FRANCES BAARD

District Municipality / Distriksmunisipaliteit

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March 2018

Biodiversity Study

Title: Ganspan Wetland Reserve: Draft Biodiversity Assessment

Prepared for: Frances Baard Disrict Municipality
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Attention: The Municipal Manager

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Contents of the specialist report

The contents of this specialist report complies with the legislated requirements as described in Appendix 6 of the National Environmental Management Act (No 107 of 1998; NEMA) Regulations of 2014 and updated in 2017 (GN R. 326 of 2017).

Appendix 6
Specialist Reports

1. (1) A specialist report prepared in terms of these Regulations must contain—
   - (a) details of—
     - (i) the specialist who prepared the report; and
     - (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;
   - (b) a declaration that the specialist is independent in a form as may be specified by the competent authority;
   - (c) an indication of the scope of, and the purpose for which, the report was prepared;
   - (cA) an indication of the quality and age of base data used for the specialist report;
   - (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;
   - (d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;
   - (e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;
   - (f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;
   - (g) an identification of any areas to be avoided, including buffers;
   - (h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;
   - (i) a description of any assumptions made and any uncertainties or gaps in knowledge;
   - (j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
   - (k) any mitigation measures for inclusion in the EMPr;
   - (l) any conditions for inclusion in the environmental authorisation;
   - (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;
   - (n) a reasoned opinion—
     - (i) whether the proposed activity, activities or portions thereof should be authorised;
     - (iA) regarding the acceptability of the proposed activity or activities; and
     - (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;
   - (o) a description of any consultation process that was undertaken during the course of preparing the specialist report;
   - (p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
   - (q) any other information requested by the competent authority.

(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.

THE PROJECT TEAM

1. (1) A specialist report prepared in terms of these Regulations must contain—
   (a) details of—
      (i) the specialist who prepared the report; and
      (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;
   (b) a declaration that the specialist is independent in a form as may be specified by the competent authority;

Mr Roy de Kock *M.Sc., Pri. Nat. Sci.*
(Biodiversity Specialist)

SACNASP Registration Number: 400216/16

Roy is a Principal Consultant holding a BSc Honours in Geology and an MSc in Botany from the Nelson Mandela University in Port Elizabeth. He has recently started a PhD in Botany focussing on the impact of fracking fluids on vegetation and soils in the Karoo Basin. He has been working for EOH since 2010, and is based at the East London branch where he focuses on Vegetation, Biodiversity, Ecological and Agricultural Assessments, Geological and Geotechnical analysis, Environmental Management Plans, mining applications and various environmental impact studies. Roy has worked on numerous projects in South Africa and Africa at large. Roy is registered with the South African Council for Natural Scientific Professional (SACNASP).

Dr Greer Hawley *Pri. Nat Sci.*
(Report reviewer)

Greer has a BSc degree in Botany and Zoology and a BSc Honours in Botany from the University of Cape Town. She completed her PhD thesis (Microbiology) at Rhodes University. Greer has been involved in a number of diverse activities. The core academic focus has been directed in the field of taxonomy both in the plant and fungal kingdom. Greer's research ranges from studying fresh and marine algae, estuarine diatoms, Restio species classification in the fynbos and forest vegetation and fungal species identification and ecology. Greer's study of fungi have also contributed towards an understanding of soil ecology and "*below ground*" ecology. She is currently working on numerous impact assessments at the East London branch

Expertise:

Relevant projects Roy and Greer have worked on include:

Name of project	Description of responsibility	Date completed
Indwe Biodiversity Study on the development of a new essential oils farm outside Kidds Beach, East London, Eastern Cape	Biodiversity study for an essential oils farming development	December 2017
Earth Free (Pty) Ltd Biodiversity study for a housing development in Kei Road, Eastern Cape	Biodiversity study for a housing development extension	October 2017
City of Johannesburg Biodiversity Assessment and Conservation management Plans for 4 Nature Reserves	Vegetation and Ridgeline Biodiversity Study	January - April 2017
Terreco Butterworth Bypass Alternatives EIA (EC)	Botanical and Biodiversity Assessment	Oct 2016
Terreco Idutywa Bypass Alternatives EIA (EC)	Botanical and Biodiversity Assessment	Oct 2016
SANRAL N2 between Tetyana & Sitebe Komkulu EIA (EC)	Ecological Impact Assessment	June 2015
Laman Mining renewal of Mining License (EC)	Botanical Impact Assessment	February 2015
ACSA East London Airport Vegetation Study (EC)	Botanical & Biodiversity Impact Assessment	February 2014
SANRAL R61 Baziya to Mthatha EIA (EC)	Ecological Impact Assessment	November 2014
SANRAL Rehabilitation of the N9, Middelburg (EC)	Ecological Impact Assessment	June 2013

Declaration:

Role on Study Team	Declaration of independence
Report Writing and Mapping	I, **Roy de Kock**, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.
Project Management and Report Review	I, **Greer Hawley**, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Table of Contents

1. Introduction

1. (1) A specialist report prepared in terms of these Regulations must contain—
(c) an indication of the scope of, and the purpose for which, the report was prepared;
(cA) an indication of the quality and age of base data used for the specialist report;
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
(q) any other information requested by the competent authority.

1.1. Project description

The Frances Baard District Municipality (FBDM) is planning the upgrading of the formerly known Ganspan-Pan Waterfowl Nature Reserve (now called the Ganspan Wetland Reserve) situated on Erf 357 of Vaalharts settlement B in the Phokwane Municipality.

The project involves the development and upgrading of infrastructure on the banks close to Ganspan in order to restore the area as a safe, attractive and durable tourism attraction.

The following activities (Figure 1.1) are envisioned by FBDM and will be assessed in the Biodiversity Assessment:

- Fishing;
- Camping facilities;
- Bird-viewing;
- Braai and picnic Spots;
- Hiking and biking trails;
- Children playground;
- Restaurant;
- Self-catering chalets;
- Jetties for boat launches;
- Informal market area; and
- Multipurpose centre

Figure 1.1: Proposed new infrastructure layout for the Ganspan Wetland Reserve.

1.2. Project location

The project is located on Erf 357 of Vaalharts settlement B outside Jan Kempdorp in the Phokwane Local Municipality (Figure 1.2). The site is currently zoned as a Nature Reserve.

1.3. Objectives

The objectives of the project are the following:

- To conduct a detailed biodiversity assessment study for the proposed upgrading of the formerly known Ganspan-Pan Waterfowl Nature Reserve; and
- To provide a report that complies with the biodiversity assessment legislative framework.

The following scope of work has been included in the Biodiversity Assessment:

- Baseline data collection;
- Conduct field work to assess the status quo of the flora and fauna;
- Analyse aerial photographs, delineating physiognomic habitat units;
- Identify indigenous fauna and flora associated with habitat components; Assessment of significance of biodiversity i.e. species composition and conservation status;
- Identify exotic (alien and invasive) fauna and flora;
- Provide the threatened status of ecosystems i.e. critically endangered, endangered, vulnerable, or protected;
- Determine best practice for the promotion of conservation of soil, water and vegetation;
- Map habitats of identified threatened species; and
- Provide mitigation measures to avoid or minimise biodiversity damage

1.4. Approach

The study site and surrounding areas were assessed using a two-phased approach. Firstly, a desktop assessment of the site was conducted in terms of current vegetation classifications and biodiversity programmes and plans. This included the consideration of:

- The South African Vegetation Map (Mucina and Rutherford, 2012);
- Northern Cape Critical Biodiversity Areas (2016);
- Department of Agriculture, Fisheries and Forestry (DAFF) - Indigenous forest maps;
- National Freshwater Ecosystem Priority Areas (NFEPA) - Water bodies and wetlands; and
- National Environmental Management Biodiversity Act (NEMBA) - Biodiversity Regulations.
- Plant of South Africa (POSA) – Quarter degree square level

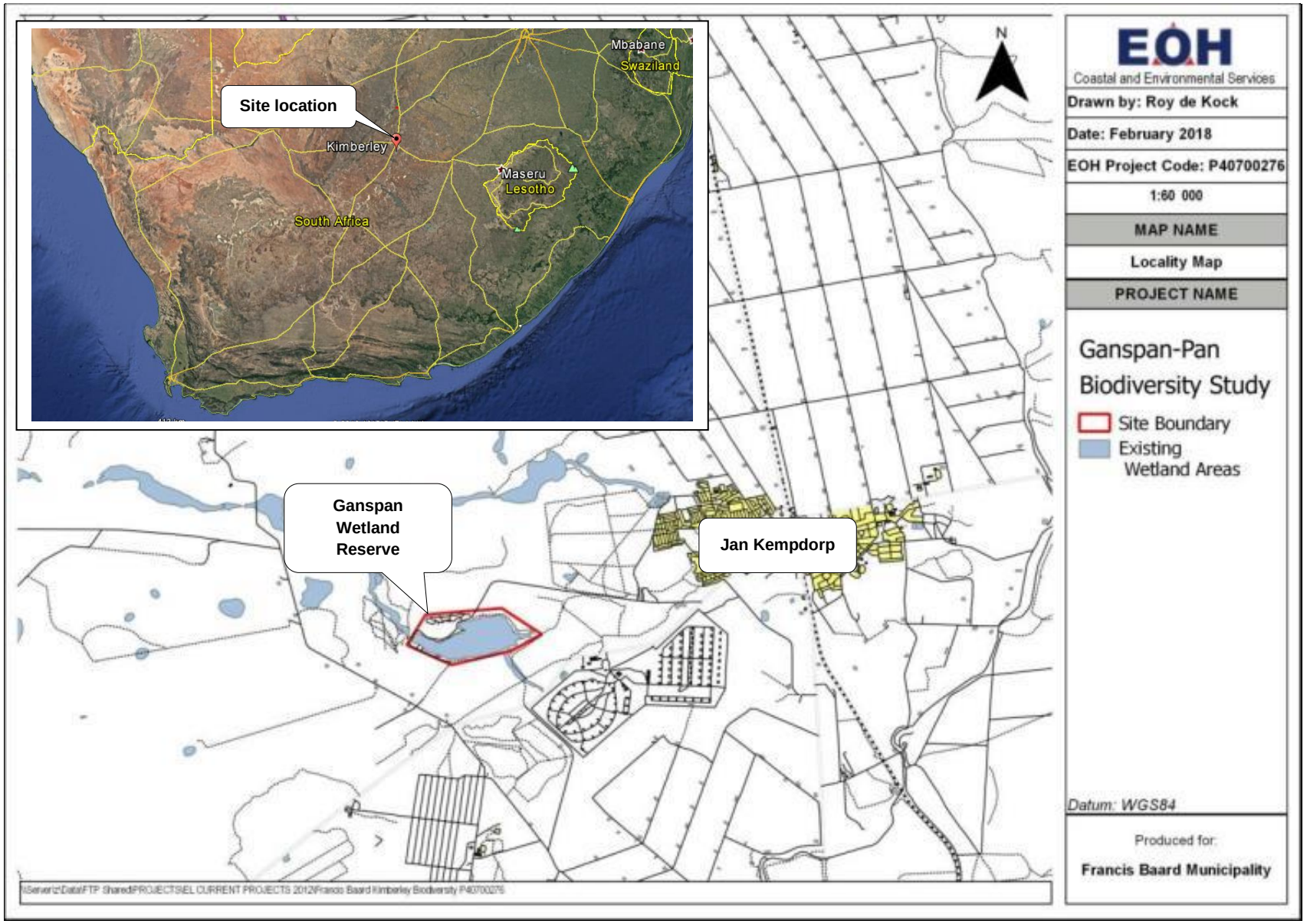

Figure 1.2: Locations of the proposed Ganspan Wetland Reserve.

A site visit was conducted between the 07th and the 9th February 2018. The site visit was used to conduct biodiversity surveys (floral, faunal, ecosystem) and to identify potential impacts of the proposed Ganspan Wetland Reserve development on the surrounding natural environment and to inform the significance of the potential impacts identified.

1.5. Assumptions and limitations

As mentioned earlier, the study sites and surrounding areas were described using a two-phased approach.

Firstly, a desktop assessment of the site was conducted in terms of current vegetation classifications and biodiversity programmes and plans. This was followed by a site visit between the 07th and 09th of February 2018 in order to assess the actual ecological state, current land-use, identify potential sensitive ecosystems and identify plant and animal species associated with the proposed project activities (see Chapter 5). The presented data on biodiversity assessments was based on a single site survey of plant and animal species conducted in February 2018 (late summer).

1.6. Public consultation

No consultation requirements were identified during the drafting of this specialist report. The findings should be presented to stakeholders and I&APs during a public meeting as part of the Environmental Impact Assessment (EIA) Public Participation Process (PPP).

No comments were received to date on this report.

2. Assessment methodology

Appendix 6
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The objective of this assessment is to identify areas of ecological importance and to evaluate these in terms of their conservation importance. In order to do so, the ecological sensitivity of the area is assessed in addition to identifying plant and animal Species of Conservation Concern (SCC) that may occur in habitats present in the area.

To achieve this, this study must identify areas of high sensitivity and assess this against possible impacts as a result of the proposed development layout. The SANBI Guidelines for a botanical assessment (Driver *et al*; 2009) was used for guidance.

Aspects that affect biodiversity impact significance include:

- Presence of plant SCC;
- Presence of animal SCC;
- Vegetation types (which also constitute faunal habitats) of conservation concern;
- Presence of threatened ecosystems;
- Areas of high biodiversity; and
- The presence of process areas:
    - Ecological corridors; and
    - Complex topographical features (especially steep and rocky slopes or aquatic environments that provide niche habitats for plants and/or animals).

It is not the aim of this study to produce a complete list of all plant and animal species occurring in the region, but rather to examine a representative sample. It is however, important to note that areas of high sensitivity as well as SCC have been identified as far as possible, either from records from the site or a review of their habitat requirements, and whether or not these habitats occur within the site.

2.1. Species of conservation concern

Plant SCC in terms of the project area is defined as:

1. Plant species listed in the revised South African Red Data Books (Driver *et al* 2009);
2. Plants listed in the Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974; NECO/PNCO)
3. Plant species listed in the NEMBA Threatened or Protected Species List (G.NR. 256 of 2015)
4. Species included in other international lists (e.g., 2010 International Union for Conservation of Nature (IUCN) Red List of Threatened Plants).

Animal SCC in terms of the project area is defined as:

1. Animal species listed in the Endangered or Vulnerable categories in the revised South African Red Data Books (SA RDB – amphibians, du Preez and Carruthers, 2009; reptiles, Branch 1988; birds, SA Birding, 2008; terrestrial mammals, Apps, 2017); and/or
2. Species included in other international lists (e.g., 2010 International Union for Conservation of Nature (IUCN) Red List of Threatened Animals).

Definitions:

The South African (SA) Red List system contains nine categories, with the main purpose of classifying species from lowest (Least Concern) to highest (Critically Endangered) threat in terms of risk of extinction (see Figure 2.1). Species that are at high risk of extinction are placed in one of three categories: Vulnerable (VU), Endangered (EN) or Critically Endangered (CR). If a species is classified into one of these three categories, it is an SCC.

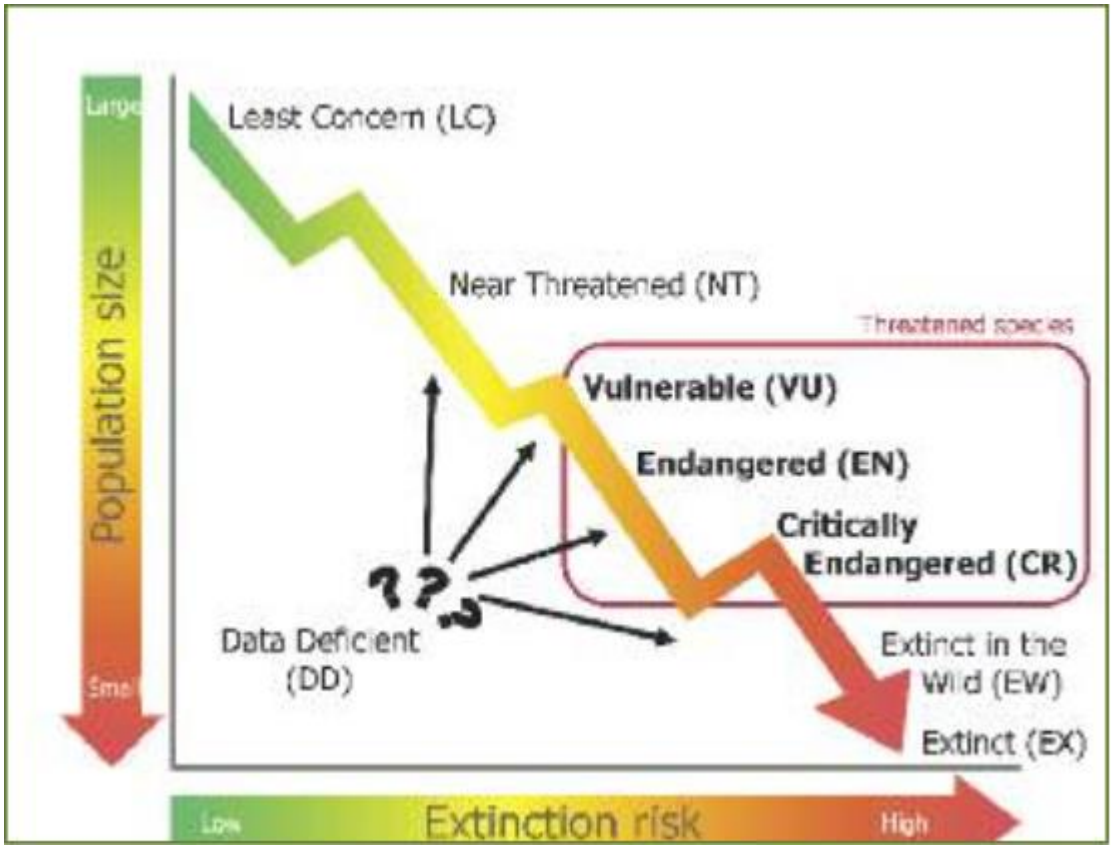


Figure 2.1: The SA Red List system categorizes species according to their risk of extinction (Source: SA Red Data Guidelines).

A species' classification is guided by five criteria relating to different biological factors that indicate danger of extinction (Table 2.2). A species should always be evaluated against all five criteria, but available data only need to meet the requirements for at least one criterion in order to classify a species as threatened. A species is always classified in the highest category of threat for which it meets the quantitative thresholds of at least one criterion.

The following management guidelines for threatened species are provided in Table 2.1 below (Source: SA Red Data Guidelines):

Table 2.1: Guidelines for the management of the various categories

Status	Criterion*	Guidelines for Recommendation
[a] *Please notify the Threatened Species Programme immediately and provide details of the location, size and threats to the subpopulation. The fact that a subpopulation of the species was found at a site zoned for development means that its Red List status has to be reviewed and is likely to be upgraded.*		
** Refer to Table 2.2 for criteria descriptions*		
[a]Critically Endangered	E	No further loss of natural habitat should be permitted as the species is on the brink of extinction, and all other known subpopulations have been lost. The subpopulation in question is likely to be newly discovered and the only remaining subpopulation of this species.
Critically Endangered	A,B,C,D	No further loss of natural habitat should be permitted as the species is on the verge of extinction.
Endangered	B,C,D	No further loss of habitat should be permitted as the species is likely to go extinct in the near future if current pressures continue. All remaining subpopulations have to be conserved if this species is to survive in the long term.
Endangered	A	If the species has a restricted range (< 2 000 km^2), recommend no further loss of habitat. If range size is larger, the species is possibly long- lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the National Environmental Management: Protected Areas Act (Act 57 of 2003), and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
[a]Vulnerable	D	This species either constitutes less than 1 000 individuals or is known from a very restricted range. No further loss of habitat should be permitted as the species' status will immediately become either Critically Endangered or Endangered, should habitat be lost.
Vulnerable	B,C	The species is approaching extinction but there are still a number of subpopulations in existence. Recommend no further loss of habitat as this will increase the extinction risk of the species.
Vulnerable	A	If the species has a restricted range, < 2 000 km^2, recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the Protected Areas Act, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
[a]Data Deficient	D	This species is very poorly known, with insufficient information on its habitat, population status or distribution to assess it. However, it is highly likely to be threatened. If a Data Deficient species will be affected by a proposed activity, the subpopulation should be well surveyed and the data sent to the Threatened Species Programme. The species will be reassessed and the new status of the species, with a recommendation, will be provided within a short timeframe.

