will not impact directly on any surface water environments (wetlands, river, streams) as the site is located outside of the 43m wetland buffer zones and ±600m away from the unnamed stream. In addition, no manure will be spread within the 43m wetland buffer zones.

B) Impact on surface water runoff velocity

Construction phase
The earthworks required during the construction phase would result in changed runoff patterns, which could indirectly impact on the Seep and Depression wetlands located near the site as well as the adjacent cultivated land in terms of erosion and sedimentation.

Operational phase
The presence of the buildings and impermeable surfaces will continue to impact on the surface water runoff of the site (decreased infiltration and increased runoff velocities). If not well managed, this could impact on the nearby Seep and Depression wetlands in terms of erosion, increased sediment load, changes in hydrology and vegetation composition, etc. (Venter, 2017).

The spreading of manure on surrounding cultivated lands could have a positive impact on the soil in terms of increased water infiltration rates by improving soil structure and increased organic matter content. This could result in less runoff from the cultivated land and a decrease in erosion.

Decommissioning phase
After decommissioning, the site will be rehabilitated in order to establish a vegetation cover and restore water flow across the site, which would have a positive impact on the adjacent Depression and Seep wetlands.

IMPACT ON SURFACE WATER RUNOFF VELOCITY					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure (including manure pit)					
Site	Long	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Spreading of manure					
Site	Long	Probable	Low Positive	Low Positive	N/A
DECOMMISSIONING PHASE					
Site	Long	Probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *A storm water management plan must be drafted and implemented during all phases of the development.*
- *Monitor for erosion and intervene and/or rehabilitate where necessary.*

C) Impact on surface water runoff quality

Construction phase
Surface water runoff may be polluted if the construction vehicles are not maintained/repaired resulting in oil leaks and fuel spills, waste management measures are not implemented and proper ablution and sanitation facilities are not provided for the site workers to use on site. This could impact on the adjacent cultivated land and the Depression and Seep wetlands located near the site.

Operational phase
Indirect pollution of surface water runoff could take place if the waste management measures as indicated in Sections 3 and 9 are not implemented and if the conservancy tank is not emptied on a regular basis (resulting in sewage overflows).

In addition, surface water runoff could be polluted if the manure storage pit does not have sufficient capacity, is not maintained and if mitigation measures are not implemented to contain spillage from the manure pit (e.g.

should there be an excessive rain storm event resulting in overflows or an equipment breakdown).

If too much manure is applied/spread onto cultivated land, it could have a negative impact in terms of increased mineral and metal content of soils as well as nitrogen and phosphates, which could lead to nutrient leaching. Leached nutrients could end up in the small unnamed stream, which could result in eutrophication, increased phytoplankton and aquatic plant growth and algal bloom. This in turn could impact on water dependent species such as fish and water birds.

The direct spreading of manure onto wetlands or within the 43m wetland buffer zone could also impact on the wetlands and the small unnamed stream. The manure would not be tilled into the soil but spread onto the wetland vegetation. During heavy rainfall periods, the manure could be washed into the unnamed stream, leading to eutrophication as described above.

Water pollution could also take place if there are cleaning chemicals, bacteria and pathogens in the manure and the manure is not tilled into the soil as quickly as possible (Venter, 2017).

Decommissioning phase

During the decommissioning phase, building rubble and any polluted soil will be removed from the site and disposed of accordingly. The said area will then be rehabilitated in order to establish a vegetation cover. This would result in clean runoff from the site.

IMPACT ON SURFACE WATER RUNOFF QUALITY					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Manure pit					
Site	Long	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Spreading of manure					
Local	Long	Highly probable	Medium Negative	Low Positive	Reversible
DECOMMISSIONING PHASE					
Site	Long	Probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *The waste management measures as indicated in Section 3 and 9 to be implemented during all phases of the development.*
- *Conservancy tank to be emptied every 4 days as recommended by Hlasane (2018).*
- *Manure pit to be emptied on a regular basis to ensure that it does not overflow.*
- *A soil nutrient management plan/effluent spreading plan should be compiled and implemented.*
- *No manure to be spread within the 43m wetland buffer zones.*

D) Direct impact on wetlands

Construction, Operational and Decommissioning phases
The development will not impact directly on any wetlands as the site is located outside of the 43m wetland buffer zones. In addition, no manure will be spread within the 43m wetland buffer zones.

E) Indirect impact on wetlands located within 500m of the site

Construction phase
The Depression wetland located east of the site (Figure 5.17) could be impacted upon if the 43m wetland buffer zone is not demarcated prior to construction, and construction vehicles or workers move outside of the development footprint into the wetland/buffer zone (Venter, 2017). The Depression wetland could also be impacted should spoil and building material be stored within this area, resulting in a loss of vegetation, habitat and wetland functions (Venter, 2017).

In addition, the hydrology of the Depression wetland (located east of the site) and Seep wetlands (located west and south of the site) (Figure 5.17) may be indirectly altered through changed runoff patterns and erosion/siltation as a result of the earthworks during the construction phase (Venter, 2017).

Operational phase
It is expected that the buildings and parking areas will increase the impermeable surfaces on site and decrease the infiltration into the soil resulting in increased runoff from the site. The following wetlands (Figure 5.17) could be impacted as a result of changes in the hydrology of the area due to altered storm water runoff:

- Depression and Seep wetlands located east of the site;
- Seep wetland located south of the site.

The Seep and Depression wetlands present north, north east and west of the site (Figure 5.17) should not be impacted since the site slopes in a south easterly direction away from these wetlands.

The spreading of manure could however, impact on all the wetlands identified within a 500m radius of the site, should the 43m wetland buffer zone not be adhered to. Impacts could include erosion of cultivated lands resulting in an increased sediment load, nutrient leaching and changes in hydrology and vegetation composition (Venter, 2017).

In addition, the Seep wetland located south of the site (Figure 5.17) could be impacted should the manure pit overflow as a result of insufficient capacity and poor maintenance.

Decommissioning phase
During the decommissioning phase, the wetlands could be impacted upon if the wetland areas are not demarcated and vehicles or workers move into these areas. After decommissioning, the site will be rehabilitated in order to establish a vegetation cover and restore water flow across the site, which would have a positive impact on the wetlands located within 500m of the site.

INDIRECT IMPACT ON WETLANDS LOCATED WITHIN 500m OF THE SITE					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Manure pit					
Site	Long	Improbable	Medium Negative	None	Reversible
OPERATIONAL PHASE - Spreading of manure					
Local	Long	Highly probable	Medium Negative	None	Reversible
DECOMMISSIONING PHASE					
Site	Long	Probable	Low Neutral	Low Neutral	N/A

Proposed mitigation:

- *Before construction, the 43m wetland buffer zones must be delineated, pegged and indicated as no-go areas.*
- *Construction, operational and decommissioning activities should be limited to the footprint of the site.*
- *A storm water management plan must be drafted and implemented during all phases of the development.*
- *No manure to be spread within the 43m wetland buffer zones.*

8.5.7 Groundwater

According to Gouws (2018), the groundwater level on site varies between a minimum of 3.58 mbgl to a maximum of 3.84 mbgl. Five (5) boreholes are present within 1.5km of the site. 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), **16 909.75 liters per day** of groundwater will be required for the proposed GTC facility. Two boreholes are present on the property (ALZ1 and ALZ2; Figure 5.18), which can deliver a total of 8600l/day if pumped at a sustainable rate of 0.1 l/s for 8 hours (Gouws, 2018).

The groundwater quality can be described as freshly recharged, unpolluted bicarbonate water.

A) Direct impact on groundwater

<u>Construction, operational and decommissioning phases of the platforms, buildings and associated infrastructure</u>

No direct impact on the groundwater is expected as a result of construction, operational or decommissioning activities as the groundwater is located at ±3.5m below ground level (Gouws, 2018). The manure compartments will be located in the built-up platforms and the foundations, service trenches and conservancy tank will not be >3m deep.

<u>Construction, operation and decommissioning of the manure pit</u>

The excavation of the manure pit could impact on the groundwater flow, since the pit will be excavated to ±4.5m and the groundwater level is

present at ±3.58 to 3.84 mbgl. The impact is however, expected to be negligible (Gouws, 2018) due to the small size of the manure pit (24m^2). The impact on the groundwater flow will continue throughout the operational and decommissioning phases and cannot be mitigated.

DIRECT IMPACT ON GROUNDWATER QUALITY					
CONSTRUCTION PHASE - Manure pit					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Permanent	Probable	Low Negative	Low Negative	Irreversible
OPERATIONAL PHASE - Manure pit					
Site	Permanent	Probable	Low Negative	Low Negative	Irreversible
DECOMMISSIONING PHASE - Manure pit					
Site	Permanent	Probable	Low Negative	Low Negative	Irreversible

B) Indirect impact on groundwater quality

Construction phase

Indirect pollution of the groundwater could take place if the construction vehicles are not maintained/repaired resulting in oil leaks and fuel spills, proper ablution and sanitation facilities are not provided for the site workers to use on site and proper waste management measures are not implemented. Pollution of the groundwater is however, highly unlikely due to the depth to groundwater.

Operational phase

The manure compartments will be located in the built-up platforms and will be cemented. No impact on groundwater is therefore expected in terms of the manure compartments.

Indirect pollution of the groundwater could however, take place if proper waste management measures are not implemented and the sewage system (conservancy tank) does not have sufficient capacity and is not maintained.

The groundwater could also be polluted if the manure pit was not constructed properly, does not have sufficient capacity and is not maintained, resulting in manure seeping through the soil to the groundwater.

Manure can be spread on suitable land, as the unsaturated (vadose zone) may have the potential to break down harmful contaminants (Gouws, 2018). Mitigation measures should however, be implemented.

If too much manure is applied on nearby cultivated land it could have a negative impact in terms of increased mineral and metal content of soils as well as nitrogen and phosphates, which could lead to nutrient leaching into the groundwater.

The groundwater could also be polluted if the required 43m wetland buffer zones in terms of the spreading of manure near wetlands/rivers and boreholes are not adhered to.

According to Gouws (2017), the salt load on the aquifer could increase by 1.5 kg/d with an increase in concentration of 10.5mg/l at the closest borehole (ALZ4; Figure 5.18) and Seep wetland (Figure 5.17). The time to reach maximum concentration at these receptors would be 7 years. If nitrate

is considered then the increase would still be within acceptable SANS drinking water standards.

The impact on the groundwater from spreading of manure has little real effect and should not have an influence on or require modification of the project design (Gouws, 2018).

Pig carcasses will not be buried on site but will be composted at the existing Alzu composting facility. No groundwater pollution on site is therefore expected in this regard.

Decommissioning phase
Indirect pollution of the groundwater could take place if the vehicles are not maintained/repaired resulting in oil leaks and fuel spills or if the manure compartments, conservancy tank and manure pit are not emptied before decommissioning.

INDIRECT IMPACT ON GROUNDWATER QUALITY					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Improbable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Manure pit					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Spreading of manure					
Site	Local	Probable	Medium Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Long	Probable	Medium Negative	Low Negative	N/A

Proposed mitigation:

- *The waste management measures as indicated in Section 3 and 9 to be implemented during all phases of the development.*
- *Manure pit to be properly constructed.*
- *Groundwater quality to be monitored on a quarterly basis.*

C) Impact of groundwater abstraction

Construction phase
Groundwater will be abstracted during the construction phase using the two boreholes located at the old farmstead complex. It is highly unlikely that more than 8 600 l/day of groundwater will be required during the construction phase. The impact on groundwater volume during the construction phase will thus be low.

Operational phase
According to Hlasane (2018), 16 909.75 liters per day of groundwater will be required for the proposed GTC facility for 400 boars. Two boreholes are present on the property (ALZ1 and ALZ2; Figure 5.18), which can deliver a total of 8600l/day if pumped at a sustainable rate of 0.1 l/s for 8 hours (Gouws, 2018). Sufficient water (8 454 l/day) is available for the initial 200 boars. However, an additional borehole will be required in order to supply sufficient water for 400 boars.

According to Gouws (2018), the sustainable abstraction of groundwater for the proposed development does not pose a risk to groundwater users in the area. The cone of depression or radius of influence was determined as 222m. No downstream groundwater users (i.e. surrounding villages/homesteads; Figure 5.4) will thus be impacted as a result of water abstraction at the GTC facility, since the closest borehole (ALZ4; Figure 5.18) is located ±380m from the site. In addition, no wetlands will be impacted. The Depression wetland is deemed to be disconnected from the groundwater as the static water levels were measured at > 3mbgl (Gouws, 2018).

Decommissioning phase

It is not expected that groundwater abstraction will take place during decommissioning and therefore there will be no impact on groundwater quantity/ volumes. After decommissioning, the said area will be rehabilitated in order to re-establish a vegetation cover and restore water flow across the site. This could have a positive impact on groundwater recharge.

IMPACT OF GROUNDWATER ABSTRACTION GTC facility (platforms, buildings and associated infrastructure)					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Local	Short	Improbable	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Long	Probable	Low Positive	Low Positive	N/A

Proposed mitigation:

- *Maximum volume of water to be abstracted from boreholes ALZ1 and ALZ2 not to exceed 0.1 l/s or 8.6 m^3/day.*
- *An additional borehole to be drilled.*
- *Maximum volume abstracted (from new and existing boreholes) should not exceed 0.5 l/s or 43 m^3/day.*
- *Groundwater levels to be monitored on a quarterly basis.*

8.5.8 Sites or archaeological and cultural interest

According to Van Vollenhoven (2017), no Stone Age or Iron Age sites were noted on or near the proposed site. No graves were noted on site, within the old farmstead complex or in close proximity of the site. Only two buildings (an old farm house and an outbuilding) within the old farmstead complex are older than 60 years (Historical Age). These buildings are located outside of the development footprint.

The proposed site is underlain by shale, shaly sandstone, grit and sandstone of the Vryheid Formation, which has a 'Very High' palaeontological sensitivity (Fourie, 2017).

A) Impact on archaeological/cultural sites

Construction, operational and decommissioning phases

No sites of archaeological/cultural interest are known to be present on site. The two historical buildings located within the old farmstead complex could however, be indirectly impacted should mitigation measures not be implemented during the construction and operational phases.

The spreading of manure is not expected to have any impact on the historical buildings as this will take place away from the old farmstead complex.

IMPACT ON ARCHAEOLOGICAL/CULTURAL SITES					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Probable	Medium Negative	Low Positive	Irreversible
OPERATIONAL PHASE					
Site	Long	Probable	Medium Negative	Low Positive	Irreversible
DECOMMISSIONING PHASE					
Site	Long	Probable	Medium Negative	Low Positive	N/A

Proposed mitigation:

- *Construction, operational and decommissioning activities should be limited to the footprint of the site.*
- *Before construction, the two historical buildings at the old farmstead complex should be demarcated and indicated as No-Go Areas.*

B) Impact on palaeontology

Construction phase

The direct impact on the palaeontology will depend on the depth of the excavations required for the buildings, conservancy tank, services and manure pit. The manure compartments will be located in the built-up platforms.

Operational phase

The operational activities (GTC facility and spreading of manure) will have no direct or indirect impact on the palaeontology of the site as no further construction will take place.

Decommissioning phase

The decommissioning activities will have no direct or indirect impact on the palaeontology of the site as no further construction will take place.

IMPACT ON PALAEONTOLOGY					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Improbable	Low Negative	Low Negative	Irreversible
OPERATIONAL PHASE					
None	None	None	None	None	N/A
DECOMMISSIONING PHASE					
None	None	None	None	None	N/A

Proposed mitigation:

- *Mitigation measures in terms of a protocol for finds (Section 9) would have to be implemented should any fossils be unearthed during the construction phase (Fourie, 2017).*

8.5.9 Air quality

The proposed site is located in the Steve Tshwete Municipal area hot spot. Activities in the surrounding area that could potentially impact on the air quality of the site include dust from agricultural activities and gravel roads, smoke from veld fires, emissions/dust from Mafube Coal Mine, etc.

