

**CONSIDERATION OF AQUATIC ENVIRONMENTS IN RELATION
TO PROPOSED INFRASTRUCTURE DEVELOPMENTS WITHIN
THE GREATER UKUWELA NATURE RESERVE NEAR HLUHLUWE,
KWAZULU-NATAL**



Mzinene River with floodplain wetlands

September 2021

Produced For:

SiVEST SA (Pty) Ltd
PO Box 707
Msunduzi
3231
Tel: (033) 347 1600

Produced By:

Alletson Ecologicals
Hilton
3245
Tel: (033) 3434972
Fax: 086 6108896

DETAILS OF SPECIALIST CONSULTANT

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Author:	D.J. Alletson (SACNASP Ecological Scientist. Reg No 125697) B.Sc. Biological Sciences B.Sc. Honours Zoological Sciences
Signature:	
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SPECIALIST'S DECLARATION

I, Dacre James Alletson as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- act as the independent specialist in this application;
- perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- will comply with the Act, Regulations and all other applicable legislation;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- have no vested interest in the proposed activity proceeding;
- undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of specialist:

Name of specialist: Dacre James Alletson
Date: 24 September 2021

CONSIDERATION OF AQUATIC ENVIRONMENTS IN RELATION TO PROPOSED INFRASTRUCTURE DEVELOPMENTS WITHIN THE GREATER UKUWELA NATURE RESERVE NEAR HLUHLUWE, KWAZULU-NATAL

1. INTRODUCTION

SiVEST SA (Pty) Ltd, has been appointed by Wild Tomorrow Fund (“the Fund”) to undertake terrestrial and aquatic biodiversity assessments in relation to the development of the Greater Ukuwela Nature Reserve (GUNR) located in the Big 5 False Bay Local Municipality (KZN273) section of the Umkhanyakude District Municipality (DC27) near the town of Hluhluwe, KwaZulu-Natal.

The GUNR has been registered as an Ezemvelo KZN Biodiversity Stewardship Site and as such is proclaimed as a Protected Area as defined within the National Environmental Management: Protected Areas Act of 2003 (NEMPAA), as amended.

This report presents the findings of an assessment of the aquatic environments in and around the reserve and the possible consequences of the proposed development on those systems. Impacts are considered in terms of both the National Environmental Management Act (Act No. 107 of 1998) (NEMA), and of the National Water Act (Act No. 36 of 1998) (NWA). The findings are that the impacts on the aquatic ecosystems will be minimal although some care will be required in the construction process. Ongoing monitoring is recommended.

2. PROJECT LOCATION

The project site is located approximately 15km northeast of the town of Hluhluwe, KwaZulu-Natal. It is accessed off Road R22 and may be entered from either the southern side near the Zulu Croc Centre, or the northern side on the approach to the Mzinene River crossing. The coordinates of the entrances are shown in Table 1.

Table 1: Location of entry points to the GUNR

Entrance Point	Latitude	Longitude
Zulu Croc Centre	27°54'57.10"S	32°18'55.04"E
FreeMe	27°53'51.38"S	32°21'52.89"E
Mfuleni	27°52'50.27"S	32°21'49.44"E

Access is restricted with the gates being locked, and arrangement to visit must be made with the reserve manager beforehand.

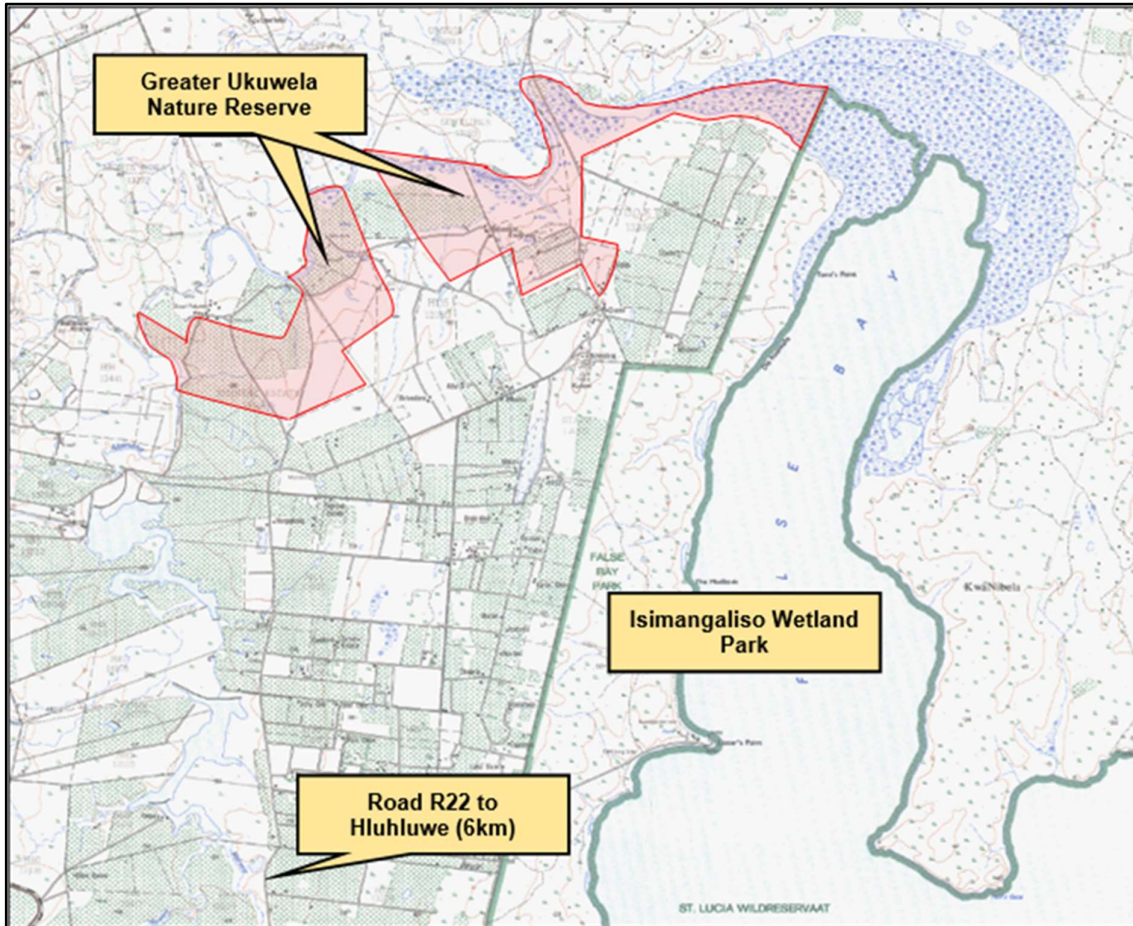


Figure 1: Location of the Greater Ukuwela Nature Reserve

The GUNR consists of three properties made of the parcels as detailed in Table 2 below. Note that the original extent of the Mfuleni property includes the Freeme site although the latter is now a separate subdivision. It is also to be noted that the Phinda Game Reserve lies immediately to the north of the area.

Table 2: Properties forming the GUNR

Entrance Point	Approximate Area (Ha)	Property Numbers
Ukuwela	517.5	N0HV00000001607400000
	166.4	(Portion of) N0HV00000001318000023
Mfuleni (Includes Freeme)	597.4	N0HV00000001335000000
	43.5	N0HV00000001335000014
	42.8	N0HV00000001335000013
	42.2	N0HV00000001335000012

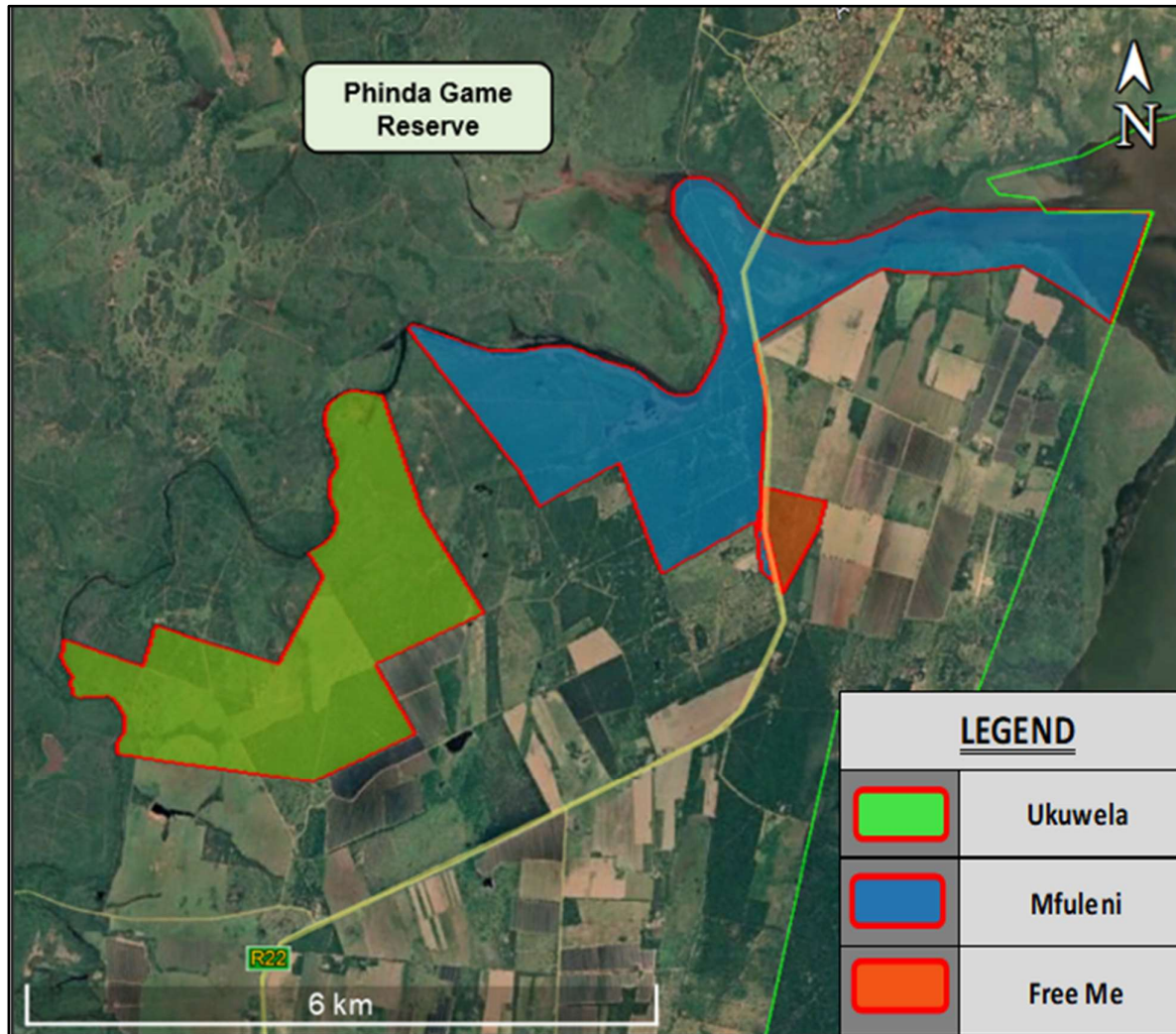


Figure 2: Properties forming the Greater Ukuwela Nature Reserve

3. PROJECT DESCRIPTION

The overall GUNR Project consists of developing a stable and functional nature conservation area which will also have educational and training functions. However, the purpose of this investigation is to consider the possible impacts of the proposed project infrastructure on the aquatic environment in its proximity. This infrastructure consists of a donor house, a manager's house, an office complex, a tented camp, and some roads/tracks. In addition, the Fund has offered space to the FreeMe Non-Governmental Organisation (NGO) in which to construct and operate a wildlife trauma and rehabilitation centre.

The proposed development is to include the following components:

- ***Donor House with associated decking, terraces, landscaping and walkways.***
The Fund is a wildlife conservation charity which receives financial donations from hundreds of people each year. These donations fund the conservation work performed on the GUNR. The Fund would like its major donors to experience the reserve first-hand and to share in the conservation achievements that they made possible. The donor house will be a place for them to stay and learn about the Fund's current and future projects. The major donors will have the chance to invite their friends and family to stay with them. The Fund believes the donor house will be an excellent means to deepen relationships with existing and potential donors and that it will ultimately lead to more funding for conservation. Thus the donor house will be an important source of sustainable revenue for the reserve, bringing both invited and paying guests while creating additional employment for people in the area.
- ***Managers House.***
The Fund intends to build a simple two-bedroom house in the GUNR for their General Manager. Having the General Manager reside on-site will increase the output and quality of work from this employee and all other staff. An additional person living full-time on the reserve will also increase the overall security for the Reserve.
- ***A Reserve Office and FreeMe Complex.***
FreeMe is a South African wildlife rehabilitation organization based in Howick, South Africa. The Wild Tomorrow Fund has entered into a legal agreement where FreeMe will lease four hectares of land from the Fund on the GUNR. The purpose is for FreeMe to create a wildlife rehabilitation centre for the indigenous mammals, birds, reptiles, amphibians and invertebrates in accordance with the Ezemvelo KZN Wildlife permit conditions. FreeMe's rehabilitation centre will fill a much-needed void in the area for a reputable place where injured wildlife can be cared for.