Status	Criterion*	Guidelines for Recommendation
Data Deficient		There is uncertainty regarding the taxonomic status of this species, but it is likely to be threatened. Contact the taxonomist working on this group to resolve its taxonomic status; the species will then be reassessed by the Threatened Species Programme.
[a]Near Threatened	D	Currently known from fewer than 10 locations, therefore preferably recommend no loss of habitat. Should loss of this species' habitat be considered, then an offset that includes conserving another viable subpopulation (in terms of the Protected Areas Act) should be implemented, provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Near Threatened	B,C	The species is approaching thresholds for listing as threatened but there are still a number of subpopulations in existence and therefore there is need to minimise loss of habitat. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.
Near Threatened	A	If the species has a restricted range, < 2 000 km^2, then recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant biodiversity conservation plan or (iii) on a site associated with additional ecological sensitivities.
[a]Critically Rare		This is a highly range-restricted species, known from a single site, and therefore no loss of habitat should be permitted as it may lead to extinction of the species. The Threatened Species Programme is not aware of any current threats to this species and should be notified without delay.
[a]Rare		The species is likely to have a restricted range, or be highly habitat specific, or have small numbers of individuals, all of which makes it vulnerable to extinction should it lose habitat. Recommend no loss of habitat. The Threatened Species Programme is not aware of any current threats to this species and should be notified without delay.
Declining		The species is declining but the population has not yet reached a threshold of concern; limited loss of habitat may be permitted. Should the species is known to be used for traditional medicine and if individuals will not be conserved *in situ*, plants should be rescued and used as mother stock for medicinal plant cultivation programmes.

Table 2.2: The biological indicators of extinction risk as contained in each of the five SANBI criteria

Criterion	Biological indicator	Risk factor	Quantitative thresholds		
			CR	EN	VU
A	Large and rapid reduction in population size relative to the life history of the species	Proportion by which population is reduced	>80%	>50%	>30%
B	Small geographic range and decline, population fluctuation or fragmentation	Extent of occurrence (EOO) Area of occupancy (AOO)	<100 km² <10 km²	<5 000 km² <500 km²	<20 000 km² <2 000 km²
C	Small population size and decline	Population size Number of mature individuals in largest subpopulation Proportion of population in largest subpopulation	<250 <50 >90%	<2 500 <250 >95%	<10 000 <1 000 100%
D	Critically small population size or very restricted distribution	Population size Area of occupancy (AOO) Number of locations	<50	<250	<1 000 <20 km² Five or fewer
E	Quantitative analysis of extinction risk	Probability of extinction over a specified time period	50%	20%	10%

2.2. Sampling protocol

The entire Ganspan Wetland Reserve study area was inspected to evaluate vegetation, animal and ecosystems and to provide more detailed information on the communities present. The site inspection took into account the amount of time available for the study and limitations such as the seasonality of the vegetation.

Vegetation communities were described according to the dominant species recorded from each type. These were mapped and assigned a sensitivity score.

The assessment of animals was based on a general observation of species noted onsite during the site assessment, but with particular consideration of known potential animal SCC.

2.3. Vegetation mapping

Mucina and Rutherford (2012) developed the National Vegetation map as part of a South African National Biodiversity Institute (SANBI) funded project: "*It was compiled in order to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before*." The SANBI Vegetation map was developed using a wealth of data from several contributors and has allowed for the best national vegetation map to date, the last being that of A Cocks developed over 50 years ago. This SANBI Vegetation map project has two main aims:

- to determine the variation in and between units of southern African vegetation based on the analysis and synthesis of data from vegetation studies throughout the region; and
- to compile a vegetation map. The aim of the map was to accurately reflect the distribution and variation on the vegetation and indicate the relationship of the vegetation with the environment. For this reason the collective expertise of vegetation scientists from universities and state departments were harnessed to make this project as comprehensive as possible.

The SANBI Vegetation map describes each vegetation type in detail, along with the most important species including endemic species and those that are biogeographically important. This is the most

comprehensive data for vegetation types in South Africa. In this study the SANBI Vegetation map is used to inform anticipated site conditions regarding the vegetation type occurring on the property.

2.4. Sensitivity assessment

The sensitivity assessment approach entails identifying zones of high, moderate and low sensitivity according to a system developed by EOH CES and used in numerous biodiversity studies. It must be noted that the sensitivity zonings in this study are based solely on ecological characteristics and social and economic factors have not been taken into consideration. The sensitivity analysis described here is based on 11 criteria which are considered to be of importance in determining ecosystem and landscape sensitivity. The method predominantly involves identifying sensitive vegetation or habitat types, topography and land transformation and biodiversity patterns (hotspots) and biodiversity process areas (ecological infrastructure and corridors) (Table 2.3).

Although very simple, this method of analysis provides a good, yet conservative and precautionary assessment of the ecological sensitivity.

Table 2.3: Criteria used for the analysis of the sensitivity of the area.

CRITERIA		LOW SENSITIVITY	MODERATE SENSITIVITY	HIGH SENSITIVITY
1	**Topography**	Level or even	Undulating; fairly steep slopes	Complex and uneven with steep slopes
2	**Vegetation** - Extent or habitat type in the region	Extensive	Restricted to a particular region / zone	Restricted to a specific locality / site
3	**Conservation status** of fauna / flora or habitats	Well conserved independent of conservation value	Not well conserved, moderate conservation value	Not conserved - has a high conservation value
4	**Species of special concern** - Presence and number	None, although occasional regional endemics	No endangered or vulnerable species, some indeterminate or rare endemics	One or more endangered and vulnerable species, or more than 2 endemics or rare species
5	**Habitat fragmentation** leading to loss of viable populations	Extensive areas of preferred habitat present elsewhere in region not susceptible to fragmentation	Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation	Limited areas of this habitat, susceptible to fragmentation
6	**Biodiversity** contribution	Low diversity or species richness	Moderate diversity, and moderately high species richness	High species diversity, complex plant and animal communities
7	**Erosion potential** or instability of the region	Very stable and an area not subjected to erosion	Some possibility of erosion or change due to episodic events	Large possibility of erosion, change to the site or destruction due to climatic or other factors

CRITERIA		LOW SENSITIVITY	MODERATE SENSITIVITY	HIGH SENSITIVITY
8	**Rehabilitation** potential of the area or region	Site is easily rehabilitated	There is some degree of difficulty in rehabilitation of the site	Site is difficult to rehabilitate due to the terrain, type of habitat or species required to reintroduce
9	**Disturbance** due to human habitation or other influences (alien invasive species)	Site is very disturbed or degraded	There is some degree of disturbance of the site	The site is hardly or very slightly impacted upon by human disturbance
10	**Ecological function** in the landscape (corridor, niche habitats)	Low ecological function. No corridors or niche habitats	N/A (There are NO moderate ecological functions. It is considered either high or low)	High ecological function. Portions of entire sections of the site contains corridors or niche habitats
11	**Ecological services** (food, water filter, grazing, etc.)	Low to no ecological services on site	Some sections of the site contains ecological services	Most of the site contains ecological services

A sensitivity map was also developed with the aid of a satellite image so that the sensitive regions and vegetation types could be plotted (see Chapter 6). The following was also taken into account:

2.4.1. Biodiversity Regulations

National:

The National Environmental Management: Biodiversity Act, (Act No. 10 OF 2004) (NEM:BA) provides a National List of Ecosystems that are threatened and in need of protection – GN 1002 of 2011. These areas are included in the sensitivity map.

Provincial:

The Northern Cape Critical Biodiversity Areas (CBA) Map identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

The identification of CBAs for the Northern Cape was undertaken using a Systematic Conservation Planning approach. Available data on biodiversity features (incorporating both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation were collated. Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

The main output of the Northern Cape CBA is a map of "*critical biodiversity areas*" (CBAs) and Ecological Support Areas (ESA's) which are associated with the following management recommendations:

Outputs	Description	Management requirement
CBA 1	These are areas that are irreplaceable or near-irreplaceable (i.e. high selection frequency) for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas	– Areas must remain in good ecological condition in order to meet biodiversity targets. – Must be maintained in natural ecological condition
CBA 2	These are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and/or avoidance of conflict with other land or resources uses.	– Areas must remain in good ecological condition in order to meet biodiversity targets. – Must be maintained in near-natural ecological condition
ESA 1	These are ESAs that are currently in either good or fair ecological condition, for which the objective is to retain them in at least fair ecological condition.	– Areas that must remain in at least fair ecological condition in order to meet biodiversity targets, support ecological functioning, or deliver ecosystem services – Maintain in at least semi-.natural ecological condition
ESA 2	Areas in which further deterioration in ecological condition must be avoided in order to meet biodiversity targets, support ecological functioning, or deliver ecosystem services.	– Maintain current land use with no intensification
Other Natural Areas	Natural or semi-natural areas that are not required to meet biodiversity targets, support ecological functioning, or deliver ecosystem services (provided that protected areas, CBAs and ESAs remain intact).	N/A
No Natural remaining	Natural or semi-natural areas that are not required to meet biodiversity targets, support ecological functioning, or deliver ecosystem services (provided that protected areas, CBAs and ESAs remain intact).	N/A

2.5. Impact assessment

2.5.1. Impact rating methodology

To ensure a direct comparison between various specialist studies, a standard rating scale has been defined and will be used to assess and quantify the identified impacts. This is necessary since impacts specific parameters that need to be assessed. Five factors need to be considered when assessing the significance of impacts, namely:

- Relationship of the impact to **temporal scales** - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

- Relationship of the impact to **spatial scales** - the spatial scale defines the physical extent of the impact.

- The **severity of the impact** - the **severity/beneficial scale** is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party.

- The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.

- The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

- Each criterion is ranked with scores assigned as presented in Table 2.4 to determine the overall significance of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 2.5, to determine the overall significance of the impact. The overall significance is either negative or positive.

- The **significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of a social nature need to reflect the values of the affected society.

Cumulative Impacts:

Cumulative impacts affect the significance ranking of an impact because the impact is taken in consideration of both onsite and offsite sources. For example, pollution making its way into a river from a development may be within acceptable national standards. Activities in the surrounding area may also create pollution which does not exceed these standards. However, if both onsite and offsite activities take place simultaneously, the total pollution level may exceed the standards. For this reason it is important to consider impacts in terms of their cumulative nature.

Seasonality:

Although seasonality is not considered in the ranking of the significance, it may influence the evaluation during various times of the year. As seasonality will only influence certain impacts, it will only be considered for these, with management measures being imposed accordingly (i.e. dust suppression measures being implemented during the dry season).

Table 2.4. Significance Rating Table.

Temporal Scale (The duration of the impact)	
Short term	Less than 5 years (many construction phase impacts are of a short duration).
Medium term	Between 5 and 20 years.
Long term	Between 20 and 40 years (from a human perspective almost permanent).
Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
Spatial Scale (The area in which any impact will have an affect)	
Individual	Impacts affect an individual.
Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
Project Level	Impacts affect the entire project area.
Surrounding Areas	Impacts that affect the area surrounding the development
Municipal	Impacts affect either the Local Municipality, or any towns within them.
Regional	Impacts affect the wider district municipality or the province as a whole.
National	Impacts affect the entire country.
International/Global	Impacts affect other countries or have a global influence.
Will definitely occur	Impacts will definitely occur.
Degree of likelihood of an impact occurring (The confidence with which one has predicted the significance of an impact)	
Definite	More than 90% likely of the impact occurring. Should have substantial supportive data.
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Over 40% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.

Table 2.5. Impact Severity Rating.

Overall Significance **(The combination of all the above criteria as an overall significance)**	
VERY HIGH NEGATIVE	VERY BENEFICIAL
These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in **severe** or **very severe** effects, or **beneficial** or **very beneficial** effects. **Example:** The loss of a species would be viewed by informed society as being of VERY HIGH significance. **Example:** The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.	
HIGH NEGATIVE	BENEFICIAL
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light. **Example:** The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated. **Example:** The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.	
MODERATE NEGATIVE	SOME BENEFITS
These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial. **Example:** The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.	
LOW NEGATIVE	FEW BENEFITS
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect. **Example:** The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels. **Example:** The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.	
NO SIGNIFICANCE	
There are no primary or secondary effects at all that are important to scientists or the public. **Example:** A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.	
DON'T KNOW	

In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information.

Example: The effect of a particular development on people's psychological perspective of the environment.

3. Relevant legislation

The proposed Ganspan Wetland Reserve Development Project will be subject to the requirements of various items of South African legislation. These are described below.

Table 3.1. Environmental legislation considered in the preparation of the Biodiversity Study for the proposed Ganspan Wetland Development Project in the Northern Cape Province

Title of Environmental legislation, policy or guideline	Implications for the Ganspan Wetland Development Project
Constitution Act (No. 108 of 1996)	– Obligation to ensure that the proposed development will not result in pollution and ecological degradation; and – Obligation to ensure that the proposed development is ecologically sustainable, while demonstrating economic and social development.
National Environmental Management Act (NEMA) (No. 107 of 1998)	– The developer must apply the NEMA principles, the fair decision-making and conflict management procedures that are provided for in NEMA; and – The developer must apply the principles of Integrated Environmental Management and consider, investigate and assess the potential impact of existing and planned activities on the environment, socio-economic conditions and the cultural heritage.
National Environment Management: Biodiversity Act (NEMBA) (No. 10 of 2004)	– The proposed development must conserve endangered ecosystems and protect and promote biodiversity; – Must assess the impacts of the proposed development on endangered ecosystems; – No protected species may be removed or damaged without a permit; and – The proposed site must be cleared of alien vegetation using appropriate means.
Nature and Environmental Conservation Ordinance (NECO) (No 19 of 1974)	– All species of animals listed as schedule 1 endangered wild animals or schedule 2 protected wild animals and plants listed as either schedule 3 endangered flora or schedule 4 protected flora must be identified on site. – All species identified must be removed/relocated for site after the issuing of a permit by the provincial Department of Economic Development Environmental Affairs and Tourism (DEDEAT).
Conservation of Agricultural Resources Act (CARA) (No. 43 Of 1983)	– The objects of this Act are to provide for the conservation of the natural agricultural resources by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants.
National Environmental Management: Protected Areas Act	– The objective of this Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; and

Title of Environmental legislation, policy or guideline	Implications for the Ganspan Wetland Development Project
(NEMPAA) (No. 57 of 2003)	– In terms of Section 50 (1) (a) (ii) of this Act, the management authority may "*Carry out or allow an activity in the reserve aimed at raising revenue*". However, Section 50 (2) states that such activity may not negatively affect the survival of any species in, or significantly disrupt the integrity of the ecological system of the nature reserve. Furthermore, in terms Section 51 (a), the Minister or MEC is responsible for the regulations or restrictions of the development and other activities in a protected environment, "*which may be inappropriate for the area, given the purpose for which the area was declared*".
National Water Act (No. 36 of 1998)	– This Act provides details of measures intended to ensure the comprehensive protection of all water resources, including the water reserve and water quality. This proposed development will likely trigger the need for a water-use license according to Sections 21 (c) and (i) of the Act.
National Forest Act (84 of 1998)	– Requires that a permit be obtained should any forests or protected trees be removed during the construction phase of the project.

4. Description of the biophysical environment

As mentioned, the study sites and surrounding areas were described using a two-phased approach. Firstly, a desktop assessment of the site was conducted in terms of current vegetation classifications and biodiversity programmes and plans. This was followed by a site visit between the 07th and 09th February 2018 in order to assess the actual ecological state, current land-use, identify potential sensitive ecosystems and identify plant and animal species associated with the proposed project activities (see Chapter 5).

4.1. Background and Literature review

Published literature on the ecology of the area was referenced in order to describe the study site in the context of the region and the Northern Cape Province. The following documents/plans are referenced:

- SANBI vegetation (Mucina & Rutherford, 2012);
- Northern Cape CBA Map (2016);
- The National Freshwater Ecosystem Priority Areas (NFEPA);
- National Environmental Management: Protected Areas Act (NEMPAA);
- National Protected Areas Expansion Strategy (NPAES);
- Review of the SANBI Red Data List (Plants and animals);
- Convention on International Trade in Endangered Species (CITES);
- International Union for Conservation of Nature (IUCN);
- Provincial Nature Conservation Ordinance (PNCO);
- Conservation of Agricultural Resources Act (CARA)
- National Environmental Management: Biodiversity Act (NEMBA) List of Threatened or Protected Species;
- National Environmental Management: Biodiversity Act (NEMBA) List of Alien Invasive Vegetation;
- National Environmental Management: Biodiversity Act (NEMBA) National List of Ecosystems that are Threatened and in need of protection; and
- National Forestry Act (NFA): List of Protected Trees.

4.2. Climate

Jan Kempdorp (the nearest town to the Ganspan site with climate data; approx. 5km) normally receives about 314mm of rain per year, with most rainfall occurring mainly during summer. The chart below (Figure 4.1, left) shows the average rainfall values for Jan Kempdorp per month. It receives the lowest rainfall (0mm) in June and the highest (64mm) in March. The monthly distribution of average daily maximum temperatures (Figure 4.1, centre) shows that the average midday temperatures for Jan Kempdorp range from 18.5°C in June to 32°C in January. The region is the coldest during July when temperatures drop to 0.6°C on average during the night (Figure 4.1, right).

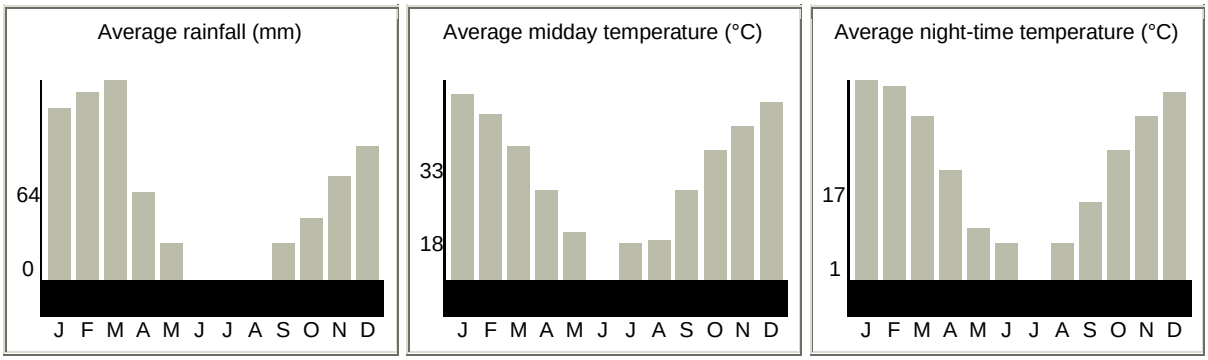


Figure 4.1 Climate conditions of Jan Kempdorp, the nearest town to Ganspan (SA Explorer; 14 February 2018)

4.3. Topography

The topography of the areas is considered flat, with a gentle 1:135 downward slope towards the northwest.