A) Impacts in terms of dust

Construction phase
Dust generation and vehicle emissions due to construction activities (i.e. platforms, buildings, manure pit and associated infrastructure) and use of heavy machinery could impact on site workers. The extent of the impact would depend on the area cleared, time of year, wind direction and velocity. It is unlikely that the surrounding homesteads/villages (including Village 3; Figure 5.4) will be impacted due to the distance (>500m) of these residences from the site.

Operational phase
The air quality of the site and surrounding area could be impacted by dust and vehicle emissions from e.g. trucks delivering feed, workers driving to site and tractors collecting manure from the manure pit.

The village located north of the site (Village 3; Figure 5.4) should not be impacted since no vehicles from the GTC facility will travel past this village. In addition, the village is not located downwind of the site, since the dominant wind direction in the area is in a north westerly direction.

The homestead located south of the site adjacent to the N4 national road (Homestead 1; Figure 5.4) could be impacted since the gravel road does extend past this residence. However, according to the applicant, only one truck per week would visit the site to deliver feed to the facility and traffic from workers will be minimal.

The spreading of manure on agricultural/cultivated land should not lead to an increase in dust since only one tractor and tanker will be used to empty the manure pit once a week. In addition, the spreading of manure could even have a positive impact since the manure would be wet and would act as a dust suppression measure.

Decommissioning phase
Dust generation and vehicle emissions due to decommissioning activities and use of heavy machinery could impact on site workers and people residing near the site at the said time. After decommissioning, the said area will be rehabilitated in order to re-establish a vegetation cover, which would decrease dust.

IMPACT IN TERMS OF DUST					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure					
Site	Long	Highly probable	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE - Spreading of manure					
Local	Long	Probable	Low Neutral	Low Neutral	Reversible
DECOMMISSIONING PHASE					
Site	Short	Highly probable	Low Neutral	Low Neutral	Reversible

Proposed mitigation:

- *Dust suppression measures to be implemented on site during the construction phase.*

- *Only Access Road 1 to be utilized during all phases of the development.*

B) Impacts in terms of odours

Construction phase
The air quality of the site and surroundings could be impacted in terms of odours if the chemical toilets used during construction are not maintained and proper waste management measures are not implemented.

Operational phase
During the operational phase, the air quality of the site and surroundings could be impacted in terms of odours if the conservancy tank does not have capacity, is not maintained and if proper waste management measures are not implemented.

In addition, bad odours (mainly sulphur dioxide, hydrogen sulphide, ammonia and volatile organic releases) could be caused by overstocking of the GTC facility and bad management of the manure pit resulting in spillage. These odours could impact on the site workers.

The extent of the odours would depend on management practices, wind directions, temperature, etc. As indicated in Section 5.11, the dominant wind direction in the area is in a north westerly direction for most of the year. No homesteads/villages are located north west (i.e. down wind) of the site (Figure 5.4). In addition, the closest residence is located 605m from the site. The impact on surrounding residents (including Village 3; Figure 5.4) in terms of odour from the GTC facility is therefore expected to be low.

Manure would be spread on Portion 24 of Kleinfontein 432 JS. No homesteads/villages are located on this property (Figure 5.4).

Odours as a result of the spreading of manure could however, impact on people residing in the homesteads/villages located on the adjacent farms (Figure 5.4), depending on where the manure is spread, the volume and composition of the manure, the height of the manure tank nozzles, how long the manure is left on top of the soil before being tilled and the wind direction. The impact would be of short duration since manure would only be spread once a week, on a different section of cultivated land.

Although mitigation measures can be implemented, odours cannot be completely eliminated.

Decommissioning phase
None, since all waste (including manure) will be removed from site and the site rehabilitated.

IMPACT IN TERMS OF ODOURS					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure (including manure pit)					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Spreading of manure					
Site	Short	Highly probable	Medium Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Short	Highly probable	Low Neutral	Low Neutral	Reversible

Proposed mitigation:

- *The GTC facility must not be overstocked and must be meticulously cleaned.*
- *The existing Standard Operating Procedures (SOP's) must be updated and adhered to.*
- *The waste management measures as indicated in Section 3 and 9 to be implemented during all phases of the development.*
- *Conservancy tank to be emptied every 4 days as recommended by Hlasane (2018).*
- *Manure pit to be well managed and emptied on a regular basis.*
- *The manure to be tilled into the soil as soon as possible.*

C) Impacts in terms of gasses

Construction phase
None.

Operational phase
A build-up of gasses (e.g. carbon dioxide, methane, ammonia and hydrogen sulphide) inside the GTC facility could impact on the boars and the employees in terms of health and odours.

There could also be a build-up of gasses in the manure pit, should the manure pit be completely covered with corrugated iron and gasses are not allowed to escape. This could impact on the employees who open the manure pit when it is full and needs to be emptied.

Decommissioning phase
None.

IMPACT IN TERMS OF GASSES GTC facility (platforms, buildings and associated infrastructure)					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
None	None	None	None	None	N/A
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure					
Site	Long	Probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE - Manure pit					
Site	Short	Probable	Medium Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
None	None	None	None	None	N/A

Proposed mitigation:

- *Adequate ventilation within the buildings to be provided at all times.*
- *The existing Standard Operating Procedures (SOP's) must be updated and adhered to.*
- *The manure pit must not be completely enclosed.*

8.5.10 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 and traffic on the N4 national road could also contribute to the ambient noise level depending on the time of day and wind direction.

The closest homesteads/villages are located 605m from the site (Figure 5.4).

Construction phase

Heavy machinery used during the construction phase will contribute to increased ambient noise levels in the immediate area, which could impact on the construction workers. It is unlikely that surrounding homesteads/villages (Figure 5.4) would be impacted since they are located >605m from the site. Village 3 and Homestead 5 (Figure 5.4) are located >1km from the site and should not be impacted. In addition, the construction activities will only take place during working hours.

Operational phase

Operational noise would be created and would include noise from the boars (mainly during feeding), vehicles, machinery, fans, etc. The operational noise could impact on the site workers. It is unlikely that surrounding residents (Figure 5.4) would be impacted by noise from the GTC facility since the majority of the operational noise will be contained within the buildings. In addition, the homesteads/villages are located >605m from the site and upwind from the facility.

The impact on noise levels as a result of the spreading of manure by means of tractor and tanker should be negligible, since the manure will be spread once a week and the tractor noise is already associated with agricultural activities in the area. In addition, manure will only be spread during working hours.

Decommissioning phase

In general, the use of heavy machinery for decommissioning activities would impact on the surrounding area in terms of noise. The impact would depend on the land use at that time.

IMPACT IN TERMS OF NOISE					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE - Platforms, buildings and associated infrastructure (including manure pit)					
Site	Long	Highly probable	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE - Spreading of manure					
Site	Short	Probable	Low Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Short	Highly probable	Low Negative	Low Negative	Reversible

8.5.11 Visual aspects

The site is highly visible from the surrounding agricultural lands, gravel access road and old farmstead complex. The site is screened from Village 3 located towards the north (Figure 5.4) by the large Pine trees around the old farmstead complex. It is unlikely that the site is visible from the other homesteads/villages in the area (i.e. Homestead 1, Farmstead 2, Village 4 and Homestead 5; Figure 5.4) due to the distance from the site and the undulating topography.

Construction, operational and decommissioning phase

Site workers and people travelling along the gravel access road could be impacted if the GTC facility is not well managed. It is unlikely that the homesteads/villages in the surrounding area (Figure 5.4) would be impacted due to the distance from the site, the undulating topography and the large Pine trees. The site is also screened from motorists on the N4 national road by a steep embankment.

IMPACT IN TERMS OF VISUAL ASPECTS					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Definite	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE					
Site	Long	Definite	Low Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Short	Definite	Low Negative	Low Negative	Reversible

Proposed mitigation:

- *The site should be kept neat and tidy during all phases of the development.*

8.5.12 Traffic

The site will be accessed via a gravel road that extends from Alzu Petroport, across the N4 national road (at an existing bridge crossing) in a northerly direction towards the proposed site (Access Road 1; Figure 5.22). The gravel roads are mainly utilized by the applicant, his workers and surrounding landowners/residents. Traffic volumes in the area are thus very low.

Construction phase

All construction activities will take place on site and will not directly impact on traffic. The delivery of building material during the construction period could lead to a slight increase in traffic on the gravel road. The deliveries would however, not occur on a continuous basis

Operational phase

During the operational phase, employees will travel to work and feed will be delivered to site. These activities will lead to a very slight increase in traffic along the gravel road (Access Road 1; Figure 5.22) and the N4 national road. According to the applicant, only one truck will enter the site per week to deliver feed. The impact is therefore expected to be negligible.

The homestead located south of the site (Homestead 1; Figure 5.4) could be impacted in terms of vehicles driving past the residence. According to the applicant, only one truck per week would visit the site to deliver feed to the facility and traffic from workers will be minimal. In addition, it should be

noted that this homestead is located adjacent to the N4 national road that carries high volumes of traffic.

The village located north of the site (Village 3; Figure 5.4) will not be impacted since no traffic from the GTC facility will drive past this village.

Decommissioning phase
Building rubble and other waste would have to be removed from site. This could lead to a slight increase in traffic on the road network. Impact on traffic after decommissioning will however, depend on the intended end land use.

IMPACT IN TERMS OF TRAFFIC					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Low Negative	Low Negative	Reversible
OPERATIONAL PHASE					
Site	Long	Highly probable	Low Negative	Low Negative	Reversible
DECOMMISSIONING PHASE					
Site	Short	Highly probable	Low Negative	Low Negative	Reversible

8.5.13 Interested and affected parties

The proposed development site belongs to the project applicant and therefore no other landowner will be directly impacted in terms of the development of the said site in the short term and/or long term.

A) Positive impacts on Interested and Affected Parties (I&APs)

Construction, operational and decommissioning phases
The proposed development could have the following positive impacts on I&APs:

- The proposed development will lead to additional employment opportunities during the construction (±40) and operational (±13-17) phases.
- The transportation of live animals between farms for breeding purposes will be avoided, reducing bio-security risks.

The impact of the decommissioning of the development in terms of interested and affected parties will depend on the landowner at the said time, the character of the area at that time and the intended end land use

POSITIVE IMPACTS ON I&APs					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Medium Positive	Medium Positive	N/A
OPERATIONAL PHASE					
Site	Long	Highly probable	Medium Positive	Medium Positive	N/A

B) Potential negative impacts on Interested and Affected Parties (I&APs)

Construction, operational and decommissioning phases
The proposed development could have the following negative impacts on I&APs:

- During the construction phase, contractors working on site could be directly impacted upon if the necessary safety and occupational health measures are not adhered to.
- During the operational phase, the employees working on site could be directly impacted upon if the necessary safety and occupational health measures are not adhered to, especially when working with mortalities, medical waste, etc.
- Due to bio-security requirements, the general public would not have direct access to the site during the operational phase. Therefore no impact i.t.o. potential health and safety risks to the general public are anticipated.
- The boars and site workers could be impacted upon in terms of health if the water quality is not monitored on a regular basis to ensure that it is fit for consumption.
- Electricity would be obtained from the Eskom power line located north of the site. This power line would have to be moved. If any consumers (apart from the applicant) are connected to the said power line, they could be impacted upon in terms of the interruption of their power supply during the re-connection of the service.
- Other impacts in terms of the natural environment, noise, odours, visual, traffic, etc. are indicated in the above-mentioned sections

The impact of the decommissioning of the development in terms of interested and affected parties will depend on the landowner at the said time, the character of the area at that time and the intended end land use

POSITIVE IMPACTS ON I&APs GTC facility (platforms, buildings and associated infrastructure)					
CONSTRUCTION PHASE					
Extent	**Duration**	**Probability**	**Significance pre-mitigation**	**Significance post-mitigation**	**Reversibility**
Site	Short	Highly probable	Medium Negative	Low Negative	Reversible
OPERATIONAL PHASE					
Site	Long	Highly probable	Medium Negative	Low Negative	Reversible

Proposed mitigation:

- *All phases of development to be managed according to the Environmental Management Plan (Section 9 of this report).*

8.6 Cumulative impacts

The proposed development will **not** lead to an overall loss of Eastern Highveld Grassland vegetation and associated animal habitat, since the majority of the site comprises cultivated land with no natural vegetation present. The north eastern corner of the site extends into the old farmstead complex, which is mostly bare of vegetation. The proposed GTC facility will thus not result in the cumulative loss of Eastern Highveld Grassland vegetation.

The said area will no longer be available for cultivation (maize) due to the presence of the GTC facility, leading to the loss of ±6ha of moderate potential agricultural land. However, the spreading of manure on surrounding cultivated lands could have a positive impact on the soil in terms of: increased nutrients needed by plants, increased water infiltration rates by improving soil structure and increased organic matter content. This could result in better crop yields thus having a positive impact on arable land.

If too much manure is applied/spread onto cultivated land, it could have a negative impact over time in terms of increased mineral and metal content of soils as well as nitrogen and phosphates, which could lead to nutrient leaching. Leached nutrients could end up in the small unnamed stream, which could result in eutrophication, increased phytoplankton and aquatic plant growth and algal bloom.

The development will **not** have a direct impact on any surface water environments (river/stream/wetland) since the site is located outside of the identified wetlands (Depression and Seep wetlands) and their associated 43m wetland buffer zones. The development will thus not result in the cumulative loss of wetlands.

The hydrology of the Depression and Seep wetlands located east of the site may however, be indirectly altered through changed runoff patterns as a result of the increase in impermeable areas (due to buildings and associated infrastructure (including manure pit)) and decrease in infiltration into the soil. If not well managed, increased runoff could impact on these wetlands in terms of erosion and increased sediment load ultimately impacting on the surface water quality of the downstream area.

If the conservancy tank and manure pit are not properly constructed, operated and maintained, it could result in overflows and spillage. This could lead to soil pollution, surface and groundwater pollution, which over time could have a cumulative impact on these environments.

Groundwater (boreholes) will be utilized at the GTC facility as no municipal services are available in the area. According to Gouws (2018), the sustainable abstraction of groundwater for the proposed development does **not** pose a risk to groundwater users in the surrounding area. However, if the boreholes are over abstracted, it could impact on the aquifer and water provision to the GTC facility in the long term. Surrounding groundwater users could also be impacted.

Due to the small scale of the development and the location of the site, no significant cumulative impacts are expected in terms of the following: topography, geology, land use, vegetation, animal life, air quality, noise, traffic or visual aspects. In addition, there will be no cumulative impact on sites of archaeological and cultural sensitivity.

8.7 'No project' impacts

The 'no project option' is the alternative of not going ahead with the proposed development. The 'no project option' is only considered if it is found that the development will have significant negative impacts on the environment, which cannot be mitigated or managed.

If the 'no project option' in terms of the proposed project was exercised, it would mean that:

- The applicant would have to investigate alternative sites for the proposed GTC facility;
- A new Basic Assessment process would have to be followed;
- New layout plans would have to be drafted;
- Alternatively, the applicant would have to close the business since the existing site would no longer be available. This would impact on the pork

industry in terms of the availability of sperm and breeding of high quality pigs;

- Job opportunities created by the project applicant (construction phase: 40 employees; operational phase: 30 employees) would be lost.

SECTION 9: ENVIRONMENTAL MANAGEMENT PROGRAMME

9.1 Definition and objectives

As indicated in Regulation 19(4) of the EIA Regulations, 2014 (as amended), an Environmental Management Programme (EMPr) must form part of the Basic Assessment Report.

The EMPr was compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended) as well as the Western Cape Guideline for Environmental Management Plans (Lochner, 2005).

According to the Western Cape Guideline, an Environmental Management Programme (EMPr) can be defined as:

> *An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.*

According to the EIA Regulations, 2014 (as amended), an EMPr must include-
(d) A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed or mitigated as identified through the environmental impact assessment process for all phases of the development including -
(i) planning and design;
(ii) pre-construction and construction activities;
(iii) operation or undertaking of the activity;
(iv) rehabilitation of the environment; and
(v) closure, where relevant.

