VEGETATION ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A DOUBLE STOREY ON MOOIFONTEIN FARM NO 14IR, PORTION 22 IN THE EKHURHULENI METRO MUNICIPALITY

DRAFT

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Prepared By

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EXECUTIVE SUMMARY

Based on the findings of the ecological assessment, it is the opinion of the botanist that from an ecological viewpoint, the proposed project be considered favourably. All essential mitigation measures and recommendations presented in this report should be adhered to. This will ensure that the ecology within the proposed construction areas as well as surrounding zone of influence is protected or adequately rehabilitated. This will minimise the deviations from the present ecological state. Particular attention needs to be paid to the location and extent of sensitive terrestrial habitat and wetland stems in order to ensure that development-related activities do not unnecessarily encroach into these zones and that ongoing functionality of these systems is ensured.

GKM Consulting was appointed by Jan Joubert Attorneys to undertake Vegetation Assessment for the proposed construction of two double storey building on Mooifontein Farm No 14IR, portion 22 in Kempton Park. The establishment of the proposed building will result in the current flora on site, hence the need to ascertain how much of it is indigenous and how it can be preserved or worked back into the development. On the 19th of November 2017, GKM team conducted a site visit in line with Gauteng Requirements for Biodiversity Assessments Version 3, 2014.

None of the species listed in the GDARD Biodiversity Assessment Version 3, 2014 are available on the proposed site.

The areas consist mainly of vegetation, approximately 80% of the land cover is vegetation and of that approximately 60% is made up of indigenous vegetation and the rest are alien species. All the indigenous plants have been included to this report as part of the report in the form of a map. None of the plants on site require permits before removal however, Environmental Authorisation is required in this instance because more than 30 square metres of indigenous vegetation is going to be cleared in an area classified as Critical Biodiversity.

Impact Assessment and Conclusion

The specialist took into consideration the proposed activity from planning to construction to operation. During construction, the appointed Environmental Control Officer (ECO) should ensure that mitigation measures are sufficient to protect the sensitive area within the study footprint. The following are some of the main envisaged impacts:

- Spread of alien species;
- Increased soil erosion; and,
- Loss of Habitat

Mitigation Measures and Recommendations

The specialist recommends the approval of the project. The developer / client should employ an Environmental Control Officer (ECO), preferably a botanist, to monitor activities and ensure that activities are in line with conditions set out by the competent authority and Environmental Management Plan Report (EMPr).

Conclusion

A qualified environmental control officer should be appointed by the applicant before construction start to ensure that mitigation measures in this report are implemented.

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1. INTRODUCTION

1.1 PROJECT BACKGROUND

Jan Joubert wishes to construct two double storey building on Mooifontein Farm. The project falls within 500m of a wetland therefore an environmental authorisation and water use license is required before activity can commence. GKM Consulting PTY LTD were appointed to undertake a vegetation assessment as part of the environmental impact assessment.

1.2 PROJECT LOCALITY

Development falls on Mooifontein Farm No 14IR, portion 22 in the Ekhurhuleni Metro Municipality. ***(Figure 1).***

