

# GALAGO ENVIRONMENTAL



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## *Flora Assessment*

*of*

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**Portion 1 of the farm Rietfontein 61-IR  
(LINKSFIELD)**

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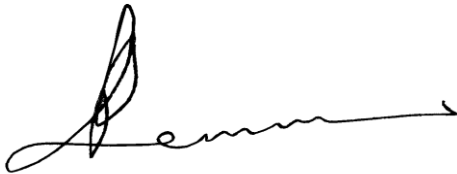
**December 2013**

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## DECLARATION OF INDEPENDENCE

I, Petro Lemmer (440129 0025 085) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of botany
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed Linksfield development project described in this report
- have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to Galago Environmental CC and its client as well as the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations, 2006.



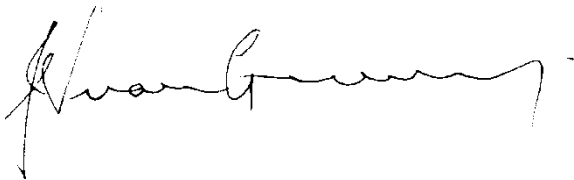
Petro Lemmer

### VERIFICATION STATEMENT

Petro Lemmer is a Certified Natural Scientist with the S.A. Council for Natural Scientific Professions. This communication serves to verify that the flora report compiled by Petro Lemmer has been prepared under my supervision, and I have verified the contents thereof.

**Declaration of Independence:** I, Dr. J.V. van Greuning (400168/08) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
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Dr. J.V. van Greuning

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# 1. INTRODUCTION

Galago Environmental was appointed to conduct a vegetation survey on Portion 1 of the farm Rietfontein 61-IR (also known as Linksfield), scheduled for mixed use development. The objective was to determine which species might still occur on the site. Special attention had to be given to the habitat requirements of all the Red List species that may occur in the area. This survey focuses on the current status of threatened plant species occurring, or which are likely to occur on the study site, and a description of the available and sensitive habitats on the site and within 200 meters of the boundary of the site.

## 2. OBJECTIVES OF THE STUDY

- To assess the current status of the habitat component and current general conservation status of the area;
- To list the perceptible flora of the site and to recommend steps to be taken should threatened plant species, plant species of conservation concern and protected plant species be found;
- To highlight potential impacts of the development on the flora of the proposed site; and
- To provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved.

## 3. SCOPE OF STUDY

This report:

- Pertains to the study site as described in subsection 4.2 and is not meant as a report of the general vegetation of the area (subsection 4.1).
- Lists the more noticeable trees, shrubs, herbs, geophytes and grasses observed during the study and offers recommendations about the protection of the sensitive areas on the study site;
- Indicates medicinal plants recorded and lists alien species;
- Comments on connectivity with natural vegetation on adjacent sites;
- Comments on ecological sensitive areas;
- Evaluates the conservation importance and significance of the site with special emphasis on the current status of resident threatened species; and
- Offers recommendations to reduce or minimise impacts, should the proposed development be approved

## 4. STUDY AREA

### 4.1 Regional vegetation

The study site lies in the quarter degree square 2627BB (Roodepoort). Mucina & Rutherford (2006) classified the area as Egoli Granite Grassland, with archaean granite and gneiss of the Halfway House Granite at the core of the Johannesburg Dome supporting leached, shallow, coarsely grained, sandy soil poor in nutrients. This grassland falls within a strongly seasonal summer-rainfall region and very dry winters with frequent frosts.

This vegetation unit is considered endangered. Its conservation target is 24%. Only about 3% of this vegetation unit is conserved in statutory reserves and a few private conservation areas. More than two-thirds of the unit has already undergone transformation, mostly by urbanization, cultivation and by building of roads. Current rates of transformation threaten most of the remaining unconserved areas.

## 4.2 The study site

The study site lies west of, and abuts, highway N3 on the arm Rietfontein 61-IR. Its western-southwestern boundary runs along Modderfontein Road and Club Street and its northern boundary runs along the grounds of the Rand Aid Association and Edenvale Hospital.

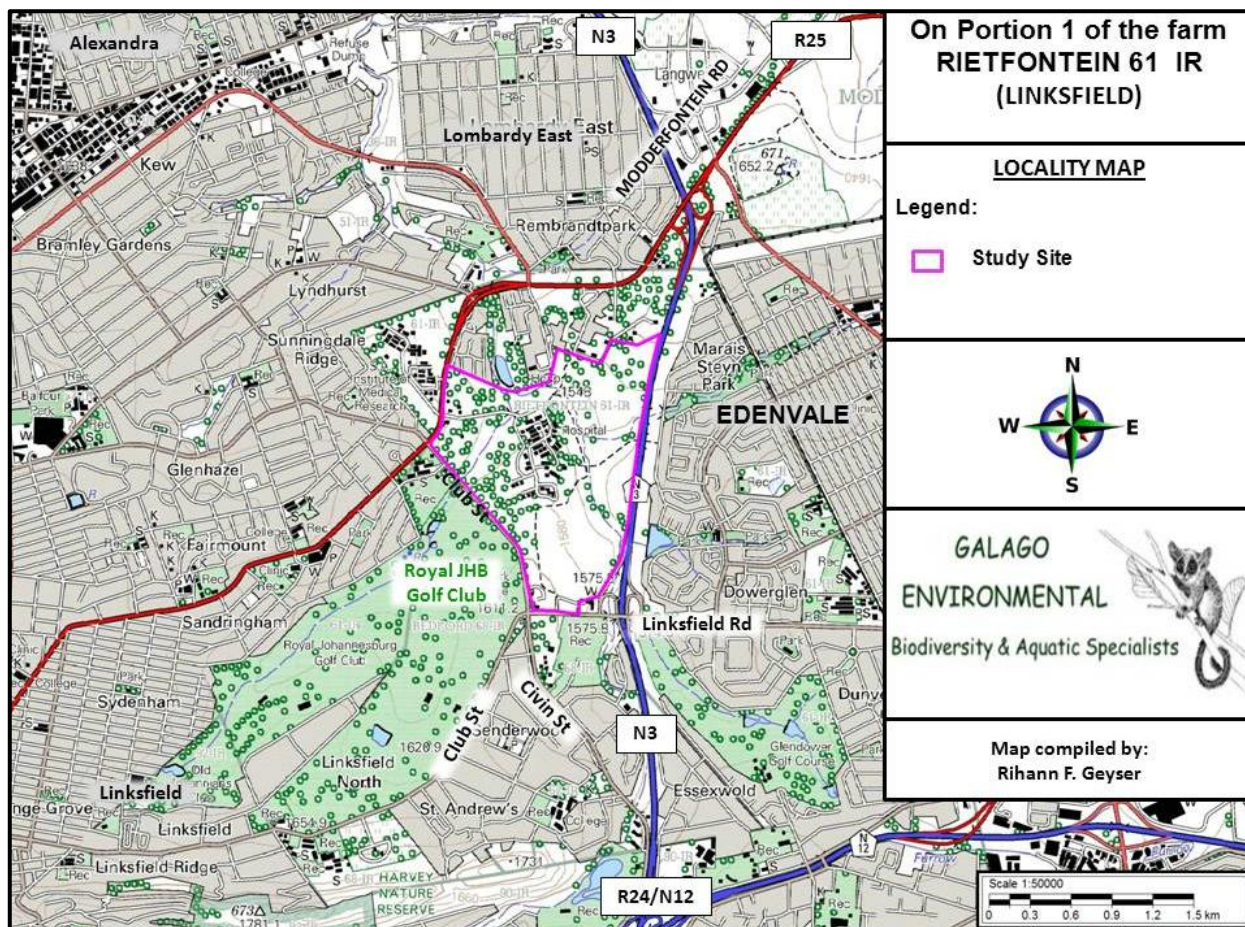


Figure 1: Locality map of the study area

## 5. METHOD

A desktop study of the habitats of the Red List and Orange List species known to occur in the area was done before the site visit. Information about the Red List and Orange List plant species that occur in the area was obtained from GDARD. Various Acts and Ordinances were consulted about the protected plant species and species of special concern that might occur on the site (Section 11). The Guidelines issued by GDARD to plant specialists as well as various publications (see Section 11) were consulted about the habitat preferences of the Red- and Orange List species concerned.

The list of plants recorded in the 2628AA quarter degree square was obtained from SANBI and consulted to verify the record of occurrence of the plant species seen on the site. The vegetation map published in Mucina and Rutherford (2006) was consulted about the composition of Egoli Granite Grassland.

The study site was visited on 19 October 2013 and again in November 2013 to determine whether suitable habitat for the Red List species known to occur in the quarter degree square, and for those for which biodiversity studies were required by GDARD, existed and to survey the flora present on the site.