This section therefore provides an indication of the mitigation measures to be implemented by the site operator (and site workers) in order to reduce the potential impacts identified (see Section 8).

9.2 Contact details of Environmental Assessment Practitioner

An EMPr must include -
(a) details of-
(i) the EAP who prepared the environmental management programme; and
(ii) the expertise of that person to prepare an environmental management programme, including a curriculum vitae.

The contact details and expertise of the Environmental Assessment Practitioner who prepared the EMPr are provided in Section 2 of this Basic Assessment Report.

The applicant will be responsible for the implementation of the EMPr. The contact details are provided in Section 2 of this Basic Assessment Report.

9.3 Description of the proposed project

An EMPr must provide -
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.

A detailed description of the proposed development and aspects covered by the EMPr is provided in Section 3 and Section 7 of this Basic Assessment Report.

In summary, the following alternatives as indicated in Section 7.6.3 and Section 8 will be implemented:

Section	Alternative	Description
7.1.5	Site 4	Site 4 is located on the Remaining Extent of Portion 24 of the farm Kleinfontein 432 JS, south of the old farmstead complex as indicated in Figure 7.1. The said property belongs to the applicant (see Section 5.3.1).
7.2.6	Layout 6	Drafted for Site 4 (preferred site) with manure pit located on the south eastern corner of the site (Figure 7.7).
7.3.1	In-house effluent collection Alternative 1B	Slotted floors with deep pit storage system (Photo 7.2).
7.3.2	Temporary outside storage of manure - Alternative 2D	Storage of manure in a concrete manure pit (Figure 7.12).
7.3.3	Utilization of manure Alternative 3C	Spreading of manure on agricultural/cultivated land as fertilizer.
7.4.1	Water provision Alternative 3	Groundwater will be abstracted from boreholes.
7.4.2	Electricity - Alternative 2	Electricity will be obtained from Eskom.
7.4.3	Sewage disposal - Alternative 4	Sewage will be disposed of by means of a conservancy tank.
7.4.4	Access Road 1	Existing gravel road that extends from Alzu Petroport, across the N4 national road (at an existing bridge crossing) in a northerly direction towards the proposed site (Figure 5.22).
7.4.5	Storm water management - Alternative 2	A new storm water system will be installed comprising of grassed trenches and culverts (Figure 7.7).

Mitigation and management measures with regards to these alternatives are provided in Section 9.5.

9.4 Sensitivity mapping

An EMPr must provide -
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.

Section 5 of this Basic Assessment Report provides a description of the biophysical environment of the site.

No sensitive environments (e.g. wetlands, sites of cultural significance, etc.) will be directly impacted by the proposed GTC facility as indicated in Figure 9.1.

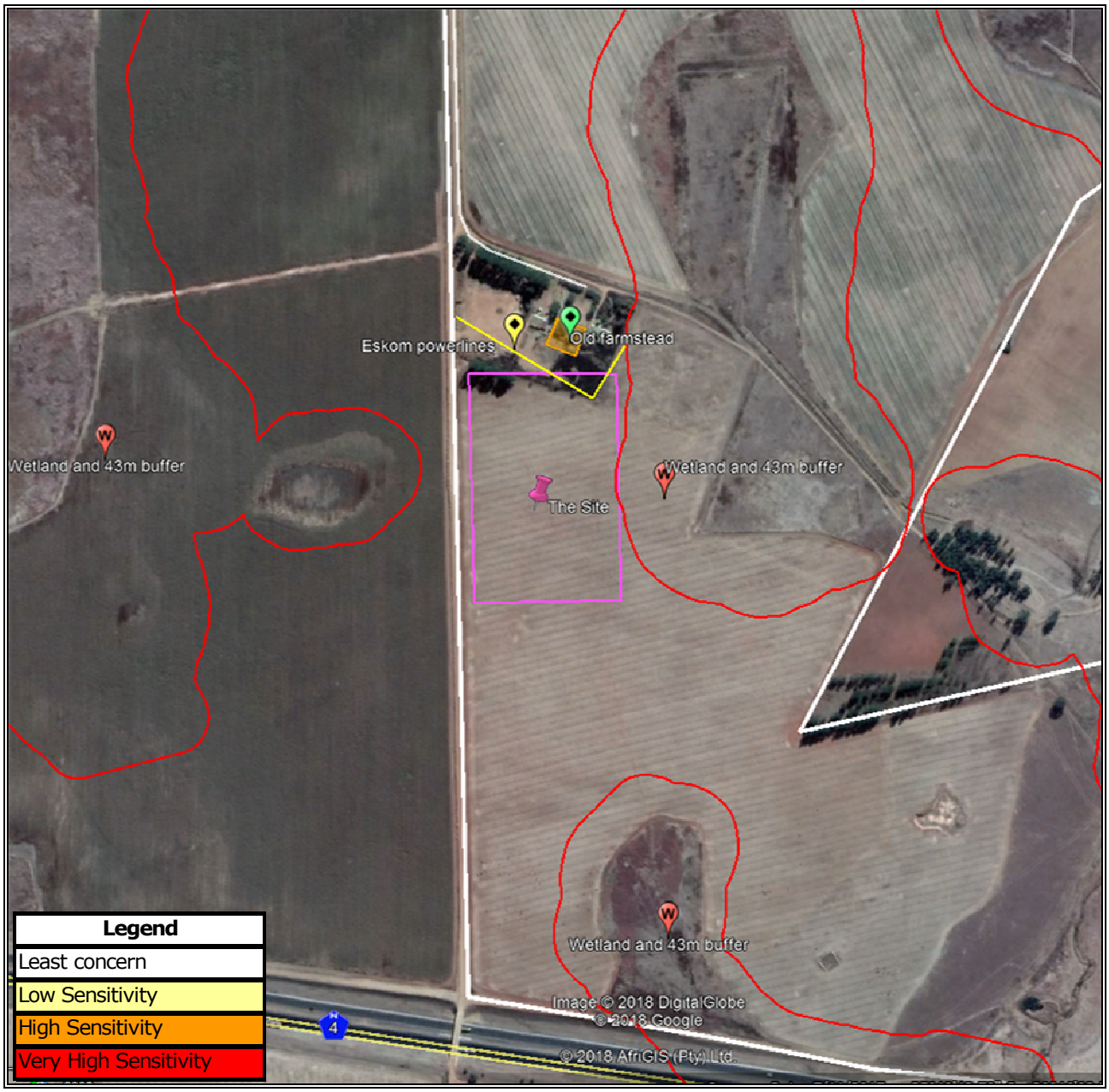


Figure 9.1: Sensitive landscapes identified

Sensitive areas identified near the site include the following (Figure 9.1):

- Depression and Seep wetlands with associated 43m wetland buffer zone (Very High Sensitivity);
- Two buildings older than 60 years of age (i.e. the old farmstead; High Sensitivity).

As is evident from Figure 9.1, the eastern fence line of the GTC facility would extend along the 43m wetland buffer zone east of the site. Indirect impacts (e.g. increased runoff, erosion, etc.) could take place which would necessitate the implementation of mitigation measures as indicated in Section 9.5.

Eskom power lines (Low Sensitivity; Figure 9.1) extend into the north eastern corner of the site and will need to be relocated.

9.5 Mitigation and management measures to be implemented

An EMPr must include -
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to -
(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
(ii) comply with any prescribed environmental management standards or practices;
(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.

9.5.1 Construction site office

Impact management objective:

1) *To ensure that an appropriate site is selected for the construction site office and that the site office is managed in an environmentally responsible manner with the least impact on the natural environment, site workers and the surrounding landowners/users.*

Mitigation and management measures:

a. A suitable site must be selected, demarcated and fenced for the construction site office within the demarcated site boundaries (i.e. within the 6 ha site; Figure 9.1).
b. It is recommended that the construction site office be located in the northern portion of the site within the old farmstead complex.
c. The historical buildings located within the old farmstead complex may not be used as part of the construction site office (Figure 9.1).
d. The construction site office may not be located within the 43m buffer zone associated with the Depression wetland located on the eastern boundary of the site (Figure 5.17).
e. Chemical toilets must be provided for use by the site workers. These must be serviced on a regular basis. No long drop toilets may be allowed.
f. Potable water must be made available to site workers.
g. The waste management measures as indicated in Section 9.5.6 must be implemented.
h. An area for the parking of construction vehicles and other vehicles should be clearly demarcated. When not in use, all vehicles should be parked within this area. The demarcated parking area should be located within or in close proximity to the construction site office.
i. As far as practically possible, vehicles must not be serviced/repaired on site. However, should it not be possible to take the vehicle to a service centre in town for repair, the contractor must ensure that the vehicles are serviced/repaired on a cement slab and that drip trays are utilized. Waste oil, filters, etc. must be properly disposed of (see Section 9.5.6).

9.5.2 General construction principles

Impact management objective:

1) *To ensure that the activities that occur during the construction phase have the least impact on the surrounding natural environment, site workers and surrounding landowners/users.*

Mitigation and management measures:

a. All relevant authorisations must be obtained before construction commences.
b. The GTC facility must be constructed within the 6 ha area as indicated in Figure 9.1.
c. Any significant changes to the site/layout plan would necessitate approval from the Department of Agriculture, Rural Development, Land and Environmental Affairs before commencing with construction.
d. Before any construction commences, the site must be fenced. All construction activities must be limited to the fenced area and the footprint kept as small as possible.
e. The boreholes and historical buildings located within the old farmstead complex must be clearly demarcated and protected.
f. The Eskom power lines located in the north eastern corner of the site (Figure 9.1) must be decommissioned or relocated before construction commences.
g. Before construction, the Depression wetland (located east of the site) and Seep wetland (located south of the site) and associated 43m buffer zones (Figure 9.1) must be surveyed and clearly marked as NO-GO areas in the field with signs and/or highly visible flagging until construction-related activities are complete. No construction/spoiling/storing activities to be allowed within these areas.
h. An area must be selected within the 6 ha site for the stockpiling of spoil (e.g. rocks, soil, etc.).
i. The excavated material (soil, rocks, etc.) must be separately stockpiled within the construction footprint until rehabilitation, or alternatively disposed of.
j. The Pine trees located on the northern boundary of the old farmstead complex must not be removed (unless dead) since it will act as visual screen.
k. Should any animals (e.g. reptiles or mammals) be found during the construction phase, a specialist should be contacted to ensure the safe removal of the specimen(s).
l. Only Access Road 1 (Figure 5.22) to be utilized during the construction phase in order to access the site.
m. Contractors to be informed to keep to low speeds along the gravel roads to reduce the amount of dust, especially whilst driving past Homestead 1 (Figure 5.4).
n. Dust suppression measures must be implemented during dry and windy periods to prevent air-borne deposition on the surrounding natural vegetation and crops.
o. No members of the general public should be allowed at the construction

9.5.2 General construction principles

site.

p. The applicant/contractor must appoint a Safety Officer and Environmental Control Officer (ECO) in order to ensure compliance with the legislation and the Environmental Authorisation.

q. Construction activities to be restricted to daylight hours (7am - 6pm) and weekdays (Monday to Friday).

r. Sufficient fire extinguishers must be provided as required by legislation.

s. All machinery used during the construction phase must be properly muffled and maintained so as to reduce noise generation to a minimum.

t. All pollution incidents must be reported to the Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation within 24 hours of occurrence.

u. The developer must take note of the historical buildings located within the old farmstead complex (Figure 9.1) and must ensure the protection/utilisation thereof. Permission for such matters should be dealt with by the Provincial Heritages Resources authority of Mpumalanga (Van Vollenhoven, 2017).

v. If any graves are discovered during construction, the discovery must be reported to the SA Police Service and SAHRA. An archaeologist must be called in to handle the matter.

w. If any archaeological remains are exposed during the construction phase, the construction must be terminated immediately and the South African Heritage Resources Agency (SAHRA) must be notified in this regard. The applicant must take note of the requirements in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999).

x. The Environmental Control Officer (ECO) must familiarise him- or herself with the Vryheid Formation and its fossils. It is recommended that a palaeontologist is involved during the construction phase of the development either for training of the Environmental Control Officer (ECO) or a site visit once a month (Fourie, 2017).

y. The ECO must survey for fossils during excavation as well as before and after blasting (Fourie, 2017).

z. If any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist must be called to determine proper mitigation measures (Fourie, 2017). A Protocol for Finds and Management Plan for fossils is attached in Appendix 2 of Appendix 5.

9.5.3 Rehabilitation of the environment after construction

Impact management objective:

1) *To ensure that the area disturbed due to construction activities is properly rehabilitated and maintained.*
2) *To control the growth of declared weeds and/or invader plants.*
3) *To ensure that any declared weeds and/or invader plants do not establish on site and spread to the Depression wetland (located east of the site), the Seep wetland (located south of the site) or the Seep and Depression wetlands (located west of the site).*

9.5.3 Rehabilitation of the environment after construction

Mitigation and management measures:

a. Before construction, topsoil must be removed and stockpiled in a demarcated area within the 6 ha site (Figure 9.1) for rehabilitation of the area surrounding the buildings. The topsoil layer generally has a high organic content and carries the seed bank. It is invaluable for post-development rehabilitation.
b. Once construction has been completed, all temporary structures, excess materials, equipment and waste must be removed from site.
c. All residual stockpiles must be removed to spoil or spread on site as directed by the ECO. The spoil could be used on the remainder of the farm as fill where erosion has taken place.
d. The disturbed areas must be top soiled and re-vegetated (i.e. rehabilitated) as soon as possible in order to prevent soil erosion and the establishment of alien vegetation.
e. Proper storm water control measures and erosion control must be implemented to prevent erosion of the newly rehabilitated areas during heavy rainfall.
f. Temporary erosion control measures (e.g. geo-textile silt fences, diversion ditches, sediment traps, sandbags, etc.) and temporary seeding with fast growing annuals to be kept in place to control erosion until the long-term erosion control methods are established and functioning.
g. If soil erosion is noted, appropriate remediation measures must be implemented.
h. For rehabilitation purposes, a seed mix comprising of grass species indigenous to the area should be used. Grass seeds can be collected from the surrounding area and used on site. Mowed grass with seeds can be used for mulching.
i. The planting of any alien plant species as part of landscaping should be prohibited.
j. Kikuyu grass (*Pennisetum clandestinum*) is a proposed declared Invader that is highly invasive in wetland habitats. It is therefore recommended that this species is not used for rehabilitation of the area or within the storm water channels between the buildings.
k. The regulations in terms of Alien Invasive Species, the Conservation of Agricultural Resources Act, 1983 and the Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998) with regards to declared alien species must be noted and complied with.
l. An alien and invasive species control and monitoring plan as required in terms of the Alien and Invasive Species Regulations under the National Environmental Management Biodiversity Act (Act 10 of 2004) should be compiled and implemented (Venter, 2017).
m. Regular site inspections to be conducted to identify any declared weeds and/or invader plants. If identified, the plants to be eradicated using appropriate methods.
n. Several alien and invasive species resemble indigenous species, especially as seedlings. Care must be taken not to control indigenous species during the control of invasive species (Venter, 2017).
o. It is advisable to consult the latest edition of 'A guide to the use of herbicides' or contact the National Department of Agriculture, Forestry

9.5.3 Rehabilitation of the environment after construction

and Fisheries with regards to the latest information pertaining to the application of herbicides. If pesticides or herbicides are to be used, the product should be chosen responsibly. Storage, administering and disposal must be done according to the prescribed methods.

p. A post-construction audit must be conducted to ensure that any shortcomings are identified and addressed.