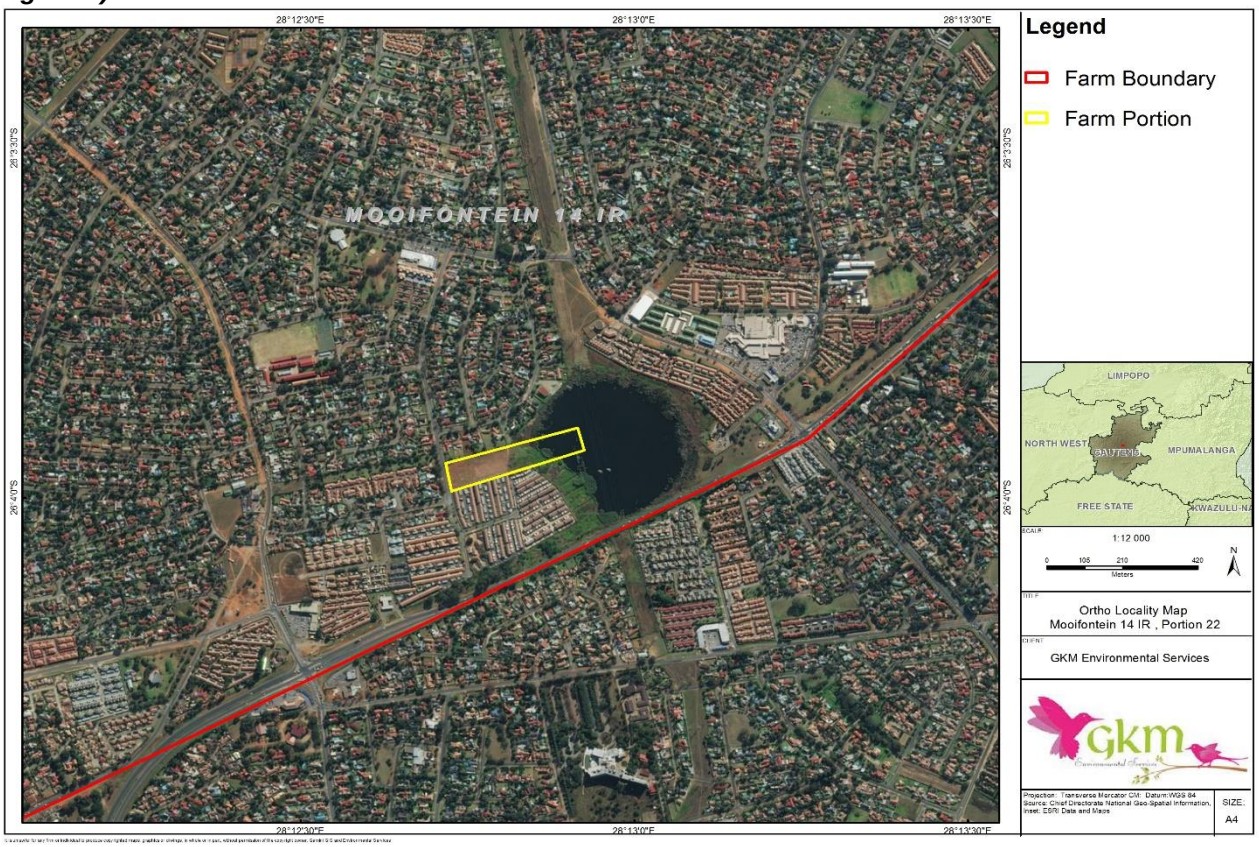


Figure 1 – Locality Map

1.3 PROJECT TEAM

- Grace Magaya - The author of this report has over 5 years' experience in the environmental field as an impact assessor for project that varies from linear to surface structures. Her role in this project was to assess the impact the proposed development was going to have on the identified flora.
- Vuyolwethu Yani – The field assessor holds a Masters in Botany. She has over 9 years in the field of plant identification.
- Ntambeleni Masia – the SACNASP Registered member of the team was responsible for reviewing field work and report has over 5 years-experience which includes work done at the South African National Biodiversity Institute (SANBI).

Table 1 - Team

Name and Surname	Role	Qualification
Grace Magaya	Project Manager; Report Writer; and Field Investigation	Bachelors in Environmental Management (2014) BSc Botany (2018)

Vuyolwethu Yani	Field Investigation	BSc Honors Botany MSc Botany
Ntambeleni Masia	Reviewer and Quality Control	BSc Honors Environmental Science BSc Environmental Science Professional Registration No 115960

1.4 DECLARATION

We at GKM Consulting PTY LTD, in our capacity as specialist consultant, hereby declare that we:

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Undertake to disclose to the competent authority, any material and/or information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake our profession in accordance with the Code of Conduct of the Council, as well as any other societies to which we are members; and
- Based on information provided to us by the project proponent, and in addition to information obtained during this study, have presented the results and conclusion to the best of our professional judgement.

1.5 COPYRIGHT

1.6 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are applicable to this report:

- The ecological assessment is confined to the study area and does not include the neighboring and adjacent properties; these were, however, considered as part of the desktop assessment.
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral communities have been accurately assessed and considered.
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa on the study area may therefore have been missed during the assessment.

It is important to note that the absence of species on site does not conclude that the species is not present at the site.

2. APPLICABLE LEGISLATION

The national and provincial legislation, policies and guidelines, which could apply to impacts of the proposed project on biodiversity, are listed below. Although the list is comprehensive, additional legislation, policies and guidelines that have not been mentioned may apply.

2.1 NATIONAL LEGISLATION

- ↔ Conservation of Agricultural Resources Act (Act 43 of 1983);
- ↔ Constitution of the Republic of South Africa (Act 108 of 1996)
- ↔ National Forests Act (Act 84 of 1998) and Protected Tree Species;
- ↔ National Veld and Forest Fire Act (Act 101 of 1998);
- ↔ National Environmental Management Act (Act 107 of 1998);
- ↔ National Heritage Resources Act (Act 25 of 1999);
- ↔ Section 28(2) (a) makes provision for the establishment of buffer zones;
- ↔ Biodiversity Policy and Strategy for South Africa: Strategy on Buffer Zones for National Parks: For general information (Government Gazette [GG] 35020 – Notice 106);
- ↔ National Environmental Management: Biodiversity Act (NEM: BA; Act 10 of 2004);
- ↔ National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of NEM: BA (GG 34809, Notice 1002, 9 December 2011);
- ↔ Alien and Invasive Species Regulations (GG 37885, 1 August 2014); and
- ↔ National Environmental Management: Air Quality Act (Act 39 of 2004).

2.2 NATIONAL POLICIES, GUIDELINES & PROGRAMMES

- ↔ National Water Resource Strategy (2004),
- ↔ National Biodiversity Strategy and Action Plan (Driver et al. 2004),
- ↔ National Aquatic Ecosystem Health Monitoring Program & River Health Program (DWAF 2008),
- ↔ National Freshwater Ecosystem Priority Areas project (Driver et al. 2011),
- ↔ National Spatial Biodiversity Assessment (DEA & SANBI 2012) including Terrestrial Priority Areas & Threatened Ecosystems (Jonas et al. 2012),
- ↔ Grasslands Programme (SANBI 2013).

2.3 GAUTENG LEGISLATION, POLICIES & GUIDELINES

- ↔ The Johannesburg Metropolitan Open Space System;
- ↔ Gauteng Nature Conservation Ordinance (Ordinance 12 of 1983), amended by the Gauteng General Law Amendment Act (Act 4 of 2005);
- ↔ Gauteng Nature Conservation Bill (2014) – to repeal the Gauteng Nature Conservation Ordinance (Ordinance 12 of 1983);
- ↔ City of Johannesburg Biodiversity Strategy and Action Plan 2015 (CoJ 2009);
- ↔ Gauteng Conservation Plan (C-Plan). Version 3.3 (GDARD 2011);
- ↔ Gauteng Protected Areas Expansion Strategy (GDARD 2011);
- ↔ GDARD Requirements for Biodiversity Assessments. Version 3 (GDARD 2014); and
- ↔ The Local Government: Municipal Systems Act, 2000 (Act No 32 of 2000).

3. DESCRIPTION OF RECEIVING ENVIRONMENT

3.1 Current Land-use

A review of available literature and spatial data formed the basis of a characterization of the biophysical environment in its theoretically undisturbed state and consequently an analysis of the degree of impact to the ecology of the study site in its current state. According to Mucina and Rutherford (2011), the proposed site falls under Tsakane Clay Grassland The description of environment that has been provided in this report is as provided by Mucina and Rutherford (2011) (Figure 2).