Adjacent to the FreeMe rehabilitation centre will be the Reserve Office where Fund employees will work. Having the employees working from one location will increase the productivity and quality of conservation work.

- ***A Tented Camp.***
The Wild Tomorrow Fund has a paid volunteer program where local and international people take part in conservation activities on the Greater Ukuwela Nature Reserve for two weeks at a time. There are typically two to three volunteer trips each year. To increase the profits the Fund generates from these trips, they would like their guests

to stay on reserve, thus eliminating the need to pay for third-party lodging. These savings will be used to fund their conservation and community projects.

- Various internal access roads and tracks for reserve management / game viewing. These roads will have gravel surfaces and will be constructed with appropriate drainage and watercourse crossing structures as may be required.

The service infrastructure requirements for the above developments includes the following:

- Potable water provision from the municipal bulk pipeline;
- On site waste water and sewage treatment will utilise septic tank and soakaway systems; and
- Electrical supply will be from an existing Eskom connection.

4. DEFINITION OF PROJECT AREA AND STUDY AREAS

The project is located within the Usutu to Mhlathuze Water Management Area and is primarily in Quaternary Catchment W32C but with the extreme north-eastern portion along the Mzinene River being in Quaternary Catchment W32H. The project area consists of the three properties which make up the nature reserve area. See

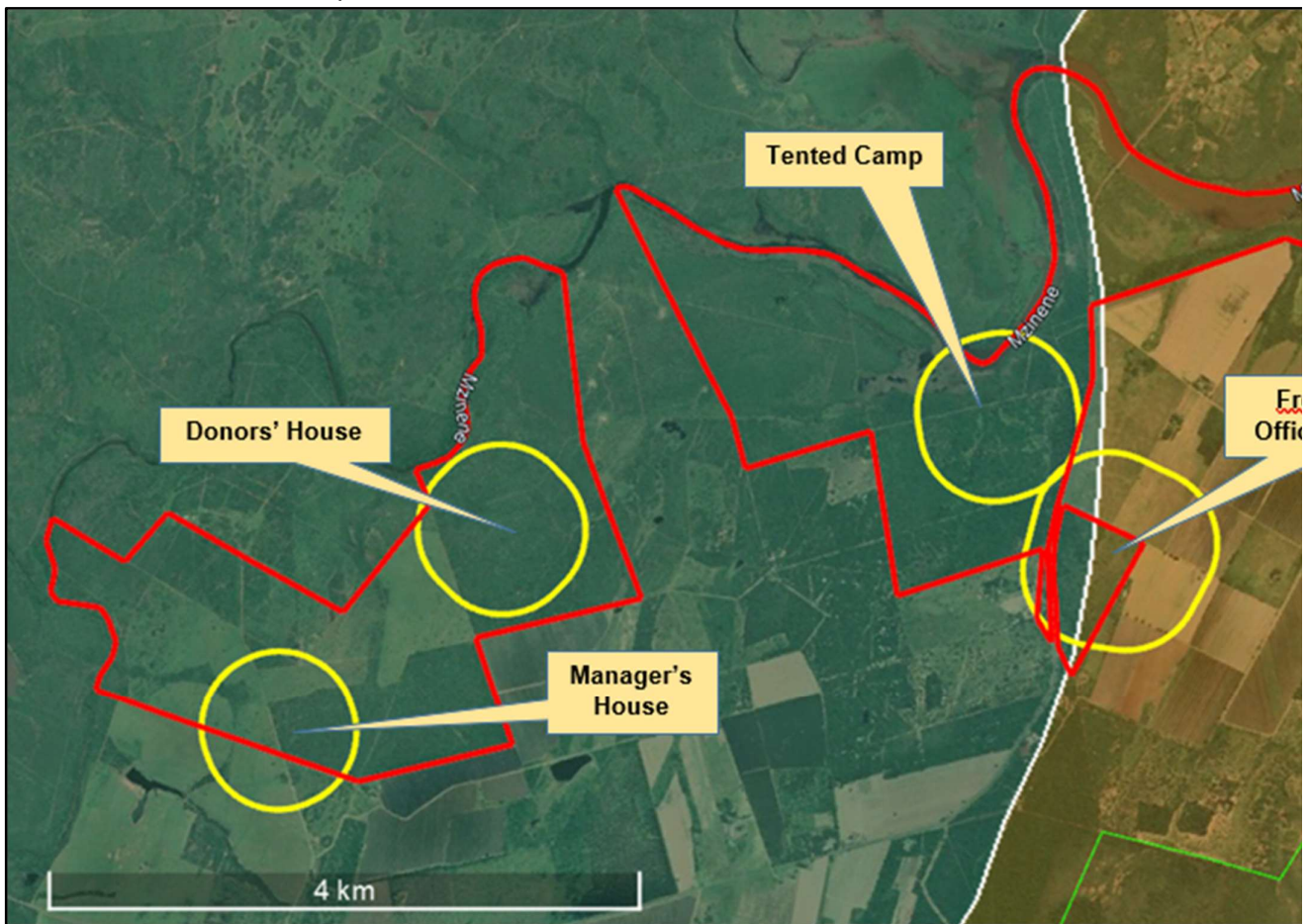


Figure 3 below. However, the extent of the study areas for the aquatic investigation also takes the following into account:

The “General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as defined in Section 21(c) and (i)”, Notice 509 of 2016, specifies that the “regulated area of a watercourse” is to mean:

- a) The outer edge of the 1 in 100 year flood line and / or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- b) In the absence of a determined 1 in 100 year flood line or riparian area, the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or
- c) A 500m radius from the delineated boundary (extent) of any wetland or pan.

In order to define the study areas, buffer areas of 500 m in width were plotted around all of the components of the proposed infrastructure since any wetlands within such areas, whether totally or partially, would need to be considered in terms of the Act.

All aquatic features (wetlands and watercourses) within the individual study areas were identified where possible by using information generated through desktop and then then through field investigations. The features that are considered to be possibly impacted by the development were then assessed further.

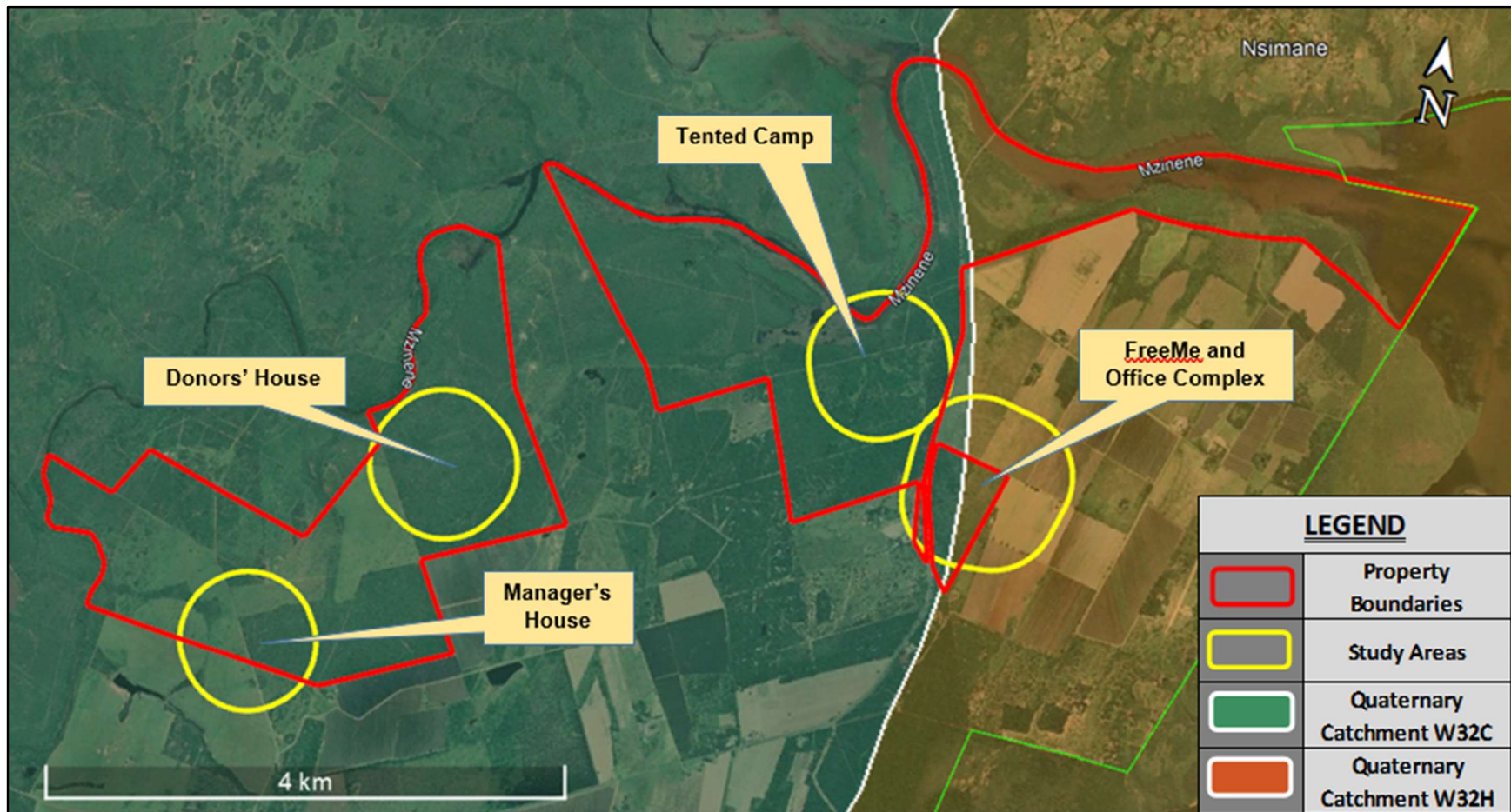


Figure 3: Quaternary Catchments and study site polygons

5. SITE DESCRIPTIONS

While most attention was focussed on the individual development sites and their proximity to any wetland or watercourse, attention was also given to wider areas as well.

5.1 Vegetation Types

The vegetation types covering the entire project area include the following and are shown in Figure 6 below.

- Western Maputaland Clay Bushveld SVI 20

Vegetation Type SVI 20 lies across most of the Ukuwela property and the across the western portion of the Mfuleni property. The type has limited distribution in KwaZulu-Natal and occurs through the low lying (20m – 200m altitude) parts of the Maputaland region immediately east of the Lebombo Mountains, eastwards to the western edge of the SVI 18 Tembe Sandy Bushveld. From the Ndumo Game Reserve on the Mozambique border, through the Makatini Flats south to Mkhuze Game Reserve, with a narrower extension to just east of the town Hluhluwe.

The vegetation comprises a mixed but mainly compound leaved short (5 – 10 m) woodlands and wooded grasslands. It occurs on the crests, upper and mid-slopes of gently undulating terrain. This vegetation unit is dissected by two large alluvial floodplains associated with the Mkuze and Phongolo Rivers. FOa 1 Lowveld Riverine Forest and woodland dominate these alluvial soils and numerous small floodplains associated with smaller streams.

- Maputaland Pallid Sandy Bushveld SVI 25

Vegetation Type SVI 25 lies across the eastern portion of the Ukuwela property and across the Mfuleni and FreeMe properties. In KwaZulu-Natal it is found on the coastal plain (40m – 140m altitude) in the Maputaland region east of the Pongola River. North of the Mkuze River it is aligned with the Muzi swamp and its water catchment and to the south it extends to near the town of Hluhluwe sandwiched between SVI 18 Tembe Sandy Bushveld and CB 1 Maputaland Coastal Belt. It is commonly found between 40m and 80m in altitude.

- Tembe Sandy Bushveld SVI 18

Type SVI 18 only lies in the extreme southern parts of the Mfuleni and FreeMe properties. In KwaZulu-Natal it is found in the Maputaland lowveld, east of the Pongola River, and in a strip of land between the Mozambique border and the Tembe Elephant Park in the north extending south as far as the surrounds of the confluence of the Mkuze and Msunduzi Rivers. Sandwiched between the SVI 20 Western Maputaland Clay Bushveld in the west and CB 1 Maputaland Coastal Belt in the east. Isolated patch found east of the town of Hluhluwe.

Typically, it consists of extensive flat plains to slightly undulating in places with open to closed woodland with canopy 5 – 10 m tall, dominated by leguminous woody and *Terminalia sericea*, with species-rich shrub layer and grassy undergrowth (*Panicum*, *Perotis*, *Urelytrum agropyroides*, *Hyperthelia dissolute* and *Diheteropogon* species).