9.5.4 General operational principles

Impact management objective:

1) *To ensure that the activities that occur during the operational phase have the least impact on the natural environment, site workers and surrounding landowners/users.*

Mitigation and management measures:

a. The GTC facility must be operated as indicated in Section 3 and Section 7 of this document.
b. The facility must be double fenced and all gates locked with clear signs indicating that the facility is a restricted area.
c. All operational activities must be limited to the said site.
d. The Standard Operating Procedures currently implemented at the existing GTC facility must be updated and implemented.
e. Alzu Pig Genetics (Pty) Ltd. must continue to participate in the Pork 360 quality assurance system (controlled by the South African Pork Producers' Organisation [SAPPO]).
f. Employees, delivery vehicles and tractors must be informed to keep to low speeds along the gravel roads to reduce the amount of dust.
g. The waste management measures provided in Section 9.5.6 must be implemented.
h. The following energy saving initiatives to be implemented to ensure the efficient use of energy at the proposed GTC facility:
    - The buildings to be north facing;
    - Heat retaining material to be used (e.g. polyurethane);
    - Energy efficient lighting to be installed where possible.

9.5.5 Soil management

Impact management objective:

1) *To ensure that the activities that occur during the construction phase have the least impact on the soils in terms of soil quality, structure and erosion potential.*
2) *To reduce the potential impact of storm water drainage from the site on the surrounding cultivated lands and wetlands in terms of soil erosion during the construction and operational phases.*

9.5.5 Soil management

Mitigation and management measures:

a. If possible, construction should take place during the dry season to prevent soil erosion.
b. Before construction, the areas identified for the buildings, infrastructure and manure pit should be properly demarcated and the footprint kept as small as possible.
c. Stripping of topsoil for construction must occur in a phased manner and must be restricted to the construction and excavation footprint to reduce the risk of erosion during precipitation.
d. Topsoil must be removed and stockpiled in a demarcated area within the 6 ha site (Figure 9.1) for rehabilitation of the area surrounding the buildings.
e. Topsoil stockpiles must be located on a flat area and must not be higher than 2 m.
f. An area must be selected (within the 6 ha site) and demarcated for the stockpiling of spoil (e.g. rocks, soil, etc.).
g. Any stockpile, which is likely to remain for 12 months or more, must be vegetated.
h. All residual stockpiles must be removed to spoil or spread on site as directed by the ECO. The spoil could be used on the remainder of the farm as fill where erosion has taken place.
i. Appropriate soil conservation and storm water management measures to be provided in order to prevent soil erosion and loss of topsoil. Increased run-off during construction must be managed using berms and other suitable structures as required to ensure flow velocities are reduced. This is of special importance near the Depression wetland located on the eastern boundary of the site (Figure 9.1).
j. The water management measures as indicated in Section 9.5.7 must be implemented during both the construction and operational phases.
k. Monitor for erosion and intervene and/or rehabilitate where necessary.

Impact management objective:

3) To reduce potential soil pollution as a result of construction and operational activities at the GTC facility.

Mitigation and management measures:

a. The waste management measures as indicated in Section 9.5.6 must be implemented during both the construction and operational phases.
b. The management measures with regards to the storage and handling of manure as indicated in Section 9.5.9 must be implemented.
c. The water management measures as indicated in Section 9.5.7 to be implemented during both the construction and operational phases.
d. Regular maintenance and emptying of the conservancy tank and the manure pit to reduce the potential for blockages and leaks and thus prevent potential soil pollution.
e. If any soil or surface water contamination is noted, appropriate remediation measures must be implemented immediately. An environmental incident report must be completed indicating the date

9.5.5 Soil management
of the incident, description of incident and action taken. The Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation must be informed of the event within 24 hours. A copy of the environmental incident report must be kept on file at the site office.

9.5.6 Waste management
Impact management objective: 1) *To ensure the proper storage, management and disposal of waste during the construction and operational phases.* 2) *To reduce potential soil, surface water and groundwater pollution as a result of waste management activities during the construction phase.*

Mitigation and management measures:

General/building waste

a. Proper waste management measures must be implemented at the site.
b. No waste may be burnt, buried or dumped on site or the surrounding area.
c. Waste skips to be provided for placement of general waste, building rubble, etc.
d. Promote source separation through the provision of waste bins clearly marked for recycling and general waste. These bins should be emptied on a regular basis and disposed of accordingly (i.e. sent for recycling, taken to licensed waste disposal site, etc.).
e. The applicant will have to ensure that the contractor removes the building rubble and any domestic waste to a licensed waste disposal site.
f. Waste and building rubble not to be placed on the soil stockpiles resulting in the contamination of the soil.
g. Building rubble must be disposed of at a site specifically earmarked for that purpose. No building rubble is to be disposed of in a haphazard way in the area surrounding the development site.
h. During the construction phase, cement/concrete should be mixed in either demarcated areas or on metal sheeting or conveyor belts. If mixed in demarcated areas, these areas will have to be ripped and the cement/concrete removed on completion of construction activities.
i. Site workers must be instructed to collect windblown rubbish which may collect in the surrounding area on the said site. This will assist with the overall visual appearance of the site.
j. The applicant/contractor must ensure that all site workers receive appropriate training with regards to the overall waste management measures to be implemented for the said site.
k. Site workers must be aware of the importance of the implementation of the waste management measures.

9.5.6 Waste management

l. Continually reduce resource waste by applying the waste hierarchy (i.e. waste avoidance, reduction, reuse, recycling and disposal).

Hazardous waste management

a. Proper bunded storage facilities must be provided for the storage of oils, grease, fuels, etc. to be used during the construction phase.
b. No wash-down water from equipment or concrete to enter the Depression wetland and associated 43m buffer zone located on the eastern boundary of the site (Figure 9.1).
c. Collection containers (e.g. drip trays) must be placed under all dispensing mechanisms for hydrocarbons or hazardous liquid substances to ensure that potential contamination from leaks/spillage is reduced.
d. No hazardous substance is to be disposed of on site.
e. No bins containing organic solvents, paint tins or bins containing thinning agents may be cleaned on site, unless containers for liquid disposal are provided. The tins must be collected and rinsed at a central waste collection point, where it poses no threat to surface or ground water.
f. All spills of chemicals or hydrocarbons (oil, grease, diesel, petrol, etc.) should be cleaned with the use of suitable absorbent materials such as drizit or oclanzorb. Appropriate soil remediation measures should be implemented where soil has been contaminated with oil.
g. Contaminated soil generated as a result of fuel, oil, etc. spills will be disposed of in a specially marked drum located at the site office. An approved waste contracting firm (e.g. Enviroserv) will collect the drum and dispose of the contaminated soil at an appropriate waste disposal site.
h. Contaminated soil/fuel that cannot be removed will be treated in situ with an appropriate remedial agent. In this instance, the services of an expert may be required.
i. Waste oils collected on site should be stored in drums in a designated, bunded area and removed by an approved recycling contractor and disposed of at an appropriate licensed waste disposal facility.
j. In all instances where a firm is contracted to collect waste (e.g. Enviroserv, Wastetech, Oilkol, etc.), the site operator will ensure that the correct documentation is completed and filed for future reference.
k. Certificates of hazardous waste disposal (waybills) are to be kept for auditing purposes.
l. Records of environmental related incidents should be maintained.
m. The applicant must ensure that all workers receive relevant training with regards to the handling of hazardous substances and the potential health risks thereof.
n. The contractor and/or applicant will be responsible for establishing an emergency procedure for dealing with spills.

9.5.6 Waste management

Impact management outcome:

3) *To reduce potential soil, surface water and groundwater pollution as a result of waste management activities during the operational phase.*

Mitigation and management measures:

a. Syringes, medicine bottles, packaging, disinfectant containers and pesticides will be placed in sealed box and removed by the consulting vet.
b. 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.
c. 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 or a similar service provider.
d. Boars that die at the GTC facility (perhaps one every two months) will be disposed of immediately and taken to the overall Alzu composting pit.
e. Empty pesticide containers (drums or packaging) must be disposed of in accordance with the manufacturer's instructions and the NEM: Waste Act (Act 59 of 2008).
f. Manure will be temporarily stored in a manure pit (86m^3) and spread on cultivated land as indicated in Section 9.5.8.
g. A conservancy tank of at least 10m^3 will be installed for the storage of sewage.
h. The conservancy tank and manure pit to be emptied on a regular basis in order to reduce spillage.

9.5.7 Water management

Impact management objective:

1) *To reduce the potential impact of storm water drainage from the site on the surrounding agricultural land in terms of soil erosion during the construction and operational phases;*
2) *To avoid an impact on the Depression wetland (located east of the site) and the Seep wetland (located south of the site) during the construction and operational phases in terms of soil erosion, sedimentation, loss of habitat and changes in hydrology (Figure 5.17).*

Mitigation and management measures:

a. The soil management measures as indicated in Section 9.5.5 must be implemented.
b. Before construction, the Depression wetland (located east of the site) and Seep wetland (located south of the site) and associated 43m buffer zones (Figure 9.1) must be surveyed and clearly marked as

9.5.7 Water management

NO-GO areas in the field with signs and/or highly visible flagging until construction-related activities are complete. No construction or operational related activities may take place within these areas.

c. All contractors to be informed of the No-Go areas and made aware of penalties (fines) to be imposed due to infringements.
d. Appropriate soil conservation and storm water management measures to be provided in order to prevent soil erosion and loss of topsoil.
e. Increased run-off during construction must be managed using berms and other suitable structures to ensure flow velocities are reduced. This is of special importance near the Depression wetland and associated 43m buffer zone located on the eastern boundary of the site (Figure 5.17).
f. Permeable surfaces should be used as far as possible and the total sealing of the surface must be avoided.
g. Storm water from the GTC facility may not enter the adjacent Depression wetland and associated 43m buffer zone directly, but must be attenuated before exiting the storm water systems.
h. Storm water may not be concentrated into the adjacent Depression wetland and associated 43m buffer zone or cultivated land but must be spread over a wide area.
i. The storm water management measures must be inspected on a regular basis in order to ensure that the structures are functional (not blocked) and not causing flooding of the adjacent agricultural lands, gravel access road or nearby wetland areas. This will be of particular importance at the start of the rainy season and during the rainy season.
j. Sediment fences to be implemented around erosion prone areas (Venter, 2017).
k. Do not spread manure on cultivated lands to the point of saturation, since this is likely to result in runoff from the cultivated fields into adjacent areas and wetlands areas (Venter, 2017).

Impact management objective:

3) To ensure that the construction and operational phases do not impact on the surface water run-off quality of the site and downstream area.

Mitigation and management measures:

a. The waste management measures as indicated in Section 9.5.6 must be implemented during both the construction and operational phases.
b. The management measures with regards to the storage and handling of manure as indicated in Section 9.5.9 must be implemented.
c. Before construction, the Depression wetland (located east of the site) and Seep wetland (located south of the site) and associated 43m buffer zones (Figure 9.1) must be surveyed and clearly marked as NO-GO areas in the field with signs and/or highly visible flagging until construction-related activities are complete. No construction or operational related activities may take place within these areas.
d. All contractors to be informed of the No-Go areas and made aware of

9.5.7 Water management

penalties (fines) to be imposed due to infringements.

e. No spreading of manure within the 43m buffer zone of the identified wetlands (Figure 5.17).
f. No spreading of manure near the unnamed stream located south east of the site.
g. The storm water management plan (see Section 3 and Section 7) must be implemented to ensure that:
   - storm water is diverted away from the site and not contaminated/polluted by any substance;
   - no accumulation of surface water takes place around the perimeter of the structures;
   - the site is properly drained;
   - the nearby wetlands are not impacted in terms of soil erosion and changes in hydrology.
h. Regular maintenance and emptying of the conservancy tank and manure pit to reduce the potential for blockages and leaks and thus prevent potential water pollution.
i. All chemicals, disinfectants and pesticides utilized on site to be biodegradable (if possible) and to be stored correctly.
j. Material Safety Data Sheets must be available on site for all chemicals/pesticides stored and used.
k. Care should be taken to prevent toxic substances (e.g. chemicals, disinfectants, pesticides, etc.) from leaving the site via storm water runoff or in cleaning water.
l. A spill kit must be in place in case of a chemical/diesel spill.
r. If any soil or surface water contamination is noted, appropriate remediation measures must be implemented immediately. An environmental incident report must be completed indicating the date of the incident, description of incident and action taken. The Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation must be informed of the event within 24 hours. A copy of the environmental incident report must be kept on file at the site office.

9.5.8 Groundwater management measures

Impact management objective:

1) *To ensure that groundwater abstraction during both the construction and operational phases do not impact on the groundwater quantity of the site and surrounding areas.*

Mitigation and management measures:

a. Boreholes ALZ1 and ALZ2 to be used for water provision to the facility.
b. An additional borehole to be sited and drilled to the east of the site before the facility is expanded to accommodate 400 boars (Gouws, 2018). The new borehole could also be used as a monitoring borehole

9.5.8 Groundwater management measures

(Gouws, 2018).

c. The recommendations of Gouws (2018) in terms of sustainable groundwater abstraction must be implemented and adhered to, namely:
    - *The boreholes may only be pumped for 8 hours per day and must be allowed to recover for the remainder of the day (16 hours);*
    - *The boreholes must be pumped at a sustainable rate of 0.1 l/s (or 8.6m^3/d);*
    - *Maximum pumping should not exceed 0.5 l/s or 43m^3/d.*
d. The following measures to minimize **water use** during the operational phase must be implemented:
    - *Regular maintenance of the water infrastructure to minimize water wastage;*
    - *High pressure washers to be used during cleaning to minimise water use;*
    - *Harvested storm water to be used if possible;*
    - *Water consumption to be monitored and recorded daily;*
    - *Groundwater levels and yields to be monitored on a quarterly basis.*
e. The boreholes must be registered with the Department of Water and Sanitation.

Impact management objective:

2) *To ensure that the groundwater quality does not impact on the employees and boars at the GTC facility.*

Mitigation and management measures:

a. Quarterly groundwater sampling and analysis of the boreholes (used for water provision) to take place to ensure that the water is fit for human and animal consumption and meets the requirements of the Department of Water and Sanitation (Gouws, 2018).
b. The following should be monitored as indicated by Gouws, 2018:
    - Water levels; Abstraction volume; Electrical conductivity at 25 degree Celsius; Total dissolved Solids; Turbidity; pH at 25 C; Nitrate as N; Nitrite as N; Sulphate; Fluoride; Ammonia as N; Chloride; Sodium Zinc; Total Iron; Lead; Total manganese; Total coliforms; Standard plate count; E. coli

9.5.9 Management of manure

Impact management objective:

1) *To ensure that the manure/effluent from the GTC facility is effectively handled and stored without causing undue impact on the surrounding natural environment (soil, surface and groundwater).*

Mitigation and management measures:

a. The waste management system in terms of the handling and storage of manure must be implemented as indicated in Section 3 and Section 7 of this report.
b. In order to prevent seepage into the soil and groundwater, the manure pit must be constructed with concrete walls and reinforced steel as indicated in Figure 7.12.
c. A portion of the manure pit must be located above ground level to ensure that no storm water can enter the manure pit, leading to overflows.
d. The applicant must ensure that the manure pit has sufficient capacity and does not overflow.
e. The manure pit to be covered with corrugated iron and emptied on a regular basis.
f. Contingency measures must be put in place should the manure pit be full and the tractor not be available to collect the manure for spreading.
g. A cement slab must be present around the manure pit to prevent any spillage from the tractor and hose from seeping into the soil.
h. The tanker, hose and manure pit must be well maintained to ensure no spillage.
i. No run-off containing waste or storm water contaminated by waste to be allowed to leave the said site.