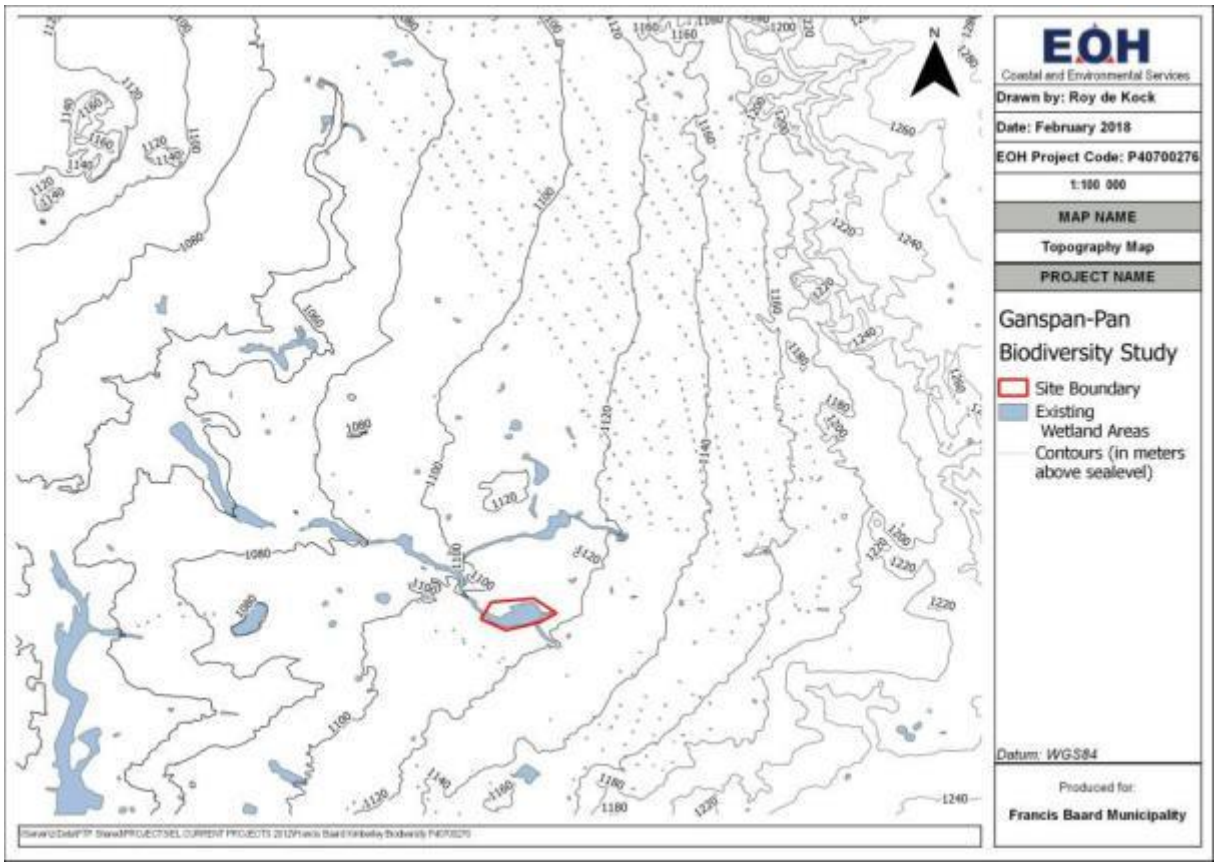


Figure 4.2 Topography showing contours with height above sea level in meters

4.4. Geology and Soils

The study area falls within the Main Karoo Basin which a large scale basin that was infilled with up to 12 km of sedimentary strata and capped by a 1.4 km thick unit of basaltic lava over geological time. Today the remnants of the lava layer are called the Drakensberg Mountains Range.

More locally, the basement rocks at the Ganspan Wetland Reserve site consist of sedimentary rocks of the Kameeldoorns Formation (of the Ventersdorp Supergroup of rocks). These rocks do not outcrop on site and the entire site consists of overlying aeolian Quaternary sand deposits (Figure 4.4).

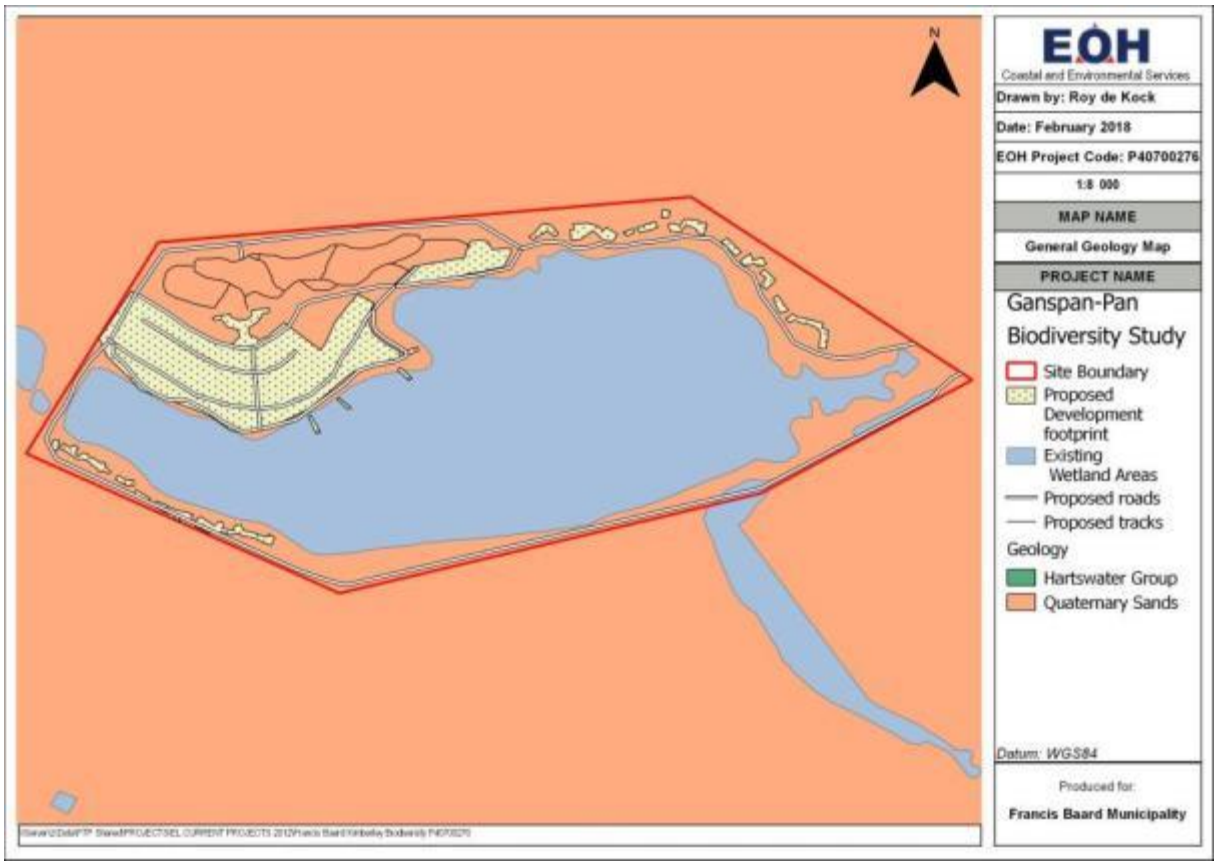


Figure 4.4: General geology at the Ganspan Wetland Reserve site.

Soils are considered as yellow, red and greyish excessively drained sandy soils associated with Arenosols.

4.5. Land use

The entire Ganspan Wetland Reserve site is zoned as a Protected Area (Figure 4.4). Land use surrounding the Ganspan Wetland Reserve includes:

Legend	Description of legend
	Agricultural land including crops, irrigation, rangeland
	Natural vegetation including impacted and unimpacted natural vegetation
	Urban areas including high and low densities

Legend	Description of legend
	Existing roads
	Water bodies

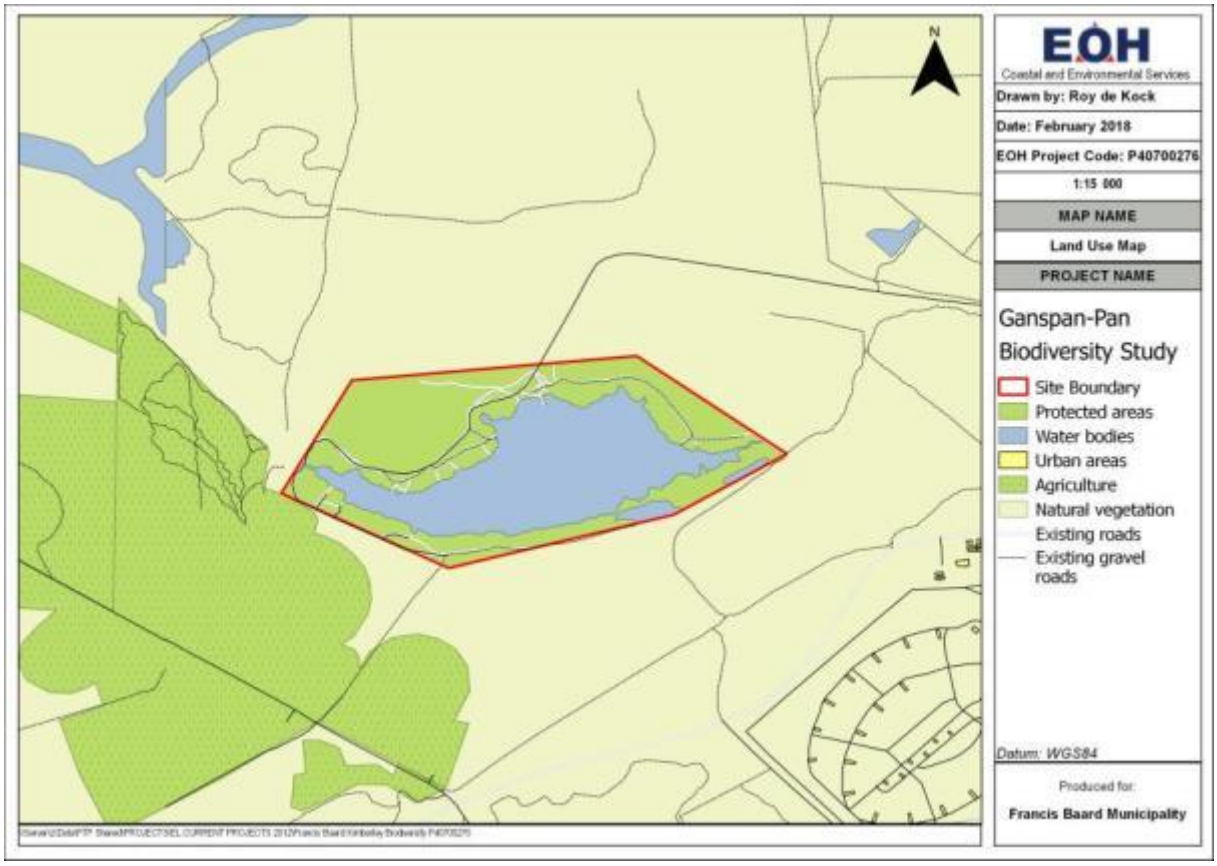


Figure 4.4: Land use at the Ganspan Wetland Reserve site and surrounding areas.

4.6. Vegetation and floristics

4.6.1. SANBI classification (Mucina and Rutherford, 2012)

According to the South African National Biodiversity Institute Map (Mucina and Rutherford; 2012) the proposed new Ganspan Wetland reserve project is located in the Savanna biome. This biome is defined by an herbaceous layer dominated by grass species and a discontinuous to sometimes very open tree layer. Two savannah vegetation types were mapped within the Ganspan Wetland Reserve area namely:

1. Schmidsdrit Thornveld
2. Kimberley Thornveld

Figure 4.6: Vegetation found at the Ganspan Wetland Reserve and surrounding areas.

Kimberley Thornveld, the dominant vegetation type within the Ganspan Wetland Reserve area (Figure 4.6) occurs on irregular plains and consist of a well-developed tree layer with *Acacia erioloba, A. tortilis, A. karroo,* and *Boscia albitrunca* while a well-developed shrub layer with occasional stands of *Tarconanthus comphoratus* and *A. mellitera*. The grass layer is open with large areas of uncovered soil. The SA VEGMAP has determined that this vegetation type is **Least Concern** even though only 2% is statutory conserved. Some 18% has already been transformed, mostly by cultivation. Erosion is considered as low.

Schmidtsdrif Thornveld occurs on flat plateaus as a well-developed shrub layer dominated by *Tarconanthus camphoratus* and *Acacia karroo* although it only occurs in the north-western corner of the study site (Figure 4.6). Apart from grasses, bulbous and annual herbaceous plant species are also prominent. The SA VEGMAP has determined that this vegetation type is of **Least Concern** even though only 0.2% is statutory conserved. Some 13% has already been transformed, mostly by cultivation. Erosion is considered as low.

4.6.2 Forest classification (NFA)

No natural forest or protected tree species will be impacted by the proposed Ganspan Wetland Reserve Development.

4.7. Biodiversity indicators

South Africa's policy and legislative framework for biodiversity is well developed, providing a strong basis for the conservation and sustainable use of biodiversity. South Africa is one of the few countries in the world to have a Biodiversity Act and a National Biodiversity Institute.

Key components of the policy and legislative framework for biodiversity include:

- The White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997);
- The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA);
- NEMBA List of Ecosystems in need of Protection;
- NEMBA List of Threatened or Protected Species;
- NEMBA List of Alien Invasive Species;
- The National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEMPAA);
- The National Biodiversity Strategy and Action Plan (NBSAP) (2015);
- The National Biodiversity Assessment (2011) (NBA);
- The National Protected Area Expansion Strategy (2008) (NPAES);
- Important Bird Areas (2015) (IBA); and the

In addition, some of South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996). An example is the Northern Cape Critical Biodiversity Map (2016) that covers the entire Northern Cape Province.

4.7.1. Northern Cape Biodiversity Conservation Areas Map

According to the Northern Cape Biodiversity Areas Map (2016) the Ganspan Wetland Reserve area is located in a Protected Area with the surrounding land almost entirely located on a CBA 2 area (Figure 4.7). The management requirements for Protected Areas and CBA 2 are as follows (taken from the Technical Guidelines for CBA Maps, 2017):

CBA area	Description	Management requirements
Protected Areas	These are areas that are formally protected in terms of NEMPAA	These areas must be managed as per the Ganspan Wetland Reserve's approved Management Plan.
CBA 2	CBA 2 areas are areas of high biodiversity with a high level of irreplaceability, but there is flexibility in the landscape to achieve biodiversity targets contained in these areas.	These areas must remain in good ecological condition in order to meet biodiversity targets.

Figure 4.7: Northern Cape CBA Map (2007) for the Ganspan Wetland Reserve site.

4.7.2. Protected areas

Various areas that are protected by legislation are located within 30km from the Ganspan Wetland Reserve sites (Figure 4.8). Protected areas in the vicinity include:

Name of protected area	Distance from site
Spitskop Dam	16.2km towards the southwest
Vallaagte Private Reserve	30km towards the southeast
Taung Skull Fossil Site	20km towards the northwest
Eastern Kalahari Bushveld (Protected ecosystem)	21km towards the south

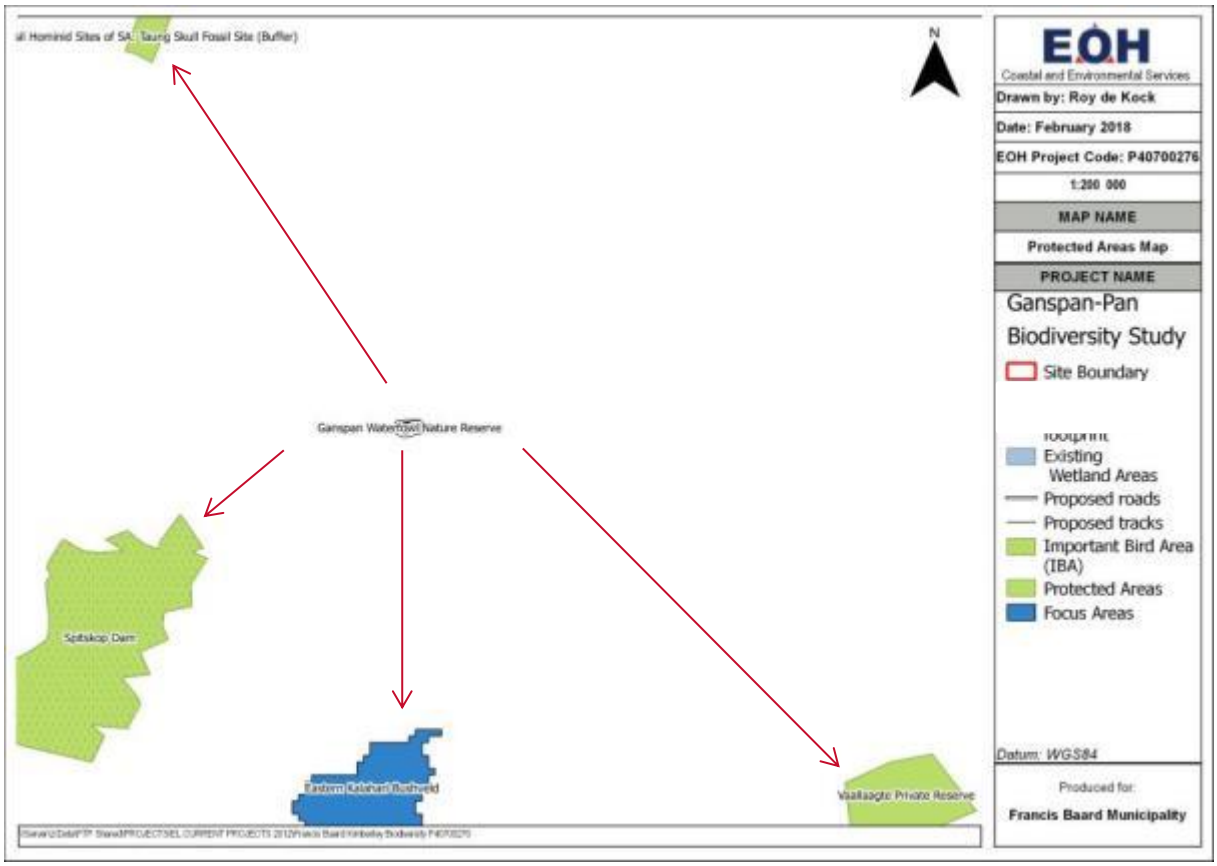


Figure 4.6: Illustrating the distances of various protected areas to the Ganspan Wetland Reserve sites (a protected site).

4.7.3. Threatened Ecosystems

The National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEMBA) published a national list of ecosystems that are threatened and in need of protection (GN. 1002 of 2011). The Ganspan Wetland Reserve development project site is NOT located in any threatened ecosystem as legislated by NEMBA. The nearest threatened ecosystem is the Eastern Kalahari Bushveld located over 20km towards the south of the site (see Figure 4.6 above).

4.8. Aquatic environment

The study area is located within Quaternary Catchment C33A (Primary Catchment C) and Water Management Area 5 (Vaal) (Figure 4.7).

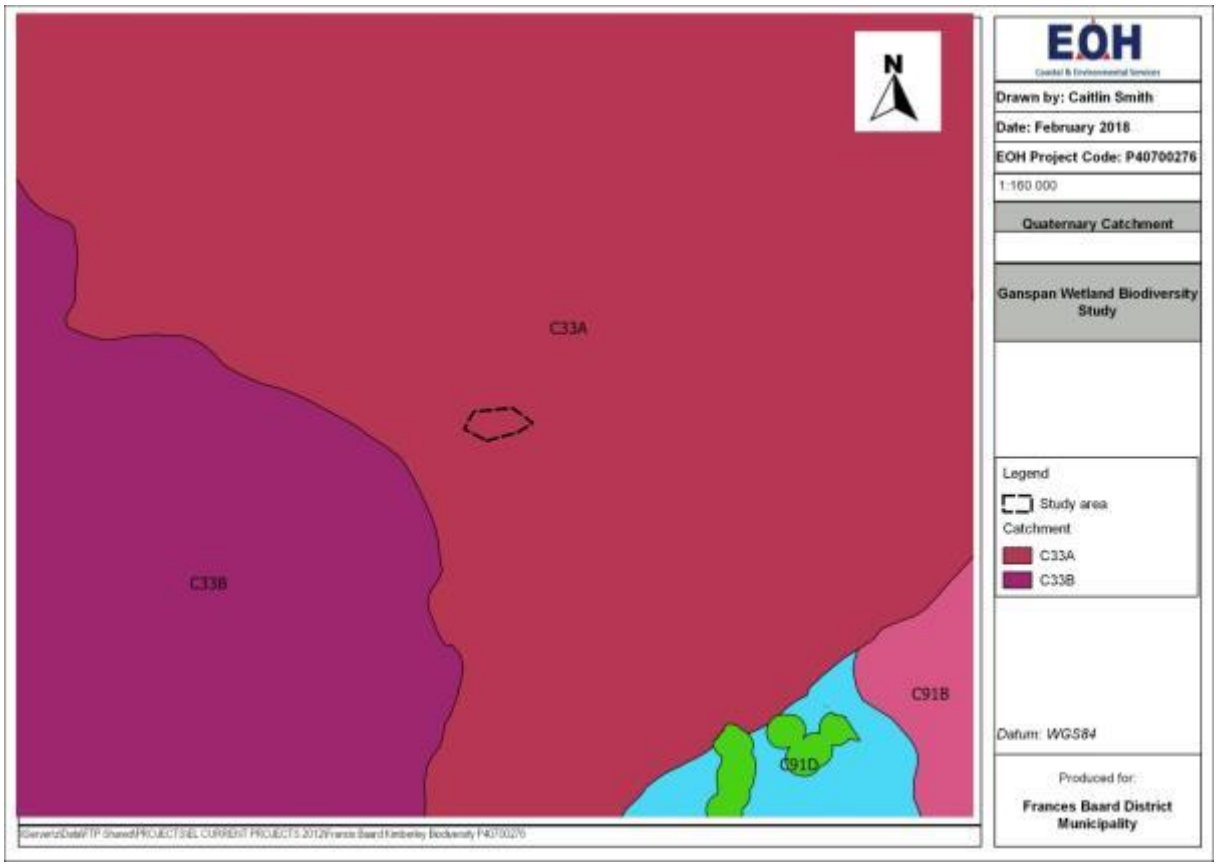


Figure 4.6: Quaternary catchment locality of the Ganspan Wetland Reserve

4.8.1. NFEPA wetland classification

Wetlands in South Africa have been mapped on a broad-scale by various stakeholders and have been included in the National Freshwater Ecosystem Priority Assessment (NFEPA, 2011-2014). Due to the broad-scale nature of the NFEPA map it is not spatially accurate and therefore some error is expected. The location of NFEPA wetlands was derived from the National Land Cover 2000 (Van Den Berg *et al*., 2008) and inland water features from the Department of Land Affairs' Chief Directorate: Surveys and Mapping (DLA-CDSM). All wetlands are classified as either 'natural' or 'artificial' water bodies.