- Freshwater Wetlands: Subtropical Freshwater Wetlands : Short Grass/ Sedge Wetlands AZf 6

Type AZf 6 is widespread in South Africa. The wetlands in the project area are confined almost entirely to the floodplain area of the Mzinene River. Typically the vegetation is dominated by reeds, sedges and rushes, water logged meadows dominated by grasses. However, the large dam across the river just west of the Road R22 crossing has permanently inundated much of the lower vegetation so that extensive areas of reedbeds and short grass/sedge plant communities have been lost. However considerable areas of reedbed persist in backwaters and are floating on the river margins in places.

Examination of old (1960, 1978) aerial survey photographs and Google Earth (2003) reveals that there were extensive tracts of crop fields within the project area. However, the activity was abandoned and, by 2010 the initial recovery of the vegetation was clearly visible. While it is now well advanced, some alien crop plants, such as cotton, are still present although they are scarce and do not appear to be invasive.

5.2 Climate

Climate data for the nearby town of Hluhluwe are given below. The climate is considered to be tropical with the Koppen-Geiger classification being Aw (Tropical savanna climate with dry winter characteristics).

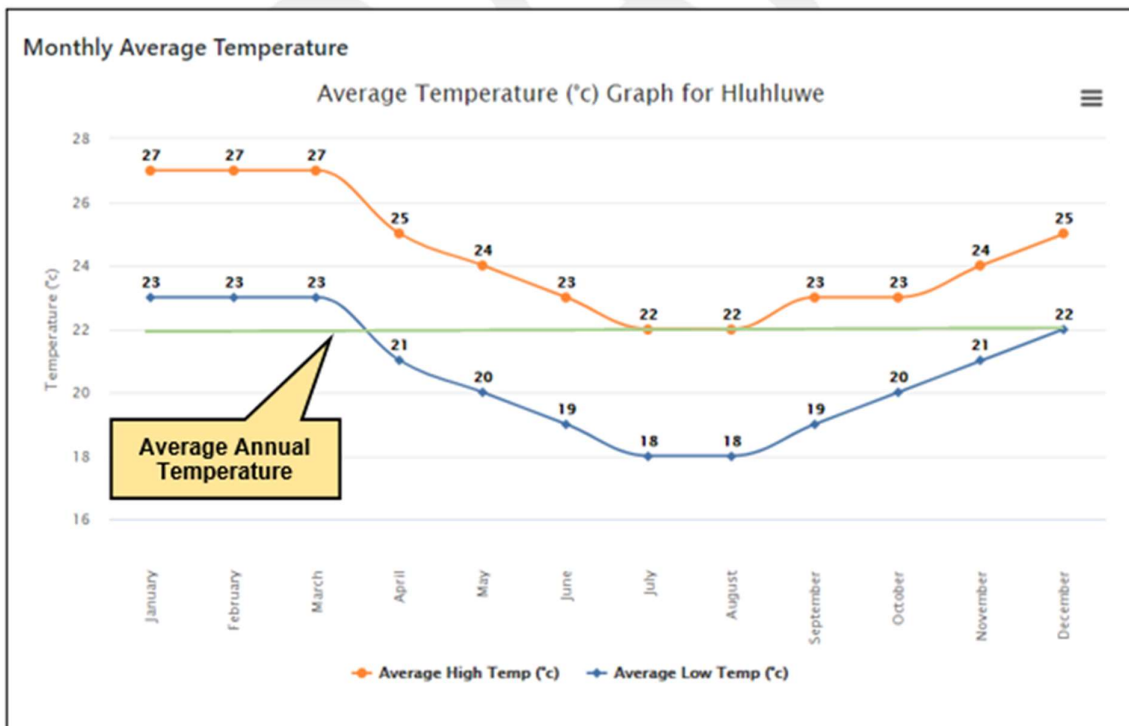


Figure 4: Average monthly and annual temperatures for the Hluhluwe area

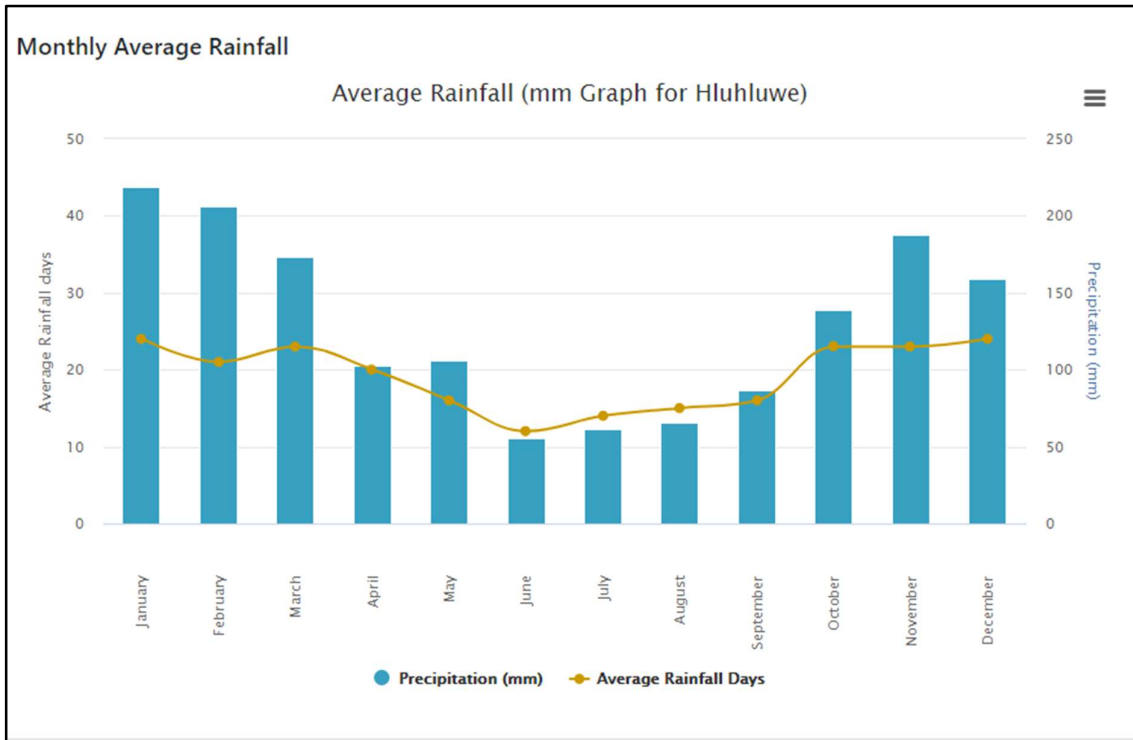


Figure 5: Average monthly rainfall figures for the Hluhluwe area



Figure 6: Vegetation types in the project area

5.3 Wetlands

The three wetland datasets which cover the project area were all examined and were found to differ substantially from one another. See Figures 7 to 9 below. Because of the difficulty in moving through the bush in the area, it was not possible to delineate the wetlands in the normal way as prescribed by the Department of Water Affairs and Forestry Guidelines (DWAF, 2005). However, as many areas as possible were visited and aerial photographs were obtained. On the basis of the observations made, as well as from aerial survey images dating back to 1960 a wetland map was produced and is shown in Figure 11. Non-riparian wetlands are only shown in and around the project area since the opposite side of river will not be affected in any way. For comparative purposes, the figure includes an outline of the NFEPA wetlands since that data set most closely matches what was seen on the ground. In general, the observed wetland areas were found to be smaller than the NFEPA areas but this situation occurs frequently due to the low level of resolution of the latter. The possible impacts on the wetlands are discussed on a site-by-site basis for each of the proposed development sites.

5.4 Watercourses

The watercourses in the project area are shown in Figure 10 below. The primary river in the area is the Mzinene River which is a NFEPA listed free-flowing river discharging into Lake St Lucia in the Isimangaliso Wetland Park which is also a Ramsar Site and a World Heritage Site. The given PES score of the river is Category A (Unmodified, Natural) although the presence of the dam wall to the west of Road R22, together with upstream water abstractions for agriculture, suggests that it may be in Category A/B or even Category B (Largely Natural with few modifications). The margins of the river are generally heavily wooded and are steep. In places are narrow strips of reedbeds (*Phragmites australis* and *P. mauritanus*). These conditions have arisen as a result of the downstream dam permanently inundating the lower levels of the natural channel leaving the steep primary channel banks as the new permanent margins.

Flowing into the Mzinene River are numerous tributary streams. These are all non-perennial in terms of their flows and so water is only present in them at times of above average rainfall. Some of the channels observed are so minor that they are virtually undetectable other than for their position in the landscape. Thus they are category A (Very Seldom Wetted) channels with perhaps a few being in Category B (Frequently Wetted) in just their lowest reaches near the Mzinene River.