Impact management objective:

2) *To ensure that the manure/effluent from the GTC facility is effectively spread without causing undue impact on the surrounding natural environment (soil, surface and groundwater).*

Mitigation and management measures:

a. Manure to be spread on cultivated lands located on Portion 24 of Kleinfontein 432 JS.
b. No spreading of manure within the identified wetlands and associated 43m buffer zones (Venter, 2017).
c. No spreading of manure near the unnamed stream located south east of the site.
d. Do not spread manure on cultivated lands to the point of saturation, since this is likely to result in runoff from the cultivated fields into adjacent areas and wetlands areas (Venter, 2017).
e. Vegetative cover in the buffer area between cultivated lands and

9.5.9 Management of manure

wetland should be maintained to minimise the movement of nutrient rich runoff into surface water environments.

f. Buffer vegetation should ideally be >10 cm high and harvested as hay or mulch to minimise any nutrient accumulation in the area.

g. The manure should be applied in such a way that it does not contribute to soil erosion.

h. Manure should not be applied to land with a steep gradient.

i. Manure should preferably not be applied during heavy rain.

j. Nutrient content of manure to be determined as soon as project is operational. A chemical analysis of the manure in the manure pit is required to estimate the nutrient application rate to the land.

k. The nutrient content of the manure must be confirmed before each major planting season by determining the nitrogen, phosphorus and potassium concentration on at least four composite samples.

l. A soil nutrient management plan/effluent spreading plan should be compiled and implemented for the said farm in order to ensure that imbalances of nitrogen and phosphate are not created. Excessive nutrients may affect soil structure, cause pollution of the soil and loss of crop quality (Venter, 2017).

m. The nutrient management plan/effluent spreading plan should detail the following:

- *Anticipated effluent composition;*
- *Estimated crop/pasture nutrient requirements;*
- *Proposed application rates and spreading schedules;*
- *Summary of spreading operations, timing of actual amounts applied and calculated nutrient removal by crops/pastures;*
- *Record of soil salinity and nutrient status;*
- *Estimated impact on local surface and groundwater.*

n. A map of the farm should be compiled indicating where the manure has been spread, the quantity and quality of the manure, the quality of the soil (before application), etc. In this way, the project applicant would be able to manage the spreading of the manure and avoid impact on the soil and farming activities.

o. A soil monitoring programme should be implemented, which should include testing the soil at least every two years for nitrogen (N), phosphates (P), potassium (K), magnesium (Mg), aluminium (Al) and acidity. The core samples must be taken at a depth of 100mm and along a W shape.

p. Soil sampling should take place on the same spot and at the same time of year (e.g. summer, spring, winter, etc.) to ensure that the results are comparable.

q. Moisture content of manure to be determined. This can affect the amount of dust created and quantity of manure to be applied to the agricultural lands. Dust created during spreading can be reduced by means of a shrouded cover attached to the back of the spreader.

r. It is recommended that a groundwater and surface water monitoring programme be initiated for the farm in order to monitor the quality of the water and identify any potential impact as a result of the spreading of the manure.

9.5.9 Management of manure

s. Ideally, manure should be spread just before sowing or when plants are actively growing, to ensure nutrient uptake and to minimise nutrient losses by leaching or runoff.

t. The land should be dry otherwise it creates an opportunity for runoff or leaching which could be a concern in terms of surface water pollution.

u. The manure should be tilled into the soil to prevent runoff and to maximize nutrient uptake by plants.

v. Adhere to the Guidelines for the Utilization and Disposal of Wastewater Sludge. Volume 2: Requirements for the Agricultural Use of Wastewater Sludge (Snyman Herselman, 2006).

9.5.10 Air quality

Impact management objective:

1) *To reduce bad odours emanating from the GTC facility and manure pit;*
2) *To prevent a build-up of toxic gases within the facility.*
3) *To ensure that the storage of manure has the least possible impact on the air quality of the site and immediate surroundings in terms of odour.*
4) *To ensure that the spreading of manure has the least possible impact on the air quality of the site and immediate surroundings in terms of odour.*

Mitigation and management measures:

a. Adequate ventilation within the buildings to be provided at all times to prevent a build-up of noxious odours, dust and toxic gases, to control air temperature and humidity, to dilute and remove airborne disease organisms and to maintain oxygen levels.

b. Before spreading, it is advisable to consider weather conditions. Application sites should be selected downwind of residences where possible.

c. Plan manure spreading so that weekends and public holidays are not affected by potential odours.

d. It is recommended that a weather station be installed, recording at the very least wind speed and wind direction. This would allow for correlation of site specific meteorological conditions to odour complaints.

e. The management measures with regards to manure storage must be implemented as indicated in Section 9.5.8.

f. The manure pit to be covered with corrugated iron to reduce odours.

g. Efficient Microbes (EM) could be added to the manure pit for odour treatment.

h. The strategic planting of trees around the GTC facility could be considered as the trees can significantly reduce visual impacts and may improve odour and dust dispersion.

9.5.10 Air quality

i. Morning applications are more desirable than late afternoon in terms of drying time and dispersion of odour.
j. Calm and humid days are not conducive for manure spreading.
k. The manure must be worked into the soil within 24 hours of application (thereby reducing ammonia which is the major odour compound and assisting with pathogen control).
l. Manure should be applied directly to soil and not to crops, as it will cling to the leaves increasing the surface for odour production.
m. The manure should be spread as close to the ground as possible in order to reduce contact time with the air and to limit the dispersion of odour.
n. Avoid spillage on roads.
o. Dust particles are capable of carrying odours over long distances. Dust roads should thus be wetted by tanker during the very dry months to limit dust in the area.
p. Try and reduce liquids as far as possible as liquid manure smells more than solid manure.
q. Any complaints with regards to odours should be recorded in the official complaints register (see Section 9.6.2).

9.5.11 Pig health

Impact management objective:

1) To ensure the health and welfare of the pigs.
2) To minimise the presence of pests.

Mitigation and management measures:

a. The GTC facility must be operated as indicated in Section 3 and Section 7 of this document.
b. Standard Operating Procedures dealing with bio-security and health must be compiled, adhered to and monitored on a regular basis.
c. New boars that arrive must be kept in quarantine for at least 4 weeks and vaccinated before entering the boar house.
d. Equipment (e.g. fans) to be well maintained to minimize stress on boars in terms of noise.
e. The facility must not be overstocked.
f. The boar houses must 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 to be treated with a disinfectant before and after washing with the pressure washer.
g. Automatic feeding systems should present feed to all the pigs simultaneously to reduce the level of noise at feeding times.
h. The water quality of the boreholes to be tested on a quarterly basis to ensure that the groundwater is suitable for both animal and human consumption and that the facility is not impacting on the

9.5.11 Pig health
groundwater of the site. i. A 40 000 l water tank to be provided on site to ensure sufficient water in case of a power failure or other technical difficulties. j. The water tanks to be inspected on a regular basis for deposited solids and algae growth. k. The design of the dummy sow must be such that it will be safe and comfortable for the boar. l. The dummy sows must be checked regularly and kept in good condition to ensure that there are no sharp edges that can cause injury to the boars. m. All reasonable steps to be taken to minimise fly-breeding. n. Bait stations must be placed where flies and/or rodents are usually active (including along walls, beneath railings and fences, in corners where manure accumulates). o. Fly and rodent bait stations must be sited so that they cannot be accessed by the boars. p. Use biological methods to control fly populations as far as practically possible. q. All weeds and plants around the facility to be cut short. r. The waste management measures as indicated in Section 9.5.6 must be implemented during the operational phase. s. The management measures with regards to the handling of manure as indicated in Section 9.5.9 must be implemented.
Impact management objective: *3) To minimize the possibility of, and spread of disease.*
Mitigation and management measures: a. Any boar found to be ill must be dealt with immediately according to the consulting veterinarian's instructions/treatment list. b. It will be the responsibility of the GTC facility manager to make decisions regarding which animals are to be euthanized and to perform euthanasia. c. Post mortems to be done on all adult animals that die. d. A record must be kept in the weekly report indicating suspected reason for death. e. Any abnormal increase in mortalities or abnormal post mortem findings to be reported to the consulting veterinarian.

9.5.12 Interested and affected parties

Impact management objective:

1) *To ensure that site workers are not impacted upon in terms of the construction work being performed.*

Mitigation and management measures:

a. The applicant/contractors must ensure that the necessary protective gear (PPE) is worn at all times and that signs are erected to warn workers to use hearing protection as well as any other hazards.
b. The applicant/contractor must adhere (at all times) to the requirements of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), the Construction Regulations, 2003 and any other applicable legislation.
c. For safety purposes, excavations must not be undertaken until such time as all required materials are available and services can be laid.
d. Excavations should be closed as soon as is practically possible.
e. If blasting is required, the requirements of the Explosives Act, 2003 (Act 15 of 2003) must be put in place in order to prevent any impact on site workers, etc.

Impact management objective:

2) *To ensure that the surrounding landowners/users are not impacted during the construction and operational phase.*

Mitigation and management measures:

a. The GTC facility must be constructed and operated as indicated in Section 3 and Section 7 of this document.
b. All construction and operational management principles as indicated in this EMPr must be implemented.
c. The waste management measures as indicated in Section 9.5.6 must be implemented during the construction and operational phases.
d. The management measures with regards to the handling of manure as indicated in Section 9.5.9 must be implemented.
e. The air quality management measures must be implemented as indicated in Section 9.5.10.
f. The adjacent landowners/users must be provided with contact numbers with whom complaints or concerns can be discussed.
g. A complaints register must be kept on site. Any complaints received with regards to the facility must be recorded in the complaints register.

Impact management objective:

3) *To ensure the health and safety of the employees during the operational phase.*

9.5.12 Interested and affected parties

Mitigation and management measures:

a. Standard Operating Procedures dealing with bio-security and health must be compiled, adhered to and monitored on a regular basis.
b. The manure must be managed as indicated in Section 9.5.9.
c. Pesticides of a persistent (i.e. bio-accumulates up the food chain) and cumulative (i.e. residues of several active substances which can interact with one another) nature must not be used in or around the piggery.
d. All staff must be trained in the safe use and handling of chemicals/pesticides, including veterinary chemicals and baits.
e. Sufficient fire extinguishers must be provided as required by legislation. The site operator must ensure that the said fire extinguishers are serviced on a regular basis and are operational.
f. The closest fire hydrant must be clearly marked and indicated to all site workers. The site operator must ensure that the fire hydrant is checked on a regular basis to ensure that it is operational.
g. An emergency response plan for fire fighting must be compiled and all site workers must receive training.
h. The site operator must ensure that all site workers are trained in the use of the appropriate fire fighting equipment.

9.6 Implementation and monitoring of the EMPr

The implementation of the Environmental Management Programme (EMPr) as part of the daily construction and operational activities is crucial and requires commitment from all levels of management and the on-site workers. The successful implementation of an EMPr has the following advantages:

- Meeting legal obligations;
- Contributes to environmental awareness;
- Can facilitate the prevention of environmental degradation;
- Can minimize impacts when they are unavoidable;
- Can ensure good environmental performance and improve community relations.

An approved contractor should be appointed to do the necessary construction on the said site. The contractor and site workers must be aware of their environmental responsibilities. Penalty clauses, in terms of the environment, must be built into the contracts and must be implemented. Monitoring of the environmental management programme must take place on a regular basis in order to ensure compliance.

The contractor must inform all site workers of their environmental responsibility during the construction phase. Measures to protect the environment and mitigation measures formulated in this EMPr must be implemented by the contractor and the site workers. The contractor must thus ensure that the site workers are aware of the Environmental Authorisation and this EMPr and understand the contents thereof.

In order to achieve the above-mentioned, the contractor and site workers should undergo basic environmental awareness training with regards to the contents of this EMPr. Environmental awareness training is critical for the contractor and site workers to understand how they can play a role in achieving the objectives specified in the EMPr. The contractor must ensure that the site workers undergo the necessary environmental awareness training (see Section 9.6.1) before commencing with activities on the site.

This section must be completed on acceptance of the appointment.

MANAGEMENT ACCOUNTABILITY		
Accountability	**Title**	**Name**

MANAGEMENT DECLARATION

I, the undersigned in my capacity as designated above hereby undertake to ensure that the conditions and recommendations in terms of the Environmental Authorisation and Environmental Management Plan (EMPr) are implemented and assume responsibility and accountability in this respect.

I further understand that officials from Steve Tshwete Local Municipality, Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) and Department of Water and Sanitation (DWS) may (at any time) conduct an inspection of the development in order to ensure compliance with the conditions and recommendations in the EMPr.

CONTRACTOR

……
Name and Designation

……
Signature:

……
Date:

EMPLOYER

……
Name and Designation:

……
Signature:

……
Date:

9.6.1 Environmental Awareness Plan (EAP)

It is recommended that the employees receive basic environmental awareness training. In order to ensure proper training, the applicant must develop and implement an Environmental Awareness Plan (EAP). This section provides an overview of what the proposed EAP will contain and how it will be implemented.

The following components would form an essential part of an Environmental Awareness Plan (EAP): -

- Development of an environmental policy;
- Identification of environmental impacts/risks and mitigation measures;
- Environmental training, awareness and competence;
- Environmental communication and reporting.

Development of an environmental policy

The applicant would have to compile an Environmental Policy (if they do not have one already), which is a one page statement setting out certain principles in terms of their environmental performance.
The environmental policy should indicate the following:

- The applicant's commitments in terms of the environment;
- Identify environmental impacts as a result of the activities taking place on site;
- Actions to be taken to minimize/mitigate the environmental impacts.
- Signature of management.

In order to ensure effective environmental management, it is important that the Environmental Policy is known and understood by all employees. It should thus be displayed at the offices and security access.

An Environmental Policy Template is provided to assist the applicant in the compilation of their Environmental Policy. A number of templates are also available on the internet.

Environmental Policy Template (taken from Richmond upon Thames, 2012)

*[*Insert company name here*] believe that we have a responsibility to care for and protect the environment in which we operate. We are fully committed to improving environmental performance across all of our business activities, and will encourage our business partners and members of the wider community to join us in this effort.*

*[*Insert company name here*] recognises our key impacts to be in the areas of [for example]:*

- *energy use*
- *raw material use*
- *waste generation*
- *emissions to air/water*
- *water use*
- *transport*
- *procurement*

We will strive to:

- *Adopt the highest environmental standards in all areas of operation, meeting and exceeding all relevant legislative requirements.*
- *Assess our organisational activities and identify areas where we can minimise impacts.*

- *Minimise waste through careful and efficient use of all materials and energy.*
- *Purchase sustainable products wherever feasible [e.g. recycled, FSC or low environmental impact products and energy from renewable sources].*
- *Train employees in good environmental practice and encourage employee involvement in environmental action.*
- *Reduce risks from environmental, health or safety hazards for employees and others in the vicinity of our operations.*
- *Adopt an environmentally sound transport strategy.*
- *Aim to include environmental and ethical considerations in investment decisions where appropriate.*
- *Assist in developing solutions to environmental problems.*
- *Continually assess the environmental impact of all our operations.*

*[*Insert company name here*] have developed a series of action plans to supplement each of our environmental policy objectives. These can be found* [in an appropriate place*].*

*[*Insert company name here*] will periodically review performance and publish these results [*in an appropriate manner*].*

Signed _____

Identification of environmental impacts/risks and mitigation measures

Environmental impacts/risks in terms of the development are indicated in Section 8 of this document while mitigation measures to be implemented are provided in Section 9.

Activities or work procedures that could have a significant impact on the environment have thus been identified and mitigation measures proposed in order to avoid pollution or the degradation of the environment.

This information must be communicated to the employees and thus forms the basis for developing an Environmental Awareness Plan (EAP) in order to ensure effective environmental management.

Environmental training, awareness and competence

Training is necessary in order to advance the competency of employees in implementing the Environmental Policy and the EMPr and to ensure effective overall environmental management.

The applicant must inform all his employees of their environmental responsibilities in terms of this Environmental Management Programme (EMPr). Measures to protect the environment and mitigation measures formulated in this EMPr must thus be implemented by the applicant and employees.

The applicant must ensure that the site workers undergo the necessary environmental awareness training before commencing with activities on the site. The applicant must thus ensure that the site workers are aware of the Environmental Authorisation and this EMPr and understand the contents thereof.

In addition, job specific training must be conducted that will be appropriate to the activity and the responsibility of the individual employees. Ad-hoc training will be undertaken as required.

Through training/awareness, the applicant will also make his employees aware of:

- the importance of conformance with the environmental policy and the requirements of the EMPr;
- the significant environmental impacts, actual or potential, of their work activities and the environmental benefits of improved personal performance;
- their roles and responsibilities in achieving conformance with the environmental policy and the requirements of the EMPr, including emergency preparedness and response requirements; and
- the potential consequences of departure from the specific operating procedures and/or mitigation measures specified in the EMPr.