Figure 2 – Current Land use

3.2 Climate

Strongly seasonal summer rainfall, with very dry winters. MAP 630 – 720mm. the overall MAT of 15^{0}Cindicates a transition between a cool temperate and warm temperate climate. The incidence of frost frequent, increasing towards the southeast.

3.3 Geology and Soils

The most significant rock is the basaltic lava of the Klipriviersberg Group (Ventersdorp Supergroup), together with the sedimentary rocks of the Madzaringwe Formation of the Karoo Supergroup. Soils typical of Ba and Bb land types. (Figure 3)

Figure 3 – Geology and Soils

(insert map)

3.4 Conservation Status

Vulnerable. Target 19%. Some 13% statutorily conserved mainly in the Magaliesberg Nature Area. About 28% transformed mainly by cultivation and urban and built up areas. Very scattered occurences to sometimes dense patches in places of various alien plants including *Cereus jamacaru, Eucalyptus species, Jacaranda mimosifolia, Lantana camara, Melia azedarach and Schinus species.* Erosion is mainly very low to low, moderate in some areas.

3.5 Important Taxa

Table 2 – Important taxa (Mucina and Rutherford)

Small Trees	Tall schrubs	Low Shrub	Shrubs
Acacia nilotica (d) Tortilis subsp. Heteracantha (d) Rhus lancea	Buddleja saligna Euclea undulata Olea europaea subsp.africana Grewia occidentalis Gymnosporia polycantha Mystroxylon aethiopicum subsp.burkeanum	Aptosimum elongatum Falicia fascicularis Lantana rugosa Teucrium trifidum.Succulent	Kalanchoe paniculate
Woondy clumber	**Herbaceous climber**	**Graminoids**	**Herbs**
Jasminum breviflorum	Lotononis bainesii	Heteropogon contortus Setaria sphacelata Themeda triandra Aristida congesta Chloris virgate Cynodont dactylon Sporoolus nitens Tragus racemosus	Achyropsis avicularis Corchorus asplenifolius Evolvulus alsinoides Helichrysum nudifolium H.undulatum Hermannia depressa Osteospermum muricatum Phyllanthus maderaspatensis

3.6 Regional Vegetation

The study sites fall within the Tsakane Clay Grassland. Flat to slightly undulating plains and low hills. Vegetation is short, dense grassland dominated by a mixture of common Highveld grasses such as *Themeda triandra, Herepogen contortus, Elionurus muticus* and a number of *Eragrostis* species.

(Mucina and Rutherford, 2006). Most prominent forbs are of the families *Asteraceae, Rubiacease, Malvaceae, Lamiaceae and Fabaceae. Disturbance leads to an increase in the abundance of the grasses Hyparrhenia hirta* and *Eragrostis chloromelas*.

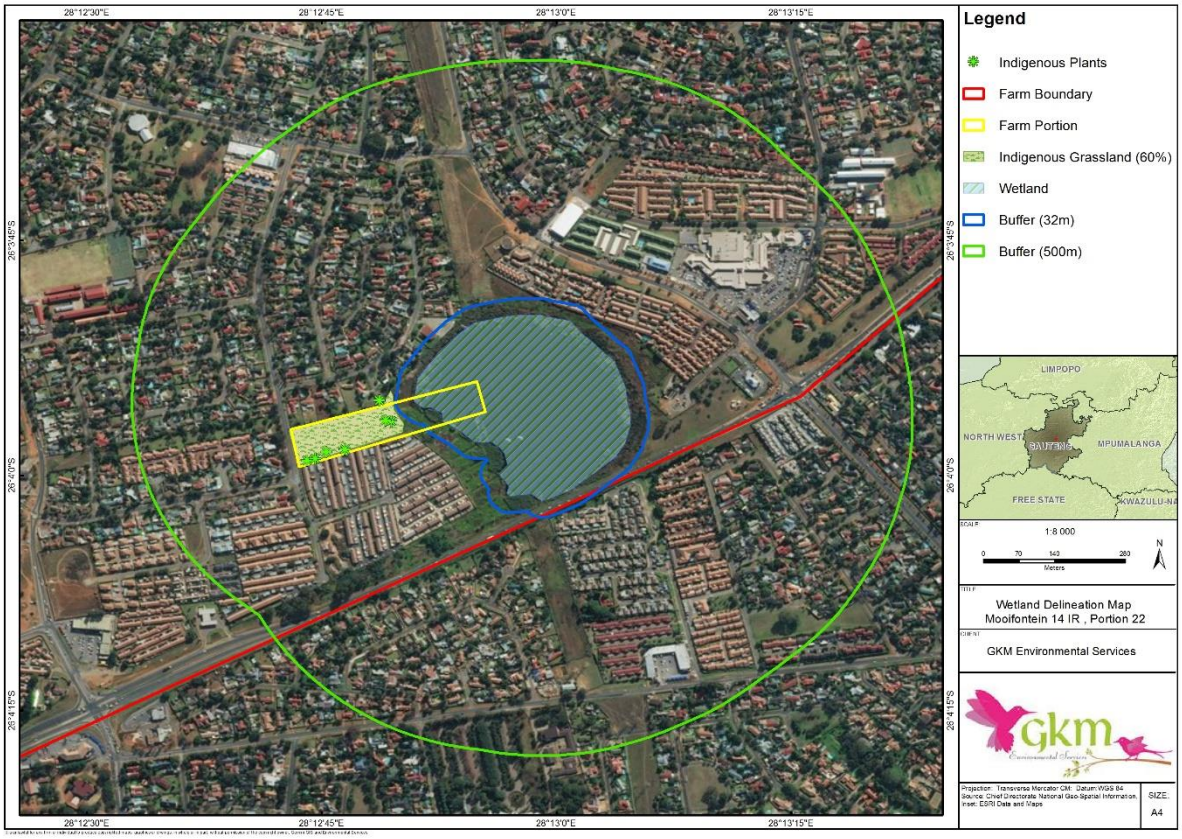


Figure 4 – Vegetation of the proposed site

3.7 Regional Hydrology

Several wetlands and open water bodies are located to the north, west and south of the site. These other waterbodies can be classified as channeled, seeps and unchanneled. One earthen dam forms the only NFEPA wetland that has been demarcated with in the 500m buffer of the study site (Nel *et al.,* 2011). Strong seasonal summer rainfall with very dry winters. The overall MAT of 15 degrees celcius indicates a transition between a cool temperate and warm temperate climate. The incidence of frost frequent, increasing towards the south east. (Figure 3)