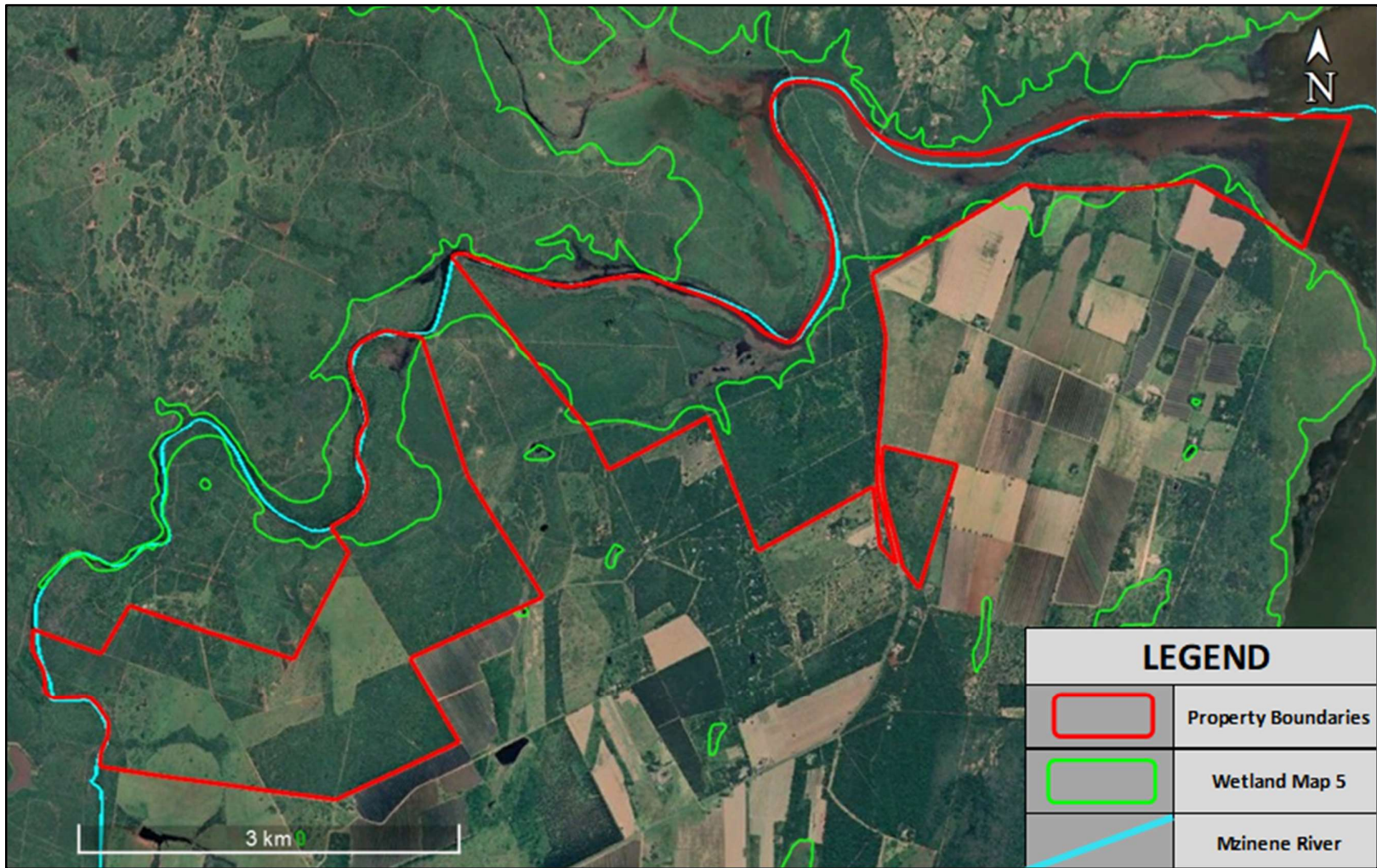


Figure 7: SAIIIE Wetland Map 5 wetlands

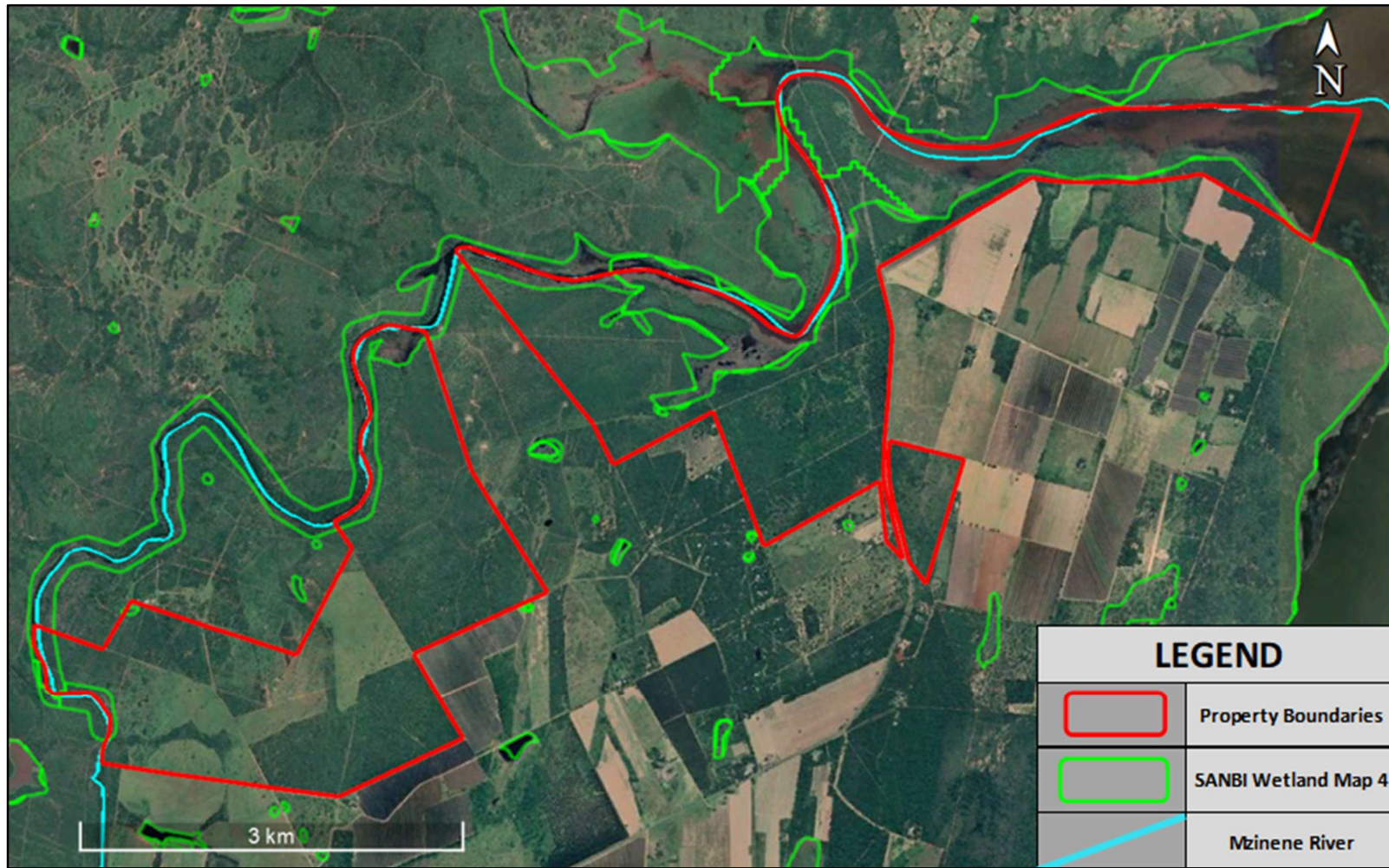


Figure 8: SANBI NFEPA Wetland Map 4 wetlands

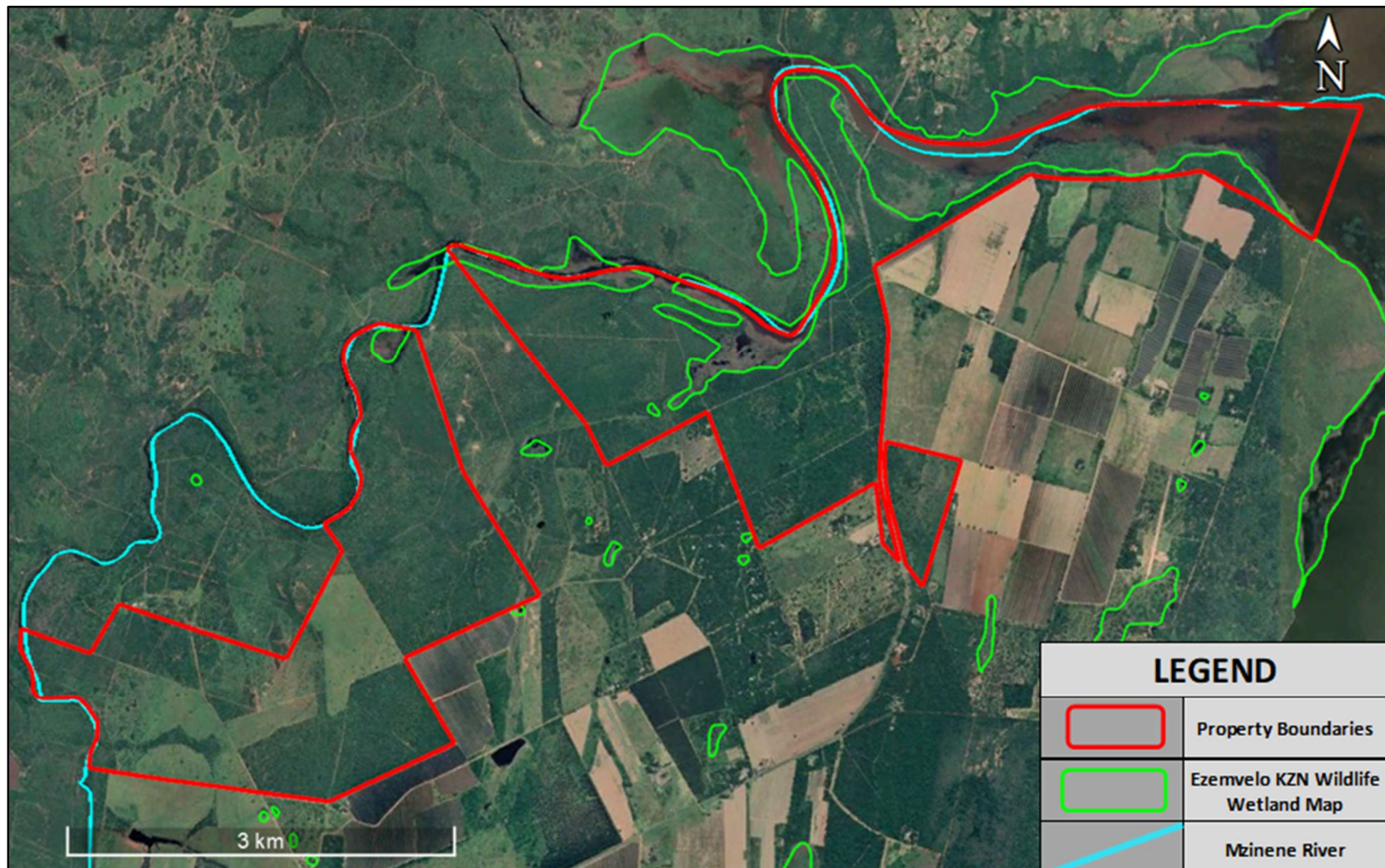


Figure 9: Ezemvelo KZN Wildlife Wetland Map

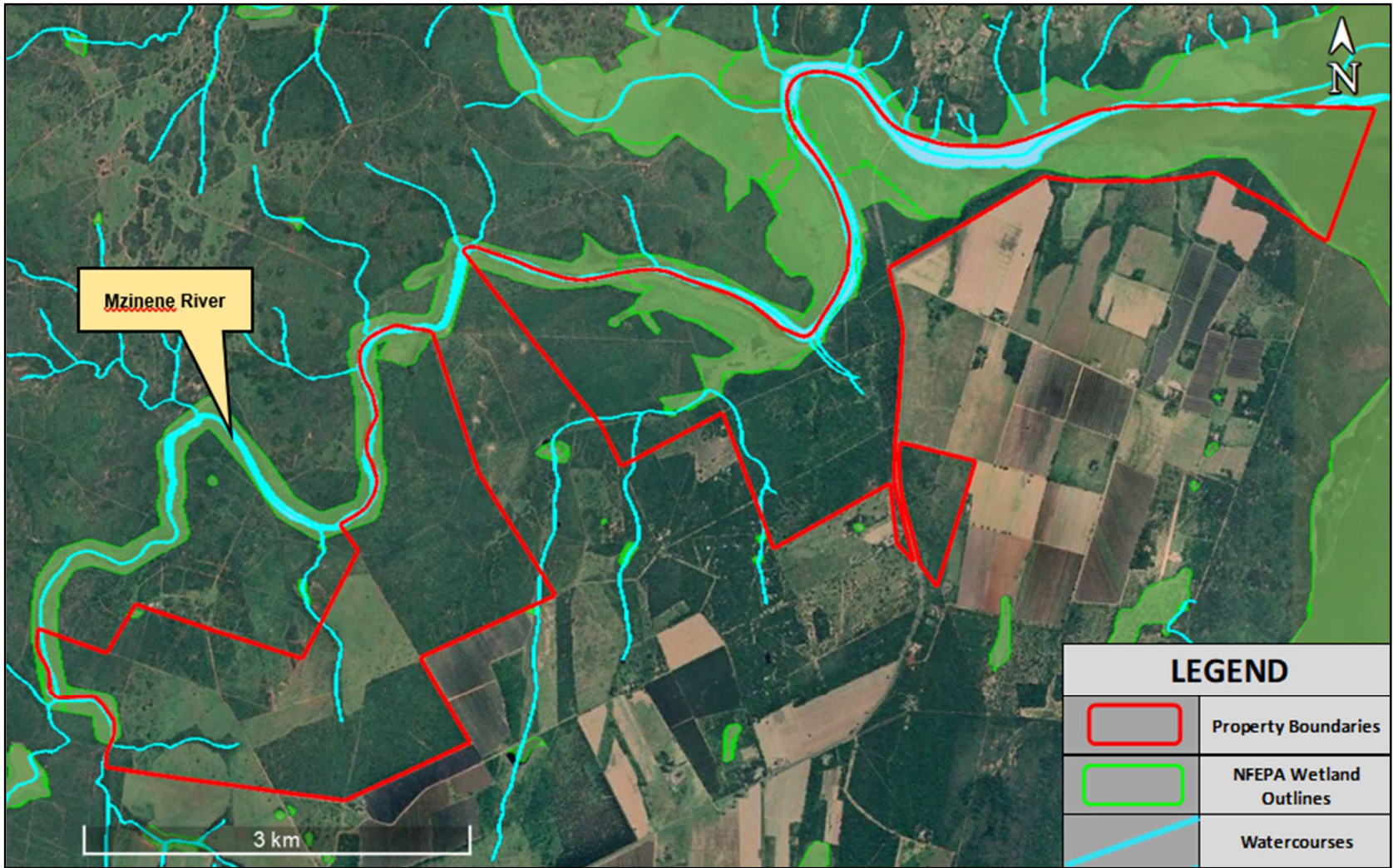


Figure 10: Watercourses in the project area

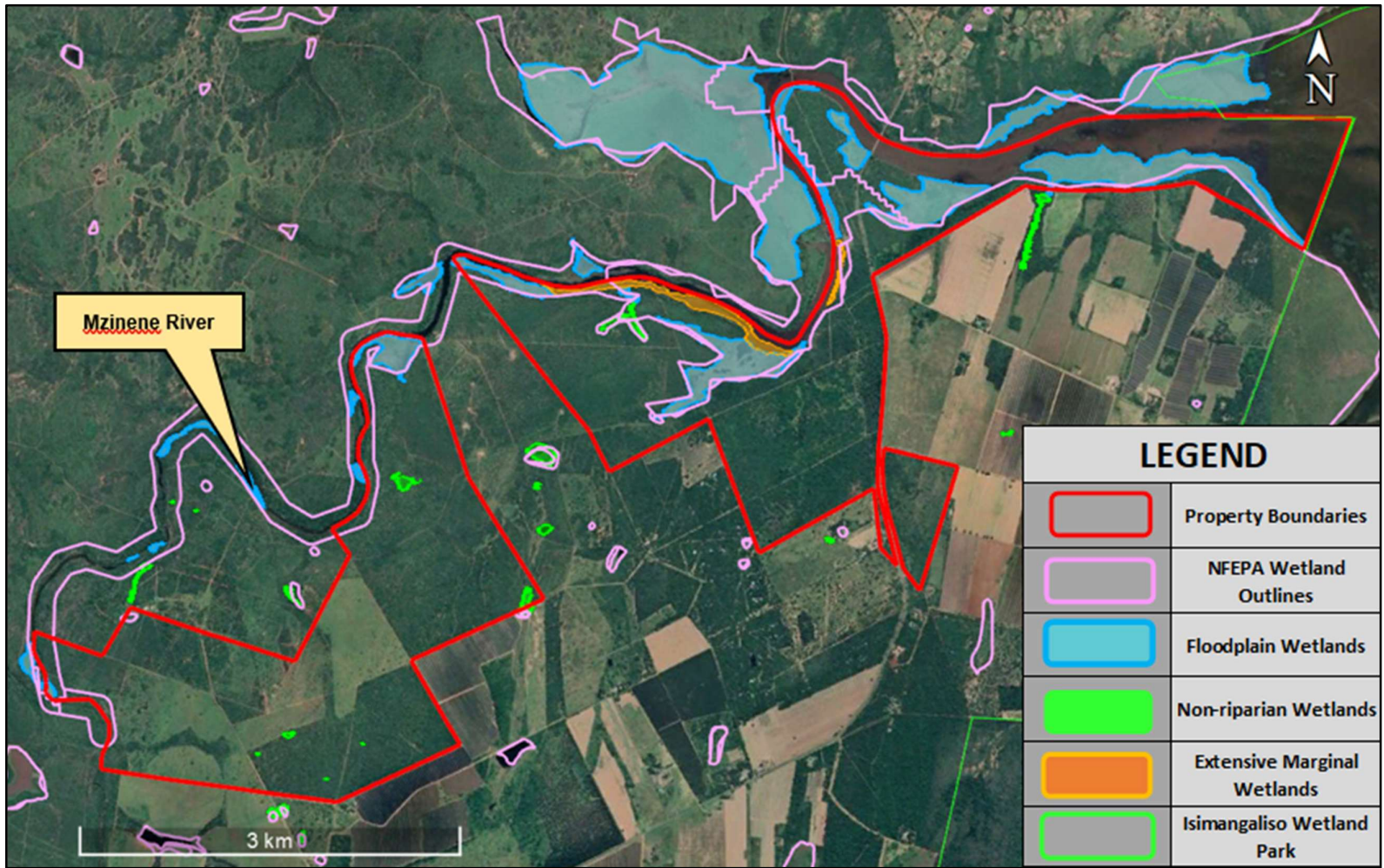


Figure 11: Project area wetland map



Plate 1: View of a typical small seasonal watercourse



Plate 2: Mzinene River with a floodplain backwater (Red Arrow) and the approximate position of the tented camp (Yellow Arrow)

6. ASSUMPTIONS AND LIMITATIONS

Assumptions and limitations relating to the aquatic survey are as follows:

- The project sites which were considered were provided by the developers and so are assumed to be correct;
- The survey was done at a time shortly after a period of high rainfall and so it was assumed that all wet areas would still be clearly discernible; and
- While all of the proposed development sites were visited, the thick vegetation around the FreeMe site made access to some areas very difficult. However, it was assumed that since the site is on a sandy hilltop, and as the conditions there were similar to the surrounds which could be seen, an absence of wet areas could be assumed.
- References to aquatic systems in the Department of Forestry, Fisheries and the Environment (DFFE) Screening Report were made from a very high level of assessment and came out with a low sensitivity and so finer detail was provided by the author on the basis of personal knowledge of the area.

7. SURVEY RESULTS

The site was visited over a period of two days in July 2021. Rain had fallen shortly before the time of the visit but conditions on the two days were clear and sunny. The survey of the wetlands was confined very largely to those within 500m of a development site as is required by the National Water Act. Each of the sites was walked over and large sections along the Mzinene River were also examined.