The NFEPA wetland map identifies important or sensitive wetlands. The figure and table below illustrate the location and NFEPA classification of the Ganspan wetland.

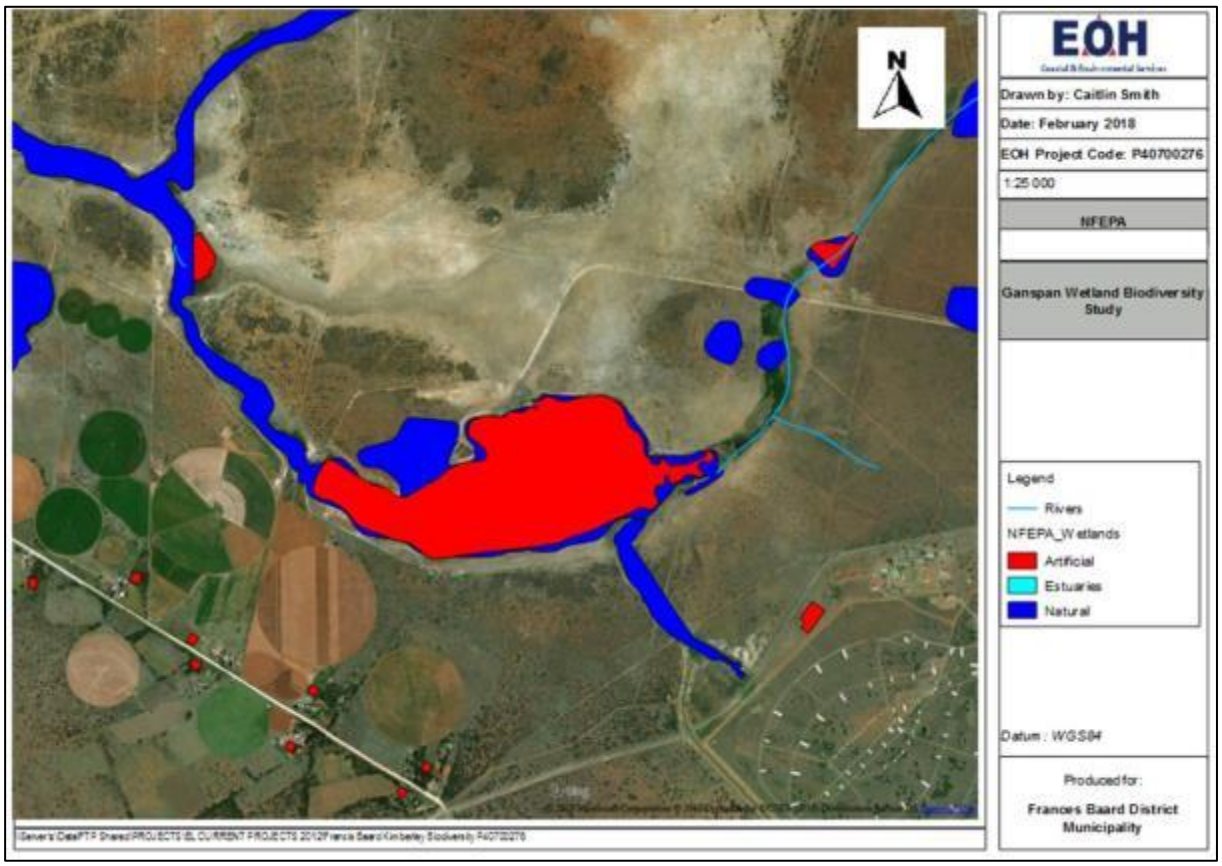


Figure 4.7: The NFEPA wetland map of the site and surrounding areas

Table 4.1: Wetland classification for the Ganspan Wetland (NFEPA, 2011)

Wetlands	Level 3: Landscape Unit	Level 4: HGM Unit			
	Landscape setting	HGM Type	Wetland Type	Natural/Artificial	NFEPA wetland condition (if available)/ PES
Ganspan wetland	Valley floor	Channelled valley bottom	Eastern Kalahari Bushveld Group 3 Channelled valley bottom wetland	Artificial – 2013 topographical maps name this wetland the "Ganspan Dam"	Z3 – heavily to critically modified

The Ganspan Wetland is filled with water from the Vaalharts Irrigation Scheme. The pan supports large bird populations as well as populations of the smallmouth yellow fish (*Labeobarbus aeneus*) and largemouth yellow fish (*Labeobarbus kimberleyensis*).

4.9. Protected species

Plants

Table 4.2 below list all plant SCC that may potentially occur on site. This list was used to assist in the location and identification of any SCC found on site during the site visit (see Chapter 5 below and Appendix A for a full list of plant species found on site).

Table 4.2: List of potential plant SCC that may occur on site.

Family	Species	Threat status	Lifecycle	Growth forms
APOCYNACEAE	*Ceropegia crassifolia var. crassifolia*	Protected (PNCO)	Perennial	Climber, succulent
IRIDACEAE	*Gladiolus permeabilis subsp. edulis*	Protected (PNCO)	Perennial	Geophyte, herb
IRIDACEAE	*Moraea natalensis*	Protected (PNCO)	Perennial	Geophyte, herb

5. Site investigation

A site investigation was conducted on the 7th and 8th February 2018 in order to:

- Verify desktop findings,
- Assess the actual ecological state,
- Assess the current land-use,
- Identify potential sensitive ecosystems
- Identify plant species communities and associated with the proposed project activities.

The site visit also served to inform potential impacts of the proposed project and to inform the significance of these impacts on the surrounding ecological environment. Vegetation was assessed on the entire Ganspan Wetland Reserve site. Although the site assessment was conducted in summer, specific flowering times of geophytic species (like Amaryllidaceae and Orchidaceae) may have been missed.

5.1. Vegetation survey

Six vegetation communities were identified within the Ganspan Wetland Reserve area (Table 5.1). Classifications were based on species composition within each community.

Table 5.1: Vegetation communities found within the Ganspan Wetland Reserve site

Community #	Name of vegetation community
1	Water bodies
2	Aquatic vegetation
3	Dense thornveld
4	Open savanna
5	Cleared areas
6	Degraded grassland

Below is a map showing the extent of each vegetation community on site:

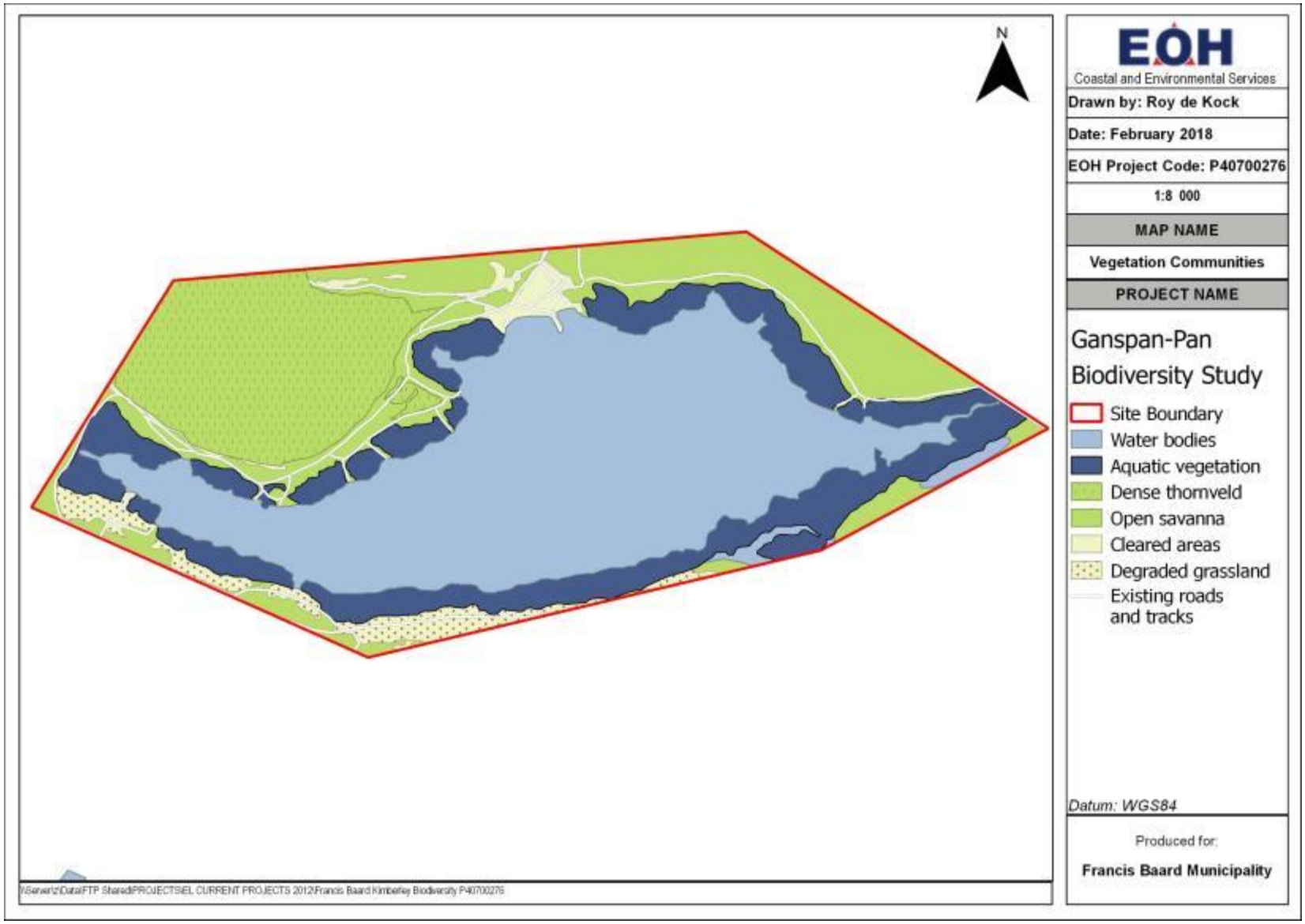


Figure 5.1: Vegetation community map of the Ganspan Wetland Reserve

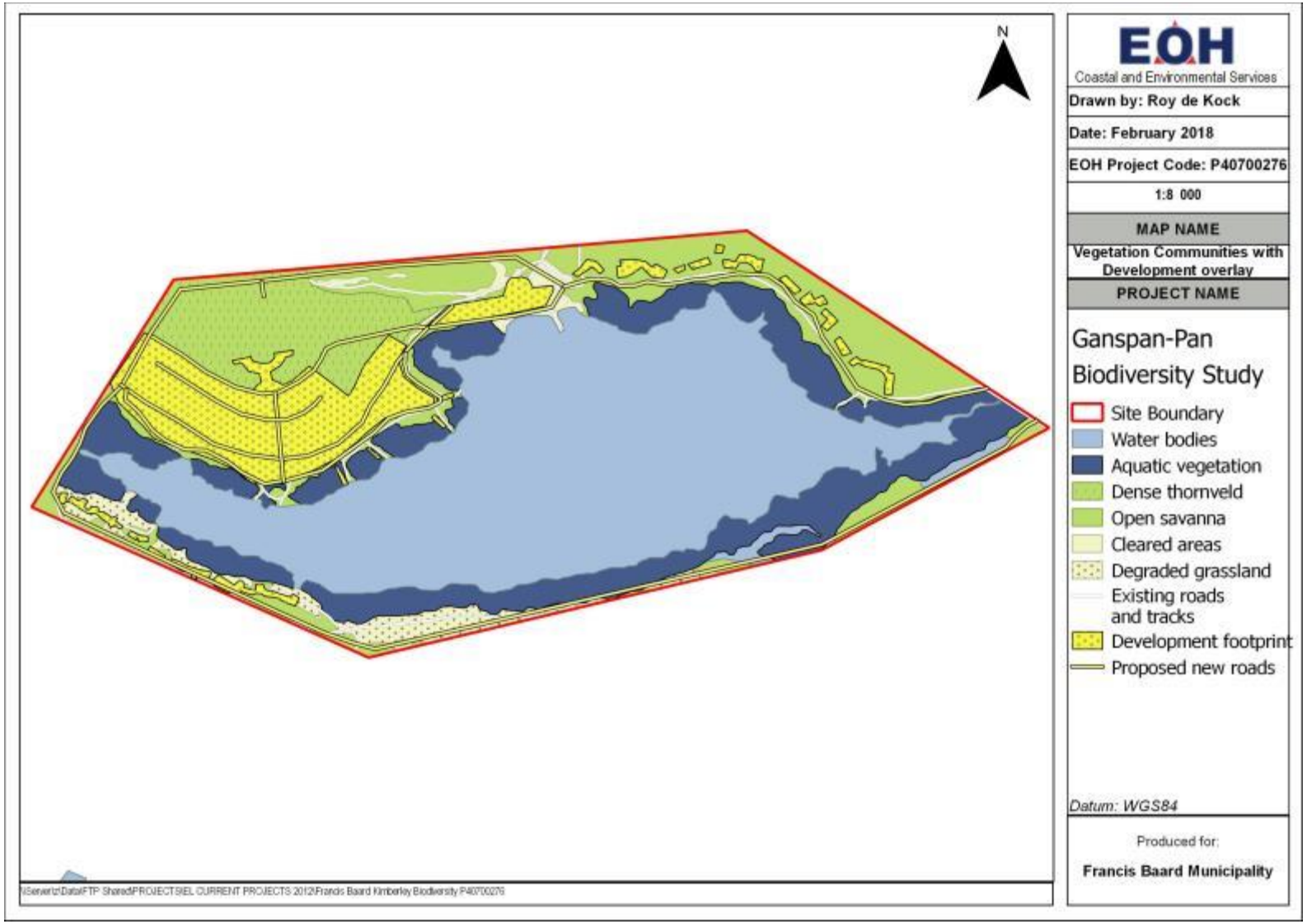


Figure 5.2: Vegetation community map of the Ganspan Wetland Reserve with the proposed development overlay

5.2. Description of vegetation communities

A description of each of the plant communities identified within the Ganspan Wetland Reserve site is given below:

5.2.1. Water bodies

The majority of the site (up to 60%) is covered by a freshwater wetland. No vegetation was observed within this community.

The only proposed new infrastructure that will impact on water bodies are jetties and small portions of walkways (Figure 5.3). The proposed new road on the boundary in the south-eastern portion of the Ganspan Wetland Reserve will transect small wetland portions. The remainder of the proposed new development footprint will mostly be located within 500m of the wetland area.

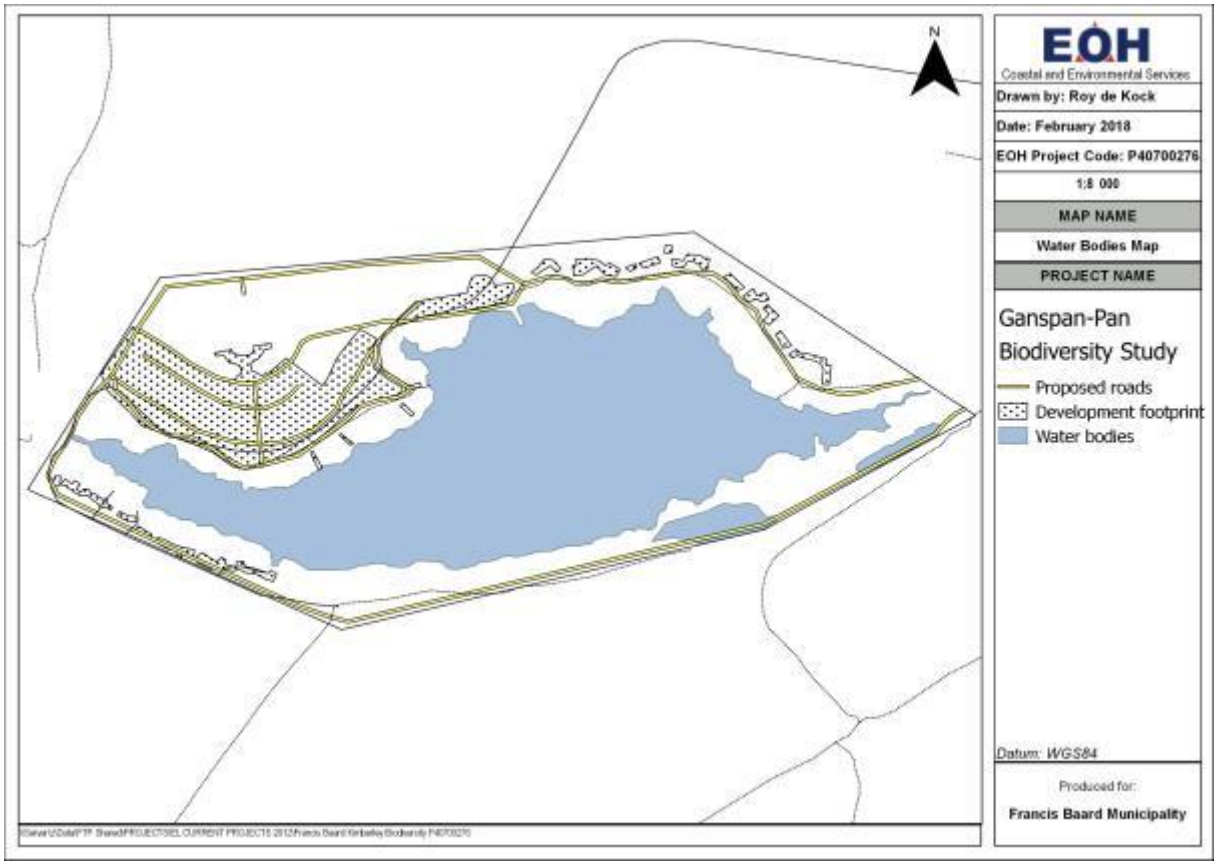


Figure 5.3: Map of the Ganspan Wetland Reserve showing all water bodies overlain with the proposed development

Below is a panoramic photo sequence of *Water Bodies* found on site:

Panorama of the Ganspan Wetland taken from the northern shore:

5.2.2. Aquatic vegetation

The Ganspan Wetland is surrounded by patches of aquatic vegetation located on rich hydromorphic soils. This vegetation occurs on all the fringes of the wetland and consists of rushes, reeds and sedges. The following plant species were observed within this vegetation community:

Table 5.3: Vegetation occurring within *Aquatic vegetation*

Species	Threat status
Juncus effusus	LC
Phragmites australis	LC
Typha capensis	LC

The only proposed new infrastructure that will impact on aquatic vegetation are jetties and small portions of walkways (Figure 5.4). The proposed new road on the boundary in the south-eastern portion of the Ganspan Wetland Reserve will transect small aquatic vegetation portions.