3.7 Quaternary Catchments

The study site falls within the quaternary catchment C21D. The name of the watercourse runs in this area is Blesbokspruit and the ecological sensitivity is Moderate and confidence level is Medium. In this catchment the mean annual precipitation is lower than the potential evapotranspiration and as such any wetlands in this catchment would rely largely on regional hydrology for their source of water (water supplied by rainfall is unlikely to be enough to support these wetlands). These wetlands are sensitive to any changes in the volume and duration of the water supplied by regional hydrology. (Figure 5).

Figure 5 – Hydrology of the area (insert map)

4. METHODOLOGY

4.1 FLORAL ASSESSMENT

Literature Review

The description of the regional vegetation relied on literature from Mucina & Rutherford 2006. Plant names follow Van Wyk & Malan (2013), Indigenous Trees identification from Fanie & Julye – Ann Venter (2012), Red List of South African Plans by Strelitzia 25 (2009), Guide to Plant Families of Southern African by Koekemoer, H.M Steyn & S.P. Bester (2014). In the absence of a guideline document for the Gauteng Province, the study was undertaken in accordance with the Gauteng Requirements for Biodiversity Assessments Version 3 (GDARD, 2014) as best practice.

Field survey

The site visit took place on the 19th of November 2017. Prior to the visit, the specialist reviewed information provided by the client. It is recommended that a follow up visit be conducted as soon as we receive the first rains to properly conclude the sensitivity of the area. The samples collected during field work are deemed to be representative of the vegetation diversity along the entire proposed route. Notes were additionally made of the general habitat and any other features, biotic and abiotic, that might have an influence on the composition of landscape components and functioning of the landscape.

Mapping

Mapping has been done by comparing georeferenced ground survey data to the visual inspection of available Google-Earth imagery (which is a generalized color composite image without any actual reflectance data attached to it), and in that way extrapolating survey reference points to the entire study area. Mapped associations will thus show where a certain vegetation unit is predominant, *even though smaller inclusions of another vegetation association in this area do exist* but have not been mapped separately.

Sensitivity Analysis

It has been clearly demonstrated that vegetation not only forms the basis of the trophic pyramid in an ecosystem, but also plays a crucial role in providing the physical habitat within which organisms complete their life cycles (Kent & Coker 1992).

The determination of specific ecosystem services and the sensitivity of ecosystem components, both biotic and abiotic, is rather complex and no single overarching criterion will apply to all habitats studied. The main aspects of an ecosystem that need to be incorporated in a sensitivity analysis include the following:

- Describing the nature and number of species present, taking into consideration their conservation value as well as the ability of such species to survive or re-establish themselves following disturbances and alterations of various magnitudes to their specific habitats.
- Identifying the species or habitat features that are 'key ecosystem providers' and characterising their functional relationships (Kremen 2005).
- Determining the aspects of community structure that influence function, especially aspects influencing stability or rapid decline of communities (Kremen 2005).
- Assessing key environmental factors that influence the provision of services (Kremen 2005).
- Gaining knowledge about the spatio-temporal scales over which these aspects operate (Kremen 2005).

This implies that in the sensitivity analysis, not only aspects that currently prevail in the area should be taken into consideration, but also if there is a possibility of a full restoration of the original environment and its biota, or at least the rehabilitation of ecosystem services resembling the original state after an area has been significantly disturbed.

The vegetation sensitivity assessment aims to identify whether the vegetation within the study area is of conservation concern and thus sensitive to development if it is amongst other things:

- Situated in a listed ecosystem or threatened vegetation unit;
- Habitat or potential habitat to threatened plants, protected plants or protected trees;
- Situated within ecologically sensitive features such as rocky areas, ridges, wetlands or riparian areas;
- Untransformed and un-fragmented natural vegetation.

5. IMPACTS AND MITIGATION METHODOLOGY

5.1 IMPACT ASSESSMENT CRITERIA

Probability of Impact

Highly likely	1
Possible	2
Likely	3
Highly likely	4
Definite	5

Severity of Impact

Insignificant / ecosystem structure and function unchanged	2
Small / ecosystem structure and function largely unchanged	4
Significant / ecosystem structure and function moderately altered	6
Great / harmful/ ecosystem structure and function Largely altered	8
Disastrous / ecosystem structure and function seriously to critically altered	10

Spatial Scope of impact

Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted	2
Local area/ within 1 km of the site boundary / < 5000ha impacted	3
Regional within 5 km of the site boundary / < 2000ha impacted	4
Entire habitat unit / Entire system/ > 2000ha impacted	5

Duration of Impact

Short term	1
Short to Medium	2
Medium	3
Long term	4
Permanent	5

Significance Rating

Significance rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
High	101 - 150	Improve current management	Maintain current management
Medium	51 – 100	Improve current management	Maintain current management
Low	0 – 50	Improve current management	Maintain current management

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the project's area of influence encompassing:
    - Primary project site and related facilities that the client and its contractors develops or controls;
    - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project related developments; and
    - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location;
- Risks/ Impacts were assessed for all stages of the project cycle including:
    - Pre-construction;
    - Construction; and
    - Operation.

6. RESULTS

6.1 FLORAL ASSESSMENT

Vegetation Survey Overview

The study was conducted at the height of summer, according to GDARD biodiversity standards, studies should be conducted between September and March. The ecologist is of the opinion that the study was a true representative of the study sites ecological status. Study did not go as far as the wetland because a wetland study was conducted. A wetland delineation study aims to assess the status of a wetland using vegetation and soil.