The various study units were identified (Figure 2) and one or more plots, depending on the size and composition of the study unit, were selected at random from each study unit for detailed study. Each plot, which measured about 10m x 10m, was surveyed in a random crisscross fashion and the plants recorded. Areas where the habitat was suitable for the Red List species known to occur in the quarter degree square were examined in detail. The entire site was examined for the presence of protected tree species.

The suitability of the habitat for the presence of Red List species on the site and on an extended area within 200 meters of the boundaries of the site was evaluated.

Suitable habitat for Red List species on the neighbouring properties, where accessible, was examined to a distance of 200 m from the boundaries of the site for the presence of Red List plant species.

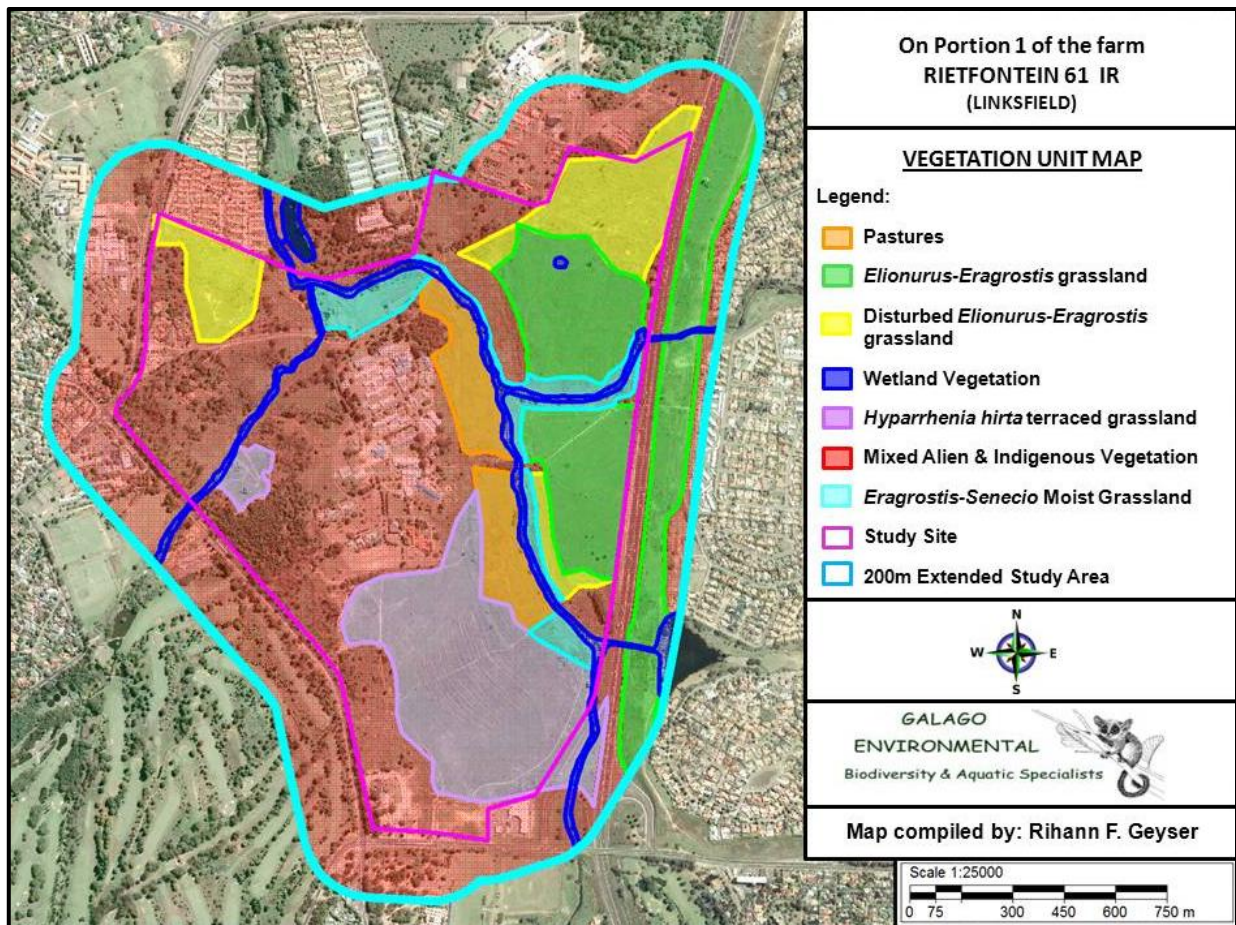


Figure 2: Vegetation study units identified on the study site

## 6. RESULTS

### 6.1 Vegetation study units

Seven vegetation study units were identified:

- Mixed alien and indigenous vegetation;
- Disturbed *Elionurus – Eragrostis* grassland;
- *Elionurus – Eragrostis* grassland;
- *Eragrostis-Senecio* Moist Grassland;
- Wetland vegetation;
- Pasture; and
- *Hyparrhenia hirta* terraced grassland.



Tables 3 to 9 list the trees, shrubs, geophytes, herbs and grasses found on each of the surveyed areas of the site.

## 6.2 Medicinal plants

The names of known medicinal plants are marked with numbers to footnotes in Tables 3 to 9 and the footnotes themselves appear at the end of the last table. Of the 168 plant species recorded on the site, 31 species with medicinal properties were found. Their distribution in the various study units is as follows:

**Table 1: Number of medicinal species in the different study units**

STUDY UNIT	TOTAL NO OF SPECIES IN STUDY UNIT	NO OF MEDICINAL SPECIES IN STUDY UNIT
Mixed alien and indigenous vegetation	58	8
Disturbed <i>Elionurus – Eragrostis</i> grassland	65	17
<i>Elionurus – Eragrostis</i> grassland	81	26
<i>Eragrostis-Senecio</i> Moist Grassland	43	6
Wetland vegetation	26	1
Pasture	5	0
<i>Hyparrhenia hirta</i> terraced grassland	28	7

## 6.3 Alien plants

Alien plants are not listed separately, but are included in the lists as they form part of each particular study unit. Their names are marked with an asterisk in Tables 3 to 9. Forty alien plant species, of which three species were Category 1 Declared weeds, eight were Category 2 Declared invaders and two were Category 3 Declared invaders, were recorded on the site. The number of alien species in each study unit is reflected in table 2.

**Table 2: Number of Alien species in each study unit**

STUDY UNIT	NO. OF ALIEN SPECIES	CAT 1	CAT 2	CAT 3	NOT DECLARED
Mixed alien and indigenous vegetation	29	2	5	2	20
Disturbed <i>Elionurus – Eragrostis</i> grassland	13	1	2	0	10
<i>Elionurus – Eragrostis</i> grassland	3	0	1	0	2
<i>Eragrostis-Senecio</i> Moist Grassland	9	0	2	0	7
Wetland vegetation	14	2	5	1	6
Pasture	3	0	0	0	3
<i>Hyparrhenia hirta</i> terraced grassland	4	0	0	0	4

The alien plant names printed in **bold** in the tables are those of Category 1 Declared Weeds and the removal of these plants is **compulsory** in terms of the regulations formulated under “The Conservation of Agricultural Resources Act” (Act No. 43 of 1983), as amended.

In terms of these regulations, Category 2 Declared invaders may not occur on any land other than a demarcated area and should likewise be removed.

Although the regulations under the above Act require that Category 3 Declared invader plants may not occur on any land or inland water surface other than in a biological control reserve, these provisions shall not apply in respect of category 3 plants already in existence at the time of the commencement of said regulations. If this is the case, a land user must take all reasonable steps to curtail the spreading of propagating material of Category 3 plants.

## 6.4 Orange List species on the study site

Suitable habitat existed for three of the four Orange List plant species known to occur in the 2628AA quarter degree square. Two of these species were found. (See details in Annexure A.)

## 6.5 Red List species on the study site

Eleven Red List plant species are known to occur in the 2628AA quarter degree square, two of these within 5 km of the site. However, the habitats on site were not suitable for these two species, but were suitable for two other species known to occur in the quarter degree square. (See Annexure A for a list of the Orange- and Red List species known to occur in the quarter degree square.)

GDARD required biodiversity studies for *Habenaria bicolor*, *Holothrix micrantha*, *Trachyandra erythrorrhiza* and *Gnaphalium nelsonii*. The habitats on site were not suitable for *Holothrix micrantha* or *Gnaphalium nelsonii*, but were suitable for the other two species. A few specimens of *Trachyandra erythrorrhiza* were found (see Annexure B)

## 6.6 Mixed alien and indigenous vegetation

### 6.6.1 Compositional aspects

This study unit comprised grassland severely invaded by alien tree species, especially Wattle and Eucalyptus. A large number of gravestones were observed and builders' rubble was dumped between and over the gravestones. Of the 168 plant species recorded on the site 58 were recorded in the Mixed alien and indigenous vegetation study unit. Of these, 29 were indigenous species. The following number of species in each life form was noted:

LIFE FORM	NUMBER OF SPECIES
Annual & perennial herbaceous species	32
Tree species	13
Shrubs and dwarf shrubs	2
Grasses	5
Geophytes	4
Succulents	2
Total No of species	58

### 6.6.2 Red and Orange List species on the study unit

The habitat of this study unit was not suitable for any of the Red List species or Orange List species known to occur in the quarter degree square.