Environmental training and development needs of employees will be identified on a regular basis through:

- Identification of significant environmental impacts;
- Analysis of non-conformance and incident reports;
- Audit reports.

Environmental communication and reporting

Environmental communication and reporting form an integral part of an Environmental Awareness Plan. It is important to maintain effective communication internally and to ensure that external communication (e.g. with government departments or adjacent landowners) is maintained.

In general, environmental communication and reporting will aim to:

- Ensure that employees understand the environmental policy and objectives;
- Ensure that information is communicated and readily accessible to the relevant parties;
- Improve feedback of operational and environmental performance to management;
- Ensure effective and constructive communication with relevant government departments and adjacent landowners (if applicable);
- Ensure that records are kept of environmental communication and interaction.

The following are some of the topics that should be discussed with new employees:

- Time of commencement and completion of duties;
- Cleaning of workplace and the importance thereof;
- Safety clothing and its importance and correct use;
- Procedure to follow in case of illness and injury;
- Annual leave and when due;
- Importance of instructions;
- Late for work and leaving workplace without permission;
- Emergency procedures;
- Environmental awareness;
- Training and its importance;
- Alcohol and drug abuse;
- Medical fitness;
- Disciplinary procedures.

The following topics should form part of the environmental awareness discussions to be held with the employees:

- NO-GO areas;
- Water;
- Fauna and flora;
- Smoking and fires;
- Dust;
- Noise;
- Waste management.

Various signs (including the Environmental Policy) should be displayed on site to remind site workers of the basic environmental principles and inform them of the 'DO'S' and 'DON'TS'.

The applicant must conduct regular inspections to check on site conditions and to provide training when necessary to ensure that the mitigation measures are being implemented and that the environment is carefully looked after.

9.6.2 Site documentation and record keeping

The following documentation must be available (at all times) at the site office:

- A copy of the Basic Assessment Report and Environmental Management Programme;
- A copy of the Environmental Authorisation;
- A copy of the Environmental Policy;
- A copy of site audit reports;
- A copy of any other permits/approvals and/or service agreements from other authorities.

The documents should be kept as hard copies as well as in electronic format.

Complaints Register

A complaints register must be kept at the site office during both the construction and operational phases. Any complaints received with regards to the project must be recorded in the complaints register. The following information must be recorded:

- Date and time complaint recorded;
- Nature of complaint;
- Details of complainant (name, address, telephone number, etc.);
- Manner in which complaint was dealt with;
- Date when complaint was reported to the Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation.

Emergency numbers

Emergency numbers (e.g. manager, police, fire department, ambulance, etc.) must be prominently displayed at the site office.

Contact details of adjacent landowners/users must also be kept on file.

Other legislation

The following should also be displayed at the site office:

- Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended;
- Basic Conditions of Employment Act, 1997;
- Summary of the Employment Equity Act.

Supplementary documentation

The following supplementary documentation should be kept at the site office:

- Site instructions;
- Emergency preparedness and response procedures;
- Incident reports;
- Training records;
- Site inspection, monitoring and auditing reports.

During the course of the development, the applicant and employees must also comply with all other relevant legislation.

9.6.3 Auditing and corrective action

Environmental audits identify existing and potential environmental problems and determine what action is needed to comply with legal requirements and the Environmental Management Programme (EMPr). Subsequent audits then confirm that corrective actions have been taken and assess the effectiveness of such actions.

Construction phase:

The applicant must appoint an Environmental Control Officer (ECO) who will have the responsibility of monitoring and reporting on compliance with the conditions of the Environmental Authorisation as well as monitoring and reporting on the implementation of the EMPr.

The ECO must be appointed before the commencement of construction and must remain employed until all rehabilitation measures as well as site clean-up are completed.

The ECO will be responsible to:

- Monitor and audit the construction activities on a weekly basis;
- Keep a record of each site inspection and the findings thereof;
- Make a register of the environmental monitoring and auditing results available for inspection at the construction site office;
- Keep records relating to the compliance and non-compliance with the conditions of the Environmental Authorization;
- Make these records available to the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) within seven (7) working days of the date of the written request by the Department for such records.

A good approach to facilitate legal enforceability of the EMPr during the construction phase is to integrate the EMPr into the tender and contract document (i.e. between the project applicant and the contractors) as a set of environmental specifications. The contractor will thus be informed prior to being appointed of his environmental responsibilities.

Penalties in terms of the environment should be implemented upon non-compliance. This will ensure that the project applicant does not sit with an environmental liability at the end of the contract.

A post-construction audit should be conducted prior to the contractors leaving site.

There are several levels at which corrective action can be affected, namely verbal instructions, written instructions and contract notices.

Level 1: The problem is discussed with the contractor and a solution is worked out together. The discussion is minuted for record purposes and the solution implemented.

Level 2: When a more serious infringement is observed, the contractor is notified in writing and given a deadline by which the issue must be rectified. Costs to be borne by the contractor.

Level 3: The contractor will be ordered to suspend all or part of the work until such time as the problem is rectified or remedial measures put in place. Costs to be borne by the contractor and no extension of time will be granted.

Level 4: Breach of contract and/or termination of employment. The applicant may also institute legal proceedings against the contractor.

An example of a penalty schedule is provided below.

PENALTY SCHEDULE

Level	Description	Penalty	Offences
1	Minor offence	R1000 first offence R2000 second offence And R1000/per day that offence continues beyond notification of offence	• Littering; inadequate or inappropriate on-site waste management or sanitation • Uncontrolled noise and dust nuisance Poaching on site • Inadequate soil / water protection controls for fuel storage & dispensing areas, vehicle parking areas
2	Moderate offence	R5000 first offence R10 000 second offence And R5000 per day that the offence continues beyond notification of offence	• Trespassing onto neighbours properties • Removal of indigenous trees marked for conservation purposes without the permission of the ECO, or trees in demarcated sensitive environmental zones • Disposal of any form of waste to a non-approved dump site • Any illegal /non-permitted abstraction or use of water from a natural resource • The withholding of pertinent information or provision of false information to the ECO or Project Manager
3	Significant offence	R30 000 first offence R50 000 second offence And R30 000 per day that the offence continues beyond notification of offence	• Non-compliance with any risk or safety management requirements • Significant spillage of hazardous materials • Use of natural materials not sourced from a legally permitted source • Construction or use of roads/access across rivers, streams or wetlands that has not been authorized by the Project Manager and ECO
4	Serious offence	Up to R500 000 or total cost of rehabilitating damaged environment	• Any serious pollution event or accident • Any serious encroachment into demarcated sensitive environmental zones, by accident or on purpose • Any serious stormwater damage that could have been avoided through appropriate management interventions

In addition to the schedule of penalties, a portion of the Retention on all contracts could be apportioned to compliance with the EMPr.

<u>Operational phase:</u>
The applicant will be responsible for auditing and corrective action during the operational phase of the development.

SECTION 10: ENVIRONMENTAL IMPACT STATEMENT

10.1 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) and is ±6ha in extent.

As indicated in Section 3.3, 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. Due to an increased market demand, the applicant decided to also expand the GTC facility as part of the relocation project.

The GTC facility supplies 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 new GTC facility will comprise of boar pens, a laboratory, offices, manure pit and associated facilities. The intention is to initially house 200 boars at the new facility, with eventual expansion to house 400 boars.

10.2 Alternatives

Section 7 provides an overview of the various alternatives investigated in terms of this project.

Five (5) alternatives in terms of the location of the proposed GTC facility were investigated. Site 4 (Figure 7.1) was found to be the most preferable in view of the following:

- The property belongs to the applicant;
- The site is easily accessible;
- Located outside the identified wetland areas and associated 43m buffer zones;
- The site is located away from the buildings identified as older than 60 years of age;
- Easy connection to Eskom power lines;
- Existing boreholes can be used;
- The site will not impact on any access roads leading to surrounding properties, homesteads or villages;
- The topography of the site is suitable for development since it is relatively flat, which will minimize the need for earthworks;
- The site is not located near a river or stream and therefore not affected by the 1:100 year floodline. There is thus no flood risk and the potential for surface water pollution is low.
- The closest homesteads are located 605m south and east of the site (Figure 5.4).

As indicated in Section 7.2, six (6) alternative layouts for the proposed GTC facility were investigated.

Layout 6 (Figure 7.7) was indicated as the preferred option as it adheres to the recommended wetland buffer zone (i.e. 43m), does not impact on any infrastructure and keeps the development footprint to a minimum by placing the manure pit close to the facility.

In terms of the handling and disposal of manure and other effluent, Alzu Pig Genetics (Pty) Ltd. opted to install a slotted floor system (Alternative 1B). All urine, manure and wash water will fall through the slotted floor into manure compartments located beneath the floor. Manure will be collected from the boar pens by means of a 250 mm pipeline and piped to a small manhole (1m x 1m x 1m) located outside the buildings. From here, the manure will be piped to the manure pit via a 315mm discharge pipe, which will be covered with a corrugated iron lid (Alternative 2D2; Figure 7.12). The manure will be stored temporarily in the manure pit and spread onto nearby cultivated lands as fertilizer (Alternative 3C).

According to Hlasane (2018), it is estimated that 12 036 liters/day (i.e. 4 393.1 m^3 per annum) of wastewater will be produced at the GTC facility when in full operation. To ensure adequate storage, a manure pit of 8m x 3m x 4.5m with a capacity of ±86m^3 will be installed. The manure pit will be emptied once a week if 400 boars are kept at the facility and once every two weeks if only 200 boars are kept at the facility.

Other alternatives for the handling and disposal of manure were discarded mainly due to economic reasons, increased electricity requirements and technical difficulties.

Services (water, electricity, waste removal, sewage, storm water management and access road) will be provided by the applicant (see Sections 3 and 7) as the rural area is not serviced by the Steve Tshwete Local Municipality.

Groundwater will be utilized to supply the GTC facility with potable water. The groundwater will be abstracted from the two (2) existing boreholes located at the old farmstead complex (Figure 7.7). Adequate water (8 454 l/day) is available for 200 boars. However, based on the estimated water demand for 400 boars (16 909.75 l/day), insufficient water is available for all phases of the development and an additional borehole will have to be drilled.

According to Hlasane (2018), approximately 33.82 m^3 of potable water should be stored on site to ensure a water supply for 48 hours. A storage tank of 40m^3 will therefore be provided in the north western corner of the site (Figure 3.2) for the storage of potable water.

The small volume of sewage/grey water produced at the facility does not justify the installation of a sewage treatment plant or package plant. A conservancy tank will thus be installed, which will be emptied on a regular basis by a contractor. Hlasane (2018) recommended that a conservancy tank of 10 m^3 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 2m^3 reserve for unforeseen circumstances.

Domestic waste produced by the personnel will be disposed of in waste bins/skips, which will be removed once a week by Easy Skip. Mortalities will be taken to the existing Alzu composting pit and medical waste will be removed by the consulting vet to a dedicated medical waste disposal facility.

Electricity will be obtained from existing Eskom power lines located at the old farmstead complex on the northern boundary of the site.

An existing gravel road that extends from Alzu Petroport, across the N4 national road in a northerly direction towards the proposed site will be utilized to access the site (Access Road 1; Figure 5.22).

A new storm water system will be installed comprising of grassed trenches and culverts (Figure 7.7).

Considering the various options investigated for the proposed GTC facility, it is felt that the best possible alternatives will be implemented in terms of the site, layout, manure handling and disposal, services, etc.

10.3 Potential impacts identified

The environmental features of the site and surrounding area are described in Section 5 of this report. Potential impacts on the environment (both positive and negative) that are expected to take place are detailed in Section 8 while Section 9 provides mitigation measures to be implemented in order to reduce the said impacts.

The impact assessment (Section 8) was based on Alternative Site 4 (Figure 7.1), Alternative Layout 6 (Figure 7.7), the installation of a concrete manure pit, the spreading of manure on cultivated land and the provision of services as indicated above.

The proposed development site belongs to the project applicant and the development of the said site will thus not impact directly on any other interested and affected party.

The site is zoned for agricultural purposes and currently used for the cultivation of maize. The northern portion of the site extends into an old farmstead complex.

No infrastructure (e.g. buildings, boreholes, pipelines, etc.) is located on site except for an Eskom power line. The power lines will be relocated by Eskom. If any consumers (apart from the applicant) are connected to the said power line, they could be impacted upon in terms of the interruption of their power supply during the re-connection of the service if mitigation measures are not in place.

The development of the GTC facility will result in the site no longer being available for cultivation. However, only a small portion of the overall farm (i.e. 6ha of 234ha) will be impacted. The proposed land use is related to agriculture and should thus not impact on the overall sense of place. In addition, the spreading of manure as fertilizer would be positive since it could improve the soil quality resulting in improved yields thus enhancing the existing land use (maize cultivation).

From a topographical point of view, the proposed site is suitable for development purposes as the site is relatively flat with a gentle slope in a south easterly direction.

As indicated in Section 5.7, the majority of the site comprises cultivated land with no natural vegetation present. Large Pine trees (*Pinus* sp.), kikuyu grass and weeds are however, present in the north eastern corner of the site within the old farmstead complex. No Eastern Highveld Grassland and associated natural animal habitats will thus be impacted upon.

No surface water environments (e.g. rivers, streams, wetlands, etc.) are present on site. The construction and operational activities will therefore have no direct impact on any surface water environments.

Venter (2017) identified Depression and Seep wetlands within a 500m radius of the site (Figure 5.17). The Present Ecological State (PES) of the nearest Depression wetland is Class C (Moderately Modified) and the Ecological Importance and Sensitivity (EIS) is Moderate. According to Venter (2017), all wetland areas are considered to be sensitive and of conservation importance, even if they have been disturbed.

As per the recommendations of Venter (2017), the entire GTC facility will be located outside of the 43m wetland buffer. However, the Depression and Seep wetlands could indirectly be impacted upon by the construction and operational activities if mitigation measures as indicated in Section 9 are not implemented. The development footprint area and wetland boundaries should be clearly demarcated as No-Go areas before any construction takes place. Of particular importance is the implementation of the storm water management measures indicated in Figure 7.7 in order to reduce the potential impact on the downstream surface water environments (including the Depression and Seep wetlands) in terms of increased runoff, erosion, sedimentation, etc.

If too much manure is applied to the agricultural lands, it could have a negative impact in terms of increased mineral and metal content of soils, which could lead to nutrient leaching and eutrophication of the downstream surface water environments. The wetlands identified by Venter (2017) and groundwater could also be polluted if the required buffer zones in terms of the spreading of manure near wetlands/rivers/boreholes are not adhered to.

According to Gouws (2018), the spreading of manure on cultivated lands will have little real effect and should not influence the proposed project. The manure can be spread on suitable land since the unsaturated (vadose zone) may have the potential to break down harmful contaminants.

Although there is a risk of pollution taking place, the spreading of manure on agricultural/cultivated land has the following major benefits, namely:

- Supply of major plant nutrients (calcium, magnesium, potassium, phosphates, nitrogen);
- Supply of some essential micronutrients (zinc, copper, molybdenum and manganese);
- Improvement in soil physical properties (i.e. better soil structure, increased water retention capacity and improved soil water transmission);
- Cost effective management option.

In order to prevent pollution taking place, a nutrient management plan to ensure that imbalances of nitrogen and phosphate are not created, should be compiled and implemented. The nutrient management plan should include issues such as the nutrient requirements of the crop and regular soil analysis. Other mitigation measures as indicated in Section 9 of this report must also be adhered to.

According to Gouws (2018), the groundwater level on site varies between a minimum of 3.58 mbgl to a maximum of 3.84 mbgl. It is therefore not anticipated that the general construction activities (foundations, trenches, excavation for conservancy tank) would impact on the groundwater of the site. The excavation of the manure pit could however, impact on the groundwater flow, since the pit will be excavated to ±4.5 mbgl. The impact is however, expected to be negligible due to the small size of the manure pit ($24m^2$).