Apart from the riverine wetlands, almost all of the other sites were dry and so indicate that they lack a permanently wetted zone. Many appeared to be artificial and to be small borrow pits or scrape dams which had been pushed up to catch a little water at times of high rainfall when there is surface runoff. The sites are discussed individually in relation to the relevant development proposal and as shown in

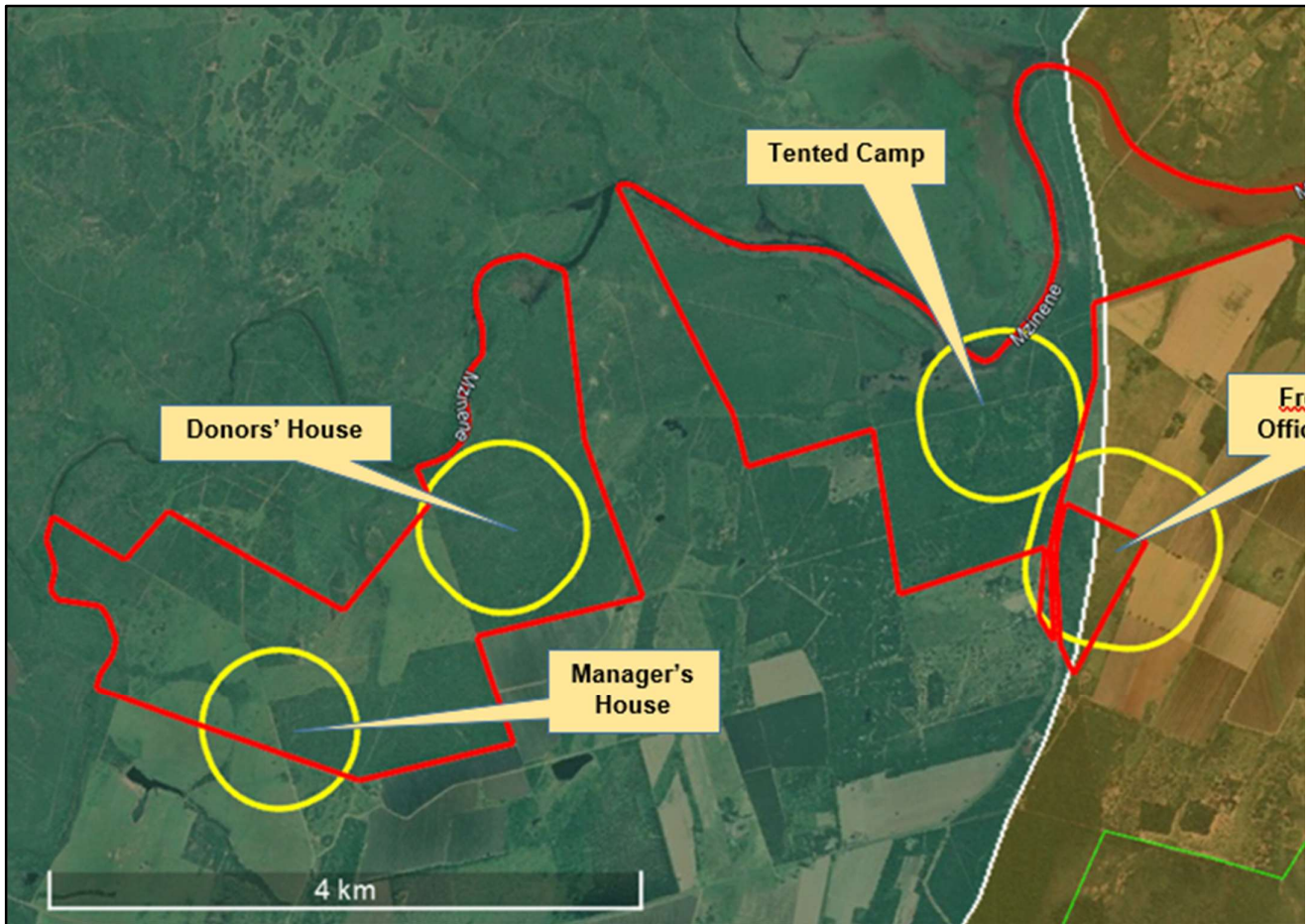


Figure 3 above.

7.1 Manager's House

The manager's house will be a small, two-bedroom house for the GUNR manager and family. An existing water pump to lift water from a borehole is already present. It is not clear if the actual site has been under cultivation in the past but nearby areas were definitely cleared and used for crops. The wetlands within 500m of the house are shown in Figure 12 below. These wetlands are probably all associated with the past agricultural activities in the area. Some may be old borrow pits from which road material may have been extracted while others may be vestigial stock watering points. Wetland 1 is a tall sedge/grass system and is probably a Seep although the hydrology is unclear. Dominant species include Wild Rice Grass (*Leersia hexandra*), Buffalo Grass (*Stenotaphrum secundatum*), Sedges (*Cyperus sexangularis*) and other *Cyperus* species.

The slope of the hill below the house is away from any wetland but is toward the headwaters of a minor watercourse. However, the house is some 280m away from the watercourse and so is well outside of the Regulated Area of the channel and will not affect it.

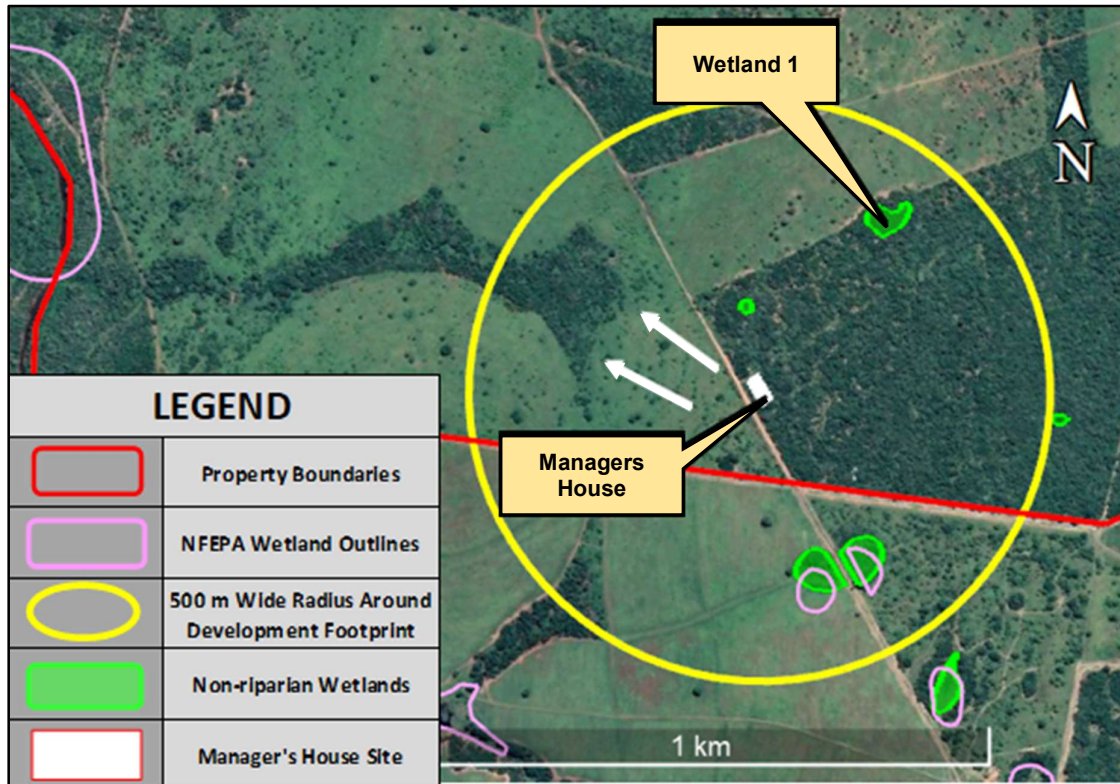


Figure 12: Wetlands within 500m of the manager's house site. The arrows indicate hill slope.



Plate 3: View of Wetland 1

7.2 Donor's House

The Donor House is intended for use by those who have contributed toward the establishment of the GUNR through donations. It will be reached off a new access road which in turn branches off an existing road. The only wetland area which appears to be included within the 500m radius around either the donor's house or the new road is a small portion of the NFEPA wetland which includes the channel of the Mzinene River. See Figure 13 below. However, the mapping exaggerates the width of the wetland and the radius does not reach to the river channel which has no floodplain at that point.