The results will be presented in the following format:

- Highlight species that are endangered (if any),
- Of medicinal value
- Exotic and invader species.

The vegetation assessment was performed within the study area. The following two main habitat units/vegetation types were identified during the assessment:

i. habitat considered to be transformed due to agricultural activities and alien/weed encroachment and;
ii. and wetland habitat.

Red data plant species

Red Lists and Red Data Books are scientific publications that document the conservation status of species. They are based on a system that categorizes species according to their risk of extinction. Red Lists are not in themselves legislation to protect species, but are used to inform of threatened species legislation.

No Red Data plant species were recorded on the site during the survey. Since the area is already disturbed, it is unlikely that listed plants would be found here.

Protected Species

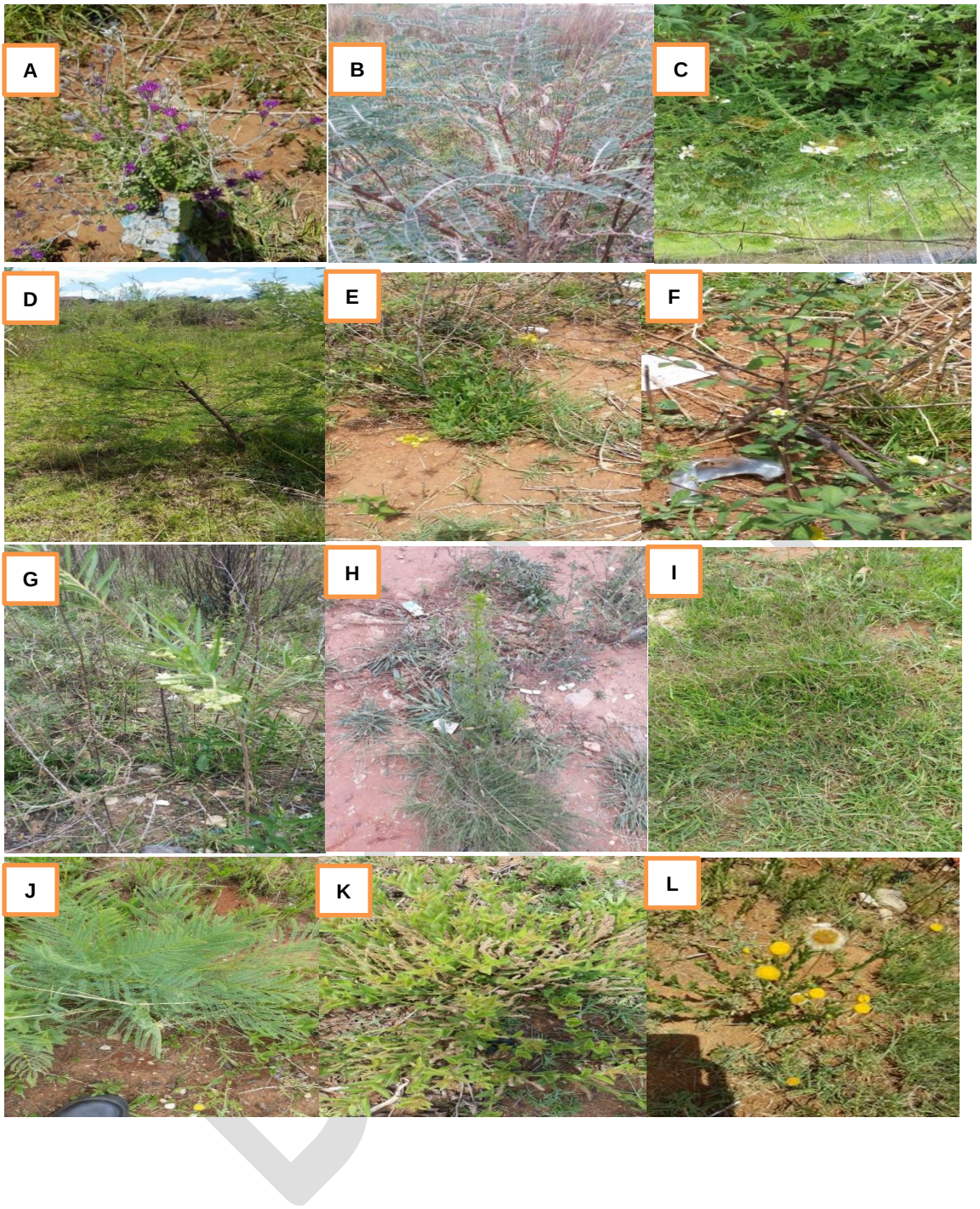
Protected species are species protected by international, national and provincial legislation. Hunting, picking, owning, importing, exporting, transporting, growing, breeding and trading of such species are illegal without valid permits or licenses. The largest part of the area is grassland and the main grass on site is indigenous. Indigenous species are protected species. However, the type of indigenous grass on site does not require a license before removal. Some of the local species on site are *Verninia oligocephala* (Bicoloured Vernonia); *Vachellia karroo* (Sweet thorn); *Bulbine narcissifolia; Setaria pallide-fusca* (Garden bristle grass); *Gomphocarpus fruticosus* (Milk weed); *Cyperus esculentus; Cynodon dactylon* (Common couch grass); *Themeda triandra; Melinis repens (*Natal grass); *Elephantina elephantorhiza* (Eland's wattle); *Acalypha punctate* (Sticky Brooms and Brushes); and *Arctotis venusta* (Free State daisy). All indigenous plants on site are classified as being of **Least Concern**. No special permits will be required to move the plants. However, during remediation, only indigenous plants should be used to rehabilitate, preferably similar to those that were removed.