### 6.6.3 Medicinal and alien species

Eight of the 31 medicinal species and 29 of the 40 alien species recorded on the site were found in the Mixed alien and indigenous vegetation study unit. Of the alien species two were Category 1 Declared weeds, five were Category 2 Declared invaders and two were Category 3 Declared invaders.

### 6.6.4 Sensitivity

From a vegetation point of view, this study unit was not considered sensitive. However, a heritage specialist should determine the extent of the grave sites.



Figure 3: Mixed alien and indigenous vegetation with grave stones between trees.

Table 3: Plants recorded in the Mixed alien and indigenous vegetation

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Acacia decurrens</i> *	2	Green wattle / Groenwattel
<i>Acacia karroo</i> <sup>1,2</sup>		Sweet thorn / Soetdoring
<i>Acacia melanoxylon</i> *		Australian blackwood
<i>Acalypha caperonioides</i> var. <i>caperonioides</i>		
<i>Agave americana</i> *	2	Century plant / Garingboom,
<b><i>Arundo donax</i>*</b>	<b>1</b>	<b>Spanish reed / Spaanse riet</b>
<i>Bergia decumbens</i>		
<i>Berkheya radula</i>		Boesmanrietjie
<i>Celtis africana</i>		White stinkwood / Witstinkhout
<i>Cephalaria zeyheriana</i>		Mock scabious
<b><i>Cirsium vulgare</i>*</b>	<b>1</b>	<b>Scotch thistle / Skotse dissel</b>
<i>Conyza albida</i> *		Tall fleabane / Vaalskraalhans
<i>Conyza podocephala</i>		
<i>Cymbopogon pospischilii</i> *		Turpentine grass / Terpentyngras
<i>Cynodon dactylon</i>		Couch grass / Kweek
<i>Delosperma herbeum</i>		
<i>Eucalyptus</i> sp*	2	Gum tree / Bloekom
<i>Fumaria muralis</i> subsp <i>muralis</i> *		
<i>Gleditsia triacanthos</i> *	2	Honey locust / Driedoring, soetpeul
<i>Gymnosporia buxifolia</i> <sup>2</sup>		Spike-thorn / Pendoring
<i>Helichrysum nudifolium</i> var <i>nudifolium</i> <sup>1,2</sup>		Hottentot's tea / Hottentotstee
<i>Helichrysum rugulosum</i> <sup>2,3</sup>		
<i>Hermannia depressa</i> <sup>2,3</sup>		Creeping red Hermannia / Rooi-opslag
<i>Hilliardiella oligocephala</i> <sup>1,2</sup>		Cape vernonia / Blounaaldetee bossie
<i>Hypochaeris radicata</i> *		Hairy wild lettuce / Harige skaapslaai
<i>Hypoxis rigidula</i> var <i>rigidula</i>		Silver-leaved star flower / Wilde tulp
<i>Lactuca inermis</i>		Wild lettuce
<i>Lactuca serriola</i>		Wild lettuce / Wilde slaai
<i>Ledebouria ovatifolia</i>		
<i>Ledebouria revoluta</i> <sup>3</sup>		Common ledebouria
<i>Ligustrum vulgare</i> *	3	Common privet / Gewone liguster
<i>Medicago sativa</i> *		Lucerne / Lusern
<i>Melilotus indicus</i> *		Yellow sweet clover / Geelstinkklawer
<i>Morus alba</i> *	3	Common mulberry / Gewone moerbeï

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Nemesia fruticans</i>		Wilde leeubekkie
<i>Oenothera rosea</i> *		Pink evening primrose / Pienk aandblom
<i>Ornithogalum tenuifolium</i> subsp <i>tenuifolium</i>		Bosui
<i>Pennisetum clandestinum</i> *		Kikuyu / Kikoejoe
<i>Pennisetum purpureum</i> *		Napier grass / Olifantsgras
<i>Physalis viscosa</i> *		
<i>Pinus</i> sp*	2	Pine / Den
<i>Populus deltoides</i> subsp <i>deltoides</i> *		Cottonwood / Vuurhoutjiepopulier
<i>Prunus persica</i> *		Peach / perske
<i>Rhynchosia monophylla</i>		
<i>Richardia brasiliensis</i> *		Tropical richardia / Tropiese richardia
<i>Rubus</i> sp*		Bramble / Braam
<i>Schkuhria pinnata</i> *		Dwarf marigold / Klein kakiebos
<i>Searsia pyroides</i> var <i>pyroides</i> <sup>4</sup>		Common wild currant / Taaibos
<i>Senecio</i> sp		
<i>Seriphium plumosum</i>		Bankrupt bush / Bankrotbos
<i>Solanum panduriforme</i>		Poison apple / Gifappel
<i>Tagetes minuta</i> *		Tall khaki weed / Lang kakiebos
<i>Tephrosia semiglabra</i>		
<i>Trachyandra saltii</i> var <i>saltii</i>		
<i>Tragopogon porrifolius</i> *		Yellow goat's beard / Geel bokbaard
<i>Verbena aristigera</i> *		Fine-leaved verbena / Fynblaar verbena
<i>Verbena bonariensis</i> *		Purple top / Blouwaterbossie
<i>Vigna unguiculata</i> subsp <i>stenophylla</i>		

## 6.7 Disturbed *Elionurus* – *Eragrostis* grassland

### 6.7.1 Compositional aspects and Connectivity

This study unit comprised natural grassland disturbed by earthworks and dumped builders' rubble and with some alien trees evident. The Disturbed *Elionurus* – *Eragrostis* grassland that abuts highway N3 is connected with the natural grassland along the highway, but the smaller area in the west is enclosed by mixed alien and indigenous vegetation. Of the 168 plant species recorded on the site 65 were recorded in the Disturbed *Elionurus* – *Eragrostis* grassland study unit. Of these, 52 were indigenous species. The following number of species in each life form was noted:

LIFE FORM	NUMBER OF SPECIES
Annual & perennial herbaceous species	40
Tree species	5
Shrubs and dwarf shrubs	2
Grasses	7
Geophytes	10
Succulents	1
Total No of species	65

### 6.7.2 Red- and Orange List species on the study unit

The habitat of the Disturbed *Elionurus* – *Eragrostis* grassland study unit was not suitable for the Red List species known to occur in the quarter degree square, but a few specimens of the Orange List *Hypoxis hemerocallidea* were found in the study unit near Modderfontein Road.

### 6.7.3 Medicinal and alien species

Seventeen of the 31 medicinal species and 13 of the 40 alien species recorded on the site were found in this study unit. Of the alien species one was a Category 1 Declared weed and two were Category 2 Declared invaders.

### 6.7.4 Sensitivity

The vegetation of this study unit was not considered sensitive. *Hypoxis hemerocallidea* did not occur in sufficient numbers to make a relocation operation viable.



Figure 4: Disturbed *Elionurus – Eragrostis* grassland

Table 4: Plants recorded in the Disturbed *Elionurus – Eragrostis* grassland

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Acacia karroo</i> <sup>1,2</sup>		Sweet thorn / Soetdoring
<i>Acalypha caperonioides</i> var. <i>caperonioides</i>		
<i>Afrosciadium magalismsontanum</i> <sup>2</sup>		Wild parsley / Wildepietersielie
<i>Albuca setosa</i>		Slymuintjie
<i>Aster harveyanus</i>		Bloublommetjie
<i>Celtis africana</i>		White stinkwood / Witstinkhout
<i>Cephalaria zeyheriana</i>		Mock scabious
<i>Chamaecrista comosa</i> var. <i>capricornia</i>		
<b><i>Cirsium vulgare</i>*</b>	<b>1</b>	<b>Scotch thistle / Skotse dissel</b>
<i>Convolvulus sagittatus</i>		
<i>Convolvulus</i> sp		
<i>Conyza podocephala</i>		
<i>Cyanotis speciosa</i>		Doll's powder puff / Bloupoeierkwassie
<i>Cymbopogon pospischilii</i> *		Turpentine grass / Terpentyngras
<i>Cynodon dactylon</i>		Couch grass / Kweek
<i>Delosperma herbeum</i>		
<i>Elephantorrhiza elephantina</i> <sup>1,2,3</sup>		Elephant's root / Olifantswortel
<i>Elionurus muticus</i>		Wire grass / Draadgras
<i>Eragrostis chloromelas</i>		Curly leaf / Krulblaar
<i>Eucalyptus</i> sp*	2	Gum tree / Bloekom
<i>Felicia muricata</i> subsp. <i>muricata</i> <sup>1,2,3</sup>		White Felicia / Blouheuning karooblom
<i>Gleditsia triacanthos</i> *	2	Honey locust / Driedoring, soetpeul
<i>Graderia subintegra</i>		Wild penstemon