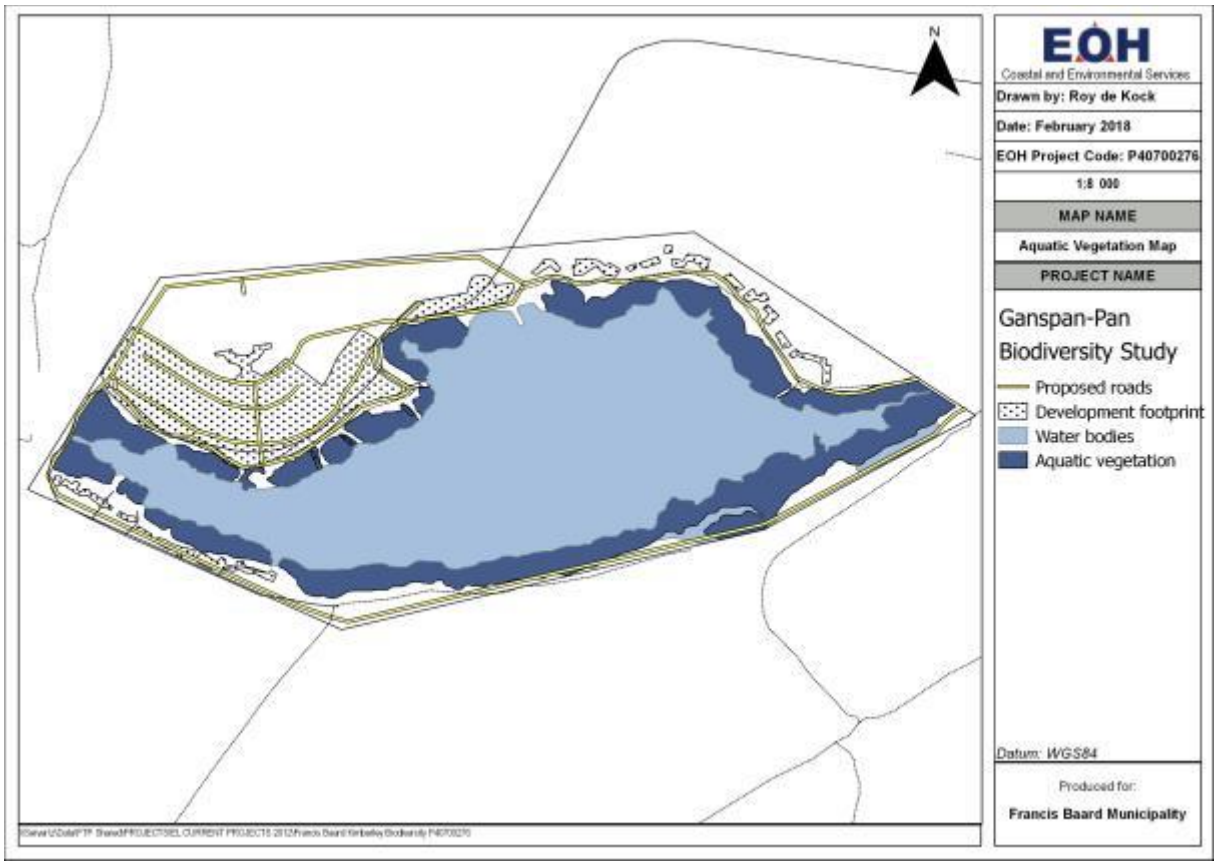


Figure 5.4: Map of the Ganspan Wetland Reserve showing the extent of aquatic vegetation overlain with the proposed development.

Below is a photo sequence of *Aquatic vegetation* found on site:


08 02 2


08 02 2018 11 55


08 02 2018 12 45

5.2.3. Dense thornveld

This vegetation community only occurs in the north-western portion of the study area (approximately 26ha of a total of 174ha) and aligns with the description of Schmidtsdrift Thornveld (as classified by Mucina and Rutherford, 2012). It is mostly intact with sand mining impacting on the fringes, especially toward the southern boundary of the vegetation within the Protected Area (see Figure 5.3 below). Closed, scrubby thornveld covers approximately 20% of the study site and is dominated by *Acacia mellifera* and *Acacia tortilis.* Grasses, bulbs, and herbaceous annuals are prominent.

The condition of this vegetation unit appears slightly degraded by over grazing, although alien vegetation cover is minimal.

The following plant species were observed within this vegetation community:

Table 5.4: Vegetation occurring within the *Dense thornveld* vegetation unit

Species	Threat status
Trees	
Acacia mellifera	NA
Acacia tortilis	NA
Ziziphus mucronata	NA
Scrubs	
Tarchonanthus camphoratus	NA
Grewia flava	NA
Aptosimum elongatum	NA
Barleria macrostegia	NA
Hermannia tomentosa	NA
Zygophyllum pubescens	NA
Thesium lineatum	NA
Graminoids	
Aristida meridionalis	NA
Eragrostis lehmanniana	NA
Eragrostis obtusa	NA
Herbs / Geophytes	
Osteospermum muricatum	NA
Aloe grandidentata	NA
Euphorbia sp.	NA
Alien vegetation	
Opuntia ficus-indica	NA
Prosopis glandulosa	NA

Almost 50% of this vegetation community will be permanently lost as a result of the proposed infrastructure upgrade. All the impacted sand mining sites occurs on the fringes of this vegetation community (Figure 5.5). This is not a protected ecosystem and it's extend is vast in the Northern Cape. It also comprises a large portion of the Ganspan Wetland Reserve but is reserved to the north-western portion of the site only.

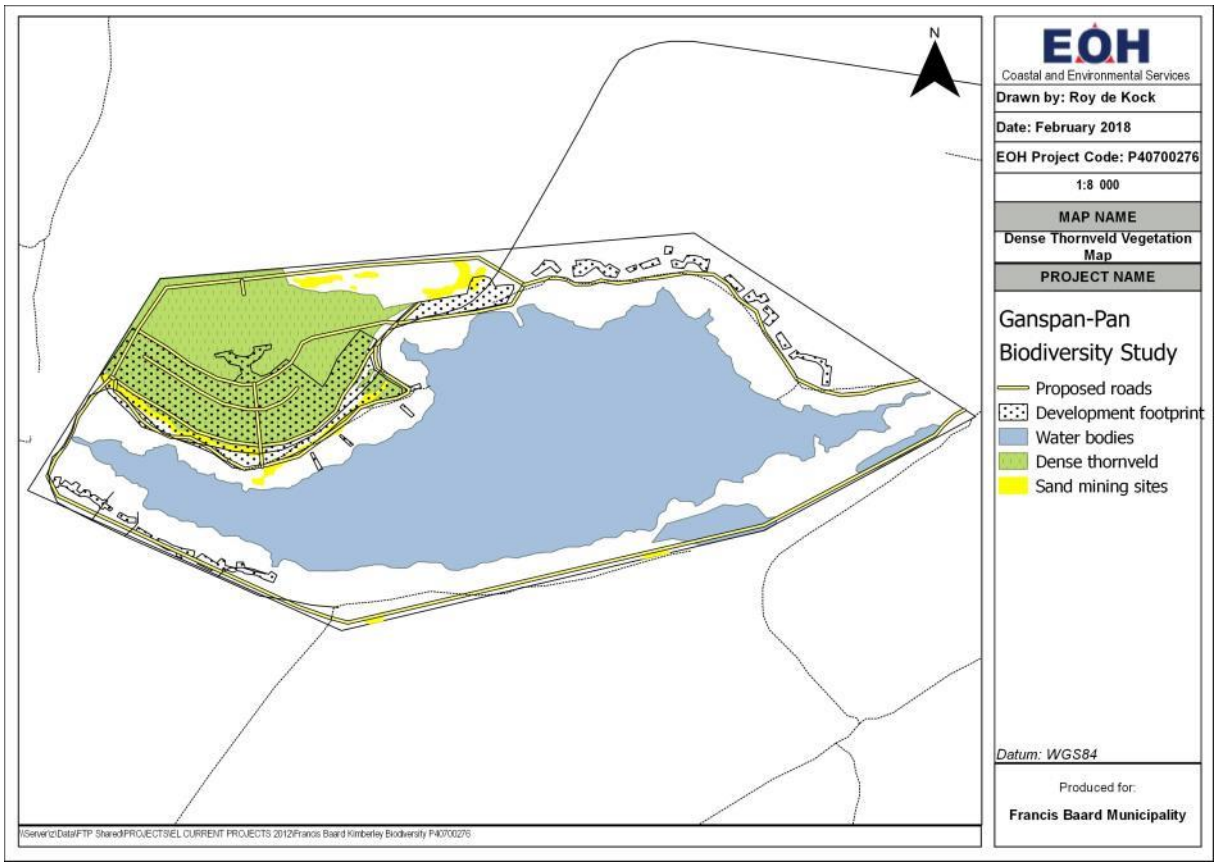
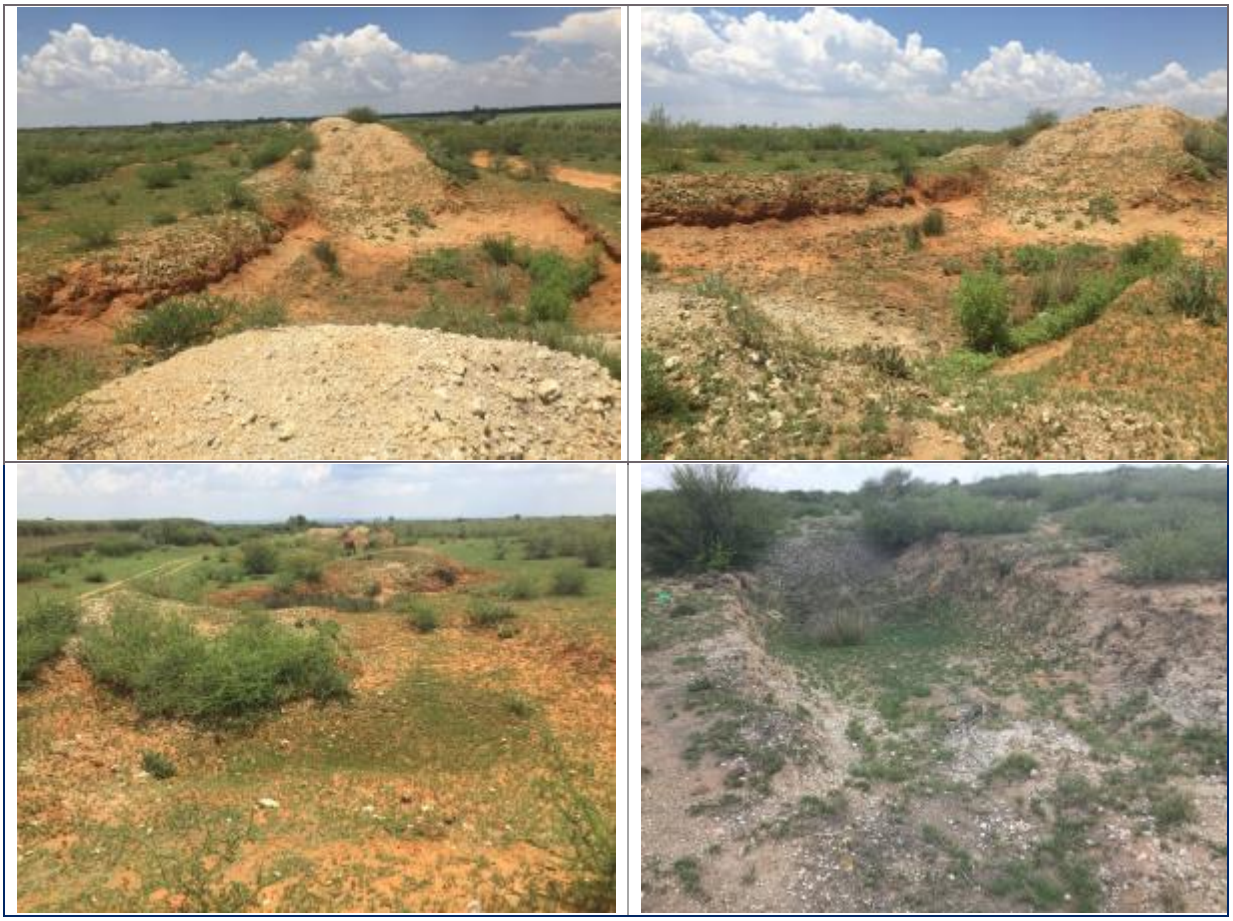


Figure 5.5: Map of the Ganspan Wetland Reserve showing the extent of dense thornveld overlain with the proposed development.

Below is a photo sequence of *Dense thornveld found* on site:

Sand mining occurring on the fringes of the dense thornveld vegetation unit:



5.2.4. Open savanna

Large portions of the site (approximately 35ha of the total area of 174ha) contain an open savannah vegetation type. This community aligns with the description of Kimberley Thornveld (as classified by Mucina and Rutherford, 2012). This vegetation community is considered as highly transformed, probably by grazing and is dominated by scattered *Acacia* spp., *Boscia albitrunca* and *Tarconanthus camphoratus* interspersed with an open grass layer.

The following plant species were observed within this vegetation community:

Table 5.5: Vegetation occurring within the *Open savanna* vegetation unit

Species	Threat status
Small trees	
Acacia karroo	NA
Acacia tortilis	NA
Boscia albitrunca	NA
Tarconanthus camphoratus	NA
Sersia lancea	NA
Ehretia rigida	NA
Euclea crispa	NA

Scrubs	
Helichrysum zeyheri	NA
Hermannia tomentosa	NA
Graminoids	
Themeda triandra	NA
Eragrostis pallens	NA
Aristida congesta	NA
Herbs / Geophytes	
Lippia scaberrima	NA
Osteospermum muricatum	NA
Vahlia capensis	NA

Almost 30% of this vegetation community will be permanently lost as a result of the proposed infrastructure upgrade Figure 5.6). This is not a protected ecosystem and it's extend is vast in the Northern Cape. It also comprises a large portion of the Ganspan Wetland Reserve spread right around the site.

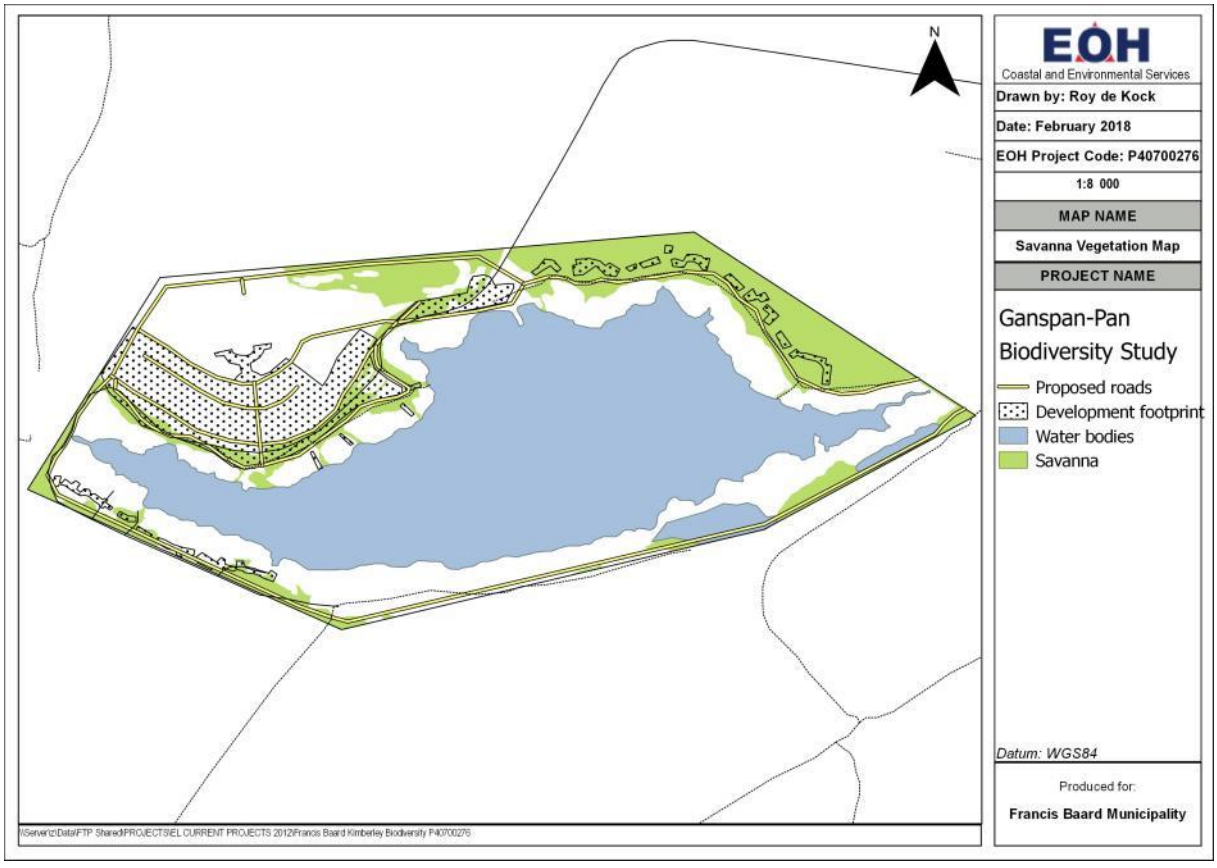


Figure 5.6: Map of the Ganspan Wetland Reserve showing the extent of savanna vegetation overlain with the proposed development.

Below is a photo sequence of *Open savanna* found on site:

4.2.5. Cleared areas

These areas cover approximately 4ha of the site (total of 174ha) and have been cleared of most natural vegetation (Figure 5.7). Introduced alien trees dominate the area as shade trees (*Cassuarina equisetifolia).* Old infrastructure (buildings and roads) also occur.

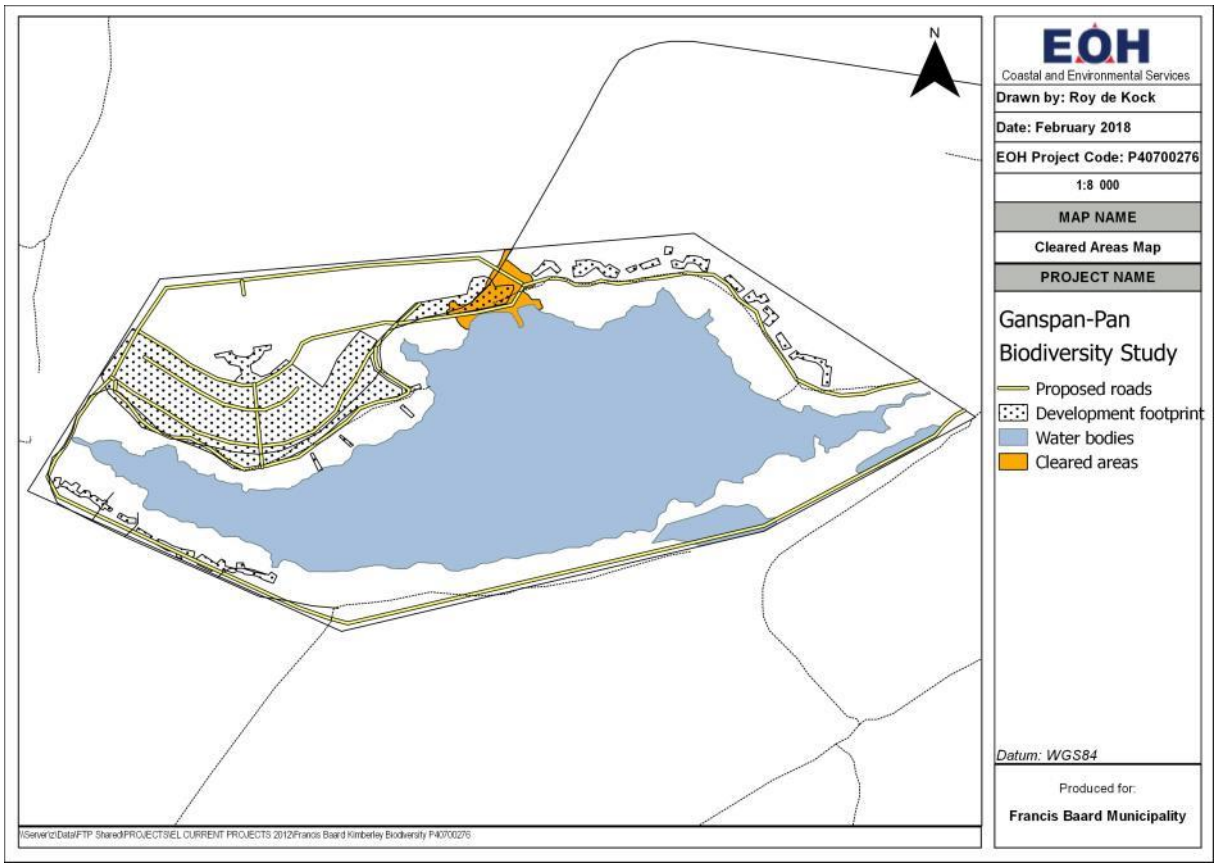


Figure 5.7: Map of the Ganspan Wetland Reserve showing cleared areas overlain with the proposed development.