Table 3 – Indigenous Plants on site

Medicinal Plants

Medicinal plants, medicinal herbs, or simply herbs have been identified and used from pre-historic times. Plants make many chemical compounds for biological functions, including defense against insects, fungi and herbivorous mammals. The following plants on site have medicinal value: *Verninia oligocephala* (Bicoloured Vernonia); *Lessertia frutescens* (Cancer bush); *Solanum sisymbriifolium* (Dense-thorned bitter apple); *Vachellia karroo* (Sweet thorn); *Bulbine narcissifolia; Sida cordifolia* (Flanel weed); *Gomphocarpus fruticosus* (Milk weed); *Tagetes minuta* (Tall khaki weed); *Cyperus esculentus; Cynodon dactylon* (Common couch grass); *Elephantina elephantorhiza* (Eland's wattle); *Acalypha punctate* (Sticky Brooms and Brushes); and *Taraxacum officinale* (common dandelion).

Table 4 – Plants of medical value



Invader and Exotic Plant Species

If a plant occurs in a region where it is not indigenous, it is referred to as an alien (exotic, foreign, introduced, non-native, and non-indigenous) plant. Any plant that occurs artificially outside its known historical natural range, no matter how long ago it was introduced, is regarded as an alien. A plant that was taken by people from one part of a country in which it is indigenous to another part of the same country can even be an alien plant there.

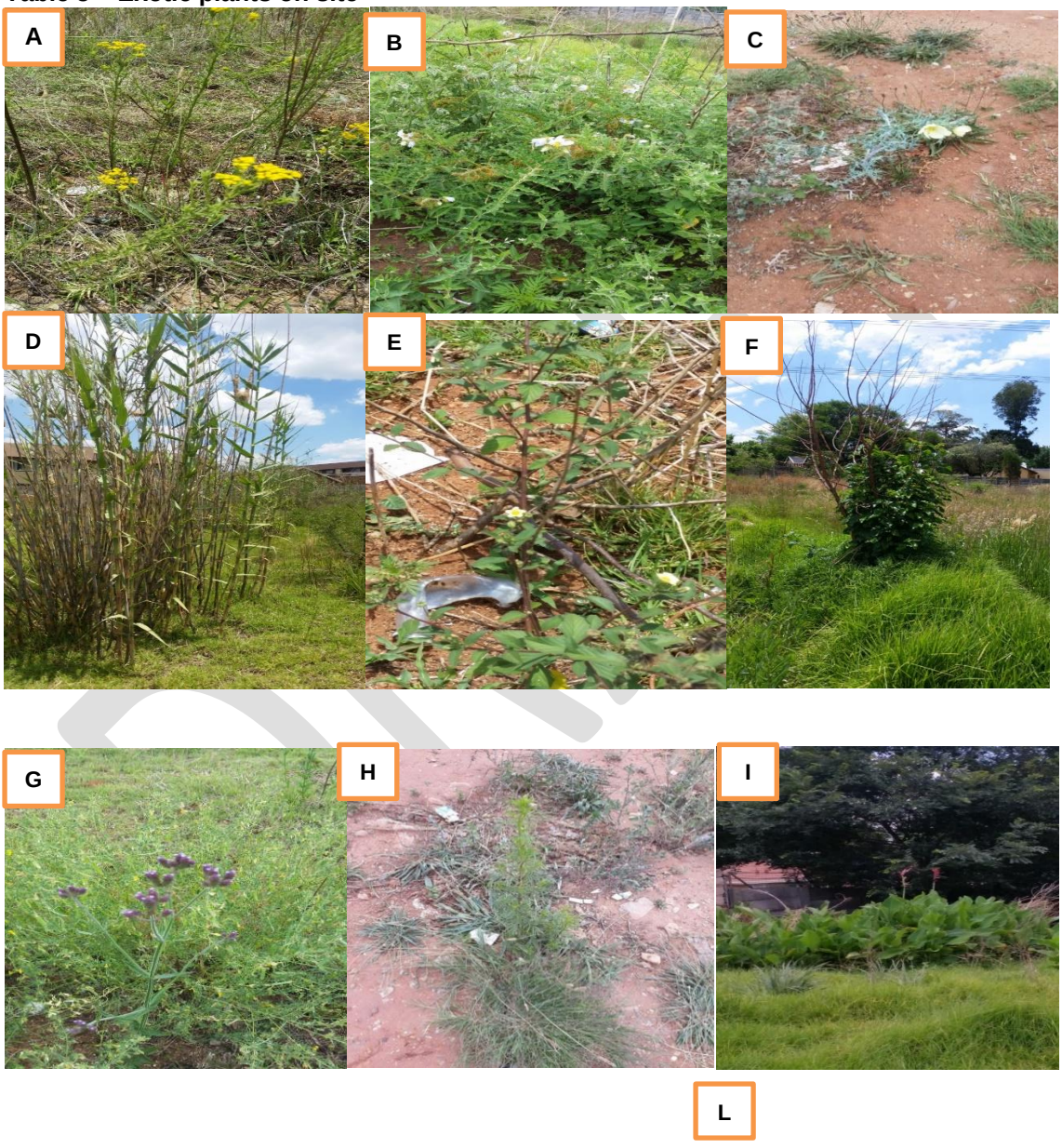
Most alien plants can survive in their adopted country or region if the conditions there are like what they are used to. However, a certain proportion of alien plants manage to thrive in the new area, to reproduce and to maintain populations without human help. These are then called naturalised plants. If such naturalised plants are also able to spread over considerable distances into new, undisturbed, natural

areas and replace the indigenous vegetation, they are regarded as invasive alien plants, or invaders for short.

Most alien plants in our country were introduced intentionally, with some useful purpose in mind. Some examples include using them as crops, forestry species, dune binders or ornamentals or simply as curios. Many alien plants also arrived inadvertently, as contaminants of grain or fodder or through attachment to animals, humans or vehicles (Henderson 2001).

The following exotic, weeds and invader plants were recorded during field work: Weeds are usually vigorous growers that are adaptable and able to invade a wide range of ecological niches. Therefore, suggested alien plant eradication measures, as part of the rehabilitation plan, are included in this report.