<i>Heliotropium amplexicaule</i> *		Blue heliotrope
<i>Hilliardiella aristata</i> <sup>1,2</sup>		Silver vernonia
<i>Hilliardiella oligocephala</i> <sup>1,2</sup>		Cape vernonia / Blounaaldetee bossie
<i>Hyparrhenia hirta</i>		Common thatching grass / Dekgras
<i>Hypochaeris radicata</i> *		Hairy wild lettuce / Harige skaapslaai
<i>Hypoxis argentea</i> var <i>argentea</i>		Small yellow star flower
<i>Hypoxis hemerocallidea</i> <sup>1,2,3</sup>		African potato / Gifbol
<i>Hypoxis rigidula</i> var <i>rigidula</i>		Silver-leaved star flower / Wilde tulp
<i>Indigastrium burkeanum</i>		
<i>Ipomoea crassipes</i> var <i>crassipes</i> <sup>2,3</sup>		Leafy-flowered Ipomoea / Wildewinde
<i>Ipomoea oblongata</i> <sup>2</sup>		
<i>Justicia anagalloides</i>		
<i>Kohautia amatymbica</i> <sup>2</sup>		Tremble tops
<i>Lactuca inermis</i>		Wild lettuce
<i>Ledebouria ovatifolia</i>		
<i>Ledebouria revoluta</i> <sup>3</sup>		Common ledebouria
<i>Macledium zeyheri</i> subsp <i>zeyheri</i> <sup>2,3</sup>		Doll's protea
<i>Nidorella hottentotica</i>		
<i>Ocimum obovatum</i> subsp <i>obovatum</i> var <i>obovatum</i> <sup>2,3</sup>		Cat's whiskers / Katsnor
<i>Ornithogalum tenuifolium</i> subsp <i>tenuifolium</i>		Bosui
<i>Pennisetum clandestinum</i> *		Kikuyu / Kikoejoe
<i>Pentanisia angustifolia</i>		Wild verbena / Sooibrandbossie
<i>Pentarrhinum inspidum</i>		Donkieperske
<i>Plantago lanceolata</i>		Buckhorn plantain / Small weëblaar
<i>Polygala amatymbica</i>		Dwarf polygala
<i>Raphionacme hirsuta</i> <sup>2</sup>		Khadi root / Khadiwortel
<i>Rhynchosia monophylla</i>		
<i>Scabiosa columbaria</i> <sup>1,2,3</sup>		Wild scabiosa / Bitterbos
<i>Schkuhria pinnata</i> *		Dwarf marigold / Klein kakiebos
<i>Searsia pyroides</i> var <i>pyroides</i> <sup>4</sup>		Common wild currant / Taaibos
<i>Sida rhombifolia</i> subsp <i>rhombifolia</i>		Arrow leaf Sida / Taaiman
<i>Solanum nigrum</i> *		Nastergal
<i>Tagetes minuta</i> *		Tall khaki weed / Lang kakiebos
<i>Tephrosia semiglabra</i>		
<i>Themeda triandra</i>		Red grass / Rooigras
<i>Tragopogon porrifolius</i> *		Yellow goat's beard / Geel bokbaard
<i>Tulbaghia acutiloba</i>		Wild garlic / Wildeknoffel
<i>Verbena aristigera</i> *		Fine-leaved verbena / Fynblaar verbena
<i>Verbena bonariensis</i> *		Purple top / Blouwaterbossie
<i>Vernonia galpinii</i>		Perskwabossie
<i>Vigna unguiculata</i> subsp <i>stenophylla</i>		
<i>Ziziphus zeyheriana</i> <sup>2</sup>		Dwarf buffalo-thorn / Dwerg-blinkblaar-wag-'n-bietjie

## 6.8 *Elionurus* – *Eragrostis* grassland

### 6.8.1 Compositional aspects and Connectivity

This study unit comprised natural primary grassland that had been burned before the site visit and most of the grasses had not yet formed inflorescences. The part of the study unit north of the drainage line contained small rocky outcrops and the species diversity was slightly higher than that of the area south of the drainage line where the vegetation was somewhat trampled by grazing cattle. Connectivity with natural grassland was limited by the highway and by the developed area and secondary grassland to the west. The species diversity of this study unit was high with 48% of all species recorded on the site found in this unit. Of the 168 plant species recorded on the site 81 were recorded in the *Elionurus* – *Eragrostis* grassland study unit. Of these, 78 were indigenous species. The following number of species in each life form was noted:

LIFE FORM	NUMBER OF SPECIES
Annual & perennial herbaceous species	52
Tree species	2
Shrubs and dwarf shrubs	6
Grasses	6
Geophytes	13
Sedges	1
Succulents	1
Total No of species	81

### 6.8.2 Red- and Orange List species on the study unit

The habitat of the *Elionurus – Eragrostis* grassland study unit north of the drainage line was suitable for the Red List species *Habenaria bicolor* but as this species only flowers in March, none was observed during the present survey. The habitat was not suitable for the two species known to occur within 5 km of the study site. (See Annexure A for a list of the Orange- and Red List species known to occur in the quarter degree square.)

GDARD required biodiversity studies for *Habenaria bicolor*, *Holothrix micrantha*, *Trachyandra erythrorrhiza* and *Gnaphalium nelsonii*. The habitat of this study unit was not suitable for the last three species, but the study unit north of the drainage line should be examined during March when *Habenaria bicolor* flowers.

A few specimens of the Orange List plant species *Callilepis leptophylla* were found in the study unit but not in such quantities to make a relocation operation viable.

### 6.8.3 Medicinal and alien species

Twenty-six of the 31 medicinal species recorded on the site were found in this study unit. Three alien species, of which one was a Category 2 Declared invader, were recorded in this study unit.

### 6.8.4 Sensitivity

The vegetation of the *Elionurus – Eragrostis* grassland study unit north of the drainage line is considered sensitive, but because connectivity with natural grassland on neighbouring sites did not exist, its continued existence as a healthy vegetation unit is doubtful.

The vegetation of the *Elionurus – Eragrostis* grassland study unit south of the drainage line was of low sensitivity.



Figure 5: *Elionurus – Eragrostis* grassland north of the drainage line



Figure 6: *Elionurus – Eragrostis* grassland south of the drainage line

Table 5: Plants recorded in the *Elionurus – Eragrostis* grassland

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Acalypha caperonioides</i> var. <i>caperonioides</i>		
<i>Afrosciadium magalismontanum</i> <sup>2</sup>		Wild parsley / Wildepietersielie
<i>Albuca pachychlams</i>		Slymbol
<i>Albuca setosa</i>		Slymuintjie
<i>Aloe greatheadii</i> var. <i>davyana</i> <sup>1,2</sup>		Kleinaalwyn
<i>Asparagus africanus</i>		
<i>Aster harveyanus</i>		Bloublommetjie