Below is a photo sequence of *Cleared areas* found on site:

4.2.6. Degraded grassland

These areas represent highly transformed areas containing few to widely dispersed trees with short grass. Transformation was most likely as a result of over grazing.

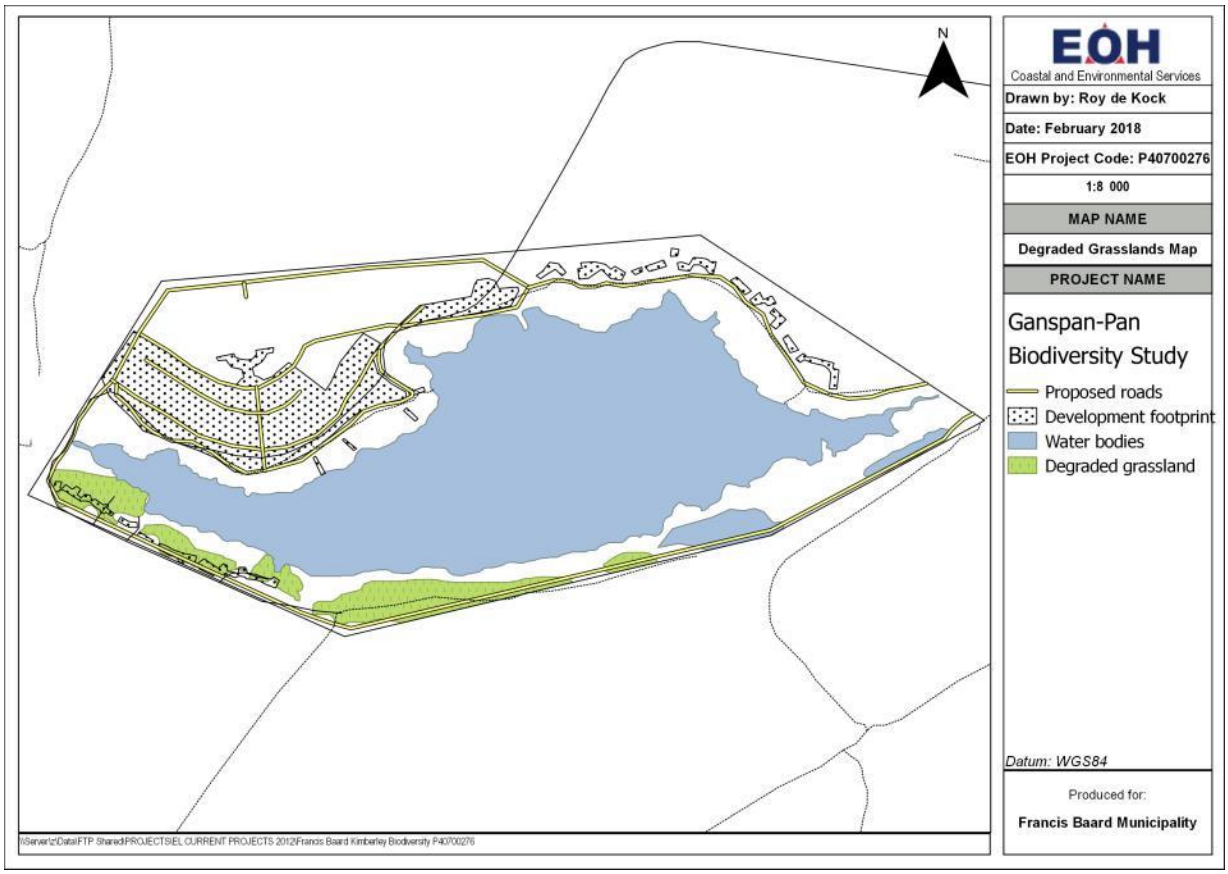


Figure 5.8: Map of the Ganspan Wetland Reserve showing the degraded grassland areas overlain with the proposed development.

Below is a photo sequence of *Degraded grassland* found on site:

5.3. Plant species observed

A total of 33 plant species were identified within the Ganspan Wetland Reserve site. Savanna is the dominant vegetation biome present with vegetation changing from dense thornveld in the northwestern portions to open savannah and grassland in the south and east. Alien & invasive plants occur in places but are not dominant. Of these 33 species, only three are listed as SCC (Table 5.6). The implication is that these species will require a permit for removal or transplant prior to construction. This should be done through a Search and Rescue exercise prior to commencement of clearing.

Table 5.6: SCC observed on site

Species	Vegetation community	Threat status
Aloe grandidentata	Dense thornveld; Open savanna	Protected (PNCO)
Boscia albitrunca	Dense thornveld	Protected tree (DAFF)
Euphorbia sp.	Dense thornveld	Protected (PNCO)

The following plant SCC were not observed on site, but may still occur:

Table 5.7: Potential plant SCC that were not observed but may still occur on site

Species	Threat status
Ceropegia crassifolia var. crassifolia	Protected (PNCO)
Gladiolus permeabilis subsp. edulis	Protected (PNCO)
Moraea natalensis	Protected (PNCO)

6. Sensitivity assessment

Appendix 6
Specialist Reports
1. (1) A specialist report prepared in terms of these Regulations must contain—
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;
(g) an identification of any areas to be avoided, including buffers;
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;

6.1. Conservation and spatial planning tools

Several conservation planning tools are available for the study area. These tools allow for the potential identification of any sensitive and important areas from a vegetation perspective at the early stage of a development and allow for the fine-tuning of plans and infrastructure layouts.

The following tools were identified and are discussed below:

- SANBI Vegetation threat status
- Northern Cape Biodiversity Conservation Areas.

These tools together with the field survey have been used to assess the sensitivity of the study area. Sensitivity of the proposed Ganspan Wetland Reserve Development is shown on a sensitivity map (Figure 6.1 below).

The conservation status of the two savannah vegetation types occurring on site, namely Kimberley Thornveld and Schmidtsdrif Thornveld, is considered as **Least Concern** even though only small portions of each are statutory conserved (2% for Kimberley Thornveld and 0.8% for Schmidsdrif Thornveld).

The Northern Cape Biodiversity Sector Plan (2016) describes the area as containing important biodiversity needed to meet national biodiversity targets.

6.2. Sensitivity allocation

A sensitivity map was developed based on the methodology presented in Table 6.1, for the entire study area.

Table 6.1. Criteria used for the analysis of the sensitivity of the Ganspan Wetland Reserve development project.

CRITERIA		LOW SENSITIVITY	MODERATE SENSITIVITY	HIGH SENSITIVITY
1	**Topography**	Level or even ***(For all areas)***	Undulating; fairly steep slopes	Complex and uneven with steep slopes

CRITERIA		LOW SENSITIVITY	MODERATE SENSITIVITY	HIGH SENSITIVITY
2	**Vegetation** - Extent or habitat type in the region	Extensive throughout the region ***(For all areas)***	Restricted to a particular region / zone	Restricted to a specific locality / site
3	**Conservation status** of fauna / flora or habitats	Well conserved independent of conservation value ***(For all vegetation communities)***	Not well conserved, moderate conservation value	Not conserved - has a high conservation value **(For water bodies)**
4	**Species of conservation concern** - Presence and number	None, although occasional regional endemics ***(For all vegetation communities other that dense thornveld)***	No Species of Conservation Concern, some indeterminate or rare endemics **(For Dense Thornveld)**	One or more Species of Conservation Concern, or more than 2 endemics or rare species
5	**Habitat fragmentation** leading to loss of viable populations	Extensive areas of preferred habitat present elsewhere in region not susceptible to fragmentation **(For all areas)**	Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation	Limited areas of this habitat, susceptible to fragmentation
6	**Biodiversity** contribution	Low diversity or species richness	Moderate diversity, and moderately high species richness ***(For all vegetation communities)***	
7	**Erosion potential** or instability of the region	Very stable and an area not subjected to erosion **(For all areas)**	Some possibility of erosion or change due to episodic events	Large possibility of erosion, change to the site or destruction due to climatic or other factors
8	**Rehabilitation** potential of the area or region	Site is easily rehabilitated	There is some degree of difficulty in rehabilitation of the site **(For all areas)**	Site is difficult to rehabilitate due to the terrain, type of habitat or species required to reintroduce
9	**Disturbance** due to human habitation or other influences (alien invasive species)	Site is very disturbed or degraded	There is some degree of disturbance of the site **(For all areas)**	The site is hardly or very slightly impacted upon by human disturbance

CRITERIA		LOW SENSITIVITY	MODERATE SENSITIVITY	HIGH SENSITIVITY
10	**Ecological function**	Habitat widely represented in the landscape not specifically harbouring any unique habitat features…etc. **(For all areas)**	Intermediate role in ecological function	Key habitat involved in ecological processes (ecological corridors and network areas or key niche habitats)
11	**Ecological Services**	Little to no ecological services	Some ecological services.	Various ecological services. Areas should be conserved. **(For all areas)**

Site sensitivity was determined based on the following criteria as classified in Table 6.1 above:

Table 6.2: List of criteria contributing to the sensitivity map

Biodiversity element	Sensitivity mapping rule	Sensitivity allocation
– Conservation status	Dense thornveld is limited within the study site	Moderate sensitivity
	Wetlands have a high conservation value	High sensitivity
– Plant SCC	Presence within a vegetation community	Moderate sensitivity
– Disturbance and rehabilitation	Some areas show signs of disturbance. It will be difficult to rehabilitate the site.	Moderate sensitivity
– Ecological services	Various ecological services (drainage and ecosystem areas)	High sensitivity

Depending on each criterion as described in Table 6.1 and listed in Table 6.2 above, sensitivity levels may vary for a specific vegetation community within the Ganspan Wetland Reserve area. Therefore site sensitivity was divided into the following classes:

Table 6.3: Sensitivity classes identified within the Ganspan Wetland Reserve

Sensitivity classes	Criteria included as per Table 6.1
Ecosystems	– Ecological function – Ecological services – Habitat fragmentation
Biodiversity	– Biodiversity contribution – Rehabilitation potential – Vegetation – Conservation status – Species of Conservation Concern
Physical	– Topography – Disturbance – Erosion potential

The following series of maps reflects the different sensitivity classes identified within the Ganspan Wetland Reserve:

Figure 6.1: Ecosystem sensitivity within the Ganspan Wetland Reserve site

Figure 6.1 shows that the entire Ganspan Wetland Reserve site is considered as a highly sensitive ecosystem area. This is due to the high level of ecological services (ecosystems, drainages etc.) occurring on site.

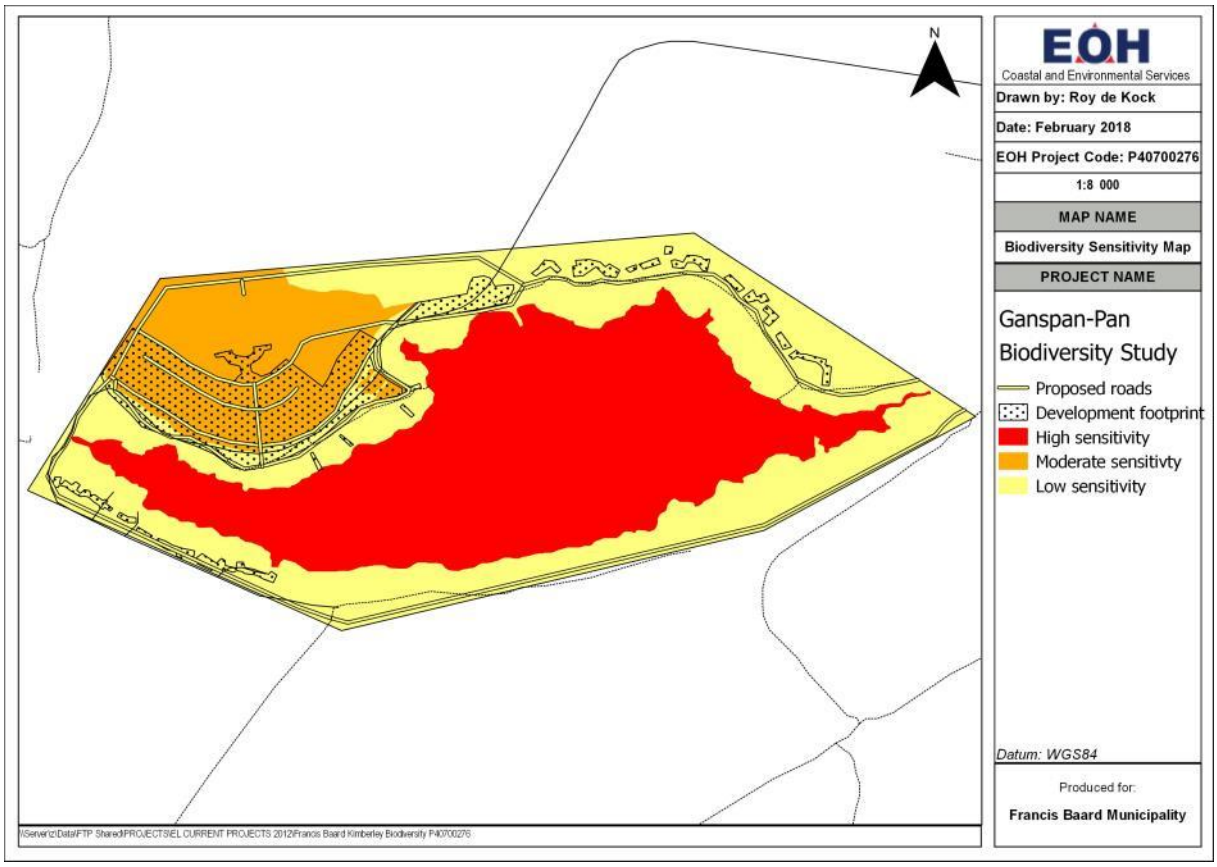


Figure 6.2: Biodiversity sensitivity within the Ganspan Wetland Reserve site

Figure 6.2 shows that all water bodies have a high sensitivity allocation. Dense thornveld (Schmidsdrift Thornveld) has a moderate sensitivity because of the presence of SCC while the remainder of the site has been allocated a low sensitivity.

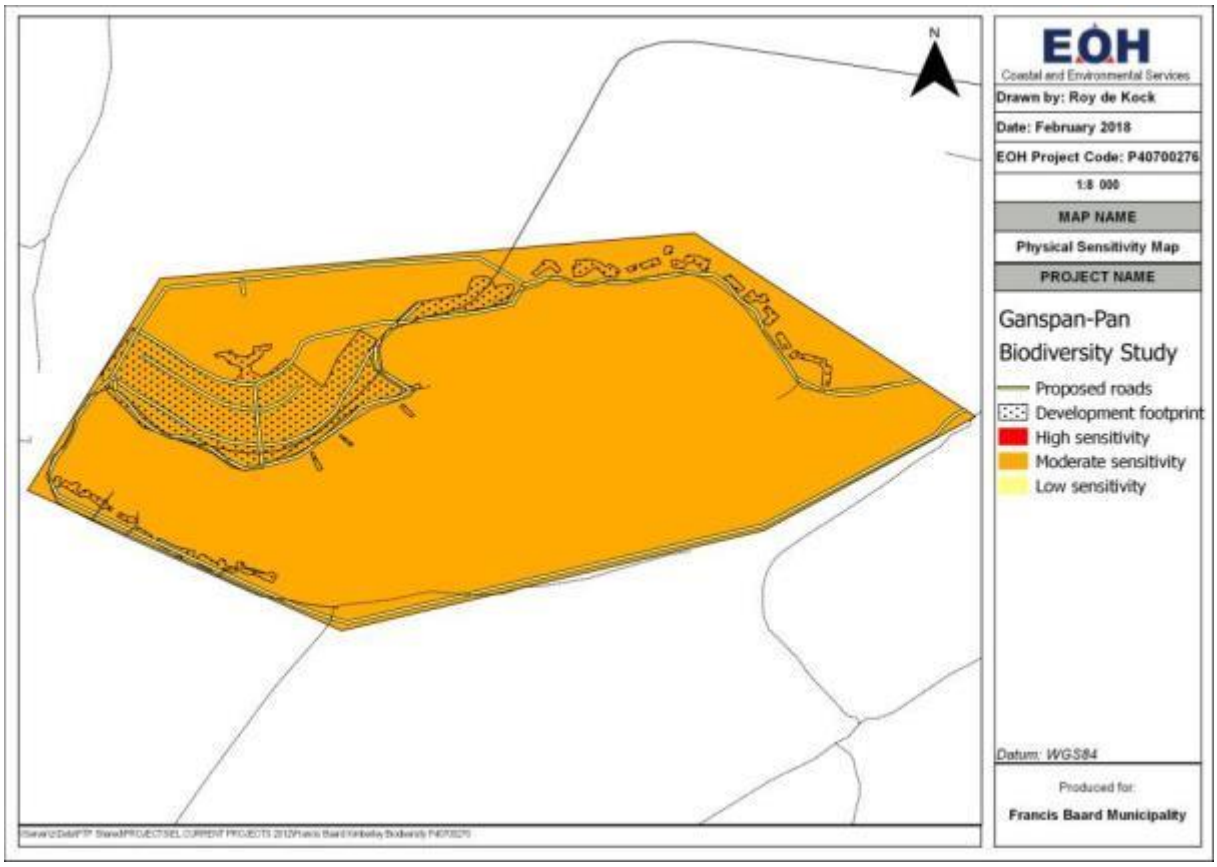


Figure 6.3: Physical sensitivity within the Ganspan Wetland Reserve site

6.3. Issues and impacts identified

Various issues have been identified that will impact the local biodiversity of the Ganspan Wetland Reserve during all phases of the proposed development upgrade (including Planning and Design, Construction and Operational phases)

The following issues were identified during the sensitivity assessment:

Table 6.2: Issues identified during the sensitivity assessment of the proposed Ganspan Wetland Reserve project

ISSUES IDENTIFIED	DESCRIPTION OF IMPACTS
Loss of natural vegetation	The clearing of indigenous vegetation will lead to the permanent loss of natural thornveld.
Loss of SCC	The clearing of natural vegetation will lead to the destruction of habitat for identified and unidentified plant SCC.
Rehabilitation of disturbed areas	Poor rehabilitation of disturbed areas after clearing and establishment may lead to the permanent degradation of ecosystems as well as allow invading alien vegetation species to establish.

Various mitigations are recommended (based on the various levels of sensitivity) to reduce the impacts of the proposed development on the natural environment within the Ganspan Wetland Reserve site. These are discussed in more detail in Section 8.

7. Alien invasive species

An "*invasive species*" is any species whose establishment and spread outside of its natural distribution range (i) threatens ecosystems, habitats or other species or has a demonstrable potential to threaten ecosystems, habitats or other species; and (ii) may result in economic or environmental harm or harm to human health. Invasive alien plant species are globally considered as one of the greatest threats to the environment, biodiversity, ecosystem integrity and the economy.

According to the Conservation of Agricultural Resources Act (No. 43 of 1983 - Regulation 15, 30 March 2001) (CARA), and the National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEMBA), invasive alien plant species should be controlled and eradicated with an emphasis on urgent action in biodiversity priority areas. NEMBA published a list of Alien and Invasive Species (No 599) in 2014 which regulates the management of alien and invasive plants.

Alien and Invasive plant species were identified within the Ganspan Wetland Reserve area. These included:

Table 7.1: List of Alien and Invasive Plant Species identified within the Ganspan Wetland Reserve project site.

Plant name	Common name	Category
Cassuarina equisetifolia	Cassuarina/horsetail tree	2
Opuntia ficus-indica	Pricly pear	1b
Prosopis glandulosa	honey mesquite	3

Other non-declared alien vegetation recorded surrounding the Ganspan Wetland Reserve project area includes:

- *Bidens bipinnata*
- *Oxalis corniculata*
- *Pennisetum clandestinum*
- *Tagetes minuta*

7.1. Discussion

Below is a discussion of each category of alien vegetation as classified in Notice 1 of GN. 599 of 2014 of NEMBA.