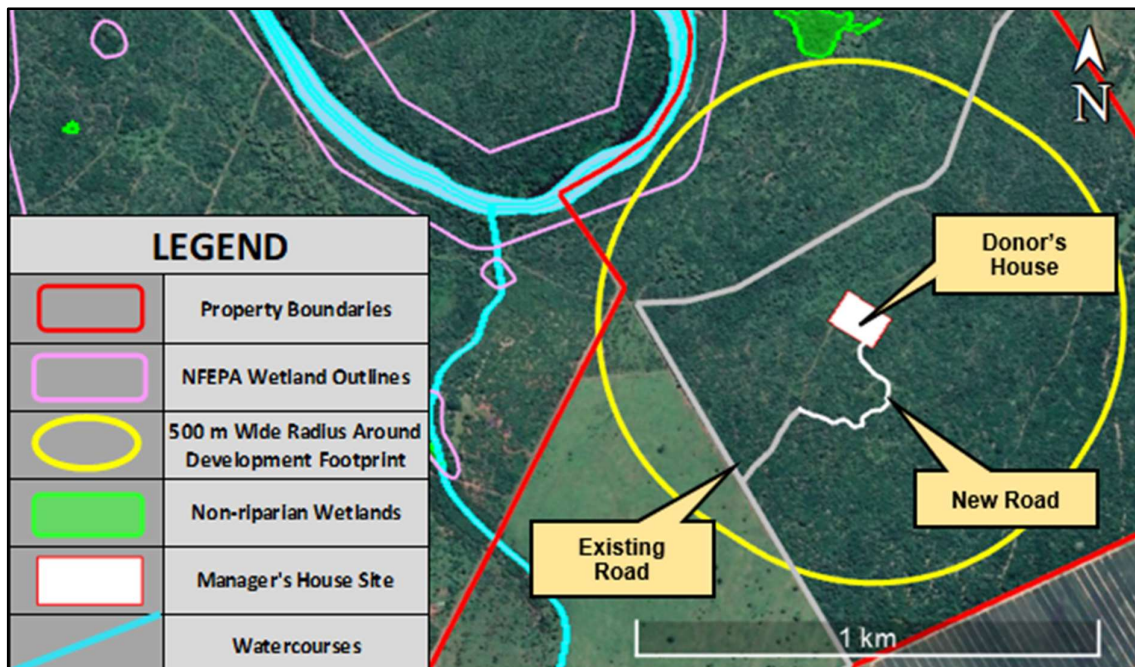


Figure 13: Wetlands in the vicinity of the proposed donor's house

On the basis of the distance of the donor's house and the associated new section of access road from any wetland or watercourse it is concluded that there will be no impact on the natural systems.

7.3 Reserve Office and FreeMe Complex

The GUNR office and the Freeme Complex will be situated together in the property which lies at the south-eastern corner of the project area. The site is near the crest of a hill and will be accessed by a new road leading off Road R22. See Figure 14 below.

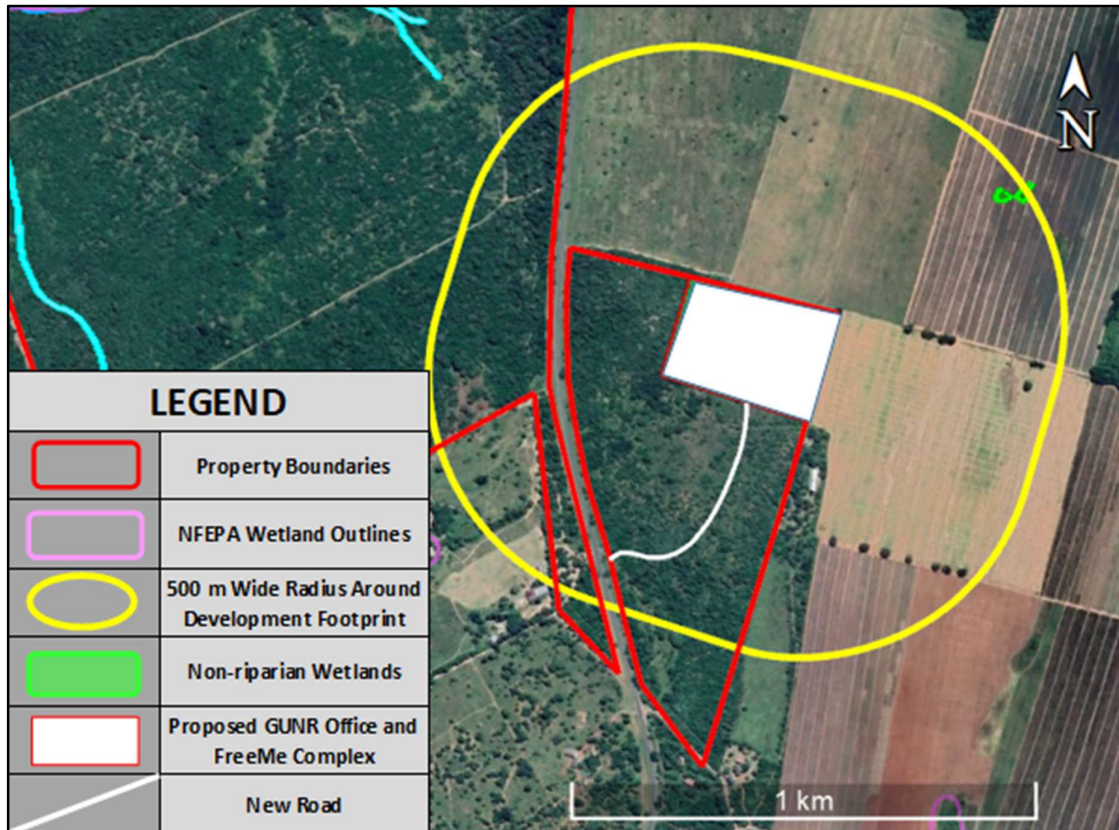


Figure 14: Wetlands in the vicinity of the proposed GUNR Office and the FreeMe Complex

Drainage from the site is toward both the east and to the west where a small dam is located some 600m away and so will not be affected. The only wetland found within the 500m radius of the site appears to be a small seep in a pineapple field to the north-east. This site was not visited but was only observed on Google Earth. There are further wetlands in that area but all seem to have been transformed to some extent by agriculture. The proposed development is most unlikely to affect any of them.

7.4 Tented Camp

The site proposed for the tented camp is situated close to Road R22 on the eastern side of the Mfuleni property. The site is located in an area which has been cultivated in the past but where the natural vegetation is well re-established. The proposal is for a central communal tent which will include cooking and eating facilities and a lounge/lecture room area. There will be nine sleeping tent sites with each making provision for two people. Sanitation will be provided by means of a number of ablution/toilet facilities.

There are two small seasonal watercourses near the camp site and their regulated areas will include the camp. The Mzinene River and a portion of a flooded backwater are located some

300m from the camp centre with the terrain in that area being characterised by low gradients. See Figure 15 below and Plate 2 in Section 5.

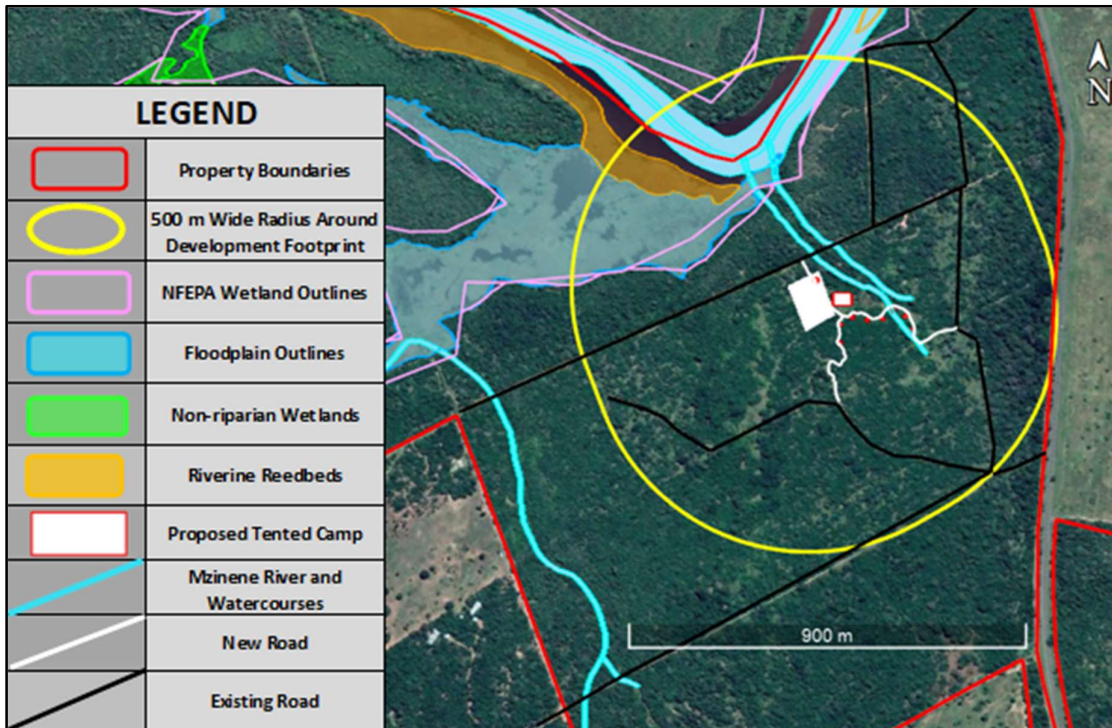


Figure 15: Wetlands in the vicinity of the proposed Tented Camp

During the construction phase there should be very little impact on the two small watercourses provided that the mitigatory measures put forward in Section 9 are implemented. Most important of these is the establishment of a buffer of 30m in width between any structures and the channels. The ablution facilities must be located so that the septic tanks can be placed further away from the channels and supernatant water should be led to soakaway pits at least 50m from the channels.

Due to the flat terrain and an intervening space of approximately 300m it is not thought that the tented camp poses any threat to the Mzinene River and its associated wetlands. It is probable that the deep roots of trees will take up any nutrients which may possibly enter the ground water and so remove them from the system.



Plate 4: View of a watercourse at the tented camp site



Plate 5: View of a watercourse at the tented camp site

8. IMPACT AND RISK ASSESSMENT

While the aquatic survey has been conducted primarily in terms of the National Environmental Management Act (Act No. 107 of 1998), as well as being investigated by means of the National Screening Tool, any development within the Regulated Area of a watercourse implies that the National Water Act (Act No. 36 of 1998) (NWA) must also be considered. For this reason, the impacts and risks that might arise as a result of the construction and operation of the infrastructure are assessed according to requirements of both Acts.

The impacts on aquatic ecosystems as a result of the proposed new developments are listed below. It is to be noted that, while most consideration has been given to the preferred site as presented in Section 3 above, it may be safely assumed that very similar impacts would be experienced at alternative sites within the project boundary.

8.1 Planning Phase

No impacts are anticipated during the planning phase since no on-site activity will be undertaken.

8.2 Construction Phase

The construction phase will include the following activities which might have impacts on the aquatic systems. See Table 3 below.

- Construction of new roads and upgrading of existing roads. The road network in the GUNR will need to be of a standard which is suitable for ordinary cars as well as for game viewing. The resulting reshaping and resurfacing of the existing roads as well as construction of new roads could result in the mobilisation of soil material which could then be transported to a watercourse or wetland system and so add to sediment loads in the larger system.
- Building of the proposed facilities. The building of the facilities will entail clearing the vegetation and preparation of the site in terms of establishing a flat platform or platforms and then the actual building operations. There will be earthworks at the site as well as along the routes of water supply pipelines which will require a trench.
- Spillage of oils or other hydrocarbons from vehicles or machines. The construction will entail the use of vehicles and machines, possibly at points close to watercourses or wetlands although not near the Mzine River and its floodplain areas. However, while any spillage or leakage is likely to be small, it is possible that fuels or oils, including hydraulic oil, could eventually enter the water where they would be toxic to the aquatic fauna and flora.
- Human wastes from toilets and ablution facilities. Human wastes if spilled or leaked from a toilet or drain could possibly be washed into a watercourse and so reduce water quality and create a health hazard.

8.3 Operational Phase

See Table 4 below for the assessment of operational phase impacts.

- Seepage from septic tanks. During the operation phase, the only anticipated impact will relate to seepage from septic tanks percolating into the aquatic systems. While this is unlikely to result in coliform contamination, it is possible that nutrients might ultimately reach the Mziznene River. The possible impact will be reduced as the sites are far from the river and the deep-rooted vegetation in the intervening space may take up the phosphates and nitrates.
- Road maintenance. Road maintenance will have to be undertaken at times but the potential for impact is very small as most roads are away from the watercourses and wetlands and the only possible threat will be at watercourse crossings.

8.4 Cumulative Impacts

The regulations under NEMA require that Cumulative Impacts be considered. While each of the proposed developments would be undertaken at a greenfields site, there are already residences and larger tourism operations close to the GUNR. These operations do not appear to be having any adverse effect on the aquatic systems and since none is within 500m of a GUNR site it is not thought that there will be any significant cumulative impacts.

8.5 Alternative Sites

Impact assessment requires that alternatives to a proposed development must be considered. In this development it is thought that the impacts from most of the sites in regard to wetlands are so small that it is not necessary to consider alternatives. The Manager's House, Donor's House and the Reserve Office and FreeMe are all so remote from watercourses or wetlands that there is very little probability of impacts during the construction phase and almost no possibility of impacts during the operational phase. Further, all the impacts can be easily mitigated through simple precautionary measures.