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Bergia decumbens</i>		
<i>Berkheya radula</i>		Boesmanrietjie
<i>Berkheya zeyheri</i> subsp <i>zeyheri</i>		
<i>Callilepis leptophylla</i> <sup>2</sup>		Wild daisy / Bergbitterbossie
<i>Chaetacanthus costatus</i>		
<i>Chamaecrista comosa</i> var. <i>capricornia</i>		
<i>Cheilanthes hirta</i> <sup>1,2</sup>		Hairy lip fern / Harige lipvaring
<i>Clematis brachiata</i> <sup>2</sup>		Traveler's joy / Klimop
<i>Convolvulus sagittatus</i>		
<i>Cyanotis speciosa</i>		Doll's powder puff / Bloupoerierkwassie
<i>Cymbopogon pospischilii</i> *		Turpentine grass / Terpentyngras
<i>Cyperus obtusiflorus</i> var. <i>obtusiflorus</i>		Witbiesie
<i>Drimia calcarata</i>		
<i>Drimia multisetosa</i>		
<i>Elephantorrhiza elephantina</i> <sup>1,2,3</sup>		Elephant's root / Olifantswortel
<i>Elionurus muticus</i>		Wire grass / Draadgras
<i>Eragrostis chloromelas</i>		Curly leaf / Krulblaar
<i>Eriosema burkei</i> var. <i>burkei</i>		
<i>Eulophia hians</i> var. <i>hians</i>		Ground orchid / Grondorgidee
<i>Felicia muricata</i> subsp <i>muricata</i> <sup>1,2,3</sup>		White Felicia / Blouheuning karooblom
<i>Gazania krebsiana</i> subsp <i>serrulata</i> <sup>3</sup>		Common gazania / Botterblom
<i>Gerbera viridifolia</i>		Griekwateebossie
<i>Gladiolus woodii</i>		
<i>Gleditsia triacanthos</i> *	2	Honey locust / Driedoring, soetpeul
<i>Gnidia capitata</i> <sup>1,2</sup>		Kerrieblom
<i>Graderia subintegra</i>		Wild penstemon
<i>Gymnosporia buxifolia</i> <sup>2</sup>		Spike-thorn / Pendoring
<i>Helichrysum nudifolium</i> var. <i>nudifolium</i> <sup>1,2</sup>		Hottentot's tea / Hottentotstee
<i>Helichrysum rugulosum</i> <sup>2,3</sup>		
<i>Heliotropium amplexicaule</i> *		Blue heliotrope
<i>Hermannia depressa</i> <sup>2,3</sup>		Creeping red Hermannia / Rooi-opslag
<i>Hibiscus aethiopicus</i> var. <i>ovatus</i> <sup>2,3</sup>		Common dwarf Hibiscus
<i>Hilliardiella aristata</i> <sup>1,2</sup>		Silver vernonia
<i>Hilliardiella oligocephala</i> <sup>1,2</sup>		Cape vernonia / Blounaaldetee bossie
<i>Hyparrhenia tamba</i>		Blue thatching grass / Blou tamboekiegras
<i>Hypoxis galpinii</i>		
<i>Hypoxis rigidula</i> var. <i>rigidula</i>		Silver-leaved star flower / Wilde tulp
<i>Indigastrum burkeanum</i>		
<i>Indigofera heterotricha</i>		
<i>Indigofera hilaris</i> var. <i>hilaris</i>		Red indigo bush
<i>Ipomoea bathycolpos</i>		Veldsambreeltjies
<i>Ipomoea oblongata</i> <sup>2</sup>		
<i>Jamesbrittenia aurantiaca</i>		Cape saffron / Saffraanbossie
<i>Justicia anagalloides</i>		
<i>Kohautia amatymbica</i> <sup>2</sup>		Tremble tops
<i>Ledebouria ovatifolia</i>		
<i>Ledebouria revoluta</i> <sup>3</sup>		Common ledebouria
<i>Macledium zeyheri</i> subsp <i>zeyheri</i> <sup>2,3</sup>		Doll's protea
<i>Melinis nerviglumis</i>		Bristle leaf red top / Steekblaarblinkgras
<i>Ocimum obovatum</i> subsp <i>obovatum</i> var <i>obovatum</i> <sup>2,3</sup>		Cat's whiskers / Katsnor
<i>Ornithogalum tenuifolium</i> subsp <i>tenuifolium</i>		Bosui
<i>Parapodium costatum</i>		
<i>Pearsonia sessilifolia</i> subsp <i>sessilifolia</i>		Silwerertjietee
<i>Pellaea calomelanos</i> var. <i>calomelanos</i> <sup>1,2</sup>		Black cliff brake / Swart kransruigtevaring
<i>Pentanisia angustifolia</i>		Wild verbena / Sooibrandbossie
<i>Polygala amatymbica</i>		Dwarf polygala
<i>Polygala hottentotta</i> <sup>2,3</sup>		Small purple broom
<i>Rhynchosia monophylla</i>		

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Rhynchosia totta</i> var. <i>totta</i>		Yellow carpet bean / Tottabossie
<i>Scabiosa columbaria</i> <sup>1,2,3</sup>		Wild scabiosa / Bitterbos
<i>Searsia rigida</i>		Kliptaaibos
<i>Senecio affinis</i>		
<i>Senecio coronatus</i>		Sybossie
<i>Senecio scitrus</i>		
<i>Seriphium plumosum</i>		Bankrupt bush / Bankrotbos
<i>Sisyranchus randii</i>		
<i>Solanum panduriforme</i>		Poison apple / Gifappel
<i>Themeda triandra</i>		Red grass / Rooigras
<i>Thesium</i> sp 1		
<i>Thesium</i> sp2		
<i>Trachyandra saltii</i> var. <i>saltii</i>		
<i>Tulbaghia acutiloba</i>		Wild garlic / Wildeknoffel
<i>Vernonia galpinii</i>		Perskwasbossie
<i>Ziziphus zeyheriana</i> <sup>2</sup>		Dwarf buffalo-thorn / Dwerg-blinkblaar-wag-'n-bietjie

## 6.9 *Eragrostis-Senecio* Moist Grassland

### 6.9.1 Compositional aspects

This study unit consisted of low-lying natural grassland along the drainage lines. Most of the vegetation was burned during winter and most of the grasses had not yet formed inflorescences. Of the 168 plant species recorded on the site 43 were recorded in the *Eragrostis-Senecio* Moist grassland study unit. Of these, 34 were indigenous species. The following number of species in each life form was noted:

LIFE FORM	NUMBER OF SPECIES
Annual & perennial herbaceous species	30
Tree species	1
Shrubs and dwarf shrubs	2
Grasses	7
Geophytes	1
Sedges	1
Succulents	1
Total No of species	43

### 6.9.2 Red- and Orange List species on the study unit

The habitat of this study unit is not suitable for any of the Red List species, but was suitable for the Orange List *Hypoxis hemerocallidea*. None was, however, found.

### 6.9.3 Medicinal and alien species

Six medicinal species and 9 alien species were recorded in this study unit. Of the alien species, two were Category 2 Declared invaders.

### 6.9.4 Sensitivity

Because of its close proximity to the drainage line, the vegetation of this study unit was considered sensitive.





Figure 7: Narrow strip of *Eragrostis-Senecio* Moist Grassland vegetation

Table 6: Plants recorded in the *Eragrostis-Senecio* Moist Grassland vegetation

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Acacia karroo</i> <sup>1,2</sup>		Sweet thorn / Soetdoring
<i>Acalypha angustata</i>	2	Copper leaf / Katpisbossie
<i>Acalypha caperonioides</i> var. <i>caperonioides</i>		
<i>Agave americana</i> *	2	Century plant / Garingboom,
<i>Agrimonia procera</i> *		Agrimony / Geelklits
<i>Asparagus laricinus</i>		Wild asparagus / Katbos
<i>Bergia decumbens</i>		
<i>Berkheya radula</i>		Boesmanrietjie
<i>Bromus catharticus</i> *		Rescue grass / Reddingsgras
<i>Conyza podocephala</i>		
<i>Cynodon dactylon</i>		Couch grass / Kweek
<i>Epilobium hirsutum</i>		
<i>Eragrostis chloromelas</i>		Curly leaf / Krulblaar
<i>Erythrina zeyheri</i>		Plough-breaker / Ploegbreker
<i>Euphorbia striata</i> var. <i>striata</i>		Melkgras
<i>Fuirena pubescens</i>		
<i>Galium capense</i> subsp. <i>garipense</i>		
<i>Gazania krebsiana</i> subsp. <i>serrulata</i> <sup>3</sup>		Common gazania / Botterblom
<i>Harpochloa falx</i>		Caterpillar grass / Ruspergras
<i>Helichrysum nudifolium</i> var. <i>nudifolium</i> <sup>1,2</sup>		Hottentot's tea / Hottentotstee
<i>Helichrysum rugulosum</i> <sup>2,3</sup>		
<i>Helictotrichon turgidulum</i>		Small oats grass / Klein hawergras
<i>Hermannia depressa</i> <sup>2,3</sup>		Creeping red Hermannia / Rooi-opslag
<i>Hilliardiella oligocephala</i> <sup>1,2</sup>		Cape vernonia / Blounaaldetee bossie
<i>Hyparrhenia tamba</i>		Blue thatching grass / Blou tamboekiegras
<i>Hypoxis argentea</i> var. <i>argentea</i>		Small yellow star flower
<i>Imperata cylindrica</i>		Cottonwool grass / Donsgras
<i>Jamesbrittenia aurantiaca</i>		Cape saffron / Saffraanbossie
<i>Medicago sativa</i> *		Lucerne / Lusern
<i>Mirabilis jalapa</i> *		Four o'clock / Vieruurtjie
<i>Nidorella anomala</i>		
<i>Oenothera rosea</i> *		Pink evening primrose / Pienk aandblom
<i>Oenothera stricta</i> subsp. <i>stricta</i> *		Yellow evening primrose / Geelaandblom
<i>Physalis viscosa</i> *		
<i>Plantago lanceolata</i>		Buckhorn plantain / Small weëblaar
<i>Raphanus raphanistrum</i>		Wild radish / Wilderadys
<i>Rhynchosia adenodes</i>		

<i>Senecio affinis</i>		
<i>Senecio erubescens</i> var. <i>crepidifolius</i>		
<i>Senecio isatideus</i>		Dan's cabbage / Blouvléibossie
<i>Tagetes minuta</i> *		Tall khaki weed / Lang kakiebos
<i>Themeda triandra</i>		Red grass / Rooigras
<i>Wahlenbergia denticulata</i> var. <i>transvaalensis</i>		

## 6.10 Wetland vegetation

### 6.10.1 Compositional aspects and Connectivity

This study unit comprised the vegetation of the drainage lines that was very disturbed by the presence of alien species such as *Nasturtium officinale*. A small natural wetland had formed as a result of seepage near the upper boundary of the *Elionurus* – *Eragrostis* grassland. The species diversity of this study unit was low. Of the 168 plant species recorded on the site 26 were recorded in the Wetland vegetation study unit. Of these, 11 were indigenous species. The following number of species in each life form was noted:

LIFE FORM	NUMBER OF SPECIES
Annual & perennial herbaceous species	6
Tree species	9
Shrubs and dwarf shrubs	3
Grasses	3
Geophytes	1
Sedges	4
Total No of species	26

### 6.10.2 Red- and Orange List species on the study unit

The habitat of the drainage lines in this study unit was not suitable for any of the Red List species, but about 15 specimens of the Red List *Trachyandra erythrorrhiza* was found in the the small wetland formed as a result of seepage near the upper boundary of the *Elionurus* – *Eragrostis* grassland (see Annexure C). The habitat was not suitable for *Gnaphalium nelsonii*.