7.1.1. Category 1b invasive species

Plants classified as Category 1b alien invasive species are prohibited from:

- Being imported into the Republic,
- growing or in any other way propagating any specimen,
- conveying, moving or otherwise translocating any specimen
- spreading or allowing the spread of any specimen
- releasing any specimen

Category 1b plants must be controlled according to a developed Management Plan.

The following Category 1b plants were identified within the Ganspan Wetland Reserve area:

- *Opuntia ficus-indica*

7.1.2. Category 2 alien invasive species

Category 2 invasive species require a permit for their cultivation and are species that have economic, recreational, aesthetic or other valued properties, notwithstanding their invasive potential. These species will be allowed in areas under conditions specified in a permit. It is important to note that a Category 2 species that falls outside the demarcated area specified in the permit becomes a Category 1b invasive species. Permit-holders must take all the necessary steps to prevent the escape and spread of the species, including the growth or spread of seeds or any other specimens of the species, outside the area for which the permit is issued, and must take all necessary steps to control any specimen that escapes or spreads.

The following Category 2 species have been identified within the Ganspan Wetland Reserve Development area:

- *Cassuarina equisetifolia*

7.1.3. Category 3 alien invasive species

Category 3 species are subject to exemptions and prohibitions. In the Northern Cape, *Prosopis glandulosa* can be utelised as a resource (mostly fodder).

7.2. Issues identified

The following issues were identified during the Alien and invasive Species assessment:

Table 7.2: Issues identified during the Alien and Invasive Species assessment of the proposed Ganspan Wetland Reserve project.

ISSUES IDENTIFIED	DESCRIPTION OF IMPACTS
Control of alien plant species	The lack of an effective alien vegetation management plan may exacerbate the problem of alien plant invasion.

Various alien invasive control measures are recommended in Section 8 to reduce the impact of alien invasive plant species in the proposed Ganspan Wetland Reserve.

8. Manner in which the environment may be affected

Appendix 6
Specialist Reports
1. (1) A specialist report prepared in terms of these Regulations must contain—
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
(k) any mitigation measures for inclusion in the EMPr;

8.1. Issues identified

Table 8.1 below list all the issues identified during the assessment of the proposed new Ganspan Wetland Reserve project:

Table 8.1. Issues identified during all development phases of the proposed new Ganspan Wetland Reserve project

MIND MAP: Biodiversity Impacts for the Ganspan Wetland Reserve development project				
THEMES	CATEGORIES/ISSUES	PLANNING & DESIGN PHASE	CONSTRUCTION PHASE	OPERATIONAL PHASE
Legislation	Legal and policy compliance	**X**		
Terrestrial environment	Loss of natural thornveld	**X**	**X**	
	Loss of SCC	**X**	**X**	**X**
	Rehabilitation of disturbed areas		**X**	**X**
Aquatic environment	Sedimentation and wetland pollution	**X**	**X**	**X**
	Water quality		**X**	
	Destruction of wetland habitat		**X**	
Cross-cutting impacts	Control of alien species	**X**	**X**	**X**

Biodiversity impacts that were identified during the Planning and Design, Establishment and Operational Phases of the proposed new Ganspan Wetland Reserve project and are described below: These issues are applicable for all proposed development alternatives.

Table 8.2. Impacts identified during all phases of the proposed new development in the Ganspan Wetland Reserve area

Categories/Issue	Description of Impact		
	Planning and Design	**Construction**	**Operation**
Legislation			
Legal and policy compliance	Non-compliance with the laws and policies of South Africa as they pertain to the	N/A	N/A

Categories/Issue	Description of Impact		
	Planning and Design	**Construction**	**Operation**
	ecological and aquatic environment could lead to damage of the environment, unnecessary delays in establishment activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.		
Terrestrial environment			
Loss of natural vegetation	Inappropriate design of the project infrastructure will lead to the unnecessary loss of natural vegetation and habitat for other taxonomic groups.	Clearing of natural vegetation outside the planned development footprint will lead to the unnecessary loss of natural vegetation and habitat for other taxonomic groups.	N/A
Loss of SCC	Inappropriate design of the project infrastructure will lead to the unnecessary loss of SCC.	Clearing of natural vegetation may result in the destruction of identified and unidentified plant and animal SCC.	N/A
Rehabilitation of disturbed areas	N/A	Poor rehabilitation of disturbed areas may lead to the permanent degradation of ecosystems as well as allow alien vegetation species to expand.	Continuous rehabilitation of disturbed areas may lead to the permanent degradation of ecosystems as well as allow alien vegetation species to expand.
Aquatic environment			
Sedimentation and wetland pollution	Incorrect design and placement of infrastructure could result in adverse impacts on the wetland ecosystem	Stockpiling of construction materials within 50 m of the wetland could result in erosion and mobilisation of the materials into the wetland, resulting in sedimentation and a decrease in water	Failure to monitor and maintain stormwater management systems could result in erosion and sedimentation of the wetland system.
	Inappropriate construction scheduling could lead to short-term (and potentially long-term) impacts on the wetland environment such		Poor maintenance of sewage infrastructure (i.e. septic tanks, sewage pipes, etc.)

Categories/Issue	Description of Impact		
	Planning and Design	**Construction**	**Operation**
	as excessive sediment mobilization, etc. Inappropriate design of stormwater structures and associated infrastructure may result in increased levels of erosion, sedimentation and pollution of the wetland.	quality and aquatic habitat.	could result in pollution of the wetland
Water quality	N/A	Accidental chemical spills or other spills (sewage, concrete, etc.) in the vicinity of wetland will result in water pollution, adversely affecting the wetland ecosystem.	N/A
Destruction of wetland habitat	N/A	Encroachment into wetland areas and unnecessary and indiscriminate vegetation removal could result in the loss of wetland habitat, which may also impact downstream aquatic ecosystems.	N/A
Cross-cutting impacts			
Control of alien species	Failure to plan for the removal and management of alien vegetation could result in the invasion of alien vegetation throughout the site during the establishment and operation phase.	Removal of natural vegetation creates 'open' habitats that will favour the establishment of undesirable alien plant species in areas that are typically very difficult to eradicate and may pose a threat to neighbouring natural ecosystems.	Loss of natural vegetation will increase the potential invasion by alien plant species. This coupled with the lack of an effective alien vegetation management plan may result in large scale alien plant invasion.

8.2. Impact assessment

The impacts identified in Section 8.1 are assessed in terms of the criteria described in Section 2.5 and are summarised in Tables 8.3- 8.5 below.

Table 8.3. Assessment of impacts during the Planning & Design Phase

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
PLANNING & DESIGN PHASE									
Legislation									
Legal and policy compliance	During the planning and design phase non-compliance with the laws and policies of South Africa as they pertain to the ecological environment could lead to damage of the ecological environment, unnecessary delays in establishment activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.	**Direct, Cumulative**	**Localised**	**Short-term**	**Probable**	**Moderately severe**	**Moderate Negative**	• All legal matters pertaining to permitting must be completed prior to any construction activity. • The relevant permits must be obtained from the competent authority in order to remove any protected plant species.	**Low Negative**
Terrestrial environment									
Loss of natural vegetation	During the planning and design phase the inappropriate design of the project infrastructure will lead to the unnecessary loss of natural vegetation and habitat supporting other taxonomic groups.	**Direct, indirect, cumulative**	**Localised**	**Permanent**	**Definite**	**Moderately severe**	**High Negative**	• The layout footprint must be reduced to include green belts to preserve natural habitat in areas of higher sensitivity. These green belts should be designed to ensure continuity and connectivity with natural areas within and beyond the boundary of the project. • The design footprint overall must be reduced in intact naturally vegetatated areas, especially in Schmidsdrift Thornveld (also called dense thornveld in this report). Areas that is already impacted from sand mining and existing infrastructure must be focussed when designing new infrastructure and must be reduced in areas that is natural.	**Moderate Negative**
Loss of SCC	During the planning and design phase the inappropriate design and layout of the project infrastructure will lead to the unnecessary loss of SCC.	**Direct**	**Localised**	**Permanent**	**Probable**	**Moderately severe**	**Moderate Negative**	• All plant and animal SCC must be relocated to outside the development footprint prior to commencement of activities. • The relevant permits must be obtained from the competent authority in order to remove any SCC.	**Low Negative**
Aquatic environment									
Sedimentation and wetland pollution	During the planning and design phase the incorrect design and placement of infrastructure could result in adverse impacts on the wetland ecosystem	**DIRECT**	**Localised**	**Long-term**	**Possible**	**Severe**	**High Negative**	• As far as possible the placement and design of infrastructure should be limited to already impacted areas and the footprint of proposed	**Low Negative**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
								infrastructure within the wetland kept to a minimum. • Authorisation must be sought from DWS and DENC on proposed designs prior to construction within the wetland.	
	During the planning and design phase the inappropriate construction scheduling could lead to short-term (and potentially long-term) impacts on the wetland environment such as excessive sediment mobilization, etc.	**INDIRECT**	**Study area**	**Medium term**	**Possible**	**Moderately severe**	**Moderate Negative**	• Wherever possible, construction activities should be undertaken during the driest part of the year to minimize sedimentation of the wetland.	**Low Negative**
	During the planning and design phase the inappropriate design of stormwater structures and associated infrastructure may result in increased levels of erosion, sedimentation and pollution of the wetland.	**DIRECT**	**Study area**	**Medium-term**	**Possible**	**Moderately severe**	**Moderate Negative**	• Appropriate stormwater structures must be designed to minimise erosion and sedimentation of the wetland, but still allow the natural flow of water to the wetland.	**Low Negative**
Cross-cutting impacts									
Control of alien species	During the planning and design phase the failure to plan for the removal and management of alien vegetation could result in the invasion of alien vegetation in sensitive areas during the construction and operation phase.	**Indirect**	**Project Level**	**Medium-term**	**Probable**	**Moderately severe**	**Moderate Negative**	• An Alien Vegetation Management Plan must be implemented to reduce the establishment and spread of undesirable alien plant species.	**Low Negative**

Table 9.4. Assessment of impacts during the Construction Phase

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
CONSTRUCTION PHASE									
Ecological environment									
Loss of Natural Vegetation	During the construction phase the clearing of natural vegetation outside the approved development footprint will lead to the unnecessary loss of natural vegetation and habitat for other taxonomic groups.	**Direct, Indirect, Cumulative**	**Localised**	**Medium-term**	**Possible**	**Moderately severe**	**Moderate Negative**	• The construction footprint must be surveyed and demarcated prior to construction commencing. • No construction activities will be allowed outside the demarcated footprint. • Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and vegetation must be undertaken.	**Low Negative**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
Loss of SCC	During the construction phase the clearing of natural vegetation will lead to the destruction of habitats and identified and unidentified plant and animal SCC.	**Direct, Indirect, Cumulative**	**Study Site**	**Medium-term**	**Definite**	**Moderately severe**	**Moderate Negative**	• All areas that will be impacted must be surveyed and demarcated by a suitably qualified specialist prior to vegetation and topsoil removal in order to locate and rescue any SCC within the area and relocate them. • Search and rescue must be undertaken by a professional and qualified specialist. • The contractor's staff must not poach or trap wild animals. • The contractor's staff must not harvest any natural vegetation.	**Low Negative**
Rehabilitation of Disturbed Areas	During the construction phase poor rehabilitation of disturbed areas may lead to the permanent degradation of ecosystems as well as allow alien vegetation species to expand.	**Direct, Indirect, Cumulative**	**Localised**	**Long-term**	**Probable**	**Moderately severe**	**Moderate Negative**	• All temporarily impacted areas must be rehabilitated with indigenous vegetation as soon as construction in the particular area or phase of work is complete, i.e. rehabilitation is on-going throughout construction as phases have been completed. • Restoration must be conducted as per a Rehabilitation Management Plan. • The Rehabilitation Management Plan must be approved by the appointed qualified Environmental Control officer (ECO) prior to implementation. • Only topsoil from the development site, which has been appropriately stored, must be used for rehabilitation.	**Low Negative**
Aquatic environment									
Material Stockpiling	During the construction phase, stockpiling of construction materials within 50 m of the wetland could result in erosion and mobilisation of the materials into the wetland, resulting in sedimentation and a decrease in water quality and aquatic habitat.	**Direct Indirect Cumulative**	**Study area, downstream**	**Medium-term**	**Possible**	**Moderately negative**	**Moderate Negative**	• As far as possible no construction material or other stock piles should be stored within 50 m of the wetland. • Stockpiles within 50 m of the wetland must be monitored for erosion and mobilisation of materials towards wetland. If this is noted by an ECO, suitable cut-off drains or berms must be placed between the stockpile area and the wetland.	**Low Negative**
Water quality	During the construction phase, accidental chemical spills or other spills (sewage, concrete, etc.) in the vicinity of wetland will result in water pollution, adversely affecting the wetland ecosystem.	**Direct Cumulative**	**Study area, downstream of watercourses**	**Short-term**	**Possible**	**Moderately severe**	**Moderate Negative**	• No machinery must be parked overnight within 50 m of the wetland. • All stationary machinery must be equipped with a drip tray to retain any oil leaks.	**Low Negative**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
								• Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp and not within 50 m of the wetland. • Emergency plans must be in place in case of spillages. • No ablution facilities should, as far as possible, be located within 50 m of the wetland. • Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution. • Concrete mixing should not take place within 50 m of the wetland. • All concrete mixing must occur on impermeable surfaces.	
Sedimentation and wetland pollution	During the construction phase encroachment into wetland areas, unnecessary and indiscriminate vegetation removal could result in the loss of wetland habitat, which may also impact downstream aquatic ecosystems.	**Direct**	**Localised and downstream**	**Long-term**	**Definite**	**Severe**	**High Negative**	• The construction footprint and route for construction vehicles must be clearly demarcated. Vehicles and machinery should not encroach into areas outside the planned project footprint. • All wetland vegetation removal must take place under supervision of a qualified Environmental Control Officer (ECO).	**Low Negative**
Cross-cutting impacts									
Control of Alien Species	During the establishment phase the removal of natural vegetation creates 'open' habitats that will favour the establishment of undesirable alien plant species in areas that are typically very difficult to eradicate and may pose a threat to neighbouring natural ecosystems.	**Indirect**	**Study Site**	**Long-term**	**Probable**	**Moderately severe**	**Moderate Negative**	• An Alien Vegetation Management Plan must be developed and implemented during the establishment phase to reduce the establishment and spread of undesirable alien plant species. • Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting, etc.	**Low Negative**

Table 9.5. Assessment of impacts during the Operational Phase

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
OPERTIONAL PHASE									
Terrestrial environment									
Rehabilitation of disturbed areas	During the Operational Phase, continuous rehabilitation of disturbed areas may lead to the	**Direct, Indirect, Cumulative**	**Study Site**	**Long-Term**	**Possible**	**Moderately Severe**	**Moderate Negative**	• All cleared areas must be continuously rehabilitated with indigenous vegetation post-establishment.	**Low Negative**

ISSUE	DESCRIPTION OF IMPACT	NATURE OF IMPACT	SPATIAL SCALE (EXTENT)	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY / BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION
	permanent degradation of ecosystems as well as allow alien vegetation species to expand.								
Aquatic environment									
Sedimentation and wetland pollution	During the operation phase failure to monitor and maintain the stormwater management system could result in erosion and sedimentation of the wetland system.	**Indirect Cumulative**	**Study area, downstream**	**Medium-term**	**Possible**	**Moderately severe**	**Moderate Negative**	• Stormwater management structures must be monitored and maintained throughout the operation phase.	**Low Negative**
	During the operational phase poor maintenance of sewage infrastructure (i.e. septic tanks, sewage pipes, etc.) could result in pollution of the wetland and	**Direct**	**Study Area, Downstream**	**Medium-Term**	**Possible**	**Moderately Severe**	**Moderate Negative**	• All sewage infrastructures in the residential area, lodge and chalets must be regularly serviced and maintained. • Any leaks must be repaired immediately.	**Low Negative**
Cross-cutting impacts									
Invasion of Alien Species	During the operational phase the loss of natural vegetation will increase the potential invasion by alien plant species. This, coupled with the lack of implementation of an alien vegetation management plan may result in large scale alien plant invasion.	**Direct, Indirect, Cumulative**	**Study Site**	**Long-Term**	**Possible**	**Moderately Severe**	**Moderate Negative**	• An Alien Vegetation Management Plan must be implemented during the operational phase to reduce the establishment and spread of undesirable alien plant species. • Alien plants must be removed through appropriate methods such as hand pulling, application of chemicals, cutting, etc. as in accordance to the NEMBA: Alien Invasive Species Regulations.	**Low Negative**

9. Impact Statement, recommendation and conclusion

Appendix 6
Specialist Reports
1. (1) A specialist report prepared in terms of these Regulations must contain—
(l) any conditions for inclusion in the environmental authorisation;
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;
(n) a reasoned opinion—
(i) whether the proposed activity, activities or portions thereof should be authorised;
(iA) regarding the acceptability of the proposed activity or activities; and
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;

9.1. Impact statement

A total of 33 plant species were identified within the proposed Ganspan Wetland Reserve. Savanna is the dominant vegetation biome present with vegetation changing from dense thornveld in the north-western portions to open savannah and grassland in the south and east. Alien & invasive plants occur at places but are not dominant. Of these 33 species, only three are listed as SCC (Table 5.6). The implication is that these species will require a permit for removal or transplant prior to construction. This should be done through a Search and Rescue exercise prior to commencement of clearing.

All water bodies within the site as well as the dense thornveld vegetation community (called Schmidsdrif Thornveld by Mucina and Rutherford; 2012) are considered as highly sensitive. All other ecosystems are considered as low sensitive. However, the entire Ganspan Wetland Reserve site is considered as a highly sensitive biodiversity area. Even though separate ecosystems within the site may vary in sensitivity, the overall functioning of these ecosystems are considered as highly sensitive. Compared to this, the overall physical attributes of the site (namely topography, Disturbance levels and Erosion) is considered as moderate for the site.

The proposed development falls within both areas that have already been transformed and areas that are still in a natural state. Dense thornveld (Schmidsdrif Thornveld) is considered as almost completely intact except for smaller areas on the fringes that has been cleared by sand mining activities, but the largest footprint will occur here. This will result in an approx. 50% permanent loss of natural vegetation. This vegetation type has been allocated a moderate sensitivity due to the amount of SCC occurring here. It is not considered as sustainable for the development to essentially be covering 50% of the land area contained in the Protected Area. At worst a Protected Area could be development justifiably 10-15% of the PA, maybe a bit more considering the small size of the site. The site visit showed that large portions of land have already been impacted by infrastructure development, sand mining and grazing. These areas should be preferentially used for lodge development and where not used, rehabilitated back to their natural state. A Conservation Management Plan must be developed and approved.

Alien species are present on site and their category according to the NEMBA Alien and Invasive Species Regulations (published 1 August 2014) are presented in Section 8.1 above. Since this project involved the development of infrastructure within a Nature Reserve s, it is advised that an Alien Vegetation

Management Plan is generated and implemented during the construction phase (for clearing) AND operation phase, throughout the life of the project, and that active management of alien species listed as category 1b is carried out.

All the mitigations stipulated in the Wetland Management Plan (Section 7) must be adhered to. It is recommended that these mitigations be incorporated into a Conservation Management Plan for the entire Ganspan Wetland Reserve for all phases of the current and potential future development within the Reserve.

9.1.1. No-Go areas

The wetland itself including the aquatic vegetation community related to the wetland should be avoided during development. If unavoidable, the mitigations recommended in the Wetland Management Plan (Section 10) must be adhered to.