The possible seepage of contaminated water from the wastewater facilities servicing the tented camp is considered to be of higher concern but may also be mitigated against. From the perspective of reserve function and management it is considered undesirable for the camp site to be changed.

Table 3: Scoring of possible Construction Phase impacts on watercourses and wetlands. See Annexure 1 for details.

Site	Environmental Impact	Mitigation Effort	Spatial extent	Reversibility	Resource Loss	Duration	Intensity / Magnitude	Probability	Significance
Donor's House Managers House GUNR Office and FreeMe Complex	Construction of new roads and upgrading of existing roads	Without Mitigation	1	1	1	1	2	1	6 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	5 Negative Low Impact
Tented Camp		Without Mitigation	1	2	2	1	2	2	16 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	5 Negative Low Impact
Donor's House Managers House GUNR Office and FreeMe Complex	Building of the proposed facilities	Without Mitigation	1	1	1	1	1	1	5 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	5 Negative Low Impact
Tented Camp		Without Mitigation	1	1	2	1	1	2	12 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	5 Negative Low Impact
Donor's House Managers House GUNR Office and FreeMe Complex Tented Camp	Spillage of hydrocarbons such as fuels and oils	Without Mitigation	1	2	3	1	3	1	10 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	7 Negative Low Impact

Site	Environmental Impact	Mitigation Effort	Spatial extent	Reversibility	Resource Loss	Duration	Intensity / Magnitude	Probability	Significance
Donor's House Managers House GUNR Office and FreeMe Complex Tented Camp	Leakage or spillage from toilets and ablution facilities	Without Mitigation	2	1	1	1	2	1	7 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	5 Negative Low Impact

Table 4: Scoring of possible Operational Phase impacts on watercourses and wetlands

Site	Environmental Impact	Mitigation Effort	Spatial extent	Reversibility	Resource Loss	Duration	Intensity / Magnitude	Probability	Significance
Donor's House Managers House GUNR Office and FreeMe Complex	Seepage from septic tanks	Without Mitigation	1	2	1	3	1	2	6 Negative Low Impact
		With Mitigation	1	1	1	3	1	1	5 Negative Low Impact
Tented Camp		Without Mitigation	2	2	2	3	2	3	33 Negative Medium Impact
		With Mitigation	2	1	1	3	1	1	8 Negative Low Impact
Donor's House Managers House GUNR Office and FreeMe Complex	Construction of new roads and upgrading of existing roads	Without Mitigation	1	1	1	1	1	1	5 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	5 Negative Low Impact
Tented Camp		Without Mitigation	1	1	2	1	1	2	12 Negative Low Impact
		With Mitigation	1	1	1	1	1	1	5 Negative Low Impact

8.6 Impacts in terms of the National Water Act

In order to assess impacts in terms of the NWA, attention was given to the definition of the “Regulated Area of a watercourse”. The following applies:

In terms of the “General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as defined in Section 21(c) and (i)”, Notice 509 of 2016, specifies that the “regulated area of a watercourse” is to mean:

The outer edge of the 1 in 100 year flood line and / or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

In the absence of a determined 1 in 100 year flood line or riparian area, the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or

A 500m radius from the delineated boundary (extent) of any wetland or pan.

No 1 in 100 year floodline was available for the project area and so the 500m radius mandated for wetlands or pans was used in all areas. See

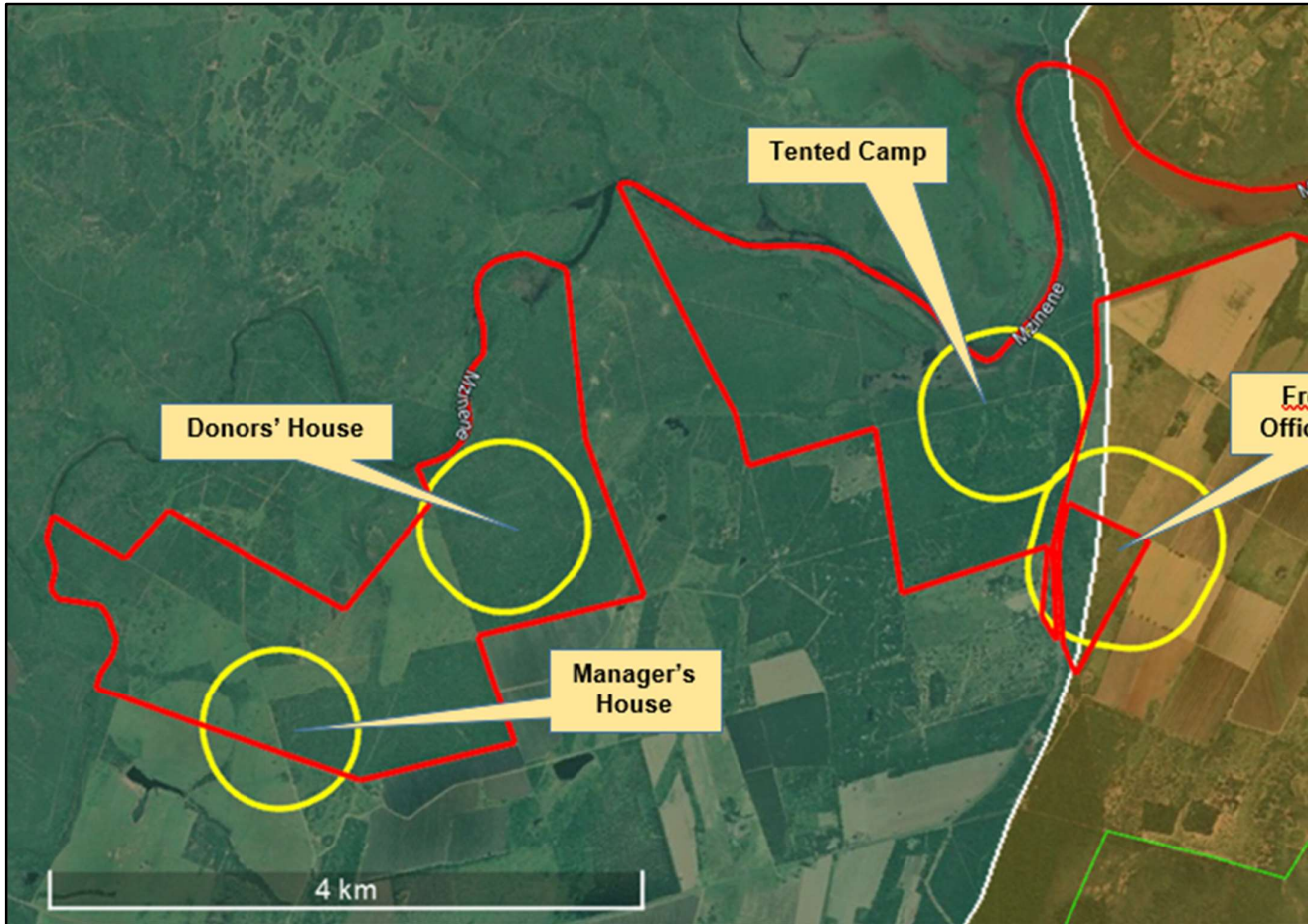


Figure 3 and Figures 12 to 15.

The identified impacts as listed in Section 8.2 and 8.3 above have been assessed by means of the Department of Water and Sanitation (DWS) Risk-based Assessment Matrix (DWS, 2014). All of the risks were assessed for conditions during the Construction Phase and with pre- and post-mitigation conditions, while the risk associated with seepage from septic tanks is also assessed for the Operational Phase. The outputs of the Matrix are shown in Table 5.

Table 5: Assessment of risks associated with development of the proposed new facilities

With/Without Mitigation	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level
Construction Phase									
Without Mitigation	Construction of new roads and upgrading of existing roads	Mobilisation of soil which could be transported into watercourses	Sediment can choke the substrate and smother plants and so lead to loss of biodiversity	1.25	3.25	8	26.0	LOW RISK	90
With Mitigation				1.0	3.0	8	24.0	LOW RISK	80
Without Mitigation	Contamination of the watercourse and wetlands by vehicles, plant and equipment leaking fuel, and oils	Spillage of hydrocarbons into the river	Hydrocarbons are toxic to aquatic fauna and may be persistent in the aquatic system.	1.5	5.5	9	49.5	LOW RISK	75
With Mitigation				1.0	3.0	9	27.0	LOW RISK	80
Without Mitigation	Tented Camp Only The tented camp site is close to two watercourses	Construction near the watercourses could lead to mobilisation of soil and sedimentation in the watercourses	Sediment can choke the substrate and smother plants and so lead to loss of biodiversity	1.25	4.25	8	34.0	LOW RISK	90
With Mitigation				1.0	3.0	8	24.0	LOW RISK	90
Without Mitigation	Provision of toilets and ablution facilities for construction workers	Toilets could leak or have spillage allowing wastes to be washed into the river	Contaminated water could percolate to the watercourse and result in contamination of the system	1.25	5.25	8	42.0	LOW RISK	85
With Mitigation				1.0	4.0	8	32.0	LOW RISK	90

With/Without Mitigation	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level
Operational Phase									
Without Mitigation	Tented Camp Only Maintenance of the access road	The road crosses two watercourses and maintenance activities could result in soil washing into the channels	Sediment can cover the substrate and fill animal habitat, and smother plants	1.25	3.25	8	26.0	LOW RISK	80
With Mitigation				1.0	3.0	8	24.0	LOW RISK	80
Without Mitigation	Tented Camp Only Seepage from toilets and ablution facilities	Seepage from toilets could enter the ground water system and be transported to down slope aquatic systems	Nutrients could contribute to eutrophication of the systems	1.25	5.25	10	52.5	LOW RISK	80
With Mitigation				1.0	3.0	10	30.0	LOW RISK	90

9. CONSIDERATION OF MITIGATORY MEASURES

In accordance with the policy of best practice it will be necessary for some mitigatory measures to be implemented in order to reduce the impacts and risk levels which might arise in the construction and operational phases of the project. Since the first potential impacts would be associated with the construction phase, the primary focus of mitigation will be to prevent impacts at that time. However, attention must also be given to the operational phase as well as to any future upgrades. Decommissioning of the infrastructure is not considered since the developments are so minor and being in a nature reserve, should persist as far as can be anticipated. The management and mitigatory measures are listed in Table 6 and should be included into the Environmental Management Programme (EMPr) for the project.

Table 6: Mitigatory measures to be used to reduce construction impacts and risks

Impact	Description	Management and Mitigation
Construction Phase		
Spillage of hydrocarbons into the river	Contamination of the watercourse and wetland areas by vehicles, plant or equipment leaking fuel, oils and other substances. Hydrocarbons are toxic to aquatic fauna and may be persistent in the aquatic system.	<ol style="list-style-type: none"> 1. No fuelling of machines or plant may be done within 20 m of a watercourse channel or wetland. 2. Drip trays must be used during refuelling. 3. Any spillages, if they occur, in these areas must be contained and cleared up immediately. Contaminated soil must be stored in appropriate containers and then be removed to an approved disposal facility. 4. An emergency clean-up kit of suitable capacity and sealable soil storage drums must be on site at all times. 5. No plant or equipment will be stored/parked within 40m of the bank of any watercourse or wetland areas when not in operation. Plant and equipment will be parked at designated parking areas. 6. All plant and equipment must be checked on a daily basis for leaks, any plant that is found to be leaking will be removed off site for maintenance.
Construction of new roads and upgrading of existing roads	Mobilisation of soil which could be transported into watercourses by storm water flows	<ol style="list-style-type: none"> 1. Ideally the road construction will be done in the dry season when rainfall is at its lowest. 2. Roads must be routed so as to avoid passing through wetlands and watercourses may only be approached at crossing points. Elsewhere a buffer strip of at least 25m in width must be adhered to. 3. During the site preparation process all soil material which is to be removed from the working area must be removed from that area. No material may be simply pushed out of the working area and into a watercourse or wetland. 4. The material which has been moved must be stockpiled or spoiled at a site which is at least 30 m away from the edge of the river macro-channel. 5. The road surface must be hardened to a standard which will prevent erosion and development of rainwater gullies. The use