### 6.10.3 Medicinal and alien species

Fourteen of the 40 alien species recorded on the site were found in the Wetland vegetation study unit. Of these, two were Category 1 Declared weeds, five were Category 2 Declared invaders and one was a Category 3 Declared invader. One medicinal species was found in this study unit.

### 6.10.4 Sensitivity

As wetlands form biological filters and drainage lines form corridors for the movement of species, which include pollinators of plant species, this study unit was considered sensitive and should be excluded from development. A buffer of 200 meters should be allowed around the Red List species.



Figure 8: One of the drainage lines in the Wetland vegetation study unit.

Table 7: Plants recorded in the Wetland vegetation

SCIENTIFIC NAME	INV CAT	COMMON NAMES
<i>Acacia decurrens</i> *	2	Green wattle / Groenwattel
<b><i>Arundo donax</i>*</b>	<b>1</b>	<b>Spanish reed / Spaanse riet</b>
<i>Bromus catharticus</i> *		Rescue grass / Reddingsgras
<i>Carex glomerabilis</i>		
<i>Celtis africana</i>		White stinkwood / Witstinkhout
<i>Eleocharis dregeana</i>		Finger sedge
<i>Epilobium hirsutum</i>		
<i>Eucalyptus</i> sp*	2	Gum tree / Bloekom
<i>Fraxinus excelsior</i> *		Common ash
<i>Fuirena pubescens</i>		
<i>Gleditsia triacanthos</i> *	2	Honey locust / Driedoring, soetpeul
<i>Gomphostigma virgatum</i>		River stars / Otterbossie
<i>Imperata cylindrica</i>		Cottonwool grass / Donsgras
<i>Juncus effusus</i>		
<i>Morus alba</i> *	3	Common mulberry / Gewone moerbeï
<i>Nasturtium officinale</i> *	2	Water cress / Bronkhors
<i>Populus deltoides</i> subsp <i>deltoides</i> *		Cottonwood / Vuurhoutjipopulier
<i>Ranunculus multifidus</i>		Common buttercup / Geelbotterblom
<i>Raphanus raphanistrum</i>		Wild radish / Wilderadys
<i>Rubus</i> sp*		Bramble / Braam
<i>Rumex crispus</i> *		Curley dock / Krultongblaar
<i>Salix babylonica</i> var. <i>babylonica</i> *	2	Weeping willow / Treurwilg
<b><i>Sesbania punicea</i>*</b>	<b>1</b>	<b>Red sesbania / Rooisesbania</b>
<i>Trachyandra erythrorrhiza</i>		
<i>Typha capensis</i> <sup>1,2</sup>		Bulrush / Papkuil
<i>Ulmus parvifolia</i> *		Chinese Elm / Fynblaarolm

## 6.11 Pasture

### 6.11.1 Compositional aspects and Connectivity

This study unit consisted of planted pasture dominated by *Medicago sativa* (lucerne). The species diversity of this study unit was very low. Of the 168 plant species recorded on the site five were recorded in the pasture study unit. Of these three were herbaceous species and two were grasses.



### 6.11.2 Red– and Orange List species on the study unit

The habitat of this study unit was not suitable for any of the Red List or Orange List species known to occur in the quarter degree square.

### 6.11.3 Medicinal and alien species

No medicinal species were recorded in this study unit. Three alien species, none of which were declared invaders, were recorded in the Pasture study unit.

### 6.11.4 Sensitivity

The vegetation of this study unit was not considered sensitive.



Figure 9: Lucerne field in the Pasture study unit.

Table 8: Plants recorded in the Pasture study unit

SCIENTIFIC NAME	COMMON NAMES
<i>Hyparrhenia hirta</i>	Common thatching grass / Dekgras
<i>Medicago sativa</i> *	Lucerne / Lusern
<i>Melilotus indicus</i> *	Yellow sweet clover / Geelstinkklawer
<i>Pennisetum clandestinum</i> *	Kikuyu / Kikoejoe
<i>Senecio affinis</i>	

## 6.12 *Hyparrhenia hirta* terraced grassland

### 6.12.1 Compositional aspects

This study unit comprised secondary grassland that had in the past been graded into terraces. This vegetation unit had been burned during winter. A concrete furrow ran parallel to the terraces in the largest portion of this study unit. The species diversity of this study unit was low. Of the 168 plant species recorded on the site 28 were recorded in the *Hyparrhenia hirta* terraced grassland. Of these, 24 were indigenous species. The following number of species in each life form was noted:

LIFE FORM	NUMBER OF SPECIES
Annual & perennial herbaceous species	20
Shrubs and dwarf shrubs	1
Grasses	6
Geophytes	1
Total No of species	28

### 6.12.2 Red- and Orange List species on the study unit

The habitat of this study unit was not suitable for any of the Red List or Orange List species known to occur in the quarter degree square.

### 6.12.3 Medicinal and alien species

Seven medicinal were recorded in this study unit. Four alien species, none of which were declared invaders, were recorded in the *Hyparrhenia hirta* terraced grassland study unit.

### 6.12.4 Sensitivity

From a vegetation point of view this study unit was not considered sensitive. However, a heritage specialist should determine the extent of possible grave sites that exist in the *Hyparrhenia hirta* terraced grassland, according to local lore.



Figure 10: *Hyparrhenia hirta* terraced grassland with concrete furrow.

Table 9: Plants recorded in the *Hyparrhenia hirta* terraced grassland.

SCIENTIFIC NAME	COMMON NAMES
<i>Conyza albida</i> *	Tall fleabane / Vaalskraalhans
<i>Conyza podocephala</i>	
<i>Eragrostis chloromelas</i>	Curly leaf / Krulblaar
<i>Felicia muricata</i> subsp <i>muricata</i> <sup>1,2,3</sup>	White Felicia / Blouheuning karooblom
<i>Gomphocarpus fruticosus</i> subsp <i>fruticosus</i> <sup>1,2</sup>	Milkweed / Melkbos
<i>Helichrysum nudifolium</i> var <i>nudifolium</i> <sup>1,2</sup>	Hottentot's tea / Hottentotstee
<i>Helichrysum rugulosum</i> <sup>2,3</sup>	
<i>Hilliardiella oligocephala</i> <sup>1,2</sup>	Cape vernonia / Blounaaldetee bossie
<i>Hyparrhenia hirta</i>	Common thatching grass / Dekgras
<i>Lactuca inermis</i>	Wild lettuce
<i>Melinis nerviglumis</i>	Bristle leaf red top / Steekblaarblinkgras



SCIENTIFIC NAME	COMMON NAMES
<i>Melinis repens</i> subsp <i>repens</i>	Red top grass
<i>Nemesia fruticans</i>	Wilde leeubekkie
<i>Nidorella anomala</i>	
<i>Nidorella hottentotica</i>	
<i>Ornithogalum tenuifolium</i> subsp <i>tenuifolium</i>	Bosui
<i>Parapodium costatum</i>	
<i>Pennisetum purpureum</i> *	Napier grass / Olifantsgras
<i>Plantago lanceolata</i>	Buckhorn plantain / Small weëblaar
<i>Polygala hottentotta</i> <sup>2,3</sup>	Small purple broom
<i>Scabiosa columbaria</i> <sup>1,2,3</sup>	Wild scabiosa / Bitterbos
<i>Senecio affinis</i>	
<i>Tephrosia semiglabra</i>	
<i>Themeda triandra</i>	Red grass / Rooigras
<i>Verbena aristigera</i> *	Fine-leaved verbena / Fynblaar verbena
<i>Verbena bonariensis</i> *	Purple top / Blouwaterbossie
<i>Vigna unguiculata</i> subsp <i>stenophylla</i>	
<i>Wahlenbergia denticulata</i> var <i>transvaalensis</i>	

<sup>1)</sup> Van Wyk, B-E., Van Oudtshoorn, B. & Gericke, N. 2002.