Soil, surface water and groundwater pollution could also take place if the conservancy tank and manure pit are not properly installed, does not have sufficient capacity, is not operated correctly and maintained resulting in leaks and overflows. Mitigation measures as indicated in Section 9 must therefore be implemented in order to reduce this potential impact.

As already indicated, groundwater (boreholes) will be utilized to supply the GTC facility with potable water. The two boreholes (ALZ1 and ALZ2; Figure 5.18) present on the property can deliver a total of 8 600l/day pumped at a sustainable rate of 0.1 l/s (Gouws, 2018). Sufficient water (8 454 l/day) is available for the initial 200 boars. However, an additional borehole will be required in order to supply sufficient water for 400 boars. Mitigation measures as recommended by Gouws (2018) must be implemented.

According to Gouws (2018), the sustainable abstraction of groundwater for the proposed development does not pose a risk to groundwater users in the area. The cone of depression or radius of influence was determined as 222m. No downstream groundwater users (i.e. surrounding villages/homesteads; Figure 5.4) will thus be impacted as a result of water abstraction at the GTC facility, since the closest borehole (ALZ4; Figure 5.18) is located ±380m from the site. In addition, no wetlands will be impacted. The Depression wetland is deemed to be disconnected from the groundwater as the static water levels were measured at > 3mbgl (Gouws, 2018).

In terms of water quality, Gouws (2018) indicated that the groundwater type can be described as freshly recharged, unpolluted bicarbonate type water. The groundwater quality is thus suitable for domestic purposes. Quarterly groundwater sampling and analysis must however, take place to ensure that the borehole water remains fit for human and animal consumption and meets the requirements of the Department of Water and Sanitation (Gouws, 2018).

The applicant will have to obtain the relevant approval (general authorisation, registration, water use license) in terms of the National Water Act, 1998 (Act 36 of 1998) from the Department of Water and Sanitation for these activities.

In terms of sites of archaeological and/or cultural interest, Van Vollenhoven (2017) indicated that no sites of cultural heritage significance (including graves) are present on site. Only two buildings (an old farm house and an outbuilding) within the old farmstead complex are older than 60 years (Historical Age). These buildings are located outside of the development

footprint. Van Vollenhoven (2017) recommended that the developer take note of the historical buildings and ensure the protection thereof. In terms of Palaeontological Sensitivity, Fourie (2017) indicated no objection and that the development may go ahead. Mitigation measures included in Section 9 must however be implemented during the construction phase.

Odours are usually associated with the keeping of pigs, which could impact on people residing in the area or passing through. However, studies show that land application of the manure constitutes 80% or more of the potential public complaints. The spreading of manure is thus the main cause of odours, not the housing or the manure pit.

It should be noted that the closest residence is located 605m from the site (Figure 5.4). No homesteads/villages are located on the property (i.e. Portion 24 of Kleinfontein 432 JS) where the manure would be spread.

The extent of the odours would depend on management practices, wind directions, temperature, etc. As indicated in Section 5.11, the dominant wind direction in the area is in a north westerly direction for most of the year. No homesteads/villages are located north west of the site (Figure 5.4). The impact on surrounding residents in terms of odour from the GTC facility is therefore expected to be low. Mitigation measures in terms of reducing odour are provided in Section 9 of this report.

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. Stringent bio-security measures and meticulous cleaning will be implemented at the GTC facility in order to control diseases and enhance animal welfare as indicated in Section 9. The SOPs for the existing facility (Appendix 11) will be adapted and implemented for the proposed facility.

10.4 Public participation

The public participation process followed is described in Section 6 of this report.

Comments were received from the following government departments, stakeholders and interested and affected parties:

- Department of Agriculture, Forestry and Fisheries (F. Mashabela);
- Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) - Directorate: Land Use and Soil Management – Ermelo (J. Venter);
- Department of Rural Development and Land Reform (Commission on Restitution of Land Rights);
- Mpumalanga Tourism and Parks Agency (MTPA);
- South African Heritage Resources Agency (SAHRA);
- G. Hoffmann;
- C. van Wyk;

- S. Skosana;
- Councillor J. Matshiane;

Issues of concern received through this public participation process and the way in which these issues were addressed are detailed in Section 6 and Table 6.9.

No villages/homesteads or farmsteads will be directly impacted by the proposed development. The closest residence is located 605m south of the site on the opposite side of the N4 national road.

The proposed project would have a positive impact in terms of the social environment since additional employment opportunities would be provided during the construction (±40) and operational (±13-17) phases.

10.5 Assumptions, uncertainties and gaps in knowledge

The following assumptions and limitations are applicable to this report:

- The report is based on project information provided by the applicant.
- In determining the significance of impacts after mitigation, it is assumed that the proposed mitigation measures will be implemented by the applicant during the construction and operational phases of the development.
- Wetland study - Some inaccuracies in the delineation of the wetland boundaries may occur due to the use of handheld GPS instrumentation.
- Due to the subterranean nature of fossils and heritage resources, objects or features may be uncovered during the construction phase.
- The data presented in the specialist reports are based on single site visits, which are deemed sufficient for the purposes of this BA process.

10.6 Reasoned opinion as to whether the proposed activity should be authorised (or not)

Based on the findings of this Basic Assessment Report, it is felt that the proposed project could be approved subject to the implementation of the mitigation measures proposed in the Environmental Management Programme (EMPr) provided in Section 9 of this report.

Regular monitoring and auditing of the activities should take place during both the construction and operational phases to ensure that the mitigation measures are implemented. The GTC facility must be managed in such a way that it is environmentally sustainable, acceptable to the community and complies with the objectives of the National Environmental Management Act, 1998 (Act 107 of 1998).

In view of the findings of this Basic Assessment, the following listed activities can be approved:

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

Listing	Activity
	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.

10.7 Reasons why the activity should be authorised (or not)

It is recommended that the activity be authorised for the following reasons:

- No interested and affected party will be directly impacted upon.
- The owner of the Rockdale property will be able to develop his property for residential purposes once the GTC facility has been relocated.
- The proposed project will not have any negative impacts on the environment that cannot be mitigated and managed.
- The proposed development will NOT impact on any sensitive natural or cultural areas.
- No surface water environments (e.g. rivers, streams, wetlands, etc.) are present on site.
- The proposed site is suitable for development purposes as the site is relatively flat with a gentle slope in a south easterly direction.
- The proposed project would have a positive impact in terms of supporting the local economy and would provide much needed employment opportunities during both the construction and operational phases.
- The proposed development will result in the production of superior quality semen that will be distributed to various customers.
- The proposed GTC facility would also have a positive impact in terms of bio-security since the transportation of live animals between farms will no longer be required for breeding purposes.
- Water can be obtained from existing boreholes located near the site.
- The groundwater is suitable for domestic purposes.
- Electricity can be obtained from existing Eskom power lines located in the northern portion of the site.
- The proposed land use is related to agriculture and would therefore not impact on the existing land use in the area (i.e. cultivation of maize).
- Agricultural land is available adjacent to the site for the spreading of manure, where no such land is available at the existing facility.
- The spreading of manure on cultivated land could result in increased crop production.
- The proposed site is located outside of the Urban Edge and will not compromise the integrity of the Steve Tshwete Local Municipality SDF or IDP.

Based on the above-mentioned, it is evident that:

- the proposed development is necessary (need);
- the proposed development will be located on an appropriate site (desirability)

- the development will benefit the local/regional community.

Therefore the need and desirability of the said project was determined through the Basic Assessment process.

10.8 Period for which the EA is required

The construction phase is estimated to be finalised within 10 years since the proposed development will be phased. Construction on the first phase will commence as soon as all the relevant authorisations have been obtained.

The operational phase of the proposed GTC facility will depend on various factors such as the economic environment and future technology.

10.9 Conditions to be included in the EA

The following conditions should be included in the Environmental Authorisation:

- *The management and monitoring measures as indicated in Section 9 (EMPr) of the Basic Assessment Report must be implemented.*
- *An additional borehole to be drilled before commencing with the additional 200 boars.*
- *The boreholes to be registered with the Department of Water and Sanitation.*
- *Water use license in terms of the National Water Act, 1998 (Act 36 of 1998) to be obtained with regards to the following:*
    - *Section 21(a) - taking water from a water resource.* Water will be abstracted from boreholes.
    - *Section 21(c) - impeding or diverting the flow of water in a watercourse.* The proposed GTC facility is located within 500m of wetlands.
    - *Section 21(i) - altering the bed, banks, course or characteristics of a watercourse.* The proposed GTC facility is located within 500m of wetlands.
    - *Section 21(e) - engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1); (Irrigation of any land with waste or water containing waste generated through any industrial activity or by a waterworks).* Manure (wastewater) from the GTC facility will be spread onto agricultural land.
    - *Section 21(g) - disposing of waste in a manner which may detrimentally impact on a water resource. Manure (wastewater) from the GTC facility will be spread onto agricultural land.*

SECTION 11: EVALUATION OF DRAFT BASIC ASSESSMENT REPORT

11.1 Availability of Basic Assessment Report

The Draft Basic Assessment Report (dated: August 2018) was submitted to the Department of Agriculture, Rural Development, Land and Environmental Affairs on 17 August 2018 (letter dated: 17 August 2018; Appendix 12).

The Draft Basic Assessment Report (dated: August 2018) was also submitted/couriered to the following authorities for evaluation (30-day period):

- Department of Water and Sanitation - letter dated: 17 August 2018 and received by Department on 17 August 2018 (Appendix 12);
- Steve Tshwete Local Municipality - letter dated: 17 August 2018 and submitted on 17 August 2018 (Appendix 12);
- Mpumalanga Tourism and Parks Agency - letter dated: 17 August 2018 and received on 20 August 2018 (Appendix 12);
- Department of Agriculture, Forestry and Fisheries - letter dated: 17 August 2018 and received on 20 August 2018 (Appendix 12)

As requested, two hard copies of the Draft Basic Assessment Report (dated: August 2018) were provided to Councillor J. Matshiane (letter dated: 17 August 2018; Appendix 12), who made these copies available to the Kleinfontein Community for evaluation purposes. A hard copy was also made available at the Alzu main offices located on the farm Kwaggafontein (Middelburg). A copy of the notice and register provided with the Draft Basic Assessment Report are attached in Appendix 12.

A notice with regards to the availability of the Draft Basic Assessment Report was also placed in the Middelburg Observer on 17 August 2018 (Appendix 12).

An e-mail (dated: 17 August 2018; Appendix 12) was forwarded to government departments, stakeholders and interested and affected parties (see interested and affected party list) informing them that the document was available for evaluation purposes from 17 August 2018 to 17 September 2018.

A copy of the document was provided on the company website (www.adienvironmental.co.za) for download (Appendix 12).

In addition, a copy of the document was loaded onto the South African Heritage Resources Agency website (SAHRIS) for their input (Appendix 12).

The following interested and affected parties/stakeholders/government departments were notified of the said report:

INTERESTED AND AFFECTED PARTY LIST	
Organisation	**Name**
Government Departments	
Department of Agriculture, Forestry and Fisheries	F Mashabela
Department of Agriculture, Rural Development, Land and Environmental Affairs - Directorate: Land Use and Soil Management – Ermelo	J Venter
Department of Agriculture, Rural Development, Land and Environmental Affairs	The Director
Department of Co-Operative Governance and Traditional Affairs	M Loock
Department of Mineral Resources	S Mathavela
Department of Rural Development and Land Reform	F. Mdushani (now Ndaba)
Department of Water and Sanitation	NS Maliaga
Other Organisations	
Distriks Landbou Unie Middelburg	JPJ Schmahl
Eskom Distribution	T Ludere
Eskom Transmission	L Motsisi
Local Municipality and Municipal Councillor	
Middelburg Chamber of Business and Commerce	M Hanekom
Mpumalanga Tourism and Parks Agency (MTPA)	K Narasoo
Nkangala District Municipality	S Links
South African Heritage Resources Agency (SAHRA)	J Lavin
South African National Roads Agency (SANRAL)	V Bota K Schmid
Steve Tshwete Local Municipality	M Mahamba
Telkom	J Smit
Trans African Concessions (TRAC)	R Nkosi, C Davis
Transvaalse Landbou Unie (TLU)	D du Plessis
Ward 9 councillor	J Matshiane
Surrounding Landowners	
Property (Figure 6.2)	**Landowner/Contact person**
Portions 1 and 2 of Kleinfontein	TKL Hoffmann Contact person: G Hoffmann
Renting Portion 2 of Kleinfontein	C van Wyk
Portion 3 of Kleinfontein	Mafube Coal Mining (Pty) Ltd. Contact person: B Mfolo
Portions 7, RE/8, RE/18 and RE/19	Kusic Prop cc

INTERESTED AND AFFECTED PARTY LIST	
of Kleinfontein	Contact person: C van Wyk
Portions RE/10 and 17 of Kleinfontein	Blyder Beleggings (Pty) Ltd. Contact person: L Cass
Portion 16 of Kleinfontein	LA Cass Contact person: L Cass
Portions 21 and 26 of Kleinfontein	Beestepan Boerdery (Pty) Ltd. Contact person: B. Kane-Berman
Village located on Portion 23 of Kleinfontein	Registered to the applicant. Village representative: S Skosana
Portions RE/4, 5, 15, 23, RE/24, 38 of Kleinfontein	Statutis Trading (Pty) Ltd. (i.e. the applicant)

11.2 Comments received

11.2.1 Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA)

The Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) was requested (telephonically and in the cover letter dated 23 July 2018; Appendix 12) to provide a date for a meeting and site visit.

Subsequently, an e-mail (dated: 4 October 2018; Appendix 12) was received from Ms. C. Mthimunye indicating that a site visit could be held on 4 November 2018. AdiEnvironmental requested an earlier date (e-mail dated: 4 October 2018) since the due date for submission of the Final Basic Assessment Report is 19 October 2018.

The site visit was confirmed for 24 October 2018 (e-mail dated: 9 October 2018), which is after the submission date for the Final Basic Assessment Report. Comment from the Department is thus not included in this report.

11.2.2 Government Departments

No comment was received from any government departments on the Draft Basic Assessment Report.

11.2.3 Other organisations

Comment on the Draft Basic Assessment Report was only received from the South African Heritage Resources Agency.

South African Heritage Resources Agency (SAHRA)

A letter (dated: 21 August 2018; Ref: 11519; Appendix 12) was received from SAHRA indicating the following:

"The Heritage Exemption report and the Desktop PIA report have been submitted to the South African Heritage Resources Agency (SAHRA), for commenting in terms section 38(8) of the National Heritage Resources Act, 25 of 1999).

Van Vollenhoven, A.C. September 2017. Letter for HIA Exemption Request: Genetics Transfer Centre (Piggery) on Portion 9 and the Remainder of Portion 24 of the Farm Kleinfontein 432 JS, Middelburg, Mpumalanga Province.

They undertook an assessment of the available historical literature of the proposed development area and a field assessment, which identified 2

historical buildings that are located just outside the development area. The field assessment did not discover any heritage resources on the fields that will be utilised for the piggery. The historical buildings consist of the old farm house, which is in disuse and all the interior historical features were removed from the farmhouse, and an outbuilding. Both buildings will not be impacted as they are located outside the development area. The author recommends an exemption from conducting a HIA, and that the historical buildings are conserved.

Fourie, H. December 2017. Palaeontological Impact Assessment: Phase 1 Field Study the Construction and Operation of a Gene Transfer Center (GTC) on the Remaining Extent of Portion 24 of the Farm Kleinfontein 432-JS, Middelburg Steve Tshwete Local Municipality, Nkangala District Municipality, Mpumalanga Province Farm: Remaining Extent of Portion 24 of the Farm Kleinfontein 432-JS.

The development area is underlain by sediments of the Permian Vryheid Formation (Ecca Group, Karoo Supergroup). This Formation has a Very High palaeontological sensitivity; however, fossils were not observed on the surface during the field survey. Just outside the development area, the underlying geology consists of feldspatic quartzites, arkosas, shales and interbedded volcanics and felsites of the Damwal Formation (Rooiberg Group, Transvaal Supergroup). This formation has no palaeontological sensitivity.