Impact	Description	Management and Mitigation
		<p>of a concreted surface or, at least, concrete strips, is recommended.</p> <ol style="list-style-type: none"> 6. Herringbone drains to remove water from the road must be included at intervals not exceeding 30 m on the steeper slopes. 7. No road drains may discharge into an area within 20m of a watercourse or wetland. 8. All road verges and surrounds are to be fully stabilised and be revegetated with local indigenous grass species at the completion of construction. Stabilisation techniques should be biased toward “soft” engineering such as banks which are sloped to below the natural angle of repose of the material, and to vegetation cover. “Hard” solutions such as gabions and walls should only be used if no other option is available.
<p>Building of the proposed facilities including the water pipelines</p>	<p>Building operations entail importing a wide variety of construction materials but also the generation of wastes such as paper, plastics, food containers, cement bags, rubble, scrap materials, etc.</p>	<ol style="list-style-type: none"> 1. Site preparation including the water pipeline trenches must include all soil management procedures with especial reference to not spoiling or stockpiling within 30m of a watercourse. 2. Pipeline trenches must be routed so as to avoid passing within 25m of the edge of any wetland other than watercourses which have to be crossed. 3. Building materials must all be stored within the site footprint. 4. During the construction phase, construction and domestic wastes must be collected in waste bins or skips that are located on site. The content of these must be removed on a daily basis to a collection point in the site camp from where the waste can be cleared on a weekly basis. The collected waste must be disposed of at a municipal landfill facility and proof thereof be retained. 5. Appropriate skips or waste bins must be placed at a number of points around the working areas. 6. No waste may be disposed of on-site by any means including burying or burning. 7. Hazardous waste must be collected and stored in bins in the construction camp prior to being removed from the site by a registered service provider for disposal. The bins must have

Impact	Description	Management and Mitigation
		<p>lids and must be marked as being hazardous. They must be stored in a designated and enclosed area, and may not be used for any other purpose.</p> <p>8. All areas must be cleared of alien weed species which may appear and must be kept weed free in accordance with the nature reserve standards and procedures.</p>
Toilets and ablution facilities could spill or leak human wastes into the river	Human wastes could constitute a health hazard	<ol style="list-style-type: none"> 1. During the construction process, chemical toilets must be provided for the building workers. 2. The capacity and functionality of the toilets must be monitored on a daily basis. 3. If, the during the monitoring, it is found that the tanks are at 80% of their capacity, they must be cleared within two days of the monitoring event. 4. The disposal of the sewage waste must be done by a registered service provider who will dispose of the material at an approved facility. 5. The permanent toilets should ideally be of a type which has low water usage so as to minimise percolation of waste water into the ground water system. 6. Where possible, such as in the tented camp, multiple tanks spread over a wide area should be installed so as to spread the area over which percolation will occur. The spread may be further increased through widely dispersed soakaway facilities.
Operational Phase		
Mobilisation of soil as a result of erosion at building sites, or along road and pipeline routes	Mobilisation of soil which could be transported into watercourses by storm water flows	<ol style="list-style-type: none"> 1. All sites must be checked for any signs of soil erosion on at least a quarterly basis. 2. Any erosion found must be addressed immediately and be rehabilitated as is appropriate to the site. 3. Once the site has been repaired and revegetation done, an ongoing check must be undertaken for invasion by alien plant species. If any are found they are to be eradicated immediately.

Impact	Description	Management and Mitigation
Movement of contaminated water from septic tanks	Human wastes could constitute a health hazard	<ol style="list-style-type: none"> 1. This impact can only be mitigated in the construction phase through careful location and design of the toilet sites.
Generation of wastes	Operation of the GUNR will result in the generation of wastes such as paper, plastics, food containers, scrap materials, etc.	<ol style="list-style-type: none"> 1. During the operational phase, domestic wastes must be collected in waste bins or skips that are located at the various sites. The content of these must be removed on a daily basis to a covered and fenced collection point from where the waste can be cleared on a weekly basis. The collected waste must be disposed of at a municipal landfill facility and proof thereof be retained. 2. Appropriate skips or waste bins must be placed at a number of points around the working areas. 3. No waste may be disposed of on-site by any means including burying or burning. 4. Hazardous waste must be collected and stored in bins in the construction camp prior to being removed from the site by a registered service provider for disposal. The bins must have lids and must be marked as being hazardous. They must be stored in a designated and enclosed area, and may not be used for any other purpose. 5. All areas must be cleared of alien weed species which may appear and must be kept weed free in accordance with the nature reserve standards and procedures.
Upgrade or Decommissioning Phases		
When the facility is eventually upgraded or decommissioned the same objective of protecting the river and the wetlands remains and so the management and mitigation measures listed above should be referred to as guidelines.		

10. MONITORING REQUIREMENTS

The construction of the proposed developments must be monitored by an appropriately qualified Environmental Control Officer (ECO) during the construction phase. The purpose of the monitoring will be to check that no watercourse or wetland is being impacted upon in any way including inputs of soil/sediment, liquid wastes of any sort, and solid wastes generated by the building activities.

10.1 Monitoring actions and locations

The monitoring programme provided for below must be conducted by an independent, suitably qualified ecological specialist or specialists.

The monitoring programme will ensure that the stipulated construction and operational conditions which have been included in the EMP are adhered to, and to monitor the condition of the aquatic systems. All of the building sites are to be monitored as well as the various road upgrades and water pipeline trenches. Apart from direct observations, a photographic record must be compiled and, at all watercourse crossing points, at least one fixed point photographic site should be established. The recorded views of the sites will be such that any sediment inputs or damaging changes to the banks can be noted and recorded.

10.2 Monitoring Actions and Frequency

Table 7 lists the required monitoring actions and schedules

Table 7: Monitoring actions to be carried out

Actions	Frequency	Rationale
Familiarisation visit to all the various sites prior to the start of any construction. The monitoring sites will be visited and fixed photo points will be selected and documented.	About one month before the start of any construction works.	To meet with the reserve manager and to acquire baseline data, including photographs, which may be used as a benchmark against which the results of future monitoring may be measured.
Visit by the ECO at the start of the construction phase	One visit	The visit at the start of the construction process is called for to ensure that the initial clearing work is done according to the required conditions.

Actions	Frequency	Rationale
Monitoring visits by the ECO to the construction area. To include fixed point photography.	Monthly for the remaining duration of the construction and sign-off phases.	The ECO will check that all the required environmental stipulations in the EMP are being adhered to and will report on the findings as required by Appendix 7 of the NEMA: Environmental Impact Assessment Regulations of 2014 (as amended).
Ecological monitoring. To include fixed point photography.	Six monthly for the duration of the construction and sign-off phases.	The results of the monitoring will form a long term record of the development process.

Each monitoring event must be reported on and the reports be submitted to the Umkhanyakude District Municipality, EDTEA, The DWS, and the project engineers as required.

10.3 Procedures for the monitoring programme

The focus of the sampling aspects is to investigate any traces of damage to the environment beyond the footprints of the various development sites. Therefore, the ECO will consider the following:

- Movement of loose soil out of the site. A search must be made for any indications that loose soil is being transported from the site. Possible origins of such materials could include building platforms, soil heaps whether stockpiles or spoil heaps, roads, pipeline trenches. Areas of particular concern will be watercourses, wetlands, and their surrounds.
- Damage to watercourses at road or pipeline crossings. At any place where a watercourse or wetland is approached or crossed, the ECO is to ensure that the banks or margins are not permanently damaged. Care must be taken to ensure that the areas are left in a stable condition and that they are revegetated with locally indigenous grasses.
- The areas downslope of any septic tanks should be walked over in the dry season to look for any traces of unnatural groundwater seepage. If any are found, an appropriate

specialist must be consulted to determine means of further dispersion of the flows at site.

- All sites must be photographed and a specific repository for the image files and/or prints be established.

11. CONCLUSION AND RECOMMENDATIONS

The watercourses and wetlands within the Greater Ukuwela Nature Reserve have been visited and assessed in relation to the proposed development of four sites within the reserve. Following from the field survey, possible risks and impacts posed by the project have been investigated and their possible significance has been quantified. The approach taken was to address the requirements of both the National Environmental Management Act (Act No. 107 of 1998) and the National Water Act (Act No. 36 of 1998) and so the observations made in the field were interpreted in slightly different ways.

11.1 Background conditions

Examination of the river channel and its surrounds, showed the river to be in moderately good condition. It is listed in the NFEPA database as being a PES Category A system. However, this status is questioned as there is a large earthen dam located within the nature reserve section just upstream of the Road R22 crossing bridge. This dam has been in place since at least 1960 since it may be seen in an aerial survey photograph dated 1-7-60. The wall is high enough for the channel all through the Mfuleni section to partially filled on a permanent basis. A second, but smaller dam partly fills the channel of the Ukuwela property section. This inundation has caused the loss of some riverine wetlands and, in places where the banks are steep, there is virtually no aquatic vegetation. However, a robust riparian vegetation dominated by large trees such as Fever Trees (*Acacia xanthophloea*) and several Fig Tree species (*Ficus* spp.) has developed. Remaining backwater sections have developed permanent reedbeds and will be further filled by flood flows. There is a diverse avian fauna and aquatic animals such as Hippos (*Hippopotamus amphibius*) and Nile Crocodiles (*Crocodilus niloticus*) were seen.

11.2 Impact assessment

The impact assessment carried out in terms of NEMA found that all the foreseen impacts have a significance score of Low (Table 3). The reason for this is that, most of the developments are located well away from any watercourse or wetland.

11.3 Risk assessment

The DWS Risk-based Matrix was used to determine the risks that the project poses to the regulated area of the watercourses and wetlands in terms of the National Water Act. It was found that all the construction phase risks that could be scored were rated as being Low. See Table 5. Some were so minor that the matrix cannot provide for them and so should be rated as being "No Risk". Risks linked to the operational phase are largely very small but there is a need for caution in regard to seepage from septic tanks in the tented camp site having an impact on nearby watercourses.

11.4 Mitigation of impacts and risks

Despite the very low ranking of the impacts and risks determined by the assessment processes, a suite of mitigatory measures has been put forward. See Table 6. These measures are designed to safeguard the riverine and wetland ecosystems and are to be included into the EMP for the project.

11.5 Summary

It is believed that the site of the proposed developments within the GUNR have been investigated and assessed sufficiently and thoroughly to allow for a decision to be made in regard to the further progression of the project. The construction phase will have very low potential for any impacts on the watercourses or wetlands and they will be short term impacts largely restricted to that phase. All can be reduced even further by careful management of the construction sites and process. In the operational phase the impacts arising from the operation and maintenance of the facilities will obviously persist through a longer time. Impacts from routine road and site maintenance are very limited and can easily be reduced through monitoring of the areas and then addressing any problems as they arise. Seepage from the tented camp septic tanks is a longer term issue but it too can be reduced through proper design and construction. Against these impacts are the major positive impacts of provision of new jobs and of the sustainable development of a new conservation area in a part of the province of KwaZulu-Natal which has very high biodiversity values and which is in direct linkage with the Isimangaliso Wetland Park which is both a world heritage site and a Ramsar site. The Mzinene River which flows along the reserve boundary will, in effect, become an integral part of the park and so contribute to the well-being of that area. In addition, since the northern bank of the river is also in a private conservation area, the protection of the south bank will give the lower reaches of the river enhanced conservation value. It is therefore the opinion of the specialist that the construction of the new facilities will have no fatal flaws but will contribute to sustainable job creation and biodiversity conservation in the region, and may therefore be authorised but only subject to certain conditions. These conditions are as follows:

- i. The mitigatory measures put forward must be adhered to.
- ii. The appointed ECO must have authority to motivate for further measures if unforeseen impacts arise.
- iii. The proposed monitoring measures must be put in place and be rigorously implemented.

12. REFERENCES

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ANNEXURE 1

Scoring System Used to Rate Impacts

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).

Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been

consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.

3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.

2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE (S)

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

$$\text{Significance} = (\text{Extent} + \text{probability} + \text{reversibility} + \text{irreplaceability} + \text{duration}) \times \text{magnitude/intensity.}$$

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.

43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

ANNEXURE 2

Compliance with the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity

Protocol Requirement	Compliance
The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP), with expertise in the field of aquatic sciences.	J. Alletson. SACNASP Registration No 125697
The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 4 Section 7
The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects: <ul style="list-style-type: none"> • a description of the aquatic biodiversity and ecosystems on the site; • aquatic ecosystem types; • presence of aquatic species, and composition of aquatic species communities; • the threat status of the ecosystem and species as identified by the screening tool; • an indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status; and • a description of the ecological importance and sensitivity of the aquatic ecosystem. 	Section 3 Section 5
The assessment must identify alternative development footprints within the preferred site which would be of a “low” sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate	Section 8
Related to impacts, a detailed assessment of the potential impacts of the proposed development.	Section 8 Section 9
How will the proposed development impact on the functioning of the aquatic feature?	Section 8
How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Section 8
The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information: <ul style="list-style-type: none"> • contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae; • a signed statement of independence by the specialist; 	Header Page Section 4 Section 7 Section 8 Section 6 Section 9 Section 10

Protocol Requirement	Compliance
<ul style="list-style-type: none"> • a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment; • the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant; • a description of the assumptions made, any uncertainties or gaps in knowledge or data; • additional environmental impacts expected from the proposed development; • any direct, indirect and cumulative impacts of the proposed development on site; • the degree to which impacts and risks can be mitigated; • the degree to which the impacts and risks can be reversed; • the degree to which the impacts and risks can cause loss of irreplaceable resources; • proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr); • a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and • any conditions to which this statement is subjected. 	