<sup>2)</sup> Watt, J.M. & Breyer-Brandwijk, M.G. 1962.

<sup>3)</sup> Pooley, E. 1998.

<sup>4)</sup> Van Wyk, B. & Van Wyk P. 1997.

## 7. LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The site was burned during winter and grasses have not yet developed inflorescences, impeding identification of these species. It is assumed that the species diversity of the grassland study units is much higher than that recorded in the survey.

## 8. FINDINGS AND POTENTIAL IMPLICATIONS

The *Elionurus – Eragrostis* grassland that abuts the N3 north of the drainage line was primary grassland and deemed sensitive. The habitat of this grassland was suitable for the orchid *Habenaria bicolor* that flowers in March. A small natural wetland, formed as a result of seepage, occurred near the northern boundary of the *Elionurus – Eragrostis* grassland. A Red List species, *Trachyandra erythorrhiza* was recorded in this small wetland. Development within the recommended buffer zone might destroy the population of this species. A wetland specialist should determine the extent of the wetland and a heritage specialist the number and extent of the graves seen on the site.

No habitat for Red List plants existed on any of the surrounding plots to a distance of 200 m around the study site.

## 9. RECOMMENDED MITIGATION MEASURES

The following mitigation measures are proposed by the specialist:

- Dumping of builders' rubble and other waste in the areas earmarked for exclusion must be prevented, through fencing or other management measures. These areas must be properly managed throughout the lifespan of the project in terms of fire, eradication of exotics etc. to ensure continuous biodiversity.
- All Declared Weeds and invaders must be removed from the site.

The following mitigation measures were developed by GDARD 2012 (Department Of Agriculture And Rural Development, Directorate of Nature Conservation) and are applicable to the study site:

- An appropriate management authority (e.g. the body corporate) that must be contractually bound to implement the Environmental Management Plan (EMP) and Record of Decision (ROD) during the operational phase of the development should be identified and informed of their responsibilities in terms of the EMP and ROD.
- All areas designated as sensitive in a sensitivity mapping exercise should be incorporated into an open space system. Development should be located on the areas of lowest sensitivity.
- Development structures should be clustered as close as possible to existing development.
- The open space system should be managed in accordance with an Ecological Management Plan that complies with the *Minimum Requirements for Ecological Management Plans* and forms part of the EMP.
- The Ecological Management Plan should:
  - o include a fire management programme to ensure persistence of grassland
  - o include an ongoing monitoring and eradication programme for all non-indigenous species, with specific emphasis on invasive and weedy species
  - o include a comprehensive surface runoff and storm water management plan, indicating how all surface runoff generated as a result of the development (during both the construction and operational phases) will be managed (e.g. artificial wetlands / storm water and flood retention ponds) prior to entering any natural drainage system or wetland and how surface runoff will be retained outside of any demarcated buffer/flood zones and subsequently released to simulate natural hydrological conditions
  - o ensure the persistence of all Red and Orange List species
  - o include a monitoring programme for all Red and Orange List species
  - o facilitate/augment natural ecological processes
  - o provide for the habitat and life history needs of important pollinators
  - o minimize artificial edge effects (e.g. water runoff from developed areas & application of chemicals)
  - o include a comprehensive plan for limited recreational development (trails, bird hides etc.) within the open space system
  - o result in a report back to the Directorate of Nature Conservation on an annual basis
- The open space system should be fenced off prior to construction commencing (including site clearing and pegging). All construction-related impacts (including service roads, temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment/building materials/vehicles or any other activity) should be excluded from the open space system. Access of vehicles to the open space system should be prevented and access of people should be controlled, both during the construction and operational phases. Movement of indigenous fauna should however be allowed (i.e. no solid walls, e.g. through the erection of palisade fencing).
- Information boards should be erected within the development to inform residents of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements.
- Only indigenous plant species, preferably species that are indigenous to the natural vegetation of the area, should be used for landscaping in communal areas. As far as possible, plants naturally growing on the development site, but would otherwise be destroyed during clearing for development purposes, should be incorporated into landscaped areas. Forage and host plants required by pollinators should also be planted in landscaped areas.
- In order to minimize artificially generated surface stormwater runoff, total sealing of paved areas such as parking lots, driveways, pavements and walkways should be avoided. Permeable material should rather be utilized for these purposes.

- The crossing of natural drainage systems should be minimized and only constructed at the shortest possible route, perpendicular to the natural drainage system. Where possible, bridge crossings should span the entire stretch of the buffer zone.

## 10. CONCLUSION

To lessen the impact of the proposed development on the vegetation of the site, great care should be taken to group residences on smaller lots in certain areas, rather than spreading them out over large areas. Roads, footpaths, services etc should be constructed with great care.

The *Elionurus – Eragrostis* grassland that abuts the N3 highway north of the drainage line also includes a small natural wetland formed as a result of seepage. A Red List species, *Trachyandra erythorrhiza* was recorded in this small wetland (Annexure C). The *Elionurus – Eragrostis* grassland, the Wetland vegetation and the *Eragrostis-Senecio* Moist grassland vegetation were deemed sensitive and should be excluded from the development and where possible, be connected to other natural grassland areas on the neighbouring properties to facilitate connectivity.

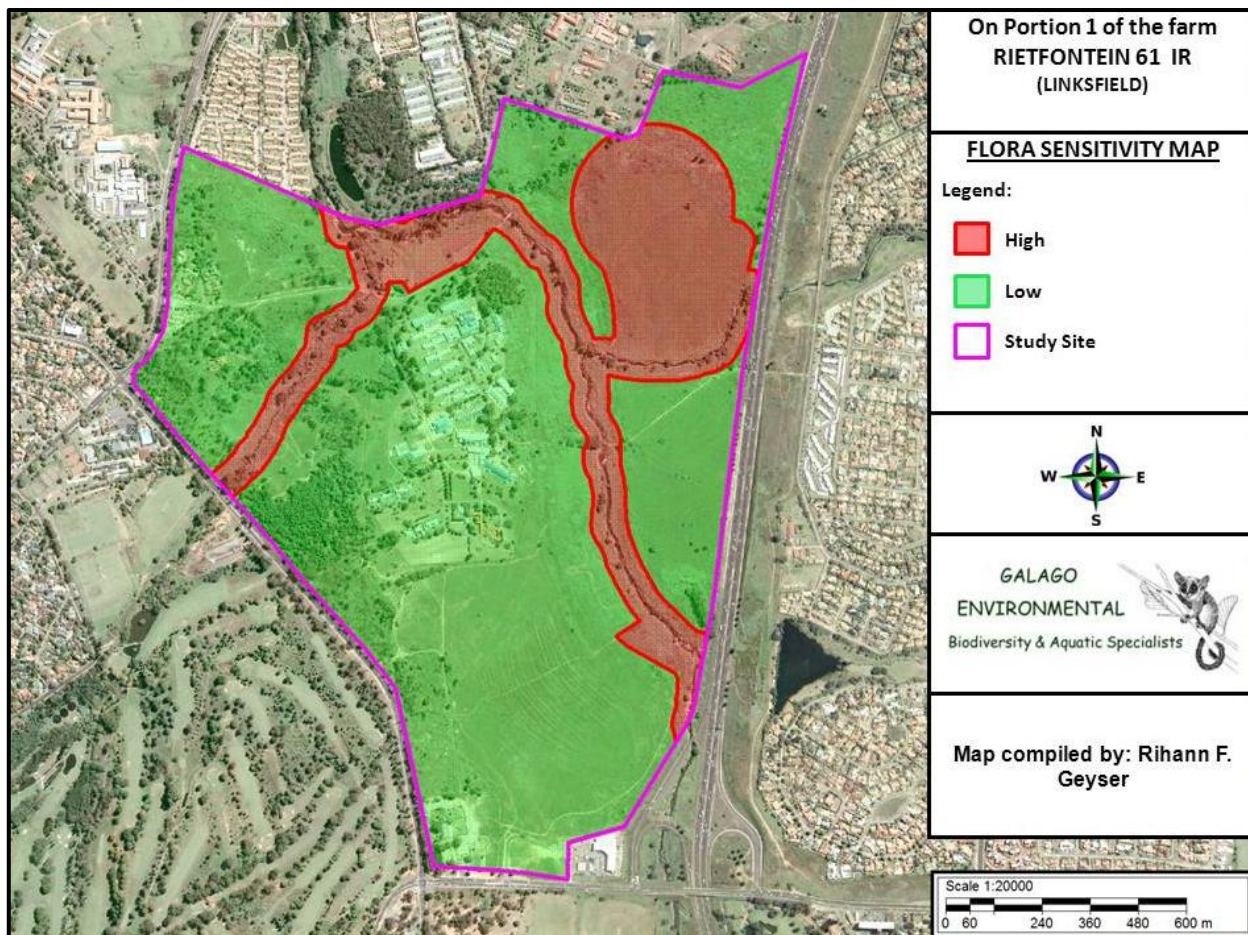


Figure 11: Vegetation sensitivity map

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## ANNEXURE A: Red- and Orange List\* plants of the 2628AA q.d.s.