The author recommends the following:
- *Mitigation by a qualified palaeontologist if any fossils are uncovered;*
- *The ECO must familiarise himself with the type of fossils that may be uncovered in the Vryheid Formation;*
- *There is no objection to the development, but the ECO must monitor for fossils before and after any blasting/excavation;*
- *The EMPr is updated to include the training of the ECO in the identification of fossils in the Vryheid Formation, or for a palaeontologist to be present once a month during construction of the development;*
- *The EMPr must also be updated to include the Protocol for Finds attached to the PIA report under Appendix 2.*

Final Comment
SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit agrees with the recommendations provided within the Heritage exemption report and the PIA report submitted to the case for commenting. These recommendations must be included in the EMPr for implementation along with Appendix 2: Protocol for Finds in the PIA report.

SAHRA cannot provide comments on the built environment protected under section 34 of the NHRA, therefore consultation with the Mpumalanga Heritage Resources Authority (MPHRA) must be undertaken by the EAP/developer. Further comments from the MPRHA please contact Benjamin Moduka at bmoduka@mpg.gov.za and at 013 766 5196.

In the unlikely event that fossils are uncovered during construction then construction must cease within the immediate vicinity, a buffer of 30 m must be established, and a palaeontologist called in to inspect the finds. The palaeontologist must obtain a section 35(4) permit in terms of NHRA and Chapter IV NHRA Regulations, before any fossils are collected.

If there are any new heritages resources are discovered during construction and operation phases of the proposed development, then a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings at the expense of the developer.

If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required at the expense of the developer. Mitigation will only be carried out after the archaeologist or palaeontologist obtains a permit in terms of section 35 of the NHRA (Act 25 of 1999).

You may contact SAHRA APM Unit for further details: (Nokukhanya Khumalo/Phillip Hine 021 202 8652).

If any unmarked human burials are uncovered and the archaeologist called in to inspect the finds and/or the police find them to be heritage graves, then mitigation may be necessary and the SAHRA Burial Grounds and Graves (BGG) Unit must be contacted for processes to follow (Ms Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490)."

The Final BAR must be uploaded to the case for record purposes as well as the Record of Decision from the competent authority as and when these reports are available for public review."

Response from AdiEnvironmental

The recommendations and requirements from SAHRA were included in the EMP (Section 9). The following was indicated (Page 9-6 of this report):

a. The developer must take note of the historical buildings located within the old farmstead complex (Figure 9.1) and must ensure the protection/utilisation thereof. Permission for such matters should be dealt with by the Provincial Heritages Resources authority of Mpumalanga (Van Vollenhoven, 2017).
b. If any graves are discovered during construction, the discovery must be reported to the SA Police Service and SAHRA. An archaeologist must be called in to handle the matter.
c. If any archaeological remains are exposed during the construction phase, the construction must be terminated immediately and the South African Heritage Resources Agency (SAHRA) must be notified in this regard. The applicant must take note of the requirements in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999).
d. The Environmental Control Officer (ECO) must familiarise him- or herself with the Vryheid Formation and its fossils. It is recommended that a palaeontologist is involved during the construction phase of the development either for training of the Environmental Control Officer (ECO) or a site visit once a month (Fourie, 2017).
e. The ECO must survey for fossils during excavation as well as before and after blasting (Fourie, 2017).
f. If any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist must be called to determine proper mitigation measures (Fourie, 2017). A Protocol for Finds and Management Plan for fossils is attached in Appendix 2 of Appendix 5.

The Mpumalanga Heritage Resources Authority (B. Moduka) was informed (e-mail dated: 22 August 2018; Appendix 12) of the proposed development and requested to provide comment on the built environment as recommended by SAHRA. To date, no comment has been received.

A copy of the Final Basic Assessment Report and Environmental Authorisation (Record of Decision) will be uploaded onto the SAHRA database as requested.

Department of Rural Development and Land Reform (Commission on Restitution of Land Rights)
A letter (dated: 23 August 2018; Appendix 12) was received from the Commission on Restitution of Land Rights indicating that claims were lodged against the farm Kleinfontein 432 JS (file numbers: 11699, 1029, 989, 11698, 6217). However, this does not affect the Remainder of Portion 24.

It should be noted that similar letters were forwarded to AdiEnvironmental cc (dated: 21 August 2017; 18 May 2018) and included in the Draft Basic Assessment Report (see Section 6.3.3).

11.2.4 Local municipality and municipal councillor

No comment was received from the Steve Tshwete Local Municipality on the Draft Basic Assessment Report.

Councillor J. Matshiane
Councillor J. Matshiane indicated telephonically (18 September 2018) that the Kleinfontein Community once again raised the following issues:

1. Impact on gravel road;
2. Odour;
3. Impact on boreholes;
4. People from local community to be employed (or there will be unrest).

Response from AdiEnvironmental
The above-mentioned issues were previously raised by the Kleinfontein Community as indicated in Section 6.5 and were addressed in Table 6.9.

11.2.5 Community

S. Skosana (representative of Kleinfontein Community)
The following comment (e-mail dated: 17 August 2018; Appendix 12) was received from the representative of the Kleinfontein Community, Mr. S. Skosana:

"We comunity of of kleinf we are not entered on the application."

Mr. Skosana was subsequently requested to clarify the comment (e-mail dated: 17 August 2018; Appendix 12). The following response was received:

"No pigger will be approved near or in our area klaaar ge praat."

Response from AdiEnvironmental
Noted. No further comment was received from Mr. Skosana.

11.3 Evaluation of Final Basic Assessment Report

A hard copy of the Final Basic Assessment Report (dated: October 2018) will be submitted to the Department of Agriculture, Rural Development, Land and Environmental Affairs for final decision making.

REFERENCES

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- Gouws, C. 2018. **Groundwater Assessment. Gene Transfer Centre (GTC) on the Remaining Extent of Portion 24 of the Farm Kleinfontein 432 JS, Middelburg.** Report prepared by Geo Pollution Technologies - Gauteng (Pty) Ltd. Report dated: March 2018. Report number: ALERM-18-2978.
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- **List of Ecosystems that are Threatened and in Need of Protection**. (General Notice No. 1002 of 2011). *Government Gazette* 34809: 3-541, 9 December 2011. Government Printing Works, Pretoria.
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- Venter, I. 2018. **Wetland Assessment for the Proposed Piggery on a Portion of Alzu AI, Middelburg.** Report prepared by: Kyllinga Consulting.

APPENDIX 1:

APPLICATION FORM

- Cover letter from AdiEnvironmental cc (dated: 23 July 2018; Ref: BA 2017/03) to the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) regarding submission of application form.
- Copy of the application form.
- Acknowledgement of receipt from DARDLEA (letter dated: 13 August 2018; Ref: 1/3/1/16/1N-138)

APPENDIX 2:

CURRICULUM VITAE

- A. Erasmus *Pr. Sci. Nat.*
- R. Janse van Rensburg
- List of projects completed by A. Erasmus and R. Janse van Rensburg
- A. van Vollenhoven
- I. Venter
- H. Fourie
- C. Gouws
- A. Hlasane

APPENDIX 3:

WETLAND ASSESSMENT

- Venter, I. 2018. **Wetland Assessment for the Proposed Piggery on a Portion of Alzu AI, Middelburg.** Report prepared by: Kyllinga Consulting.

APPENDIX 4:

GEOHYDROLOGICAL STUDY

- Gouws, C. 2018. **Groundwater Assessment. Gene Transfer Centre (GTC) on the Remaining Extent of Portion 24 of the Farm Kleinfontein 432 Js, Middelburg.** Report prepared by Geo Pollution Technologies - Gauteng (Pty) Ltd. Report dated: March 2018. Report number: ALERM-18-2978.

APPENDIX 5:

HERITAGE REPORT

- Van Vollenhoven, A. 2017. **Letter for HIA Exemption Request: Genetics Transfer Centre (Piggery) on Portion 9 and the Remainder of Portion 24 of the Farm Kleinfontein 432 JS, Middelburg, Mpumalanga Province.** Report prepared by: Archaetnos Culture and Cultural Consultants. Report dated: 28 September 2017.

APPENDIX 6:

PALAEONTOLOGICAL REPORT

- Fourie, H. 2017. **The Construction and Operation of a Gene Transfer Centre (GTC) on the Remaining Extent of Portion 24 of the Farm Kleinfontein 432-JS, Middelburg, Steve Tshwete Local Municipality, Nkangala District Municipality, Mpumalanga Province. Palaeontological Impact Assessment: Phase 1 Field Study.** Report dated: 4 December 2017.

APPENDIX 7:

ADVERTISING OF THE PROJECT

- A copy of the advertisement published in the Middelburg Observer, 11 August 2017.
- A copy of the on-site notice.
- Printout of company website page www.adienvironmental.co.za – Document Downloads.

APPENDIX 8:

BACKGROUND INFORMATION DOCUMENT

APPENDIX 9:

CORRESPONDENCE WITH THE AUTHORITIES AND INTERESTED AND AFFECTED PARTIES

- E-mail from AdiEnvironmental cc (dated: 16 August 2018) to:

AUTHORITY/ STAKEHOLDER	CONTACT PERSON
Department of Agriculture, Forestry and Fisheries	Mashabela, F
Department of Agriculture, Rural Development, Land and Environmental Affairs - Directorate: Land Use and Soil Management – Ermelo	Venter, J
Department of Co-Operative Governance and Traditional Affairs	Loock, M
Department of Mineral Resources	Mathavhela, S
Department of Rural Development and Land Reform (Commission on Restitution of Land Rights)	F. Mdushani
Department of Water and Sanitation	Maliaga, NS
Distriks Landbou Unie Middelburg	Schmahl, JPJ
Eskom Distribution	Ludere, T
Eskom Transmission	Motsisi, L
Middelburg Chamber of Business and Commerce	Hanekom, M
Mpumalanga Tourism and Parks Agency	Narasoo, K
Nkangala District Municipality	Links, S
South African National Roads Agency (SANRAL)	Bota, V; K Schmid
Steve Tshwete Local Municipality	Mahamba, M
Telkom	Smit, J
Trans African Concessions	Nkosi, R; C Davis

- Completed comment sheet (dated: 29 August 2017) from F. Mashabela (Department of Agriculture, Forestry and Fisheries.
- Completed comment sheet (dated: 26 September 2017) from J. Venter (Department of Agriculture, Rural Development, Land and Environmental Affairs - Directorate: Land Use and Soil Management – Ermelo).
- E-mail from AdiEnvironmental cc (AdiEnv) (dated: 16 August 2017) to F. Mdushani (Commission on Restitution of Land Rights).
- Letter from Commission on Restitution of Land Rights (dated: 21 August 2017) to AdiEnv.
- Email from AdiEnv (dated: 15 May) to T. Sambo (Commission on Restitution of Land Rights).
- E-mail from F. Ndaba (Commission on Restitution of Land Rights) (dated: 18 May 2018) to AdiEnv.
- Letter from Commission on Restitution of Land Rights (dated: 22 May 2018) to AdiEnv.
- Letter from TLU SA (dated: 8 September 2017) regarding the land claim.
- Sabinet printout regarding the land claim on Portion 2 of Kleinfontein 432 JS.
- Government Gazette 38863 (Notice 567 of 2015) regarding the land claim on Portions 3, 17, 19 and 21 of Kleinfontein 432 JS.
- Government Gazette 38863 (Notice 569 of 2015) regarding the land claim on Portion 18 of Kleinfontein 432 JS.
- Letter from Mpumalanga Tourism and Parks Agency (dated: 30 August 2017) to AdiEnv.

- Webpage printout (dated: 16 August 2017): South African Heritage Resources Information System (SAHRIS).
- Letter from the South African Heritage Resources Agency (SAHRA) (dated: 11 September 2017; Ref: 11519) to AdiEnv.
- Webpage printout (dated: 7 June 2018): South African Heritage Resources Information System (SAHRIS).
- E-mail from AdiEnv (dated: 21 August 2017) to Charles van Wyk and Gustav Hoffmann
- E-mail from G. Hoffmann (dated: 13 September 2017) to AdiEnv
- E-mail from AdiEnv (dated: 16 August 2017) to B. Mfolo, L. Cass and B. Kane-Berman.
- E-mail from AdiEnv (dated: 24 August 2017) to S. Skosana.
- E-mail from Councillor J. Matshiane (datd: 30 August 2017) to AdiEnv.
- E-mail from AdiEnv (dated: 30 August 2017) to Councillor J. Matshiane.
- E-mail from AdiEnv (dated: 13 September 2017) to S. Skosana regarding the meeting of 19 September 2017.
- E-mail from AdiEnv (dated:: 12 September 2017) to Councillor J. Matshiane regarding the meeting of 19 September 2017.
- E-mail from Councillor J. Matshiane (dated: 12 September 2017) regarding the meeting of 19 September 2017.
- Minutes of the meeting and attendance register - 19 September 2017.
- E-mail from AdiEnv (dated: 2 October 2017) to Councillor J. Matshiane, S. Skosana, T. Mnguni and N. Mahlangu regarding the site visit of 3 October 2017.
- Minutes of the meeting and attendance register - 3 October 2017.

APPENDIX 10:

ENGINEERING SERVICES REPORT

- Hlasane, A. 2018. **The Construction and Operation of a Gene Transfer Centre on the Remaining Extent of Portion 24 of the Farm Kleinfontein 432 Js, Middelburg Mpumalanga Province. Engineering Services Report: Water and Wastewater.** Report prepared by: BTW & Associates (Pty) Ltd. Report dated: 4 July 2018. Report number: 20446-REP-001.

APPENDIX 11:

STANDARD OPERATING PROCEDURES (SOP)- GTC

- 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;
- SOP 9.2 - Hazardous Waste

APPENDIX 12:

EVALUATION OF DRAFT BASIC ASSESSMENT REPORT

- Letter from AdiEnvironmental cc (AdiEnv) (dated: 17 August 2018; Ref: BA 2017/03) to the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA).
- Letter from AdiEnv (dated: 17 August 2018; Ref: BA 2017/03) to the Department of Water and Sanitation and courier printout.
- Letter from AdiEnv (dated: 17 August 2018; Ref: BA 2017/03) to the Steve Tshwete Local Municipality.
- Letter from AdiEnv (dated: 17 August 2018; Ref: BA 2017/03) to the Mpumalanga Tourism and Parks Agency and courier printout.
- Letter from AdiEnv (dated: 17 August 2018; Ref: BA 2017/03) to the Department of Agriculture, Forestry and Fisheries and courier printout.
- Letter from AdiEnv (dated: 17 August 2018; Ref: BA 2017/03) to Councillor J. Matshiane.
- Copy of the notice displayed at the Alzu offices, the notice provided with the Draft Basic Assessment Report and the register.
- A copy of the notice published in the Middelburg Observer, 17 August 2018.
- E-mail from AdiEnv (dated: 17 August 2018) forwarded to government departments and stakeholders.
- E-mail from AdiEnv (dated: 17 August 2018) forwarded to interested and affected parties.
- E-mail from AdiEnv (dated: 17 August 2018) forwarded to Kleinfontein Community members.
- Web page printout (dated: 16 August 2018) - www.adienvironmental.co.za.
- Web page printout (dated: 16 August 2018) - SAHRIS (South African Heritage Resources Information System).
- Letter from the South African Heritage Resources Agency (dated: 21 August 2018) to AdiEnv.
- E-mail from AdiEnv (dated: 22 August 2018) to B. Moduka (Mpumalanga Heritage Resources Authority).
- Letter from the Commission on Restitution of Land Rights (dated: 23 August 2018) to AdiEnv.
- E-mails from Mr. S. Skosana (representative of Kleinfontein Community) (dated: 17 August 2018) to AdiEnv.
- E-mails from AdiEnv (dated: 17 August 2018) to Mr. S. Skosana.
- E-mail from C. Mthimunye (dated: 4 October 2018) to AdiEnv.
- E-mails from AdiEnv (dated: 4 and 9 October 2018) to C. Mthimunye