Table 5 – Exotic plants on site



7. IMPACTS AND MITIGATION MEASURES

The purpose of this section is to discuss the potential impacts that will arise because of the proposed expansion of Hotel Street in Lynwood, Pretoria. The earth works, construction and operation of the facility will change habitats and the ecological environment, infiltration rates, amount of runoff and runoff intensity of storm-water, and therefore the hydrological regime of the site. This impact evaluation will assess and rate the *extent, magnitude, duration* and *significance* of each potential impact together with possible mitigation measures.

7.1 IMPACT ASSESSMENT CRITERIA

Extent of the Impact

- … Study site - 1;
- … Local study area - 2;
- … Regional - 3;
- … National – 4; and
- … International – 5.

Duration of the impact

Short term: the impact will disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase – 1;
Short to Medium term: the impact will be relevant to the end of a construction phase – 2;
Medium term: the impact will last up to the end of the development phases, where after it will be entirely negated – 3;
Long term: the impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter – 4; and
Permanent: environmental ceases to exist - 5

Intensity

This indicates the degree to which the impact changes or could change the conditions or quality of the environment.
None – 2;
Low: the impact alters the affected environment in such a way that the natural processes or functions are not affected – 4;
Medium: the affected environment is altered, but functions and processes continue, albeit in a modified way – 6;
High: function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases- 8; and
Very high: process will cease - 10

Probability of Occurrence

This describes the probability of the impact occurring. This is rated as:
Improbable: chances of this impact are 0 – 1;
Improbable: low likelihood - the chance of this impact occurring is between 0 and 25%. However, mitigation measures might be needed in the event of this impact occurring – 2;
Probable: a distinct possibility - the chance of this impact occurring is approximately 50% and therefore it needs to be mitigated – 3;
Highly probable: the impact is most likely to occur and the planning phase must address the relevant mitigation measures to limit the impact – 4; and
Definite: this impact will occur regardless of any prevention measures, or is currently occurring. Mitigation measures or contingency plans must be implemented to contain the impact – 5.

Significance mitigation measures

Without mitigation measures (WOMM):

0 – 33	Low: the impact is of little importance, but may require some mitigation.

34 – 66	Medium: the impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
67 - 100	High: the impact is of major importance and mitigation is essential. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable.

Significance with mitigation measures (WMM):

0 – 33	Low: the impact will be mitigated to the point where it is of limited importance.
34 – 66	Medium: despite the successful implementation of the mitigation measures that reduce the negative impacts to acceptable levels, the negative impact remains significant. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
67 - 100	High: The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance after mitigation could render the entire development option or entire project proposal unacceptable.

7.2 IDENTIFIED IMPACTS AND MITIGATION MEASURES

The Introduction of Alien invasive species

Potential Impact	Mitigation Measures
Nature of Impact Introduction and spread of alien invasive vegetation due to both opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. **Construction** **Operational**	Weed control; Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area and returning it where possible afterwards; Rehabilitate or revegetate disturbed areas; and Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to be establishing.

Construction

	Without mitigation	With mitigation
Extent	Local – 2	Study Site – 1
Duration	Medium – 3	Short – 1
Intensity	High – 8	Medium - 6
Probability	Highly Probable – 4	Probable - 3
Status	Negative	Negative
Significance	Medium – 52	Low - 24

Operational

	Without mitigation	With mitigation
Extent	Local – 2	Study Site – 1
Duration	Long term – 4	Short to Med – 2
Intensity	Low – 4	None – 2
Probability	Probable – 3	Low Likelihood - 2
Status	Negative	Negative
Significance	Low – 30	Low - 10

Loss of Vegetation

<table>
<tr><th>Potential Impact</th><th>Mitigation Measures</th></tr>
<tr><td>

Nature of Impact

Removal of vegetation as part of creating a footprint for the expansion of Hotel Street.

Construction:

	Without mitigation	With mitigation
Probability	Definite – 5	Definite- 5
Duration	Long – 4	Short - 1
Intensity	High- 8	Medium – 6
Extent	Regional – 4	Local – 3
Status	Negative	Negative
Significance	High – 75	Medium - 66

Operational:

	Without mitigation	With mitigation
Probability	Improbable – 2	Improbable – 1
Duration	Long Term – 4	Short – 2
Intensity	Low – 2	None – 1
Extent	Study Site – 1	Study Site – 1
Status	Negative	Negative
Significance	Low – 14	Low - 4

</td><td>

-All protected and culturally important species should be delineated, where possible, permits should be obtained before removal.
-ECO should supervise the relocation of plants where possible;
- Prior to the construction phase, the crew must be briefed on:
  - The importance of biodiversity;
  - They must know what alien invasive species are and which ones occur on site;
  - They must also be aware of potentially threatening faunal species and the reporting procedure when these are detected (e.g. Snakes);

-The Environmental Control Officer (ECO) must be trained in snake awareness and have the contact details of snake handlers within the area should one be required to remove snakes off the construction site.
-Development footprint should be clearly demarcated to ensure that the area of disturbance is minimised. The demarcations must be maintained in position until the cessation of construction works.
-Minimise the road network by utilising existing roads where possible, minimise the frequency of driving within the buffer zone, utilise only light equipment for access and deliveries into areas of unstable soils, in areas where erosion is evident, and at river embankment.
-Topsoil, where available, should be conserved, and used to cover and re-landscape all disturbed areas. Once the subsoil has been returned, the topsoil can be replaced in its former position.
-Revegetate with indigenous trees only.
-A temporary fence or demarcation must be erected around the construction area (include the servitude, construction camps, areas where material is stored and the actual footprint of the development) to prevent access to sensitive environs.
-Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area.
-No open fires are permitted within naturally vegetated areas.
-A vegetation rehabilitation plan should be implemented. Grassland can be removed as sods and stored within transformed vegetation – remove alien invasive vegetation prior to storing grassland sods in transformed areas. The sods must preferably be removed during the winter months and be replanted at the latest by springtime. The sods should not be stacked on top of each other. Once construction is completed, these sods should be used to rehabilitate the disturbed areas from where they have been removed. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks.
-Construction workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority.
-No activities should take place on rainy days and at least 2 days afterwards.