It is recommended that green belts be identified within the Ganspan Wetland Reserve where no development (current or future) or limited development may occur. This is to allow movement of fauna and flora within the Reserve site. These green belts must also connect to green belts outside the Reserve site to allow regional movements. The following green belts are proposed:

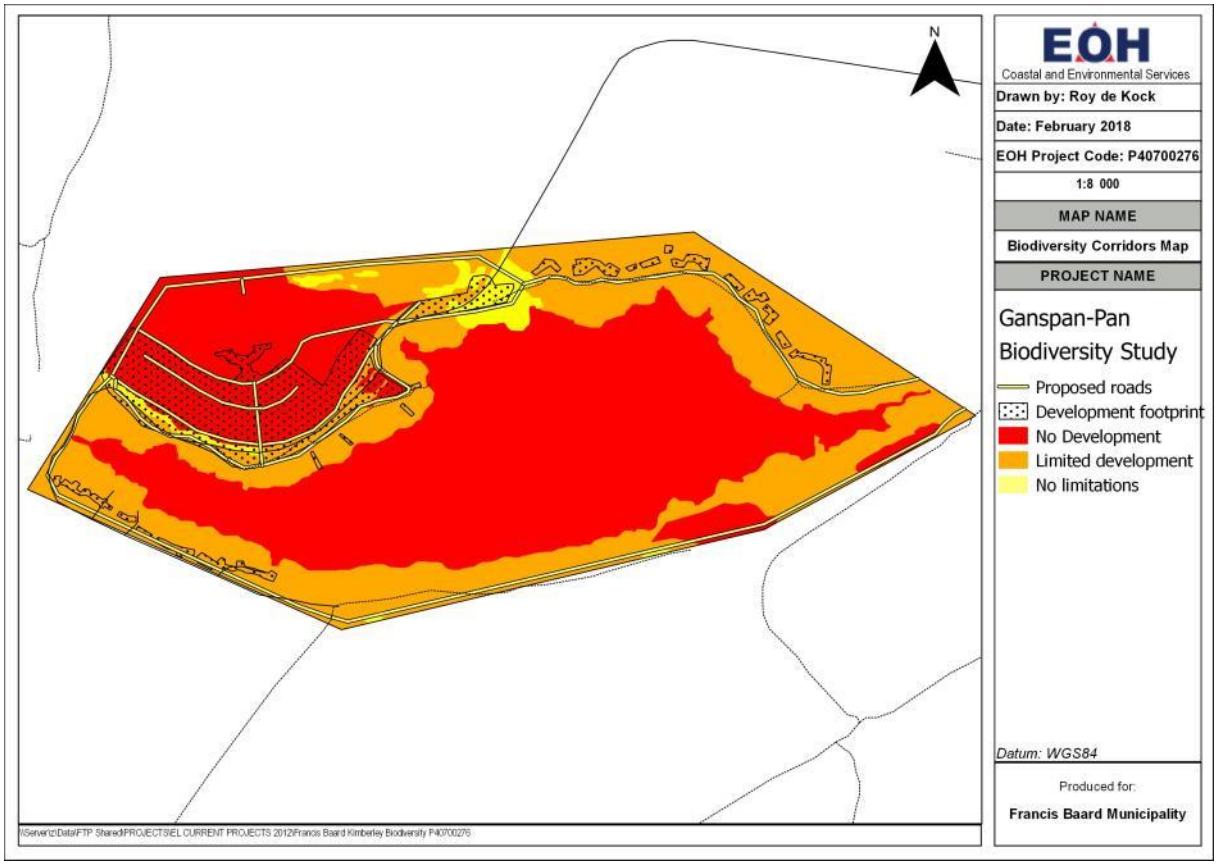


Figure 9.1: Proposed Biodiversity Corridors for the Ganspan Wetland Reserve site.

These belts were based on the following:

1. Areas were identified within the Ganspan Wetland Reserve where development must be limited. These include:

   a. Areas excluded from high density development; and
   b. Areas excluded from having any fence lines.
2. Areas were identified within the Ganspan Wetland Reserve where no development must take place. These include:
   a. Highly sensitive area.
3. Areas were identified within the Ganspan Wetland Reserve where no development constraints are applicable. These include:
   a. Transformed areas;
   b. Degraded areas; and
   c. Highly impacted areas

The following recommendations are made for each Biodiversity Corridor identified:

No Development corridor:
- No development must take place in these areas.
- If unavoidable, biodiversity offsets must be calculated as per the National Biodiversity Offset Policy (GN R 276 of 2017 of NEMA) for any areas impacting into this corridor.

Limited Development corridor:
- Low density development will be allowed in these areas like chalets, limited parking, etc.
- No fence lines will be allowed in these areas. This is to allow movement of fauna in these areas.

No Limitation corridor:
- Any relevant development will be allowed in these areas.

9.1.2. Alternatives

No alternatives were presented and therefore were not assessed.

9.1.3. Cumulative impact

The project entails the clearing of natural vegetation for infrastructure development within the Ganspan Wetland Reserve outside Jan Kempdorp in the Northern Cape. The proposed development will occur on land proclaimed for conservation although some areas have been transformed due to sand mining and grazing. All areas not developed are considered as sensitive and must be avoided and conserved for their biodiversity value.

9.2. Recommendation

The following recommendations must be included into the final EMPr:
- The layout and design of the development MUST incorporate the following green corridors as well as the recommended management requirements for each corridor as defined in Section 9.1.1 of this Report.
- Plant Permits must be obtained from DENC for the following SCC identified onsite:

Species	Vegetation community	Threat status
Aloe grandidentata	Dense thornveld; Open savanna	Protected (PNCO)
Boscia albitrunca	Dense thornveld	Protected tree (DAFF)
Euphorbia sp.	Dense thornveld	Protected (PNCO)

- Any SCC found must be immediately relocated to areas close by, but beyond the proposed development footprint.
- The appointed qualified ECO must be immediately notified if any SCC is identified during construction (clearing phase).
- All mitigation measures indicated in this report must be included into the EMPr
- The following Management Plans must be developed prior to clearing, during construction and operations of the proposed development. These management plans must incorporated into the Environmental Management Programme (EMPr) during the Environmental Imapct Assessment (EIA) for this project:
    - Rehabilitation Management Plan
    - Alien Vegetation Management Plan
    - Wetland Management Plan (already developed in Section 7 of this assessment)
    - Conservation Management Plan

9.2.1. Mitigation measures

All the mitigation measures provided below are to be implemented during the planning and design, construction and operational phases of the proposed new Ganspan Wetland Reserve project.

During planning and design:

- All legal matters pertaining to permitting must be completed prior to any construction activity.
- The relevant permits must be obtained from the competent authority in order to remove any protected plant species.
- The layout footprint must be reduced to include green belts to preserve natural habitat in areas of higher sensitivity. These green belts should be designed to ensure continuity and connectivity with natural areas within and beyond the boundary of the project.
- The design footprint overall must be reduced in intact naturally vegetatated areas, especialiit in Schmidsdrift Thornveld (also called dense thornveld in this report). Alreas that is already impacted from sand mining and existing infrastructure must be focussed when designing new infrastructure and must be reduced in areas that is natural.
- All plant and animal SCC must be relocated to outside the development footprint prior to commencement of activities.
- The relevant permits must be obtained from the competent authority in order to remove any SCC.
- As far as possible the placement and design of infrastructure should be limited to already impacted areas and the footprint of proposed infrastructure within the wetland kept to a minimum.
- Authorisation must be sought from DWS and DENC on proposed designs prior to construction within the wetland.
- Wherever possible, construction activities should be undertaken during the driest part of the year to minimize sedimentation of the wetland.
- Appropriate stormwater structures must be designed to minimise erosion and sedimentation of the wetland, but still allow the natural flow of water to the wetland.
- An Alien Vegetation Management Plan must be implemented to reduce the establishment and spread of undesirable alien plant species.

During the construction phase:

- The construction footprint must be surveyed and demarcated prior to construction commencing.
- No construction activities will be allowed outside the demarcated footprint.

- Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and vegetation must be undertaken.
- All areas that will be impacted must be surveyed and demarcated by a suitably qualified specialist prior to vegetation and topsoil removal in order to locate and rescue any SCC within the area and relocate them.
- Search and rescue must be undertaken by a professional and qualified specialist.
- The contractor's staff must not poach or trap wild animals.
- The contractor's staff must not harvest any natural vegetation.
- All temporarily impacted areas must be rehabilitated with indigenous vegetation as soon as construction in the particular area or phase of work is complete, i.e. rehabilitation is on-going throughout construction as phases have been completed.
- Restoration must be conducted as per a Rehabilitation Management Plan.
- The Rehabilitation Management Plan must be approved by the appointed qualified Environmental Control officer (ECO) prior to implementation.
- Only topsoil from the development site, which has been appropriately stored, must be used for rehabilitation.
- As far as possible no construction material or other stock piles should be stored within 50 m of the wetland.
- Stockpiles within 50 m of the wetland must be monitored for erosion and mobilisation of materials towards wetland. If this is noted by an ECO, suitable cut-off drains or berms must be placed between the stockpile area and the wetland.
- No machinery must be parked overnight within 50 m of the wetland.
- All stationary machinery must be equipped with a drip tray to retain any oil leaks.
- Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp and not within 50 m of the wetland.
- Emergency plans must be in place in case of spillages.
- No ablution facilities should, as far as possible, be located within 50 m of the wetland.
- Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution.
- Concrete mixing should not take place within 50 m of the wetland.
- All concrete mixing must occur on impermeable surfaces.
- The construction footprint and route for construction vehicles must be clearly demarcated. Vehicles and machinery should not encroach into areas outside the planned project footprint.
- All wetland vegetation removal must take place under supervision of a qualified Environmental Control Officer (ECO).
- An Alien Vegetation Management Plan must be developed and implemented during the establishment phase to reduce the establishment and spread of undesirable alien plant species.
- Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting, etc.

<u>During operational phase:</u>

- All cleared areas must be continuously rehabilitated with indigenous vegetation post-establishment.
- Stormwater management structures must be monitored and maintained throughout the operation phase.
- All sewage infrastructures in the residential area, lodge and chalets must be regularly serviced and maintained.
- Any leaks must be repaired immediately.

- An Alien Vegetation Management Plan must be implemented during the operational phase to reduce the establishment and spread of undesirable alien plant species.
- Alien plants must be removed through appropriate methods such as hand pulling, application of chemicals, cutting, etc. as in accordance to the NEMBA: Alien Invasive Species Regulations.

9.3. Conclusion

Table 10.1 summarises the change in impacts from pre- to post- mitigation for the proposed development within the Ganspan Wetland Reserve. All impacts identified as high and moderate will reduce to a low significance if the mitigation measures as proposed in this report is adhered to.

Table 10.1: Assessment of pre- and post-mitigation impact significance.

	PRE-MITIGATION				POST-MITIGATION			
	LOW	MODERATE	HIGH	UN-KNOWN	LOW	MODERATE	HIGH	UN-KNOWN
Planning and Design	2	4	2	0	7	1	0	0
Construction	0	6	1	0	7	0	0	0
Operational	0	4	0	0	4	0	0	0
TOTAL	2	15	2	0	19	0	0	0

9.3.1. Biodiversity Statement and Opinion of the Specialist

The biodiversity impacts of all aspects (including both terrestrial and aquatic environments) for the proposed Ganspan Wetland Reserve project were assessed and considered to be ecologically acceptable, provided that the footprint is reduced to a sustainable area and that mitigation measures provided in this report are implemented. Most impacts are rated as LOW to MODERATE pre-mitigation (Table 9.1), therefore implementation of recommended mitigation measures coupled with comprehensive rehabilitation and monitoring in terms of re-vegetation and restoration is an important element of the mitigation strategy. Implementing the recommended mitigations measures will reduce most impacts to LOW.

The proposed development is **NOT considered to be Fatally Flawed**.

The **No-Go option** refers to the proposed Ganspan Wetland Reserve project not being established. This option will therefore have no impact (positive or negative) on the local vegetation and biodiversity if it is not established.

10. Wetland management plan

A wetland management plan is proposed to ensure protection and prevent unnecessary degradation of the Ganspan Wetland during the proposed upgrade activities. Management plans specifically for wetlands, at any scale, can ensure the best outcomes for sustaining the values and benefits of wetlands.

8.1. Existing biophysical environment

Refer to Section 4.8 for a full description of the aquatic environment found within the Ganspan Wetland Reserve site.

8.2. Existing value and importance

The Ganspan Wetland is classified as an artificial wetland. This wetland, however, does provide important ecosystem services and functions. Typical ecosystem services currently being provided (and/or which can be potentially provided) by the Ganspan Wetland include the following:

- Erosion control;
- Sediment trapping;
- Phosphate removal;
- Nitrate removal;
- Toxicant removal;
- Flood attenuation;
- Tourism and recreation;
- Natural resources; and
- Water supply.

8.3. Management actions

Refer to Section 10.2 for a full list of recommended mitigation measures.

8.4. Legislative environment

National Water Act (Act No. 36 of 1998).

A Water Use Licence Application (WULA) is required for any construction activity within the extent of a watercourse (i.e. riparian and in stream habitat or within 100 m of the watercourse) or the 1:100 year flood line (if determined); or within 500 m of a wetland (including artificial wetlands) in terms of the following triggers from the National Water Act (No. 36 of 1998):

- Sec 21 (c) - impeding or diverting the flow of water in a watercourse;
- Sec 21 (i) - altering the bed, banks, course or characteristics of a watercourse.

The Department of Water and Sanitation (DWS) must be engaged with and the relevant WULAs obtained prior to commencement of any construction activity at the Ganspan Wetland.

National Environmental Management Act Environmental Impact Assessment Regulations (as amended in 2017)

Environmental authorisation must be obtained from the relevant competent authority (Department of the Environment and Nature Conservation; DENC) prior to commencement of any construction activity in terms of the following listed activities:

- **GNR 327 No. 12:** the development of (ii) infrastructure or structures with a physical footprint of 100 square metres or more where such development occurs (a) within a watercourse; (c) within 32 metres of a watercourse;
- **GNR 327 No. 19:** The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.

8.5. General wetland rehabilitation guidelines

Rehabilitation guidelines which can be included in the Rehabilitation Plan are described below. For further guidelines on wetland rehabilitation refer to WET-Rehab Methods (Russell, 2009).

- Stabilise unstable and eroded areas

Any erosion features immediately upslope and/or within the wetland habitat that is created during the construction phase needs to be stabilised. This may also include the need to deactivate any erosion head cuts/rills/gullies that may have developed. Compacted soil infill, rock plugs, gabions or any other suitable measures can be used for this purpose.

- Remove any waste products
    - All foreign sediment washed into the wetland from upslope erosion must be removed taking care not to remove or disturb the natural soil profile.
    - Any foreign material or waste (spoil, construction materials, hazardous substances and general litter) must be removed from the wetland and disposed of in proper waste facilities.
    - Additional disturbance must be prevented by limiting the use of heavy vehicles and personnel during clean-up operations.
- Remove alien plants from wetlands
    - All exotic/alien plants and weeds that colonise the wetlands and immediate vicinity must be removed and properly disposed of prior to the implementation of rehabilitation measures.
- Restore natural topography and re-vegetation
    - The natural topography of the wetland area must be re-instated as close as practically possible to pre-construction conditions to ensure natural drainage patterns.
    - In the case of unstable steep banks these may be reshaped to a stable angle of repose to avoid slumping.
    - If significant soil compaction has occurred, the soil may need to be ripped to reduce the bulk density of the soil such that vegetation can become established at the site. If topsoil is lost during construction as a result of erosion, topsoil will need to be imported to the site and re-established. This topsoil must be sourced responsibly and legally.
    - Where re-vegetation is not sufficient on its own to stabilise areas, “soft” stabilisation interventions should be installed where necessary and applicable. “Soft” stabilisation

interventions should be favoured over "hard" interventions wherever possible to ensure that wetlands retain habitat.
    - The following soft interventions (in addition to re-vegetation) should be investigated:
        - Fibre mats / blankets/ mattresses / nets.
        - Fibre rolls.
        - Fibre bags.
        - Brush or vegetation mattresses (mats).
        - Terracing.
    - A trained rehabilitation expert should be contracted to oversee the rehabilitation of the wetland.
    - Once alien vegetation and waste products have been removed and soils are prepared for planting, vegetation must be reinstated as soon as weather conditions allow for plant growth.
    - For wetland and riparian habitat, the disturbed and bare areas must be re-vegetated using indigenous plants with active planting using plugs and/or sprigs of indigenous locally occurring wetland vegetation similar/identical to that existing prior to disturbance or transplants of local vegetation that can only be sourced under the guidance of the ECO/re-vegetation specialist and must not be sourced from freshwater habitats.
    - Rapidly germinating indigenous species (e.g. fast growing, deep rooting, rhizomatous, stoloniferous) known to bind soils in terrestrial, riparian and/or wetland areas must be utilised where there is a strong motivation for stabilisation over reinstating similar plant communities to that being disturbed. Again, this should be informed by a qualified re-vegetation specialist.
    - Although it would be advantageous to plant at the onset of the wet season such timing would coincide with peak flow events that pose a higher risk to re-vegetation failure. Therefore, careful planning is required to maximise the success of re-vegetation and avoiding peak flow events. Thus, it is likely that some watering will be required.
    - Do not use fertilizer, lime, or mulch unless absolutely required.
    - Alien plant species are not to be used for re-vegetation, particularly those with invasive potential (Conservation of Agricultural Resources Act (Act 43 of 1983), as well as the Alien & Invasive Species list (2014) of the National Environmental Management: Biodiversity Act (Act 10 of 2004).
    - When sourcing plants from nurseries, it is important to consider the genetic origin of the plants. It is considered best to use small regional nurseries that breed plants from the region, instead of large commercial nurseries that are likely to obtain stock from large regional suppliers.
    - Temporary erosion protection measures must only be removed once good vegetation cover has been established.
    - Should the replanting area be invaded by weeds prior to planting, these must be hand pulled, hoed or killed with an appropriate environmentally friendly herbicide. Care must be taken, however, to not clear all weeds indiscriminately as the weeds may be performing a useful soil covering and binding function.
- Monitor re-vegetation progress and administer alien plant control
    - Recovery of disturbed areas should be assessed for the first 6 months to assess the success of rehabilitation actions. Any areas that are not progressing satisfactorily must be identified (e.g. on a map) and action must be taken to actively re-vegetate these areas. If natural recovery is progressing well, no further intervention may be required.
    - The ECO should assess the need / desirability for further monitoring and control after the first 12 months and include any recommendations for further action.

- The use of herbicides in invasive alien plant control will require an investigation into the necessity, type to be used, effectiveness and impacts of the agent on aquatic biota (manual removal of alien vegetation should be sufficient).
- Any soil erosion in rehabilitated areas must also be addressed through appropriate actions.

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12. Appendix A – List of plant species

List of all plant species that were identified within the Ganspan Wetland Reserve:

Family	Species	Threat status
ACANTHACEAE	*Barleria macrostegia*	LC
ANACARDIACEAE	*Sersia lancea*	LC
APOCYNACEAE	*Ceropegia crassifolia var. crassifolia*	Protected (PNCO)
ASPHODELACEAE	*Aloe grandidentata*	Protected (PNCO)
ASTERACEAE	*Bidens bipinnata*	Not Evaluated
	Bidens pilosa	Not Evaluated
	Helichrysum azeyheri	LC
	Osteospermum muricatum	LC
BORAGINACEAE	*Ehretia rigida*	LC
CACTACEAE	*Opuntia ficus-indica*	Alien Invasive
CAPPARACEAE	*Boscia albitrunca*	Protected tree (DAFF)
CASUARINACEAE	*Cassuarina equisetifolia*	Invasive
COMPOSITAE	*Tarchonanthus camphoratus*	LC
EBENACEAE	*Euclea crispa*	LC
EUPHORBIACEAE	*Euphorbia sp.*	Protected (PNCO)
FABACEAE	*Acacia mellifera*	LC
	Acacia tortilis	LC
	Acacia karroo	LC
	Prosopis glandulosa	Alien Invasive
IRIDACEAE	*Gladiolus permeabilis subsp. edulis*	Protected (PNCO)
	Moraea natalensis	Protected (PNCO)
JUNCACEAE	*Juncus effusis*	LC
MALVACEAE	*Hermannia tomentosa*	LC
POACEAE	*Aristida congesta subsp. congesta*	LC
	Aristida meridionalis	LC
	Eragrostis lehmanniana var. lehmanniana	LC
	Eragrostis pallens	LC
	Eragrostis x pseud-obtusa	Not Evaluated
	Phragmites australis	LC
	Themeda triandra	LC
RHAMNACEAE	*Ziziphus mucronata*	LC
SANTALACEAE	*Thesium lineatum*	LC
SCROPHULARIACEAE	*Aptosimum elongatum*	LC
TILIACEAE	*Grewia flava*	LC
TYPHACEAE	*Typha capensis*	LC
VAHLIACEAE	*Vahlia capensis*	Not Evaluated
VERBENACEAE	*Lippia scaberrima*	LC
ZYGOPHYLLACEAE	*Zygophyllum pubescens*	LC