Species	Flower season	Suitable habitat	Priority group	Conserv status	PRESENT ON SITE
<i>Adromischus umbraticola</i> subsp <i>umbraticola</i>	Sep-Jan	Rock crevices on rocky ridges, usually south-facing, or in shallow gravel on top of rocks, but often in shade of other vegetation.	A2	Near threatened <sup>1</sup>	Habitat not suitable
<i>Callilepis leptophylla</i>	Aug-Jan & May	Grassland or open woodland, often on rocky outcrops or rocky hillslopes.	N/A	Declining <sup>2</sup>	<b>FOUND</b>
<i>Cineraria austrotransvaalensis</i>	Mar-Jun	Among rocks on steep slopes of hills and ridges as well as at the edge of thick bush or under trees.	A3	Near threatened <sup>1</sup>	Habitat not suitable
<i>Cineraria longipes</i>	Mar-May	Grassland, on koppies, amongst rocks and along seep lines exclusively on basalt on south-facing slopes.	A1	Vulnerable <sup>1</sup>	Habitat not suitable
<i>Delosperma purpureum</i>	Nov-Apr	South-facing slopes, grows in shallow soils among quartzitic rocks of crystalline or coglamoratte type in open or broken shade, in grassland with some trees. .	A1	Endangered <sup>1</sup>	Habitat not suitable
<i>Eucomis autumnalis</i>	Nov-Apr	Damp open grassland and sheltered places.	N/A	Declining <sup>2</sup>	<b>Habitat suitable</b>
<i>Gunnera perpensa</i>	Oct-Mar	In cold or cool continually moist localities, mainly along upland streambanks.	N/A	Declining <sup>2</sup>	Habitat not suitable
<i>Habenaria bicolor</i>	Jan-Apr	Well-drained grassland, at about 1600m.	B	Near Threatened <sup>2</sup>	<b>Habitat suitable</b>
<i>Habenaria mossii</i>	Mar-Apr	Open grassland on dolomite or in black sandy soil.	A1	Endangered <sup>1</sup>	Habitat not suitable
<i>Holothrix micrantha</i>	Oct	Terrestrial on grassy cliffs, recorded from 1500 to 1800m.	A1	Endangered <sup>1</sup>	Habitat not suitable
<i>Holothrix randii</i>	Sep-Jan	Grassy slopes & rock ledges, usually southern aspects.	B	Near Threatened <sup>2</sup>	Habitat not suitable
<i>Hypoxis hemerocallidea</i>	Sep-Mar	Occurs in a wide range of habitats Grassland and mixed woodland.	N/A	Declining <sup>2</sup>	<b>FOUND</b>
<i>Khadia beswickii</i>	Jul-Apr	Open areas on shallow surfaces over rocks in grassland.	A1	Vulnerable <sup>1</sup>	Habitat not suitable
<i>Stenostelma umbelluliferum</i>	Sep-Mar	Deep black turf in open woodland mainly in the vicinity of drainage lines.	A3	Near threatened <sup>1</sup>	Habitat not suitable
<i>Trachyandra erythrorrhiza</i>	Sep-Nov	Marshy areas, grassland, usually in black turf marshes.	A3	Near Threatened <sup>1</sup>	<b>FOUND</b>

<sup>1</sup>) global status

<sup>2</sup>) national status

\* Orange listed plants have no priority grouping and are designated 'N/A'

▲ Has been recorded from the farm on which the study site is situated / within 5km of the study site. Should suitable habitat be present, it is highly likely that this species occur on the study site.

## ANNEXURE B: Red List plants for which biodiversity studies were required by GDARD

Species	Flower season	Suitable habitat	Priority group	Conserv status	PRESENT ON SITE
<i>Gnaphalium nelsonii</i>	Oct-Dec	Seasonally wet grasslands	A2	Rare-sparse <sup>1</sup>	Habitat not suitable
<i>Habenaria bicolor</i>	Jan-Apr	Well-drained grassland, at about 1600m.	B	Near Threatened <sup>2</sup>	<b>Habitat suitable</b>
<i>Holothrix micrantha</i>	Oct	Terrestrial on grassy cliffs, recorded from 1500 to 1800m.	A1	Endangered <sup>1</sup>	Habitat not suitable
<i>Trachyandra erythrorrhiza</i>	Sep-Nov	Marshy areas, grassland, usually in black turf marshes.	A3	Near Threatened <sup>1</sup>	<b>FOUND</b>

## ANNEXURE C: Coordinates for the Red List species

*Trachyandra erythrorrhiza*:

S 26° 08' 02,5" / E 28° 07' 48,3"

Confidential

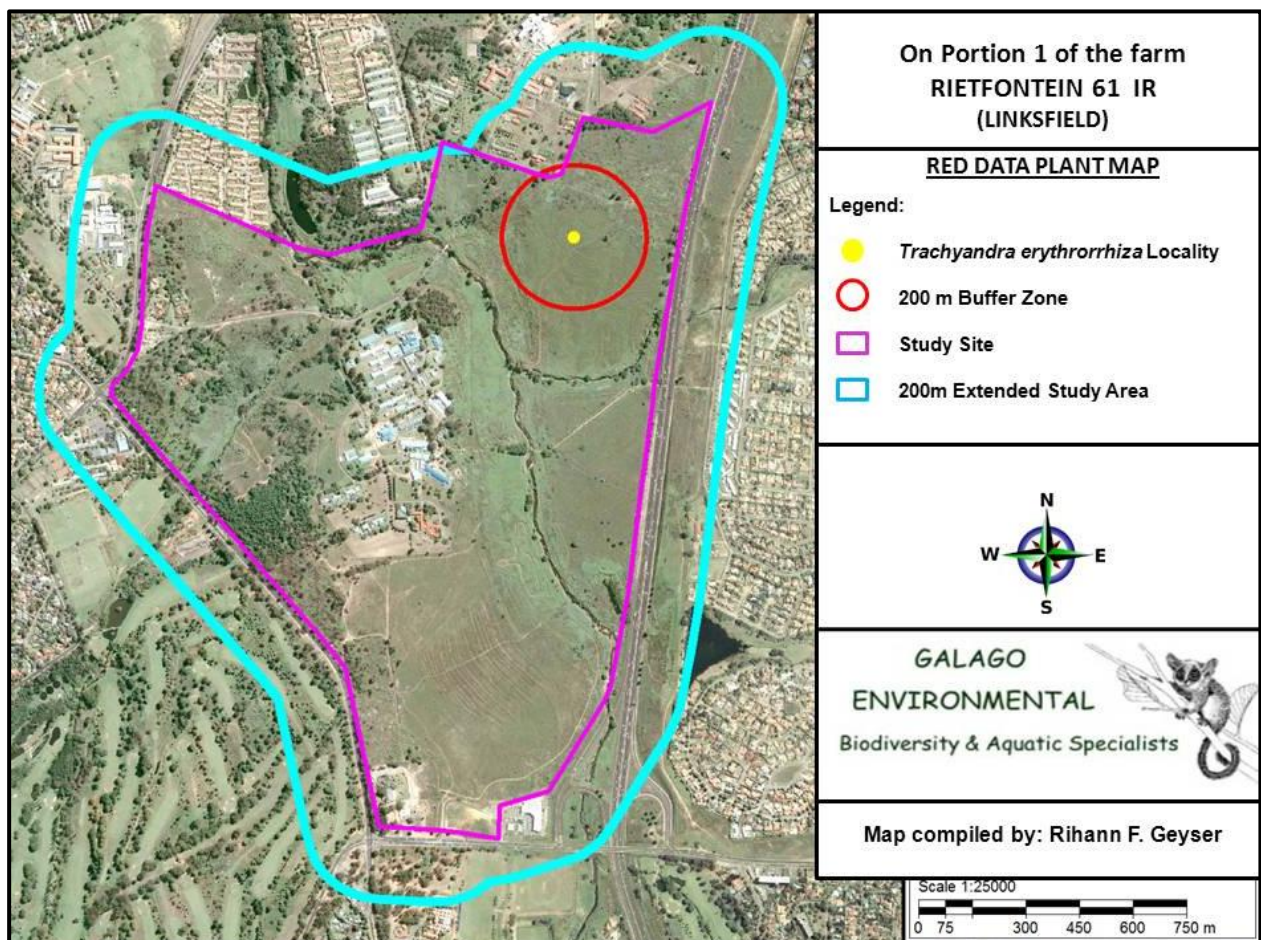


Figure 12: Map showing the locality of the red listed plant and the recommended buffer area