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	-Where possible, construction activities must be restricted to previously disturbed areas. -A suitably qualified person (botanist / horticulturist) should survey the study area within the growing season of the plants to confirm whether these plants will be impacted. -Implement a Plant Rescue and Rehabilitation Plan. Where the plants of conservation concern are deemed to be under threat from the construction activity, the plants should be removed by a suitably qualified specialist and replanted as part of vegetation rehabilitation after the construction. (Note, these plants may only be removed with the permission of the provincial authority).

Noise and Artificial Impact

<table>
<tr><th>Potential Impact</th><th>Mitigation Measures</th></tr>
<tr><td>

Nature of Impact

Increased noise during construction will chase away fauna from within the study site and surroundings. Numerous species will be attracted towards the light sources and this will result in the disruption of natural cycles, such as the reproductive cycle and foraging behavior.

Construction

	Without mitigation	With mitigation
Probability	Highly Probable - 4	Probable – 3
Duration	Long term – 4	Long term – 4
Intensity	Low – 2	None – 0
Extent	Local – 2	Study site – 1
Status	Negative	Negative
Significance	Low – 32	Low - 15

Operational

	Without mitigation	With mitigation
Probability	Improbable – 1	Improbable – 0
Duration	Long term – 4	Long term – 4
Intensity	None – 2	None – 2
Extent	Study site – 1	Study Site - 1
Status	Negative	Negative
Significance	Low – 7	Low – 7

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Ensure noise levels are not more than 80 decibels;

A large part of the noise emitted is due to engine air intake and exhaust cycle. Specifying the use of adequate muffler systems can control much of this engine noise;

Construction should be restricted to day time hours;

It may be appropriate to require contractors to participate in training programs related to project-specific noise requirements, specifications, and/or equipment operations. This may include awareness on the need to limit movement from the study site;

ECO to monitor noise levels regularly and ensure noise is within acceptable levels always.

Where lighting is required for safety or security reasons, this should be targeted at the areas requiring attention.

Yellow sodium lights should be prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife. Sodium lamps require a third less energy than conventional light bulbs.

The main mitigation involves the primary location of road lighting. These should not be placed next to sensitive habitats, i.e. wetlands, forests and vulture breeding/roosting cliffs.

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Dust Management

<table>
<tr><th>Potential Impact</th><th>Mitigation Measures</th></tr>
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Nature of Impact

Most of the plant communities are affected by dust deposition so that community structure is altered.

Construction

	Without mitigation	With mitigation
Probability	Probable- 3	Low likelihood – 2
Duration	Long term – 4	Long term – 4
Intensity	Medium – 3	Low – 2
Extent	Local – 2	Study site – 1
Status	Negative	Negative
Significance	Low – 27	Low - 14

Operational

	Without mitigation	With mitigation
Probability	Low likelihood – 2	Low likelihood – 2
Duration	Long term – 4	Long term – 4
Intensity	Low – 2	Low – 2
Extent	Study Site – 1	Study Site – 1
Status	Negative	Negative
Significance	Low – 14	Low - 14

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Adequate dust control strategies should be applied to minimise dust deposition and reduce sedimentation in the river system, for example:

↔ Periodic spraying of roads with water or dust inhibitors;
↔ Cover trucks to prevent dust emission during transportation; and
↔ Construction vehicles transporting materials to and from the construction site must be covered to reduce the formation of dust.

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8. RECOMMENDATIONS

Recommendations were developed to address and mitigate impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development. Mitigation measures have been developed to address issues in all phases throughout the course of the operation from planning, through construction, operation and closure, to the after-care and maintenance.

8.1 Construction and operational footprint

- Limit the footprint area of the construction activities to what is essential to minimise environmental damage. Construction vehicles must use existing roads where possible;
- All informal fires near operations and new construction areas should be prohibited.
- Limit vegetation clearance during the operational phase to the absolute minimum to avoid increased silt loads and runoff velocities and volumes which may affect the hydrology of downstream wetland areas;
- Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed in all areas of increased ecological sensitivity;
- Keep all demarcated sensitive zones outside of the construction area off limits during the construction and rehabilitation phases of the development; and
- Appropriate sanitary facilities must be provided during the construction phase and all waste removed to an appropriate waste facility.

8.2 Vehicle access

- All construction footprint areas should remain as small as possible and should not encroach onto surrounding more sensitive wetland areas. It must be ensured that these areas are off-limits to construction vehicles and personnel as much as possible;
- In the event of a breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into the topsoil;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. All vehicles must be regularly inspected for leaks. Re-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil; and
- All spills should be immediately cleaned up and treated accordingly.

8.3 Alien plant species

- Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the linear development. Alien plant seed dispersal within the top layers of the soil within footprint areas must be controlled as it will have an impact on future rehabilitation;
- Removal of the alien and weed species encountered on the property must take place to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational, and rehabilitation/ maintenance phases;
- Species specific and area specific eradication recommendations:
    - Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;
    - Footprint areas should be kept as small as possible when removing alien plant species; and
    - No vehicles should be allowed to drive through designated sensitive areas during the eradication of alien and weed species.

8.4 Soils

- All soils compacted because of construction activities falling outside of project footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all construction and rehabilitation phases to prevent loss of floral habitat; and
- Monitor all systems for erosion and incision.

8.5 Remediation

- Upon remediation, re-seeding of indigenous grasses should be implemented in all impacted areas and strategic planting of grassland species should take place;
- As much vegetation growth as possible should be promoted surrounding the new development in order to protect soils. In this regard, special mention is made of the need to use indigenous vegetation species where hydro seeding and rehabilitation planting (where applicable) are to be implemented.

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